AMC8 Past Paper Collections

Year 2025 — 2000

Updated on: September 8, 2025
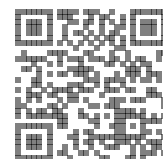
2025	2015	2006
2024	2014	2005
2023	2013	2004
2022	2012	2003
2020	2011	2002
2019	2010	2001
2018	2009	2000
2017	2008	1999
2016	2007	

Answer Keys

	Q1	Q2	Q3	Q4	Q5	Q6	Q7	Q8	Q9	Q10	Q11	Q12	Q13	Q14	Q15	Q16	Q17	Q18	Q19	Q20	Q21	Q22	Q23	Q24	Q25
2020																									
2019	D	E	E	D	B	C	A	E	B	B	D	A	A	C	B	D	B	C	C	D	E	E	B	B	C
2018	A	D	D	C	E	C	B	C	B	C	C	B	A	D	D	C	A	E	C	A	E	B	D	C	E
2017	A	E	C	D	B	D	A	D	D	C	C	D	B	C	D	D	C	B	D	B	A	D	C	D	B
2016	C	A	A	B	E	B	B	C	B	D	B	B	D	A	C	D	D	C	E	A	B	C	C	A	B
2015	A	D	D	E	A	B	E	D	D	B	B	C	D	C	D	B	D	B	A	D	C	C	D	B	C
2014	A	E	B	E	C	D	B	D	D	A	A	B	D	B	C	B	B	D	A	B	A	E	A	C	B
2013	A	D	E	C	E	C	C	C	C	C	D	B	A	C	B	E	B	B	D	C	E	E	B	C	A
2012	E	B	B	C	E	E	B	D	C	D	D	A	C	B	D	C	B	A	C	B	D	D	C	A	C
2011	E	E	D	C	D	D	C	B	E	C	A	B	C	C	D	C	A	D	D	D	C	D	D	A	A
2010	C	D	C	C	B	E	B	D	D	B	B	D	E	C	C	B	D	C	C	A	C	E	B	A	E
2009	E	D	C	B	D	A	C	B	B	D	D	D	B	C	D	D	B	C	C	D	D	D	B	E	E
2008	B	A	A	C	E	D	E	D	D	D	A	C	C	C	B	D	D	E	B	B	C	A	C	C	A
2007	D	E	C	D	B	E	D	B	B	D	D	A	C	C	A	A	C	D	C	A	D	C	B	C	B
2006	D	C	C	A	D	C	B	E	C	A	C	D	D	B	C	E	B	D	D	C	A	D	A	A	B
2005	B	C	D	C	B	C	B	E	D	D	C	D	C	B	C	D	E	C	A	A	C	E	B	B	A
2004	B	B	A	B	D	C	D	B	D	E	C	B	E	C	C	C	D	A	B	D	D	B	D	C	D
2003	E	C	D	C	B	B	A	A	C	E	B	E	B	D	B	D	E	D	C	D	B	C	A	B	C
2002	D	A	C	B	C	A	E	D	B	E	C	B	E	B	E	E	C	B	D	D	E	C	B	B	B
2001	D	D	E	E	C	B	A	E	D	A	C	A	D	C	A	E	B	D	D	A	D	E	D	B	D
2000	B	A	D	E	C	A	B	D	D	E	C	D	C	D	C	C	A	E	C	A	B	C	B	D	B
1999	A	C	D	A	D	E	E	A	C	E	D	B	C	D	D	B	C	E	B	B	B	D	C	D	A
	Q1	Q2	Q3	Q4	Q5	Q6	Q7	Q8	Q9	Q10	Q11	Q12	Q13	Q14	Q15	Q16	Q17	Q18	Q19	Q20	Q21	Q22	Q23	Q24	Q25

Q1. The eight-pointed star, shown in the figure below, is a popular quilting pattern. What percent of the entire grid is covered by the star?
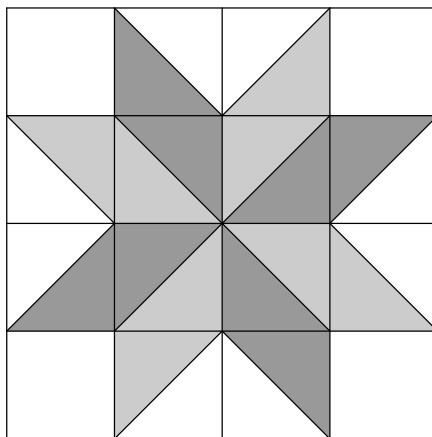

A) 40   **B)** 50   **C)** 60   **D)** 75   **E)** 80

**Q2**. The table below shows the Ancient Egyptian hieroglyphs that were used to represent different numbers.
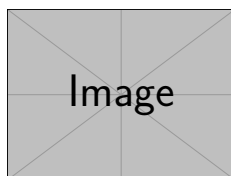
For example, the number 32 was represented by the hieroglyphs ∩∩∩||. What number is represented by the following combination of hieroglyphs?

A) 1,423   **B)** 10,423   **C)** 14,023   **D)** 14,203   **E)** 14,230

Q3. Buffalo Shuffle-o is a card game in which all the cards are distributed evenly among all players at the start of the game. When Annika and 3 of her friends play Buffalo Shuffle-o, each player is dealt 15 cards. Suppose 2 more friends join the next game. How many cards will be dealt to each player?

A) 8   **B)** 9   **C)** 10   **D)** 11   **E)** 12

Q4. Lucius is counting backward by 7s. His first three numbers are 100, 93, and 86. What is his 10th number?

A) 30   **B)** 37   **C)** 42   **D)** 44   **E)** 47

Q5. Betty drives a truck to deliver packages in a neighborhood whose street map is shown below. Betty starts at the factory (labled F) and drives to location A, then B, then C, before returning to F. What is the shortest distance, in blocks, she can drive to complete the route?
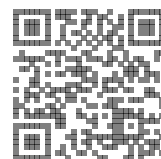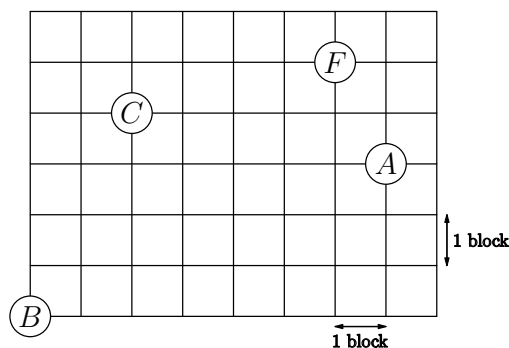
A) 20   **B)** 22   **C)** 24   **D)** 26   **E)** 28

Q6. Sekou writes the numbers $15, 16, 17, 18, 19$. After he erases one of his numbers, the sum of the remaining four numbers is a multiple of 4. Which number did he erase?

    A) 15   **B)** 16   **C)** 17   **D)** 18   **E)** 19

Q7. On the most recent exam on Prof. Xochi's class,

5 students earned a score of at least 95%
13 students earned a score of at least 90%
27 students earned a score of at least 85%
50 students earned a score of at least 80%

How many students earned a score of at least 80% and less than 90%?

    A) 8   **B)** 14   **C)** 22   **D)** 37   **E)** 45

Q8. Isaiah cuts open a cardboard cube along some of its edges to form the flat shape shown on the right, which has an area of 18 square centimeters. What is the volume of the cube in cubic centimeters?

    A) $3\sqrt{3}$ **B)** 6   **C)** 9   **D)** $6\sqrt{3}$ **E)** $9\sqrt{3}$

Q9. Ningli looks at the 6 pairs of numbers directly across from each other on a clock. She takes the average of each pair of numbers. What is the average of the resulting 6 numbers?
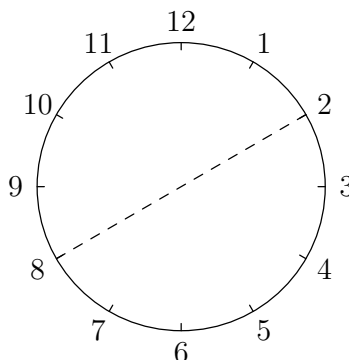
    A) 5   **B)** 6.5   **C)** 8   **D)** 9.5   **E)** 12

Q10. In the figure below, $ABCD$ is a rectangle with sides of length $AB = 5$ inches and $AD = 3$ inches. Rectangle $ABCD$ is rotated $90°$ clockwise around the midpoint of side DC to give a second rectangle. What is the total area, in square inches, covered by the two overlapping rectangles?
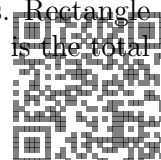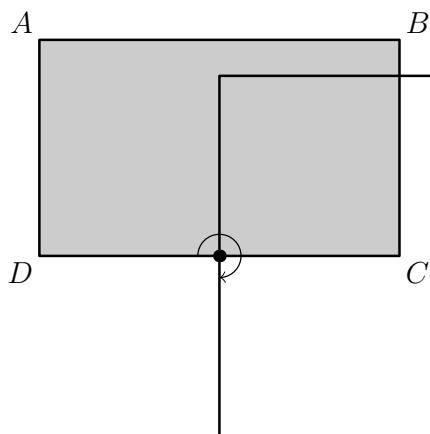
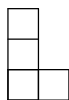**A)** 21   **B)** 22.25   **C)** 23   **D)** 23.75   **E)** 25

Q11. A *tetromino* consists of four squares connected along their edges. There are five possible tetromino shapes, I, O, L, T, and S, shown below, which can be rotated or flipped over. Three tetrominoes are used to completely cover a 3×4 rectangle. At least one of the tiles is an S tile. What are the other two tiles?
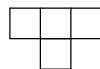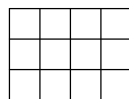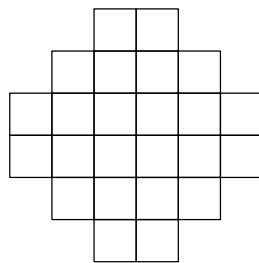

A) I and L **B)** I and T **C)** L and L **D)** L and S **E)** O and T

Q12. The region shown below consists of 24 squares, each with side length 1 centimeter. What is the area, in square centimeters, of the largest circle that can fit inside the region, possibly touching the boundaries?
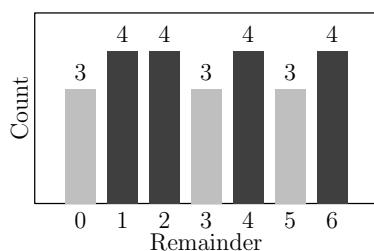

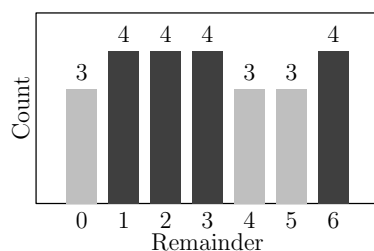**A)** 3π **B)** 4π **C)** 5π **D)** 6π **E)** 8π

Q13. Each of the even numbers $2, 4, 6, \ldots, 50$ is divided by 7. The remainders are recorded. Which histogram displays the number of times each remainder occurs?
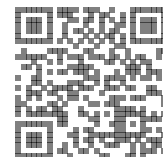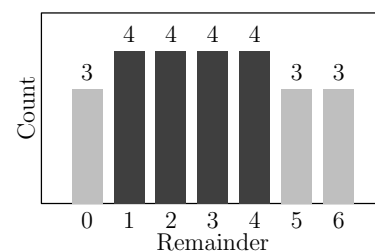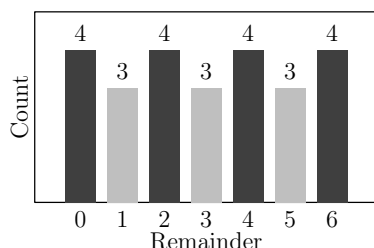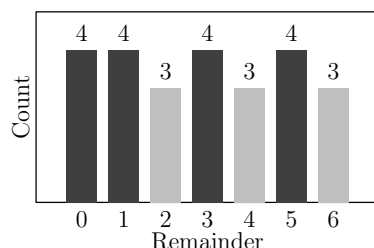
(A)

(B)

(C)

(D)

(E)

Q14. A number N is inserted into the list $2, 6, 7, 7, 28$. The mean is now twice as great as the median. What is N?

    A) 7   **B)** 14   **C)** 20   **D)** 28   **E)** 34

Q15. Kei draws a 6-by-6 grid. He colors 13 of the unit squares silver and the remaining squares gold. Kei then folds the grid in half vertically, forming pairs of overlapping unit squares. Let m and M equal the least and greatest possible number of gold-on-gold pairs, respectively. What is the value of $m + M$?
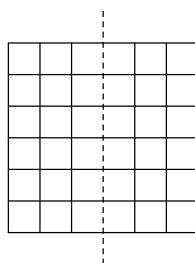

    A) 12   **B)** 14   **C)** 16   **D)** 18   **E)** 20

Q16. Five distinct integers from 1 to 10 are chosen, and five distinct integers from 11 to 20 are chosen. No two numbers differ by exactly 10. What is the sum of the ten chosen numbers?

    A) 95   **B)** 100   **C)** 105   **D)** 110   **E)** 115

Q17. In the land of Markovia, there are three cities: A, B, and C. There are 100 people who live in A, 120 who live in B, and 160 who live in C. Everyone works in one of the three cities, and a person may work in the same city where they live. In the figure below, an arrow pointing from one city to another is labeled with the fraction of people living in the first city who work in the second city. (For example, $\frac{1}{4}$ of the people who live in A work in B). How many people work in A?
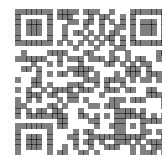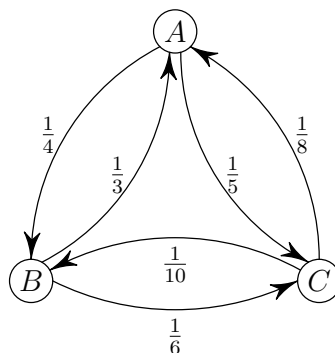
A) 55 **B)** 60 **C)** 85 **D)** 115 **E)** 160

Q18. The circle shown below on the left has a radius of 1 unit. The region between the circle and the inscribed square is shaded. In the circle shown on the right, one quarter of the region between the circle and the inscribed square is shaded. The shaded regions in the two circles have the same area. What is the radius R, in units, of the circle on the right?
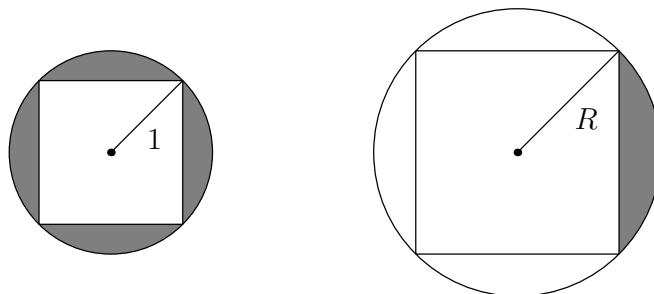

A) $\sqrt{2}$ **B)** 2 **C)** $2\sqrt{2}$ **D)** 4 **E)** $4\sqrt{2}$

Q19. Two towns, A and B, are connected by a straight road, 15 miles long. Traveling from town A to town B, the speed limit changes every 5 miles: from 25 to 40 to 20 miles per hour (mph). Two cars, one at town A and one at town B, start moving toward each other at the same time. They drive at exactly the speed limit in each portion of the road. How far from town A, in miles, will the two cars meet?
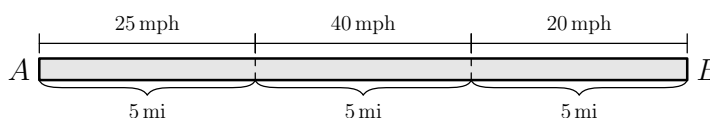


A) 7.75 **B)** 8 **C)** 8.25 **D)** 8.5 **E)** 8.75

Q20. Sarika, Dev, and Rajiv are sharing a large block of cheese. They take turns cutting off half of what remains and eating it: first Sarika eats half of the cheese, then Dev eats half of the remaining half, then Rajiv eats half of what remains, then back to Sarika, and so on. They stop when the cheese is too small to see. About what fraction of the original block of cheese does Sarika eat in total?

A) $\frac{4}{7}$ **B)** $\frac{3}{5}$ **C)** $\frac{2}{3}$ **D)** $\frac{3}{4}$ **E)** $\frac{7}{8}$

Q21. The Konigsberg School has assigned grades 1 through 7 to pods A through G, one grade per pod. Some of the pods are connected by walkways, as shown in the figure below. The school noticed that each pair of connected pods has been assigned grades differing by 2 or more grade levels. (For example, grades 1 and 2 will not be in pods directly connected by a walkway). What is the sum of the grade levels assigned to pods C, E, and F?
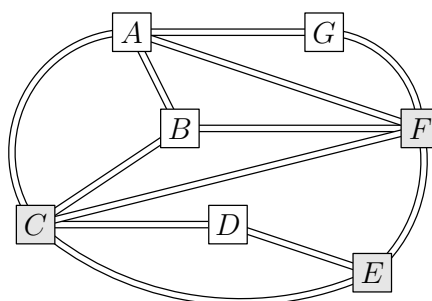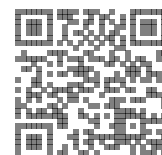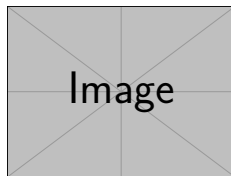

A) 12 **B)** 13 **C)** 14 **D)** 15 **E)** 16

Q22. A classroom has a row of 35 coat hooks. Paulina likes coats to be equally spaced, so that there is the same number of empty hooks before the first coat, after the last coat, and between every coat and the next one. Suppose there is at least 1 coat and at least 1 empty hook. How many different numbers of coats can satisfy Paulina's pattern?


A) 2 **B)** 4 **C)** 5 **D)** 7 **E)** 9

Q23. How many four-digit numbers have all three of the following properties?

(a) The tens and ones digit are both 9.

(b) The number is 1 less than a perfect square.

(c) The number is the product of exactly two prime numbers.

A) 0 **B)** 1 **C)** 2 **D)** 3 **E)** 4

Q24. In trapezoid $ABCD$, angles B and C measure 60° and $AB = DC$. The side lengths are all positive integers, and the perimeter of $ABCD$ is 30 units. How many non-congruent trapezoids satisfy all of these conditions?
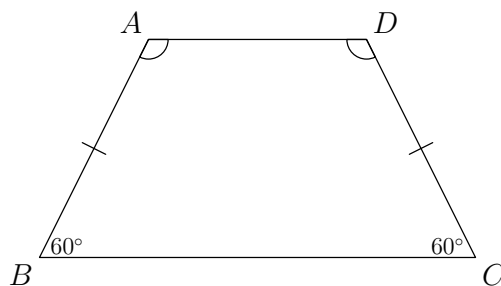
A) 0 **B)** 1 **C)** 2 **D)** 3 **E)** 4

Q25. Makayla finds all the possible ways to draw a path in a 5×5 diamond-shaped grid. Each path starts at the bottom of the grid and ends at the top, always moving one unit northeast or northwest. She computes the area of the region between each path and the right side of the grid. Two examples are shown in the figures below. What is the sum of the areas determined by all possible paths?

area = 11   area = 13
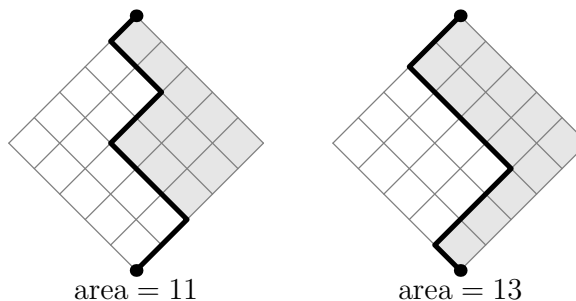
A) 2520 **B)** 3150 **C)** 3840 **D)** 4730 **E)** 5050
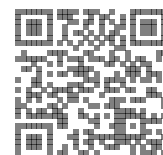
Q1. What is the ones digit of
$$222{,}222 - 22{,}222 - 2{,}222 - 222 - 22 - 2?$$

A) 0   **B)** 2   **C)** 4   **D)** 6   **E)** 8

Q2. What is the value of this expression in decimal form?

$$\frac{44}{11} + \frac{110}{44} + \frac{44}{1100}$$

A) 6.4   **B)** 6.504   **C)** 6.54   **D)** 6.9   **E)** 6.94

Q3. Four squares of side length $4, 7, 9,$ and 10 are arranged in increasing size order so that their left edges and bottom edges align. The squares alternate in color white-gray-white-gray, respectively, as shown in the figure. What is the area of the visible gray region in square units?
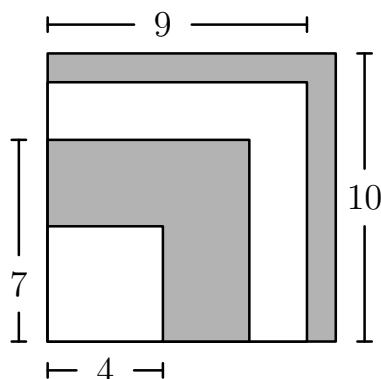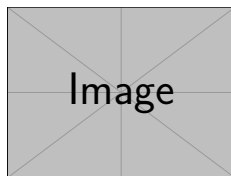

A) 42   **B)** 45   **C)** 49   **D)** 50   **E)** 52

Q4. When Yunji added all the integers from 1 to 9, she mistakenly left out a number. Her sum turned out to be a square number. What number did Yunji leave out?

A) 5   **B)** 6   **C)** 7   **D)** 8   **E)** 9

Q5. Aaliyah rolls two standard 6-sided dice. She notices that the product of the two numbers rolled is a multiple of 6. Which of the following integers cannot be the sum of the two numbers?

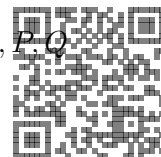**A)** 5   **B)** 6   **C)** 7   **D)** 8   **E)** 9

Q6. Sergei skated around an ice rink, gliding along different paths. The gray lines in the figures below show four of the paths labeled P, Q, R, and S. What is the sorted order of the four paths from shortest to longest?


**A)** P, Q, R, S **B)** P, R, S, Q **C)** Q, S, P, R **D)** R, P, S, Q **E)** R, S, P, Q

Q7. A 3×7 rectangle is covered without overlap by 3 shapes of tiles: 2×2, 1×4, and 1×1, shown below. What is the minimum possible number of 1×1 tiles used?
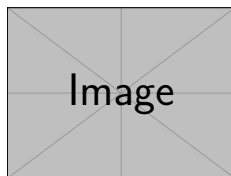
A) 1 　　　　**B)** 2 　　　　**C)** 3 　　　　**D)** 4 　　　　**E)** 5

Q8. On Monday Taye has \$2. Every day, he either gains \$3 or doubles the amount of money he had on the previous day. How many different dollar amounts could Taye have on Thursday, 3 days later?

A) 3 　　　　**B)** 4 　　　　**C)** 5 　　　　**D)** 6 　　　　**E)** 7

Q9. All the marbles in Maria's collection are red, green, or blue. Maria has half as many red marbles as green marbles and twice as many blue marbles as green marbles. Which of the following could be the total number of marbles in Maria's collection?

A) 24 　　　　**B)** 25 　　　　**C)** 26 　　　　**D)** 27 　　　　**E)** 28

Q10. In January 1980 the Moana Loa Observation recorded carbon dioxide (CO_2) levels of 338 ppm (parts per million). Over the years the average CO_2 reading has increased by about 1.515 ppm each year. What is the expected CO_2 level in ppm in January 2030? Round your answer to the nearest integer.

A) 399 　　　　**B)** 414 　　　　**C)** 420 　　　　**D)** 444 　　　　**E)** 459

Q11. The coordinates of $\triangle ABC$ are $A(5,7)$, $B(11,7)$, and $C(3,y)$, with $y > 7$. The area of $\triangle ABC$ is 12. What is the value of y?

$C(3,y)$

$A(5,7)$　　　　　　$B(11,7)$
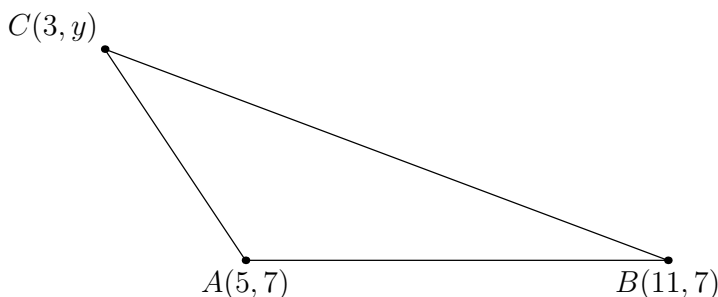
A) 8 　　　　**B)** 9 　　　　**C)** 10 　　　　**D)** 11 　　　　**E)** 12

Q12. Rohan keeps a total of 90 guppies in 4 fish tanks.

There is 1 more guppy in the 2nd tank than the 1st tank. There are 2 more guppies in the 3rd tank than the 2nd tank. There are 3 more guppies in the 4th tank than the 3rd tank. How many guppies are in the 4th tank?

A) 20 　　　　**B)** 21 　　　　**C)** 23 　　　　**D)** 24 　　　　**E)** 26

Q13. Buzz Bunny is hopping up and down a set of stairs, one step at a time. In how many ways can Buzz Bunny start on the ground, make a sequence of 6 hops, and end up back on the ground? (For example, one sequence of hops is up-up-down-down-up-down.)
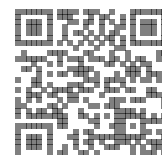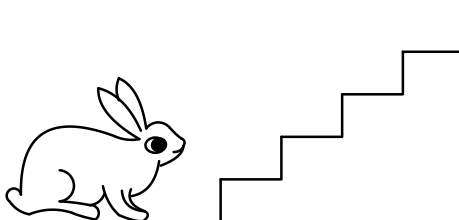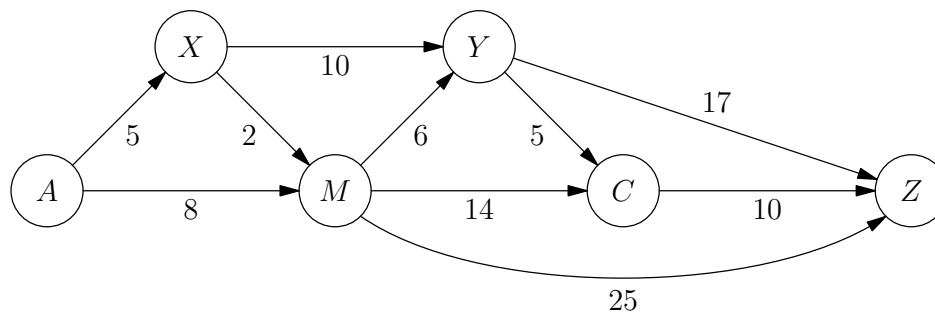
A) 4   **B)** 5   **C)** 6   **D)** 8   **E)** 12

Q14. What is the distance of the shortest route from A to Z?

A) 28   **B)** 29   **C)** 30   **D)** 31   **E)** 32

Q15. Let the letters F, L, Y, B, U, G represent distinct digits. Suppose $\underline{F}\,\underline{L}\,\underline{Y}\,\underline{F}\,\underline{L}\,\underline{Y}$ is the GREATEST number that satisfies the equation

$$8 \cdot \underline{F}\,\underline{L}\,\underline{Y}\,\underline{F}\,\underline{L}\,\underline{Y} = \underline{B}\,\underline{U}\,\underline{G}\,\underline{B}\,\underline{U}\,\underline{G}.$$

What is the value of $\underline{F}\,\underline{L}\,\underline{Y} + \underline{B}\,\underline{U}\,\underline{G}$?

A) 1089   **B)** 1098   **C)** 1107   **D)** 1116   **E)** 1125

Q16. Minh enters the numbers 1 through 81 into the cells of a 9×9 grid in some order. She calculates the product of the numbers in each row and column. What is the least number of rows and columns that could have a product divisible by 3?

A) 8   **B)** 9   **C)** 10   **D)** 11   **E)** 12

Q17. A chess king is said to attack all squares one step away from it (basically any square right next to it in any direction), horizontally, vertically, or diagonally. For instance, a king on the center square of a 3 x 3 grid attacks all 8 other squares, as shown below. Suppose a white king and a black king are placed on different squares of 3 x 3 grid so that they do not attack each other. In how many ways can this be done?
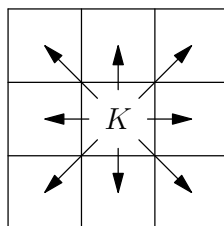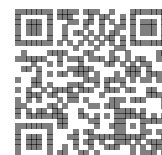
A) 20   **B)** 24   **C)** 27   **D)** 28   **E)** 32

Q18. Three concentric circles centered at O have a radius of $1, 2,$ and 3. Points B and C lie on the largest circle. The region between the two smaller circles is shaded, as is the portion of the region between the two larger circles bounded by central angle BOC, as shown in the figure below. Suppose the shaded and unshaded regions are equal in area. What is the measure of $\angle BOC$ in degrees?
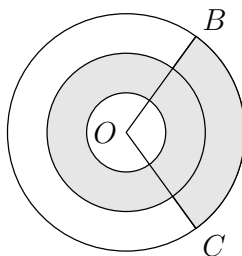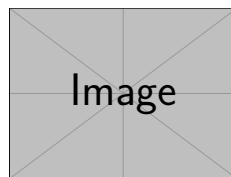
A) 108 **B)** 120 **C)** 135 **D)** 144 **E)** 150

Q19. Jordan owns 15 pairs of sneakers. Three fifths of the pairs are red and the rest are white. Two thirds of the pairs are high-top and the rest are low-top. The red high-top sneakers make up a fraction of the collection. What is the least possible value of this fraction?

A) 0 **B)** $\dfrac{1}{5}$ **C)** $\dfrac{4}{15}$ **D)** $\dfrac{1}{3}$ **E)** $\dfrac{2}{5}$

Q20. Any three vertices of the cube $PQRSTUVW$, shown in the figure below, can be connected to form a triangle. (For example, vertices P, Q, and R can be connected to form $\triangle PQR$.) How many of these triangles are equilateral and contain P as a vertex?
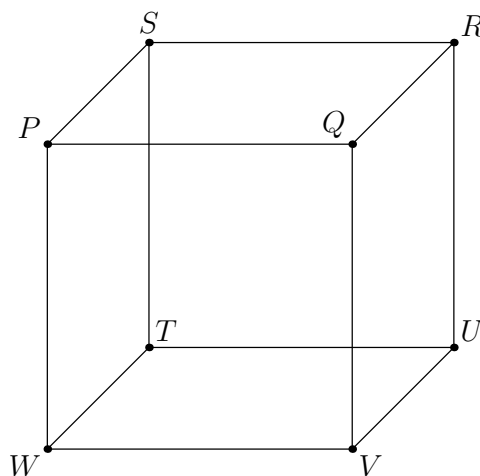
A) 0 **B)** 1 **C)** 2 **D)** 3 **E)** 6

Q21. A group of frogs (called an army) is living in a tree. A frog turns green when in the shade and turns yellow when in the sun. Initially, the ratio of green to yellow frogs was $3 : 1$. Then 3 green frogs moved to the sunny side and 5 yellow frogs moved to the shady side. Now the ratio is $4 : 1$. What is the difference between the number of green frogs and the number of yellow frogs now?
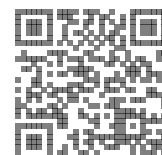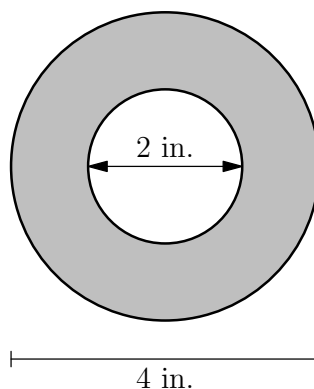
A) 10 **B)** 12 **C)** 16 **D)** 20 **E)** 24

Q22. A roll of tape is 4 inches in diameter and is wrapped around a ring that is 2 inches in diameter. A cross section of the tape is shown in the figure below. The tape is 0.015 inches thick. If the tape is completely unrolled, approximately how long would it be? Round your answer to the nearest 100 inches.
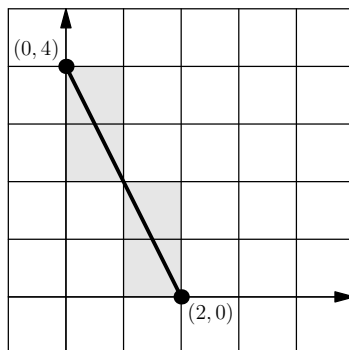
A) 300　　　**B)** 600　　　**C)** 1200　　　**D)** 1500　　　**E)** 1800

Q23. Rodrigo has a very large sheet of graph paper. First he draws a line segment connecting point $(0, 4)$ to point $(2, 0)$ and colors the 4 cells whose interiors intersect the segment, as shown below. Next Rodrigo draws a line segment connecting point $(2000, 3000)$ to point $(5000, 8000)$. How many cells will he color this time?


A) 6000　　　**B)** 6500　　　**C)** 7000　　　**D)** 7500　　　**E)** 8000

Q24. Jean has made a piece of stained glass art in the shape of two mountains, as shown in the figure below. One mountain peak is 8 feet high while the other peak is 12 feet high. Each peak forms a 90° angle, and the straight sides form a 45° angle with the ground. The artwork has an area of 183 square feet. The sides of the mountain meet at an intersection point near the center of the artwork, h feet above the ground. What is the value of h?
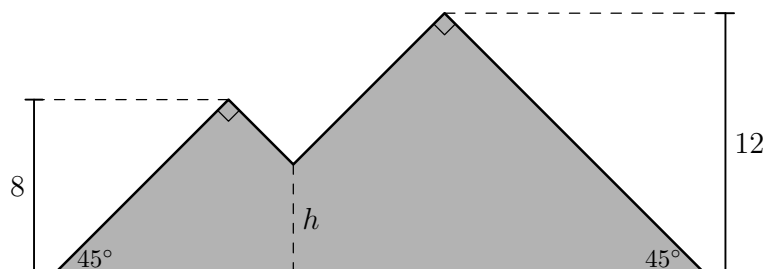
A) 4　　　**B)** 5　　　**C)** $4\sqrt{2}$　　　**D)** 6　　　**E)** $5\sqrt{2}$

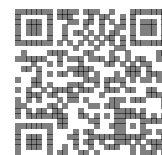**Q25**. A airplane has 4 rows of seats with 3 seats in each row. Eight passengers have boarded the plane and are distributed randomly among the seats. A married couple is next to board. What is the probability there will be 2 adjacent seats in the same row for the couple?
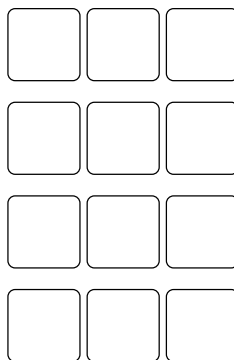
A) $\dfrac{8}{15}$　　　**B)** $\dfrac{32}{55}$　　　**C)** $\dfrac{20}{33}$　　　**D)** $\dfrac{34}{55}$　　　**E)** $\dfrac{8}{11}$

Q1. What is the value of $(8 \times 4 + 2) - (8 + 4 \times 2)$?

    A) 0   **B)** 6   **C)** 10   **D)** 18   **E)** 24

Q2. A square piece of paper is folded twice into four equal quarters, as shown below, then cut along the dashed line. When unfolded, the paper will match which of the following figures?

(A)   **(B)**   **(C)**

(D)   **(E)**

Q3. Wind chill is a measure of how cold people feel when exposed to wind outside. A good estimate for wind chill can be found using this calculation

$$(\text{wind chill}) = (\text{air temperature}) - 0.7 \times (\text{wind speed}),$$

where temperature is measured in degrees Fahrenheit (°F) and the wind speed is measured in miles per hour (mph). Suppose the air temperature is 36°F and the wind speed is 18 mph. Which of the following is closest to the approximate wind chill?

    A) 18   **B)** 23   **C)** 28   **D)** 32   **E)** 35

Q4. The numbers from 1 to 49 are arranged in a spiral pattern on a square grid, beginning at the center. The first few numbers have been entered into the grid below. Consider the four numbers that will appear in the shaded squares, on the same diagonal as the number 7. How many of these four numbers are prime?

A) 0 **B)** 1 **C)** 2 **D)** 3 **E)** 4

Q5. A lake contains 250 trout, along with a variety of other fish. When a marine biologist catches and releases a sample of 180 fish from the lake, 30 are identified as trout. Assume that the ratio of trout to the total number of fish is the same in both the sample and the lake. How many fish are there in the lake?

A) 1250 **B)** 1500 **C)** 1750 **D)** 1800 **E)** 2000

Q6. The digits $2, 0, 2,$ and 3 are placed in the expression below, one digit per box. What is the maximum possible value of the expression?

A) 0 **B)** 8 **C)** 9 **D)** 16 **E)** 18

Q7. A rectangle, with sides parallel to the x-axis and y-axis, has opposite vertices located at $(15, 3)$ and $(16, 5)$. A line is drawn through points $A(0, 0)$ and $B(3, 1)$. Another line is drawn through points $C(0, 10)$ and $D(2, 9)$. How many points on the rectangle lie on at least one of the two lines?
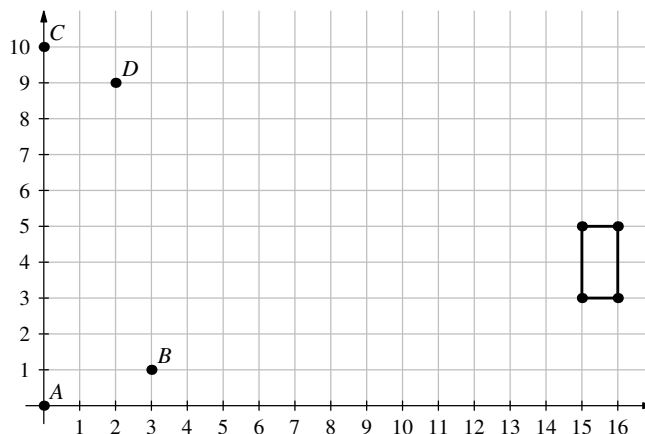

A) 0 **B)** 1 **C)** 2 **D)** 3 **E)** 4

Q8. Lola, Lolo, Tiya, and Tiyo participated in a ping pong tournament. Each player competed against each of the other three players exactly twice. Shown below are the win-loss records for the players. The numbers 1 and 0 represent a win or loss, respectively. For example, Lola won five matches and lost the fourth match. What was Tiyo's win-loss record?

Player	Result
Lola	111011
Lolo	101010
Tiya	010100
Tiyo	??????

A) 000101 **B)** 001001 **C)** 010000 **D)** 010101 **E)** 011000

Q9. Malaika is skiing on a mountain. The graph below shows her elevation, in meters, above the base of the mountain as she skis along a trail. In total, how many seconds does she spend at an elevation between 4 and 7 meters?
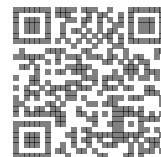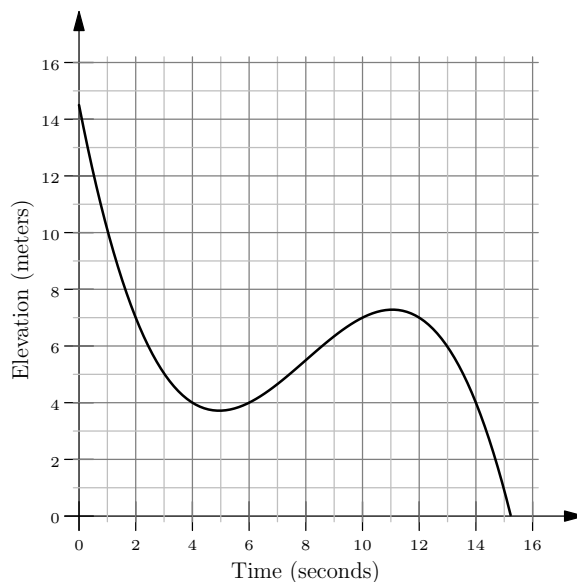
**A)** 6   **B)** 8   **C)** 10   **D)** 12   **E)** 14

Q10. Harold made a plum pie to take on a picnic. He was able to eat only $\frac{1}{4}$ of the pie, and he left the rest for his friends. A moose came by and ate $\frac{1}{3}$ of what Harold left behind. After that, a porcupine ate $\frac{1}{3}$ of what the moose left behind. How much of the original pie still remained after the porcupine left?

A) $\frac{1}{12}$ **B)** $\frac{1}{6}$ **C)** $\frac{1}{4}$ **D)** $\frac{1}{3}$ **E)** $\frac{5}{12}$

Q11. NASA's Perseverance Rover was launched on July 30, 2020. After traveling 292,526,838 miles, it landed on Mars in Jezero Crater about 6.5 months later. Which of the following is closest to the Rover's average interplanetary speed in miles per hour?

A) 6,000   **B)** 12,000   **C)** 60,000   **D)** 120,000   **E)** 600,000

Q12. The figure below shows a large white circle with a number of smaller white and shaded circles in its interior. What fraction of the interior of the large white circle is shaded?
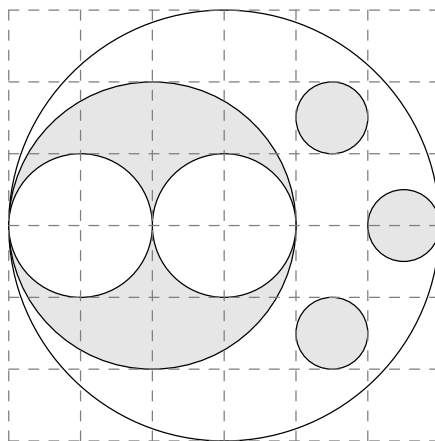
A) $\frac{1}{4}$ **B)** $\frac{11}{36}$ **C)** $\frac{1}{3}$ **D)** $\frac{19}{36}$ **E)** $\frac{5}{9}$

Q13. Along the route of a bicycle race, 7 water stations are evenly spaced between the start and finish lines, as shown in the figure below. There are also 2 repair stations evenly spaced between the start and finish lines. The 3rd water station is located 2 miles after the 1st repair station. How long is the race in miles?

非淡泊无以明志，非宁静无以致远。
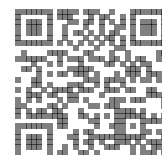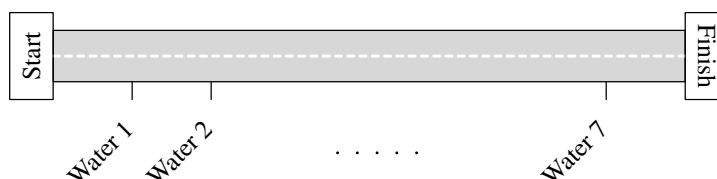
A) 8   **B)** 16   **C)** 24   **D)** 48   **E)** 96

Q14. Nicolas is planning to send a package to his friend Anton, who is a stamp collector. To pay for the postage, Nicolas would like to cover the package with a large number of stamps. Suppose he has a collection of 5-cent, 10-cent, and 25-cent stamps, with exactly 20 of each type. What is the greatest number of stamps Nicolas can use to make exactly $7.10 in postage? (Note: The amount $7.10 corresponds to 7 dollars and 10 cents. One dollar is worth 100 cents).

    A) 45   **B)** 46   **C)** 51   **D)** 54   **E)** 55

Q15. Viswam walks half a mile to get to school each day. His route consists of 10 city blocks of equal length and he takes 1 minute to walk each block. Today, after walking 5 blocks, Viswam discovers he has to make a detour, walking 3 blocks of equal length instead of 1 block to reach the next corner. From the time he starts his detour, at what speed, in mph, must he walk, in order to get to school at his usual time?
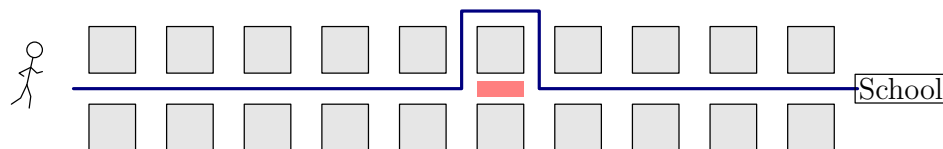
    A) 4   **B)** 4.2   **C)** 4.5   **D)** 4.8   **E)** 5

Q16. The letters P, Q, and R are entered into a 20×20 table according to the pattern shown below. How many Ps, Qs, and Rs will appear in the completed table?

$\vdots$	$\vdots$	$\vdots$	$\vdots$	$\vdots$	$\ddots$
Q	R	P	Q	R	$\cdots$
P	Q	R	P	Q	$\cdots$
R	P	Q	R	P	$\cdots$
Q	R	P	Q	R	$\cdots$
P	Q	R	P	Q	$\cdots$

    A) 132 Ps, 134 Qs, 134 Rs
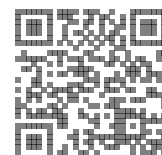
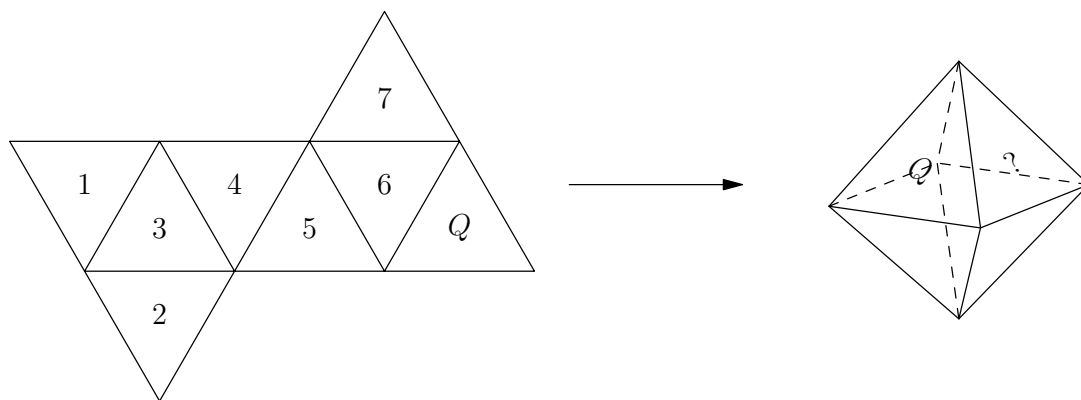   **B)** 133 Ps, 133 Qs, 134 Rs

    C) 133 Ps, 134 Qs, 133 Rs

    D) 134 Ps, 132 Qs, 134 Rs

    E) 134 Ps, 133 Qs, 133 Rs

Q17. A regular octahedron has eight equilateral triangle faces with four faces meeting at each vertex. Jun will make the regular octahedron shown on the right by folding the piece of paper shown on the left. Which numbered face will end up to the right of Q?

A) 1   **B)** 2   **C)** 3   **D)** 4   **E)** 5

Q18. Greta Grasshopper sits on a long line of lily pads in a pond. From any lily pad, Greta can jump 5 pads to the right or 3 pads to the left. What is the fewest number of jumps Greta must make to reach the lily pad located 2023 pads to the right of her starting point?

    A) 405   **B)** 407   **C)** 409   **D)** 411   **E)** 413

Q19. An equilateral triangle is placed inside a larger equilateral triangle so that the region between them can be divided into three congruent trapezoids, as shown below. The side length of the inner triangle is $\frac{2}{3}$ the side length of the larger triangle. What is the ratio of the area of one trapezoid to the area of the inner triangle?
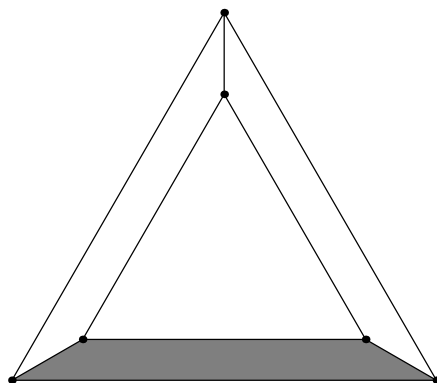
    A) $1:3$ **B)** $3:8$ **C)** $5:12$ **D)** $7:16$ **E)** $4:9$

Q20. Two integers are inserted into the list $3, 3, 8, 11, 28$ to double its range. The mode and median remain unchanged. What is the maximum possible sum of the two additional numbers?

   **A)** 56   **B)** 57   **C)** 58   **D)** 60   **E)** 61

Q21. Alina writes the numbers $1, 2, \ldots, 9$ on separate cards, one number per card. She wishes to divide the cards into 3 groups of 3 cards so that the sum of the numbers in each group will be the same. In how many ways can this be done?
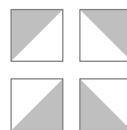
    A) 0   **B)** 1   **C)** 2   **D)** 3   **E)** 4
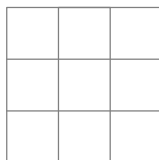
Q22. In a sequence of positive integers, each term after the second is the product of the previous two terms. The sixth term is 4000. What is the first term?
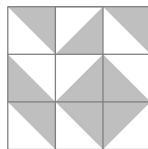
    A) 1   **B)** 2   **C)** 4   **D)** 5   **E)** 10

Q23. Each square in a 3×3 grid is randomly filled with one of the 4 gray and white tiles shown below on the right.
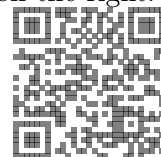
What is the probability that the tiling will contain a large gray diamond in one of the smaller 2×2 grids? Below is an example of such tiling.
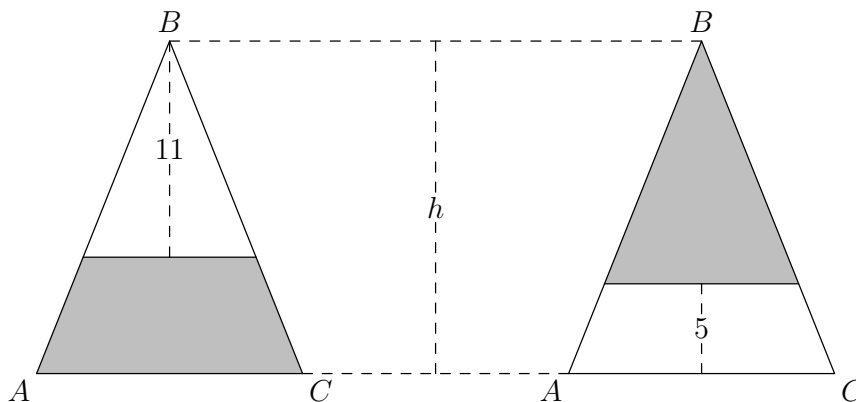
A) $\frac{1}{1024}$ **B)** $\frac{1}{256}$ **C)** $\frac{1}{64}$ **D)** $\frac{1}{16}$ **E)** $\frac{1}{4}$

Q24. Isosceles triangle ABC has equal side lengths AB and BC. In the figures below, segments are drawn parallel to $\overline{AC}$ so that the shaded portions of $\triangle ABC$ have the same area. The heights of the two unshaded portions are 11 and 5 units, respectively. What is the height h of $\triangle ABC$?

A) 14.6   **B)** 14.8   **C)** 15   **D)** 15.2   **E)** 15.4

Q25. Fifteen integers $a_1, a_2, a_3, \ldots, a_{15}$ are arranged in order on a number line. The integers are equally spaced and have the property that

$$1 \le a_1 \le 10, \ 13 \le a_2 \le 20, \ \text{and} \ 241 \le a_{15} \le 250.$$
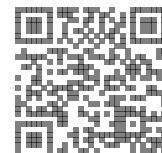
What is the sum of digits of a_{14}?

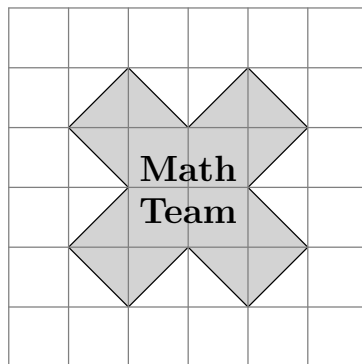**A)** 8   **B)** 9   **C)** 10   **D)** 11   **E)** 12

Q1. The Math Team designed a logo shaped like a multiplication symbol, shown below on a grid of 1-inch squares. What is the area of the logo in square inches?
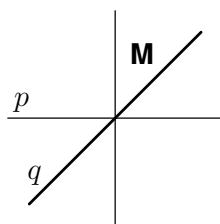

A) 10   **B)** 12   **C)** 13   **D)** 14   **E)** 15

Q2. Consider these two operations:

$$a \blacklozenge b = a^2 - b^2$$
$$a \bigstar b = (a - b)^2$$

What is the value of $(5 \blacklozenge 3) \bigstar 6$?

A) -20 **B)** 4   **C)** 16   **D)** 100   **E)** 220

Q3. When three positive integers a, b, and c are multiplied together, their product is 100. Suppose $a < b < c$. In how many ways can the numbers be chosen?

A) 0   **B)** 1   **C)** 2   **D)** 3   **E)** 4

Q4. The letter M in the figure below is first reflected over the line q and then reflected over the line p. What is the resulting image?
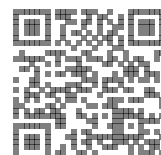
Q5. Anna and Bella are celebrating their birthdays together. Five years ago, when Bella turned 6 years old, she received a newborn kitten as a birthday present. Today the sum of the ages of the two children and the kitten is 30 years. How many years older than Bella is Anna?

A) 1 **B)** 2 **C)** 3 **D)** 4 **E)** 5

Q6. Three positive integers are equally spaced on a number line. The middle number is 15, and the largest number is 4 times the smallest number. What is the smallest of these three numbers?

A) 4 **B)** 5 **C)** 6 **D)** 7 **E)** 8

Q7. When the World Wide Web first became popular in the 1990s, download speeds reached a maximum of about 56 kilobits per second. Approximately how many minutes would the download of a 4.2-megabyte song have taken at that speed? (Note that there are 8000 kilobits in a megabyte.)

A) 0.6 **B)** 10 **C)** 1800 **D)** 7200 **E)** 36000

Q8. What is the value of

$$\frac{1}{3} \cdot \frac{2}{4} \cdot \frac{3}{5} \cdots \frac{18}{20} \cdot \frac{19}{21} \cdot \frac{20}{22}?$$

A) $\frac{1}{462}$ **B)** $\frac{1}{231}$ **C)** $\frac{1}{132}$ **D)** $\frac{2}{213}$ **E)** $\frac{1}{22}$

Q9. A cup of boiling water (212°F) is placed to cool in a room whose temperature remains constant at 68°F. Suppose the difference between the water temperature and the room temperature is halved every 5 minutes. What is the water temperature, in degrees Fahrenheit, after 15 minutes?

A) 77 **B)** 86 **C)** 92 **D)** 98 **E)** 104

Q10. One sunny day, Ling decided to take a hike in the mountains. She left her house at 8 AM, drove at a constant speed of 45 miles per hour, and arrived at the hiking trail at 10 AM. After hiking for 3 hours, Ling drove home at a constant speed of 60 miles per hour. Which of the following graphs best illustrates the distance between Ling's car and her house over the course of her trip?
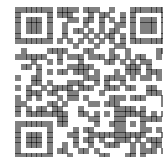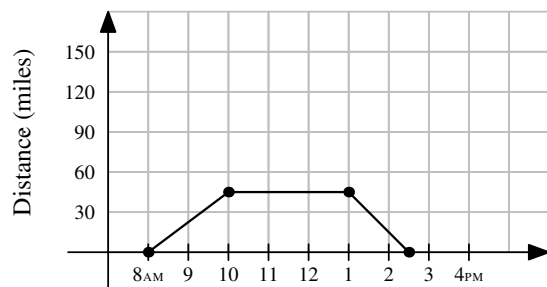
(A)
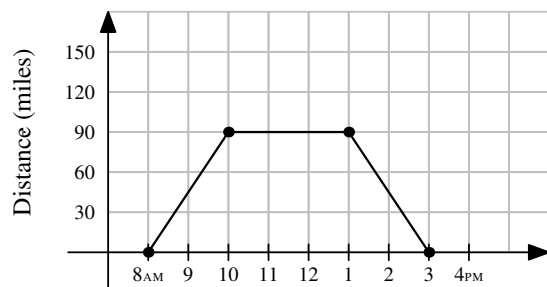
(B)
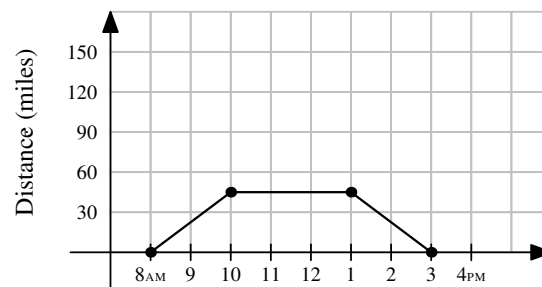
(C)

(D)

(E)
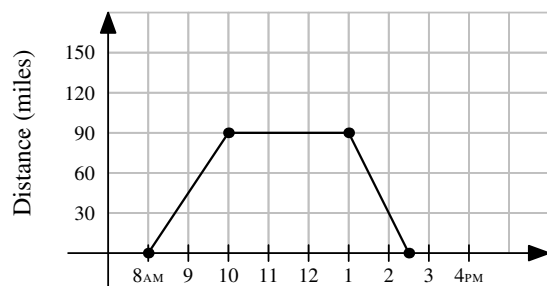
Q11. Henry the donkey has a very long piece of pasta. He takes a number of bites of pasta, each time eating 3 inches of pasta from the middle of one piece. In the end, he has 10 pieces of pasta whose total length is 17 inches. How long, in inches, was the piece of pasta he started with?

A) 34 **B)** 38 **C)** 41 **D)** 44 **E)** 47

Q12. The arrows on the two spinners shown below are spun. Let the number N equal 10 times the number on Spinner A, added to the number on Spinner B. What is the probability that N is a perfect square number?
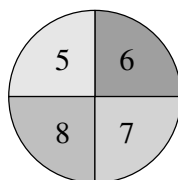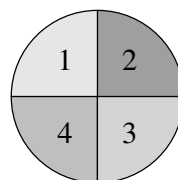
Spinner A   Spinner B

A) $\dfrac{1}{16}$ **B)** $\dfrac{1}{8}$ **C)** $\dfrac{1}{4}$ **D)** $\dfrac{3}{8}$ **E)** $\dfrac{1}{2}$

Q13. How many positive integers can fill the blank in the sentence below?

"One positive integer is _____ more than twice another, and the sum of the two numbers is 28

A) 6   **B)** 7   **C)** 8   **D)** 9   **E)** 10

Q14. In how many ways can the letters in **BEEKEEPER** be rearranged so that two or more **E**s do not appear together?

A) 1   **B)** 4   **C)** 12   **D)** 24   **E)** 120

Q15. Laszlo went online to shop for black pepper and found thirty different black pepper options varying in weight and price, shown in the scatter plot below. In ounces, what is the weight of the pepper that offers the lowest price per ounce?

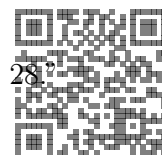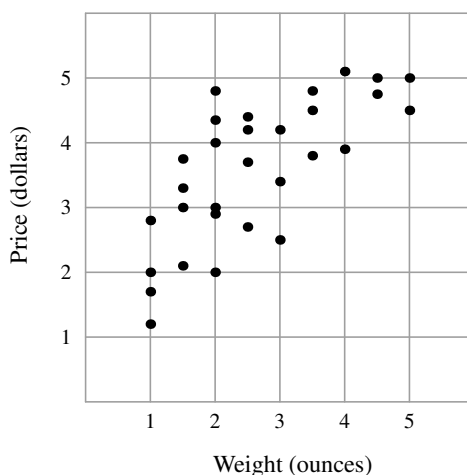**A)** 1   **B)** 2   **C)** 3   **D)** 4   **E)** 5

Q16. Four numbers are written in a row. The average of the first two is 21, the average of the middle two is 26, and the average of the last two is 30. What is the average of the first and last of the numbers?

A) 24   **B)** 25   **C)** 26   **D)** 27   **E)** 28

Q17. If n is an even positive integer, the *double factorial* notation $n!!$ represents the product of all the even integers from 2 to n. For example, $8!! = 2 \cdot 4 \cdot 6 \cdot 8$. What is the units digit of the following sum?

$$2!! + 4!! + 6!! + \cdots + 2018!! + 2020!! + 2022!!$$

A) 0   **B)** 2   **C)** 4   **D)** 6   **E)** 8

Q18. The midpoints of the four sides of a rectangle are $(-3, 0), (2, 0), (5, 4)$, and $(0, 4)$. What is the area of the rectangle?

A) 20   **B)** 25   **C)** 40   **D)** 50   **E)** 80

Q19. Mr. Ramos gave a test to his class of 20 students. The dot plot below shows the distribution of test scores.
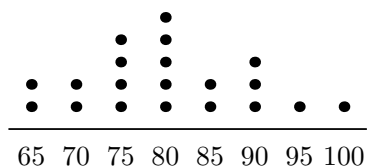
Later Mr. Ramos discovered that there was a scoring error on one of the questions. He regraded the tests, awarding some of the students 5 extra points, which increased the median test score to 85. What is the minimum number of students who received extra points?

(Note that the median test score equals the average of the 2 scores in the middle if the 20 test scores are arranged in increasing order.)
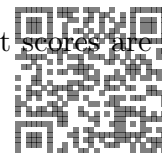
A) 2   **B)** 3   **C)** 4   **D)** 5   **E)** 6

Q20. The grid below is to be filled with integers in such a way that the sum of the numbers in each row and the sum of the numbers in each column are the same. Four numbers are missing. The number x in the lower left corner is larger than the other three missing numbers. What is the smallest possible value of x?

-2	9	5
		-1
x		8

A) -1 **B)** 5   **C)** 6   **D)** 8   **E)** 9

Q21. Steph scored 15 baskets out of 20 attempts in the first half of a game, and 10 baskets out of 10 attempts in the second half. Candace took 12 attempts in the first half and 18 attempts in the second. In each half, Steph scored a higher percentage of baskets than Candace. Surprisingly they ended with the same overall percentage of baskets scored. How many more baskets did Candace score in the second half than in the first?

	First Half	Second Half
Steph	$\dfrac{15}{20}$	$\dfrac{10}{10}$
Candace	$\dfrac{\square}{12}$	$\dfrac{\square}{18}$

A) 7   **B)** 8   **C)** 9   **D)** 10   **E)** 11

Q22. A bus takes 2 minutes to drive from one stop to the next, and waits 1 minute at each stop to let passengers board. Zia takes 5 minutes to walk from one bus stop to the next. As Zia reaches a bus stop, if the bus is at the previous stop or has already left the previous stop, then she will wait for the bus. Otherwise she will start walking toward the next stop. Suppose the bus and Zia start at the same time toward the library, with the bus 3 stops behind. After how many minutes will Zia board the bus?

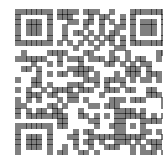**A)** 17   **B)** 19   **C)** 20   **D)** 21   **E)** 23

Q23. A $\triangle$ or $\bigcirc$ is placed in each of the nine squares in a 3-by-3 grid. Shown below is a sample configuration with three $\triangle$s in a line.

How many configurations will have three $\triangle$s in a line and three $\bigcirc$s in a line?
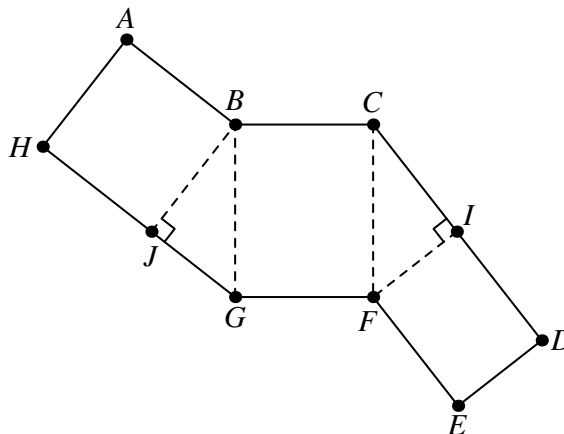
A) 39   **B)** 42   **C)** 78   **D)** 84   **E)** 96

Q24. The figure below shows a polygon $ABCDEFGH$, consisting of rectangles and right triangles. When cut out and folded on the dotted lines, the polygon forms a triangular prism. Suppose that $AH = EF = 8$ and $GH = 14$. What is the volume of the prism?

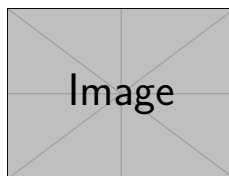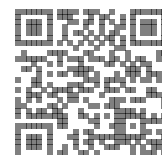**A)** 112   **B)** 128   **C)** 192   **D)** 240   **E)** 288

Q25. A cricket randomly hops between 4 leaves, on each turn hopping to one of the other 3 leaves with equal probability. After 4 hops, what is the probability that the cricket has returned to the leaf where it started?


A) $\frac{2}{9}$ **B)** $\frac{19}{80}$ **C)** $\frac{20}{81}$ **D)** $\frac{1}{4}$ **E)** $\frac{7}{27}$

Q1. Luka is making lemonade to sell at a school fundraiser. His recipe requires 4 times as much water as sugar and twice as much sugar as lemon juice. He uses 3 cups of lemon juice. How many cups of water does he need?

A) 6 **B)** 8 **C)** 12 **D)** 18 **E)** 24

Q2. Four friends do yardwork for their neighbors over the weekend, earning $15, $20, $25, and $40, respectively. They decide to split their earnings equally among themselves. In total how much will the friend who earned $40 give to the others?

A) 5 **B)** 10 **C)** 15 **D)** 20 **E)** 25

Q3. Carrie has a rectangular garden that measures 6 feet by 8 feet. She plants the entire garden with strawberry plants. Carrie is able to plant 4 strawberry plants per square foot, and she harvests an average of 10 strawberries per plant. How many strawberries can she expect to harvest?

A) 560 **B)** 960 **C)** 1120 **D)** 1920 **E)** 3840

Q4. Three hexagons of increasing size are shown below. Suppose the dot pattern continues so that each successive hexagon contains one more band of dots. How many dots are in the next hexagon?
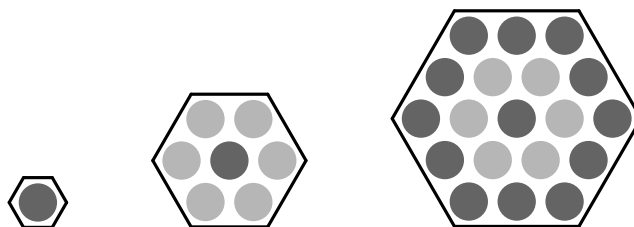
A) 35 **B)** 37 **C)** 39 **D)** 43 **E)** 49

Q5. Three fourths of a pitcher is filled with pineapple juice. The pitcher is emptied by pouring an equal amount of juice into each of 5 cups. What percent of the total capacity of the pitcher did each cup receive?

A) 5 **B)** 10 **C)** 15 **D)** 20 **E)** 25

Q6. Aaron, Darren, Karen, Maren, and Sharon rode on a small train that has five cars that seat one person each. Maren sat in the last car. Aaron sat directly behind Sharon. Darren sat in one of the cars in front of Aaron. At least one person sat between Karen and Darren. Who sat in the middle car?

A) Aaron **B)** Darren **C)** Karen **D)** Maren **E)** Sharon

Q7. How many integers between 2020 and 2400 have four distinct digits arranged in increasing order? (For example, 2347 is one integer.)

A) 9 **B)** 10 **C)** 15 **D)** 21 **E)** 28

Q8. Ricardo has 2020 coins, some of which are pennies (1-cent coins) and the rest of which are nickels (5-cent coins). He has at least one penny and at least one nickel. What is the difference in cents between the greatest possible and least possible amounts of money that Ricardo can have?

A) 8062 **B)** 8068 **C)** 8072 **D)** 8076 **E)** 8082

Q9. Akash's birthday cake is in the form of a $4 \times 4 \times 4$ inch cube. The cake has icing on the top and the four side faces, and no icing on the bottom. Suppose the cake is cut into 64 smaller cubes, each measuring $1 \times 1 \times 1$ inch, as shown below. How many small pieces will have icing on exactly two sides?
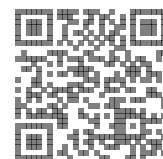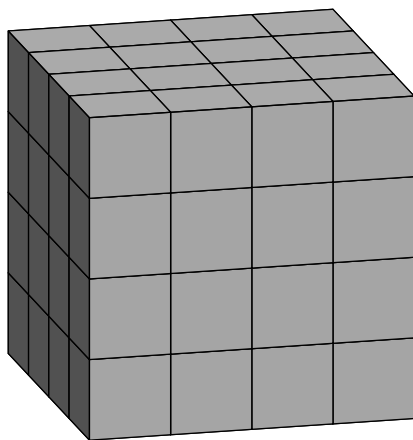
A) 12   **B)** 16   **C)** 18   **D)** 20   **E)** 24

Q10. Zara has a collection of 4 marbles: an Aggie, a Bumblebee, a Steelie, and a Tiger. She wants to display them in a row on a shelf, but does not want to put the Steelie and the Tiger next to one another. In how many ways can she do this?

A) 6   **B)** 8   **C)** 12   **D)** 18   **E)** 24

Q11. After school, Maya and Naomi headed to the beach, 6 miles away. Maya decided to bike while Naomi took a bus. The graph below shows their journeys, indicating the time and distance traveled. What was the difference, in miles per hour, between Naomi's and Maya's average speeds?
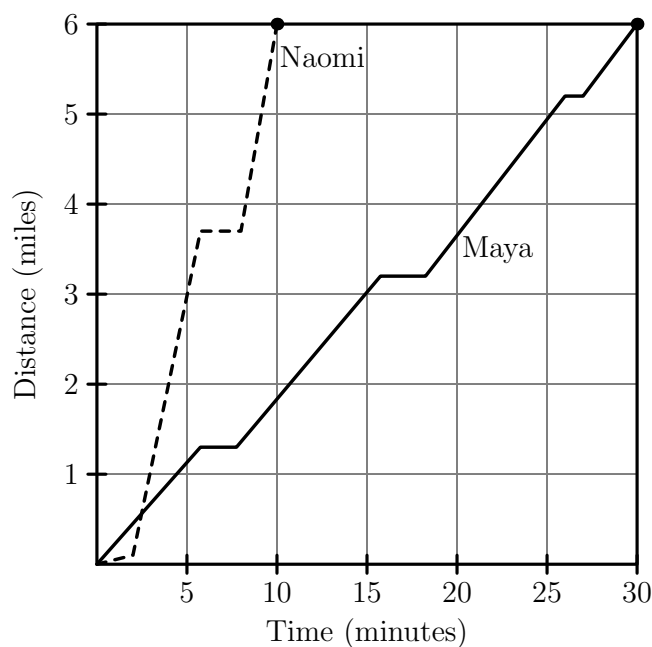

A) 6   **B)** 12   **C)** 18   **D)** 20   **E)** 24

Q12. For a positive integer n, the factorial notation $n!$ represents the product of the integers from n to 1. (For example, $6! = 6 \cdot 5 \cdot 4 \cdot 3 \cdot 2 \cdot 1$). What value of N satisfies the following equation?

$$5! \cdot 9! = 12 \cdot N!$$

A) 10   **B)** 11   **C)** 12   **D)** 13   **E)** 14

Q13. Jamal has a drawer containing 6 green socks, 18 purple socks, and 12 orange socks. After adding more purple socks, Jamal noticed that there is now a 60% chance that a sock randomly selected from the drawer is purple. How many purple socks did Jamal add?
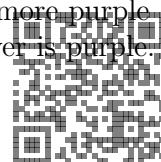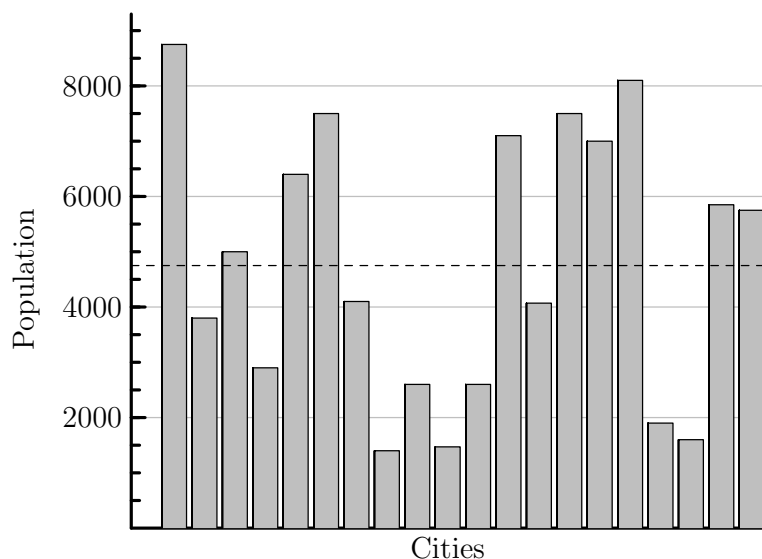
A) 6   **B)** 9   **C)** 12   **D)** 18   **E)** 24

Q14. There are 20 cities in the County of Newton. Their populations are shown in the bar chart below. The average population of all the cities is indicated by the horizontal dashed line. Which of the following is closest to the total population of all 20 cities?

A) 65,000   **B)** 75,000   **C)** 85,000   **D)** 95,000   **E)** 105,000

Q15. Suppose 15% of x equals 20% of y. What percentage of x is y?
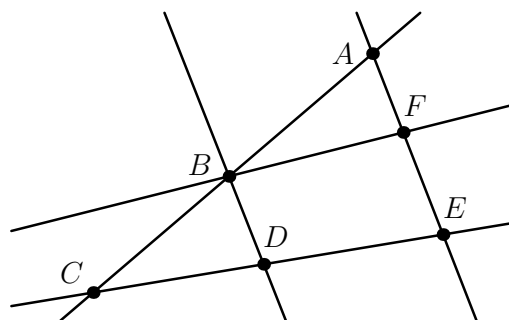
A) 5   **B)** 35   **C)** 75   **D)** $133\frac{1}{3}$ **E)** 300

Q16. Each of the points A, B, C, D, E, and F in the figure below represents a different digit from 1 to 6. Each of the five lines shown passes through some of these points. The digits along each line are added to produce five sums, one for each line. The total of the five sums is 47. What is the digit represented by B?

A) 1   **B)** 2   **C)** 3   **D)** 4   **E)** 5

Q17. How many factors of 2020 have more than 3 factors? (As an example, 12 has 6 factors, namely $1, 2, 3, 4, 6$, and 12.)
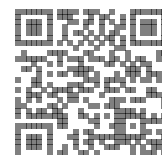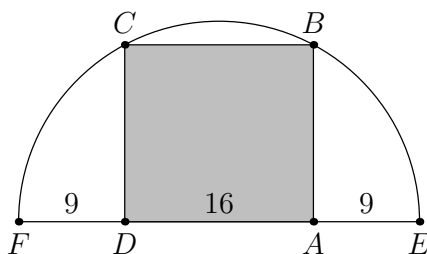
A) 6   **B)** 7   **C)** 8   **D)** 9   **E)** 10

Q18. Rectangle $ABCD$ is inscribed in a semicircle with diameter $\overline{FE}$, as shown in the figure. Let $DA = 16$, and let $FD = AE = 9$. What is the area of $ABCD$?

A) 240   **B)** 248   **C)** 256   **D)** 264   **E)** 272

Q19. A number is called flippy if its digits alternate between two distinct digits. For example, 2020 and 37373 are flippy, but 3883 and 123123 are not. How many five-digit flippy numbers are divisible by 15?

    A) 3   **B)** 4   **C)** 5   **D)** 6   **E)** 8

Q20. A scientist walking through a forest recorded as integers the heights of 5 trees standing in a row. She observed that each tree was either twice as tall or half as tall as the one to its right. Unfortunately some of her data was lost when rain fell on her notebook. Her notes are shown below, with blanks indicating the missing numbers. Based on her observations, the scientist was able to reconstruct the lost data. What was the average height of the trees, in meters?

Tree 1	__ meters
Tree 2	11 meters
Tree 3	__ meters
Tree 4	__ meters
Tree 5	__ meters
Average height	__ .2 meters

    A) 22.2   **B)** 24.2   **C)** 33.2   **D)** 35.2   **E)** 37.2

Q21. A game board consists of 64 squares that alternate in color between black and white. The figure below shows square P in the bottom row and square Q in the top row. A marker is placed at P. A step consists of moving the marker onto one of the adjoining white squares in the row above. How many 7-step paths are there from P to Q? (The figure shows a sample path.)
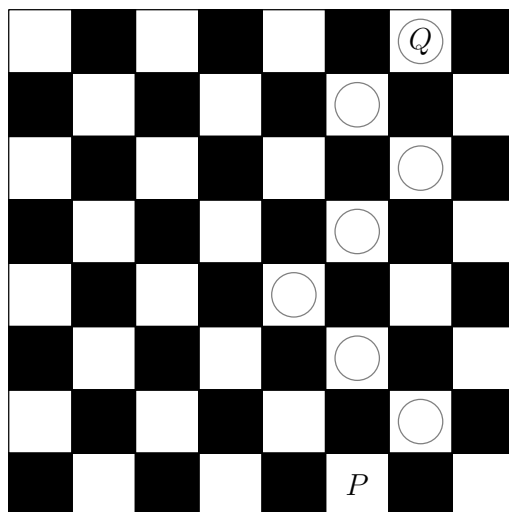
    A) 28   **B)** 30   **C)** 32   **D)** 33   **E)** 35
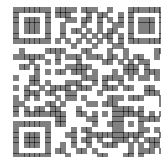
Q22. When a positive integer N is fed into a machine, the output is a number calculated according to the rule shown below.
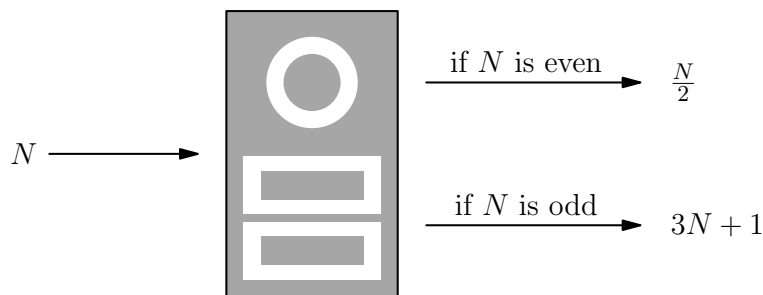

For example, starting with an input of $N = 7$, the machine will output $3 \cdot 7 + 1 = 22$. Then if the output is repeatedly inserted into the machine five more times, the final output is 26.

$$7 \rightarrow 22 \rightarrow 11 \rightarrow 34 \rightarrow 17 \rightarrow 52 \rightarrow 26$$

When the same 6-step process is applied to a different starting value of N, the final output is 1. What is the sum of all such integers N?

$$N \rightarrow \underline{} \rightarrow \underline{} \rightarrow \underline{} \rightarrow \underline{} \rightarrow \underline{} \rightarrow 1$$

A) 73 **B)** 74 **C)** 75 **D)** 82 **E)** 83

Q23. Five different awards are to be given to three students. Each student will receive at least one award. In how many different ways can the awards be distributed?

A) 120 **B)** 150 **C)** 180 **D)** 210 **E)** 240

Q24. A large square region is paved with n^2 gray square tiles, each measuring s inches on a side. A border d inches wide surrounds each tile. The figure below shows the case for $n = 3$. When $n = 24$, the 576 gray tiles cover 64% of the area of the large square region. What is the ratio $\dfrac{d}{s}$ for this larger value of n?
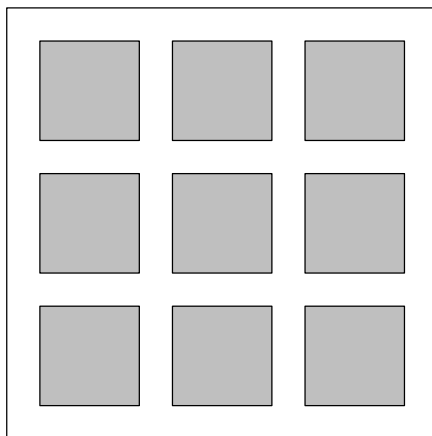
A) $\dfrac{6}{25}$ **B)** $\dfrac{1}{4}$ **C)** $\dfrac{9}{25}$ **D)** $\dfrac{7}{16}$ **E)** $\dfrac{9}{16}$

Q25. Rectangles R_1 and R_2, and squares S_1, S_2, and S_3, shown below, combine to form a rectangle that is 3322 units wide and 2020 units high. What is the side length of S_2 in units?
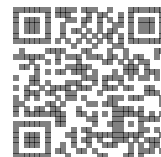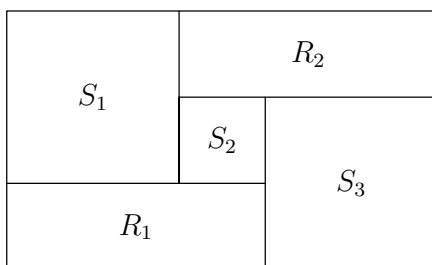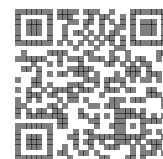
A) 651   **B)** 655   **C)** 656   **D)** 662   **E)** 666

书山有路勤为径，学海无涯苦作舟。

Q1. Ike and Mike go into a sandwich shop with a total of \$30.00 to spend. Sandwiches cost \$4.50 each and soft drinks cost \$1.00 each. Ike and Mike plan to buy as many sandwiches as they can and use the remaining money to buy soft drinks. Counting both soft drinks and sandwiches, how many items will they buy?

A) 6   **B)** 5   **C)** 8   **D)** 9   **E)** 2

Q2. Three identical rectangles are put together to form rectangle $ABCD$, as shown in the figure below. Given that the length of the shorter side of each of the smaller rectangles is 5 feet, what is the area in square feet of rectangle $ABCD$?
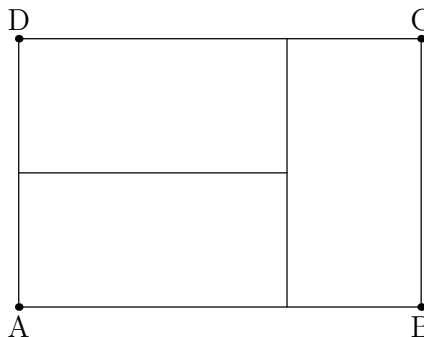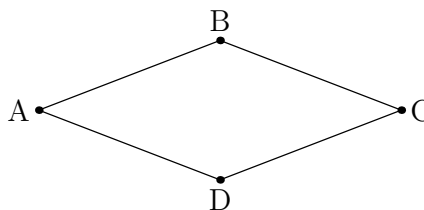

A) 45   **B)** 75   **C)** 100   **D)** 125   **E)** 150

Q3. Which of the following is the correct order of the fractions $\frac{15}{11}, \frac{19}{15}$, and $\frac{17}{13}$, from least to greatest?

**A)** $\frac{15}{11} < \frac{17}{13} < \frac{19}{15}$ **B)** $\frac{15}{11} < \frac{19}{15} < \frac{17}{13}$ **C)** $\frac{17}{13} < \frac{19}{15} < \frac{15}{11}$ **D)** $\frac{19}{15} < \frac{15}{11} < \frac{17}{13}$ **E)** $\frac{19}{15} < \frac{17}{13} < \frac{15}{11}$

Q4. Quadrilateral $ABCD$ is a rhombus with perimeter 52 meters. The length of diagonal $\overline{AC}$ is 24 meters. What is the area in square meters of rhombus $ABCD$?

A) 60   **B)** 90   **C)** 105   **D)** 120   **E)** 144

Q5. A tortoise challenges a hare to a race. The hare eagerly agrees and quickly runs ahead, leaving the slow-moving tortoise behind. Confident that he will win, the hare stops to take a nap. Meanwhile, the tortoise walks at a slow steady pace for the entire race. The hare awakes and runs to the finish line, only to find the tortoise already there. Which of the following graphs matches the description of the race, showing the distance d traveled by the two animals over time t from start to finish?
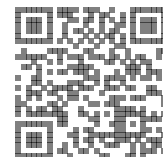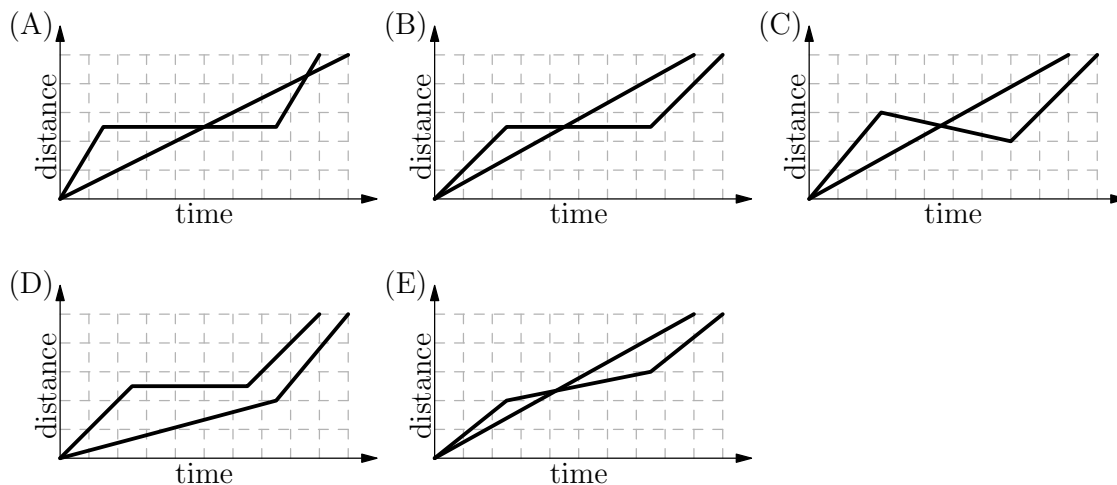
Q6. There are 81 grid points (uniformly spaced) in the square shown in the diagram below, including the points on the edges. Point P is in the center of the square. Given that point Q is randomly chosen among the other 80 points, what is the probability that the line PQ is a line of symmetry for the square?
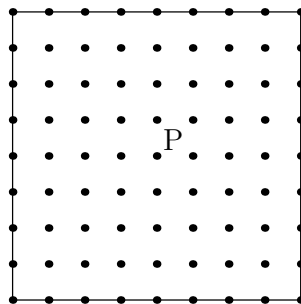
A) $\frac{1}{5}$ **B)** $\frac{1}{4}$ **C)** $\frac{2}{5}$ **D)** $\frac{9}{20}$ **E)** $\frac{1}{2}$

**Q7**. Shauna takes five tests, each worth a maximum of 100 points. Her scores on the first three tests are 76, 94, and 87. In order to average 81 for all five tests, what is the lowest score she could earn on one of the other two tests?

A) 48   **B)** 52   **C)** 66   **D)** 70   **E)** 74

Q8. Gilda has a bag of marbles. She gives 20% of them to her friend Pedro. Then Gilda gives 10% of what is left to another friend, Ebony. Finally, Gilda gives 25% of what is now left in the bag to her brother Jimmy. What percentage of her original bag of marbles does Gilda have left for herself?

A) 20   **B)** $33\frac{1}{3}$ **C)** 38   **D)** 45   **E)** 54

Q9. Alex and Felicia each have cats as pets. Alex buys cat food in cylindrical cans that are 6 cm in diameter and 12 cm high. Felicia buys cat food in cylindrical cans that are 12 cm in diameter and 6 cm high. What is the ratio of the volume one of Alex's cans to the volume one of Felicia's cans?

A) $1:4$ **B)** $1:2$ **C)** $1:1$ **D)** $2:1$ **E)** $4:1$

Q10. The diagram shows the number of students at soccer practice each weekday during last week. After computing the mean and median values, Coach discovers that there were actually 21 participants on Wednesday. Which of the following statements describes the change in the mean and median after the correction is made?

Number of students at soccer practice
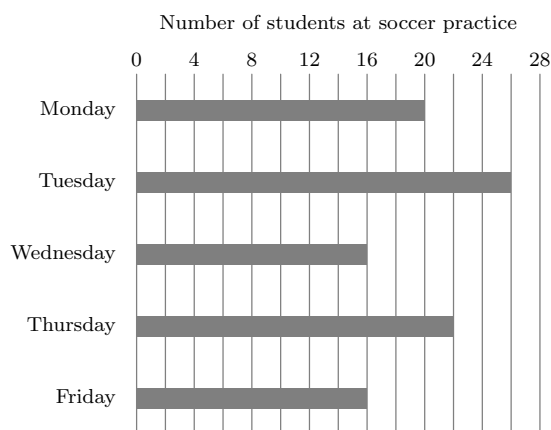
A) The mean increases by 1 and the median does not change.

B) The mean increases by 1 and the median increases by 1.

C) The mean increases by 1 and the median increases by 5.

D) The mean increases by 5 and the median increases by 1.

E) The mean increases by 5 and the median increases by 5.

Q11. The eighth grade class at Lincoln Middle School has 93 students. Each student takes a math class or a foreign language class or both. There are 70 eighth graders taking a math class, and there are 54 eight graders taking a foreign language class. How many eighth graders take "only" a math class and "not" a foreign language class?
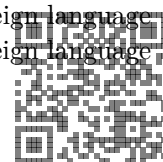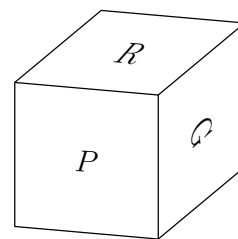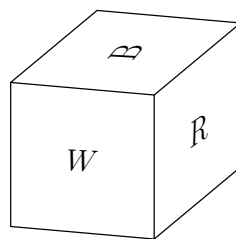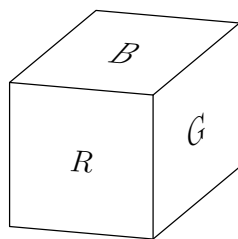
A) 16   **B)** 23   **C)** 31   **D)** 39   **E)** 70

Q12. The faces of a cube are painted in six different colors: red (R), white (W), green (G), brown (B), aqua (A), and purple (P). Three views of the cube are shown below. What is the color of the face opposite the aqua face?

A) red   **B)** white   **C)** green   **D)** brown   **E)** purple

Q13. A "palindrome" is a number that has the same value when read from left to right or from right to left. (For example 12321 is a palindrome.) Let N be the least three-digit integer which is not a palindrome but which is the sum of three distinct two-digit palindromes. What is the sum of the digits of N?

A) 2   **B)** 3   **C)** 4   **D)** 5   **E)** 6

Q14. Isabella has 6 coupons that can be redeemed for free ice cream cones at Pete's Sweet Treats. In order to make the coupons last, she decides that she will redeem one every 10 days until she has used them all. She knows that Pete's is closed on Sundays, but as she circles the 6 dates on her calendar, she realizes that no circled date falls on a Sunday. On what day of the week does Isabella redeem her first coupon?

A) Monday   **B)** Tuesday   **C)** Wednesday   **D)** Thursday   **E)** Friday

Q15. On a beach 50 people are wearing sunglasses and 35 people are wearing caps. Some people are wearing both sunglasses and caps. If one of the people wearing a cap is selected at random, the probability that this person is is also wearing sunglasses is $\frac{2}{5}$. If instead, someone wearing sunglasses is selected at random, what is the probability that this person is also wearing a cap?

A) $\frac{14}{85}$ **B)** $\frac{7}{25}$ **C)** $\frac{2}{5}$ **D)** $\frac{4}{7}$ **E)** $\frac{7}{10}$

Q16. Qiang drives 15 miles at an average speed of 30 miles per hour. How many additional miles will he have to drive at 55 miles per hour to average 50 miles per hour for the entire trip?

A) 45   **B)** 62   **C)** 90   **D)** 110   **E)** 135

Q17. What is the value of the product

$$\left(\frac{1\cdot 3}{2\cdot 2}\right)\left(\frac{2\cdot 4}{3\cdot 3}\right)\left(\frac{3\cdot 5}{4\cdot 4}\right)\cdots\left(\frac{97\cdot 99}{98\cdot 98}\right)\left(\frac{98\cdot 100}{99\cdot 99}\right)?$$

A) $\frac{1}{2}$ **B)** $\frac{50}{99}$ **C)** $\frac{9800}{9801}$ **D)** $\frac{100}{99}$ **E)** 50

Q18. The faces of each of two fair dice are numbered 1, 2, 3, 5, 7, and 8. When the two dice are tossed, what is the probability that their sum will be an even number?

A) $\frac{4}{9}$ **B)** $\frac{1}{2}$ **C)** $\frac{5}{9}$ **D)** $\frac{3}{5}$ **E)** $\frac{2}{3}$

Q19. In a tournament there are six teams that play each other twice. A team earns 3 points for a win, 1 point for a draw, and 0 points for a loss. After all the games have been played it turns out that the top three teams earned the same number of total points. What is the greatest possible number of total points for each of the top three teams?

A) 22   **B)** 23   **C)** 24   **D)** 26   **E)** 30

Q20. How many different real numbers x satisfy the equation

$$(x^2 - 5)^2 = 16?$$
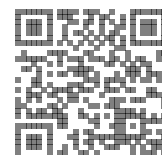
A) 0   **B)** 1   **C)** 2   **D)** 4   **E)** 8

**Q21**. What is the area of the triangle formed by the lines $y = 5$, $y = 1 + x$, and $y = 1 - x$?

   A) 4   **B)** 8   **C)** 10   **D)** 12   **E)** 16

Q22. A store increased the original price of a shirt by a certain percent and then lowered the new price by the same amount. Given that the resulting price was 84% of the original price, by what percent was the price increased and decreased?

   A) 16   **B)** 20   **C)** 28   **D)** 36   **E)** 40

Q23. After Euclid High School's last basketball game, it was determined that $\frac{1}{4}$ of the team's points were scored by Alexa and $\frac{2}{7}$ were scored by Brittany. Chelsea scored 15 points. None of the other 7 team members scored more than 2 points. What was the total number of points scored by the other 7 team members?

   A) 10   **B)** 11   **C)** 12   **D)** 13   **E)** 14

Q24. In triangle ABC, point D divides side $\overline{AC}$ so that $AD : DC = 1 : 2$. Let E be the midpoint of $\overline{BD}$ and let F be the point of intersection of line BC and line AE. Given that the area of $\triangle ABC$ is 360, what is the area of $\triangle EBF$?
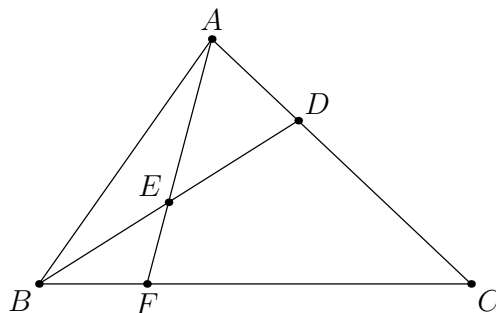

   A) 24   **B)** 30   **C)** 32   **D)** 36   **E)** 40

Q25. Alice has 24 apples. In how many ways can she share them with Becky and Chris so that each of the three people has at least two apples?

   A) 105   **B)** 114   **C)** 190   **D)** 210   **E)** 380
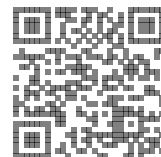
Q1. An amusement park has a collection of scale models, with a ratio 1 : 20, of buildings and other sights from around the country. The height of the United States Capitol is 289 feet. What is the height in feet of its duplicate to the nearest whole number?

A) 14   **B)** 15   **C)** 16   **D)** 18   **E)** 20

Q2. What is the value of the product

$$\left(1 + \frac{1}{1}\right) \cdot \left(1 + \frac{1}{2}\right) \cdot \left(1 + \frac{1}{3}\right) \cdot \left(1 + \frac{1}{4}\right) \cdot \left(1 + \frac{1}{5}\right) \cdot \left(1 + \frac{1}{6}\right)?$$

A) $\frac{7}{6}$ **B)** $\frac{4}{3}$ **C)** $\frac{7}{2}$ **D)** 7   **E)** 8

Q3. Students Arn, Bob, Cyd, Dan, Eve, and Fon are arranged in that order in a circle. They start counting: Arn first, then Bob, and so forth. When the number contains a 7 as a digit (such as 47) or is a multiple of 7 that person leaves the circle and the counting continues. Who is the last one present in the circle?

A) Arn   **B)** Bob   **C)** Cyd   **D)** Dan   **E)** Eve

Q4. The twelve-sided figure shown has been drawn on 1 cm × 1 cm graph paper. What is the area of the figure in cm^2?
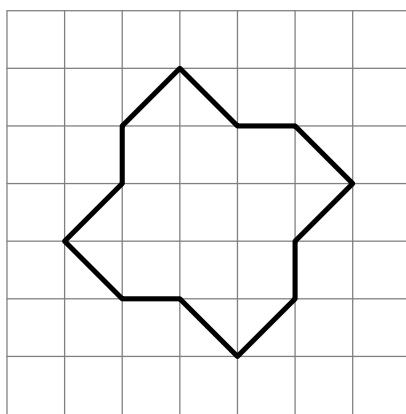
A) 12   **B)** 12.5   **C)** 13   **D)** 13.5   **E)** 14

Q5. What is the value of $1 + 3 + 5 + \cdots + 2017 + 2019 - 2 - 4 - 6 - \cdots - 2016 - 2018$?

A) -1010 **B)** -1009 **C)** 1008   **D)** 1009   **E)** 1010

Q6. On a trip to the beach, Anh traveled 50 miles on the highway and 10 miles on a coastal access road. He drove three times as fast on the highway as on the coastal road. If Anh spent 30 minutes driving on the coastal road, how many minutes did his entire trip take?

A) 50   **B)** 70   **C)** 80   **D)** 90   **E)** 100

Q7. The 5-digit number $\underline{2}\,\underline{0}\,\underline{1}\,\underline{8}\,\underline{U}$ is divisible by 9. What is the remainder when this number is divided by 8?

A) 1   **B)** 3   **C)** 5   **D)** 6   **E)** 7

Q8. Mr. Garcia asked the members of his health class how many days last week they exercised for at least 30 minutes. The results are summarized in the following bar graph, where the heights of the bars represent the number of students.
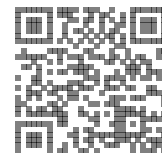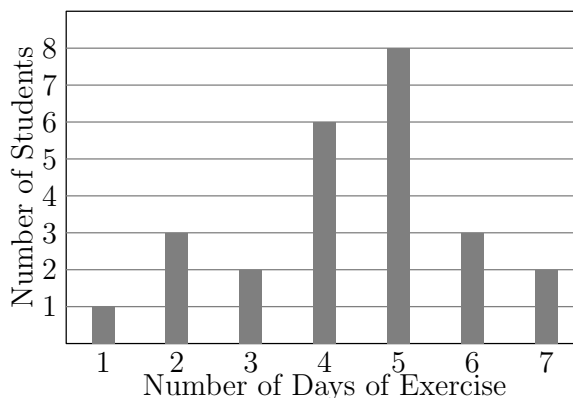
What was the mean number of days of exercise last week, rounded to the nearest hundredth, reported by the students in Mr. Garcia's class?

A) 3.50   **B)** 3.57   **C)** 4.36   **D)** 4.50   **E)** 5.00

Q9. Bob is tiling the floor of his 12 foot by 16 foot living room. He plans to place one-foot by one-foot square tiles to form a border along the edges of the room and to fill in the rest of the floor with two-foot by two-foot square tiles. How many tiles will he use?

A) 48   **B)** 87   **C)** 89   **D)** 96   **E)** 120

Q10. The harmonic mean of a set of non-zero numbers is the reciprocal of the average of the reciprocals of the numbers. What is the harmonic mean of 1, 2, and 4?

A) $\frac{3}{7}$ **B)** $\frac{7}{12}$ **C)** $\frac{12}{7}$ **D)** $\frac{7}{4}$ **E)** $\frac{7}{3}$

Q11. Abby, Bridget, and four of their classmates will be seated in two rows of three for a group picture, as shown.

$$
\begin{array}{ccc}
X & X & X \\
X & X & X
\end{array}
$$

If the seating positions are assigned randomly, what is the probability that Abby and Bridget are adjacent to each other in the same row or the same column?

A) $\frac{1}{3}$ **B)** $\frac{2}{5}$ **C)** $\frac{7}{15}$ **D)** $\frac{1}{2}$ **E)** $\frac{2}{3}$

Q12. The clock in Sri's car, which is not accurate, gains time at a constant rate. One day as he begins shopping he notes that his car clock and his watch (which is accurate) both say 12:00 noon. When he is done shopping, his watch says 12:30 and his car clock says 12:35. Later that day, Sri loses his watch. He looks at his car clock and it says 7:00. What is the actual time?

**A)** $5:50$ **B)** $6:00$ **C)** $6:30$ **D)** $6:55$ **E)** $8:10$

Q13. Laila took five math tests, each worth a maximum of 100 points. Laila's score on each test was an integer between 0 and 100, inclusive. Laila received the same score on the first four tests, and she received a higher score on the last test. Her average score on the five tests was 82. How many values are possible for Laila's score on the last test?

A) 4   **B)** 5   **C)** 9   **D)** 10   **E)** 18

Q14. Let N be the greatest five-digit number whose digits have a product of 120. What is the sum of the digits of N?

**A)** 15   **B)** 16   **C)** 17   **D)** 18   **E)** 20

Q15. In the diagram below, a diameter of each of the two smaller circles is a radius of the larger circle. If the two smaller circles have a combined area of 1 square unit, then what is the area of the shaded region, in square units?
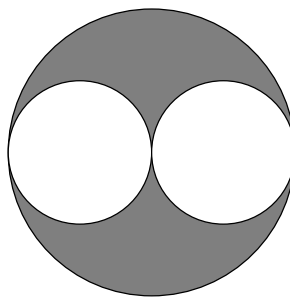
A) $\frac{1}{4}$ **B)** $\frac{1}{3}$ **C)** $\frac{1}{2}$ **D)** 1   **E)** $\frac{\pi}{2}$

Q16. Professor Chang has nine different language books lined up on a bookshelf: two Arabic, three German, and four Spanish. How many ways are there to arrange the nine books on the shelf keeping the Arabic books together and keeping the Spanish books together?

**A)** 1440   **B)** 2880   **C)** 5760   **D)** 182, 440   **E)** 362, 880
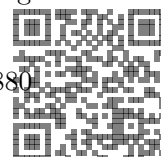
Q17. Bella begins to walk from her house toward her friend Ella's house. At the same time, Ella begins to ride her bicycle toward Bella's house. They each maintain a constant speed, and Ella rides 5 times as fast as Bella walks. The distance between their houses is 2 miles, which is 10,560 feet, and Bella covers $2\frac{1}{2}$ feet with each step. How many steps will Bella take by the time she meets Ella?

A) 704   **B)** 845   **C)** 1056   **D)** 1760   **E)** 3520

Q18. How many positive factors does 23,232 have?

A) 9   **B)** 12   **C)** 28   **D)** 36   **E)** 42

Q19. In a sign pyramid a cell gets a "+" if the two cells below it have the same sign, and it gets a "-" if the two cells below it have different signs. The diagram below illustrates a sign pyramid with four levels. How many possible ways are there to fill the four cells in the bottom row to produce a "+" at the top of the pyramid?
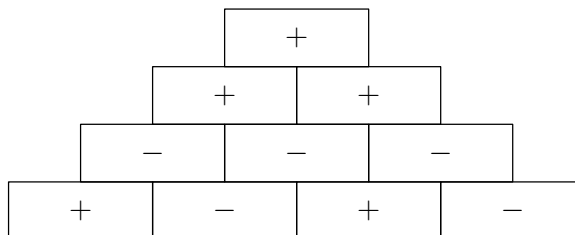
A) 2   **B)** 4   **C)** 8   **D)** 12   **E)** 16

Q20. In $\triangle ABC$, a point E is on $\overline{AB}$ with $AE = 1$ and $EB = 2$. Point D is on $\overline{AC}$ so that $\overline{DE} \parallel \overline{BC}$ and point F is on $\overline{BC}$ so that $\overline{EF} \parallel \overline{AC}$. What is the ratio of the area of $CDEF$ to the area of $\triangle ABC$?
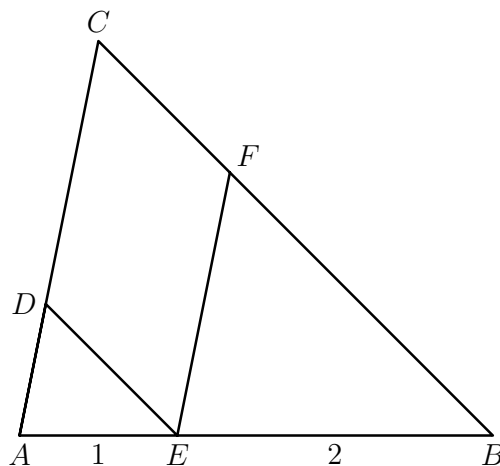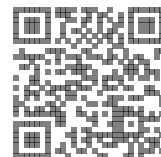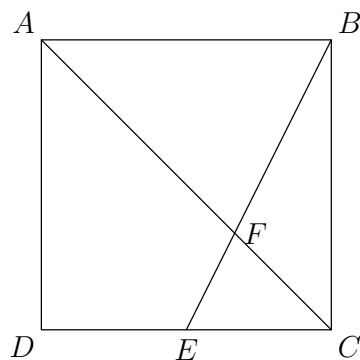

A) $\frac{4}{9}$ **B)** $\frac{1}{2}$ **C)** $\frac{5}{9}$ **D)** $\frac{3}{5}$ **E)** $\frac{2}{3}$

Q21. How many positive three-digit integers have a remainder of 2 when divided by 6, a remainder of 5 when divided by 9, and a remainder of 7 when divided by 11?

**A)** 1   **B)** 2   **C)** 3   **D)** 4   **E)** 5

Q22. Point E is the midpoint of side $\overline{CD}$ in square $ABCD$, and $\overline{BE}$ meets diagonal $\overline{AC}$ at F. The area of quadrilateral $AFED$ is 45. What is the area of $ABCD$?

A) 100 **B)** 108 **C)** 120 **D)** 135 **E)** 144

Q23. From a regular octagon, a triangle is formed by connecting three randomly chosen vertices of the octagon. What is the probability that at least one of the sides of the triangle is also a side of the octagon?
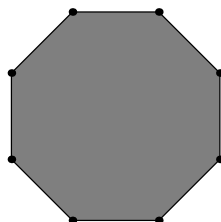
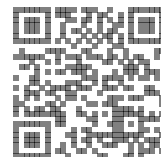**A)** $\frac{2}{7}$ **B)** $\frac{5}{42}$ **C)** $\frac{11}{14}$ **D)** $\frac{5}{7}$ **E)** $\frac{6}{7}$

Q24. In the cube $ABCDEFGH$ with opposite vertices C and E, J and I are the midpoints of segments $\overline{FB}$ and $\overline{HD}$, respectively. Let R be the ratio of the area of the cross-section $EJCI$ to the area of one of the faces of the cube. What is R^2?
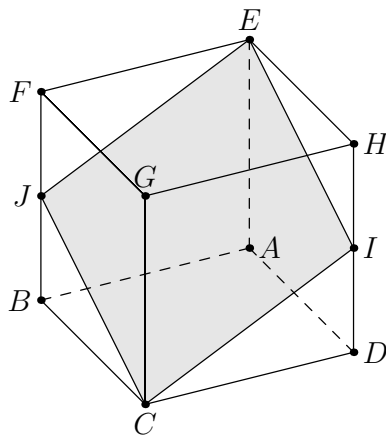
A) $\frac{5}{4}$ **B)** $\frac{4}{3}$ **C)** $\frac{3}{2}$ **D)** $\frac{25}{16}$ **E)** $\frac{9}{4}$

Q25. How many perfect cubes lie between $2^8 + 1$ and $2^{18} + 1$, inclusive?

A) 4 **B)** 9 **C)** 10 **D)** 57 **E)** 58
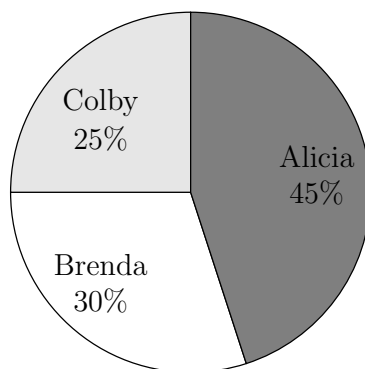
Q1. Which of the following values is largest?

    A) $2+0+1+7$ **B)** $2 \times 0 + 1 + 7$ **C)** $2 + 0 \times 1 + 7$ **D)** $2 + 0 + 1 \times 7$ **E)** $2 \times 0 \times 1 \times 7$

Q2. Alicia, Brenda, and Colby were the candidates in a recent election for student president. The pie chart below shows how the votes were distributed among the three candidates. If Brenda received 36 votes, then how many votes were cast all together?

    A) 70   **B)** 84   **C)** 100   **D)** 106   **E)** 120

Q3. What is the value of the expression $\sqrt{16\sqrt{8\sqrt{4}}}$?

    A) 4   **B)** $4\sqrt{2}$ **C)** 8   **D)** $8\sqrt{2}$ **E)** 16

Q4. When 0.000315 is multiplied by $7,928,564$ the product is closest to which of the following?

    A) 210   **B)** 240   **C)** 2100   **D)** 2400   **E)** 24000

Q5. What is the value of the expression

$$\frac{1 \cdot 2 \cdot 3 \cdot 4 \cdot 5 \cdot 6 \cdot 7 \cdot 8}{1+2+3+4+5+6+7+8}?$$

    A) 1020   **B)** 1120   **C)** 1220   **D)** 2240   **E)** 3360

Q6. If the degree measures of the angles of a triangle are in the ratio $3 : 3 : 4$, what is the degree measure of the largest angle of the triangle?

    A) 18   **B)** 36   **C)** 60   **D)** 72   **E)** 90

Q7. Let Z be a 6-digit positive integer, such as 247247, whose first three digits are the same as its last three digits taken in the same order. Which of the following numbers must also be a factor of Z?

    A) 11   **B)** 19   **C)** 101   **D)** 111   **E)** 1111

Q8. Malcolm wants to visit Isabella after school today and knows the street where she lives but doesn't know her house number. She tells him, "My house number has two digits, and exactly three of the following four statements about it are true."

    (1) It is prime.

    (2) It is even.

    (3) It is divisible by 7.

    (4) One of its digits is 9.

This information allows Malcolm to determine Isabella's house number. What is its units digit?

   **A)** 4   **B)** 6   **C)** 7   **D)** 8   **E)** 9

Q9. All of Macy's marbles are blue, red, green, or yellow. One third of her marbles are blue, one fourth of them are red, and six of them are green. What is the smallest number of yellow marbles that Macy could have?

A) 1   **B)** 2   **C)** 3   **D)** 4   **E)** 5

Q10. A box contains five cards, numbered 1, 2, 3, 4, and 5. Three cards are selected randomly without replacement from the box. What is the probability that 4 is the largest value selected?

    A) $\frac{1}{10}$ **B)** $\frac{1}{5}$ **C)** $\frac{3}{10}$ **D)** $\frac{2}{5}$ **E)** $\frac{1}{2}$

Q11. A square-shaped floor is covered with congruent square tiles. If the total number of tiles that lie on the two diagonals is 37, how many tiles cover the floor?

    A) 148   **B)** 324   **C)** 361   **D)** 1296   **E)** 1369

Q12. The smallest positive integer greater than 1 that leaves a remainder of 1 when divided by 4, 5, and 6 lies between which of the following pairs of numbers?

    A) 2 and 19   **B)** 20 and 39   **C)** 40 and 59   **D)** 60 and 79   **E)** 80 and 124

Q13. Peter, Emma, and Kyler played chess with each other. Peter won 4 games and lost 2 games. Emma won 3 games and lost 3 games. If Kyler lost 3 games, how many games did he win?

    A) 0   **B)** 1   **C)** 2   **D)** 3   **E)** 4

Q14. Chloe and Zoe are both students in Ms. Demeanor's math class. Last night they each solved half of the problems in their homework assignment alone and then solved the other half together. Chloe had correct answers to only 80% of the problems she solved alone, but overall 88% of her answers were correct. Zoe had correct answers to 90% of the problems she solved alone. What was Zoe's overall percentage of correct answers?

    A) 89   **B)** 92   **C)** 93   **D)** 96   **E)** 98

Q15. In the arrangement of letters and numerals below, by how many different paths can one spell AMC8? Beginning at the A in the middle, a path only allows moves from one letter to an adjacent (above, below, left, or right, but not diagonal) letter. One example of such a path is traced in the picture.

$$
\begin{array}{ccccc}
 & 8 & C & 8 & \\
8 & C & M & C & 8 \\
C & M & A & M & C \\
8 & C & M & C & 8 \\
 & 8 & C & 8 &
\end{array}
$$

    A) 8   **B)** 9   **C)** 12   **D)** 24   **E)** 36

Q16. In the figure below, choose point D on $\overline{BC}$ so that $\triangle ACD$ and $\triangle ABD$ have equal perimeters. What is the area of $\triangle ABD$?
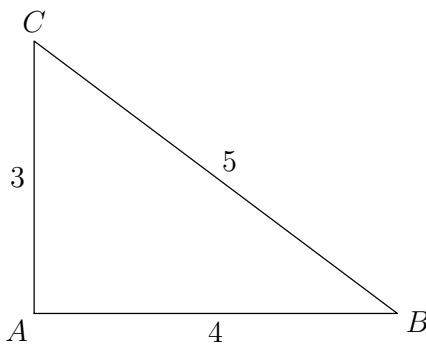
    A) $\frac{3}{4}$ **B)** $\frac{3}{2}$ **C)** 2   **D)** $\frac{12}{5}$ **E)** $\frac{5}{2}$

Q17. Starting with some gold coins and some empty treasure chests, I tried to put 9 gold coins in each treasure chest, but that left 2 treasure chests empty. So instead I put 6 gold coins in each treasure chest, but then I had 3 gold coins left over. How many gold coins did I have?
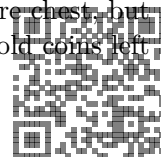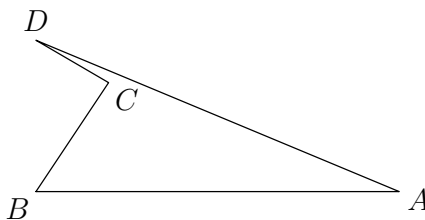
A) 9 **B)** 27 **C)** 45 **D)** 63 **E)** 81

Q18. In the non-convex quadrilateral $ABCD$ shown below, $\angle BCD$ is a right angle, $AB = 12$, $BC = 4$, $CD = 3$, and $AD = 13$.

What is the area of quadrilateral $ABCD$?

A) 12 **B)** 24 **C)** 26 **D)** 30 **E)** 36

Q19. For any positive integer M, the notation $M!$ denotes the product of the integers 1 through M. What is the largest integer n for which 5^n is a factor of the sum $98! + 99! + 100!$?

A) 23 **B)** 24 **C)** 25 **D)** 26 **E)** 27

Q20. An integer between 1000 and 9999, inclusive, is chosen at random. What is the probability that it is an odd integer whose digits are all distinct?

A) $\frac{14}{75}$ **B)** $\frac{56}{225}$ **C)** $\frac{107}{400}$ **D)** $\frac{7}{25}$ **E)** $\frac{9}{25}$

Q21. Suppose a, b, and c are nonzero real numbers, and $a + b + c = 0$. What are the possible value(s) for $\frac{a}{|a|} + \frac{b}{|b|} + \frac{c}{|c|} + \frac{abc}{|abc|}$?

A) 0 **B)** 1 and -1 **C)** 2 and -2 **D)** $0, 2$ and -2 **E)** $0, 1$ and -1

Q22. In the right triangle ABC, $AC = 12$, $BC = 5$, and angle C is a right angle. A semicircle is inscribed in the triangle as shown. What is the radius of the semicircle?
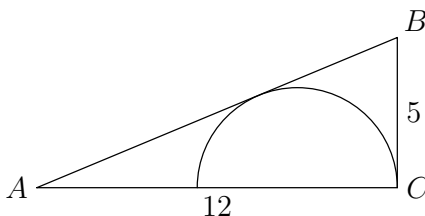
A) $\frac{7}{6}$ **B)** $\frac{13}{5}$ **C)** $\frac{59}{18}$ **D)** $\frac{10}{3}$ **E)** $\frac{60}{13}$

Q23. Each day for four days, Linda traveled for one hour at a speed that resulted in her traveling one mile in an integer number of minutes. Each day after the first, her speed decreased so that the number of minutes to travel one mile increased by 5 minutes over the preceding day. Each of the four days, her distance traveled was also an integer number of miles. What was the total number of miles for the four trips?

A) 10 **B)** 15 **C)** 25 **D)** 50 **E)** 82

Q24. Mrs. Sanders has three grandchildren, who call her regularly. One calls her every three days, one calls her every four days, and one calls her every five days. All three called her on December 31, 2016. On how many days during the next year did she not receive a phone call from any of her grandchildren?
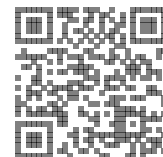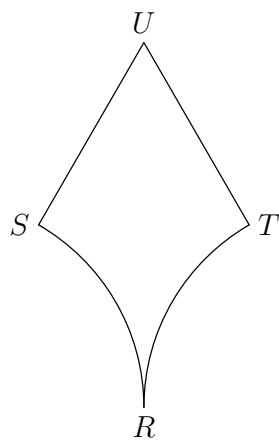
A) 78 **B)** 80 **C)** 144 **D)** 146 **E)** 152

Q25. In the figure shown, $\overline{US}$ and $\overline{UT}$ are line segments each of length 2, and $m\angle TUS = 60°$. Arcs $\overset{\frown}{TR}$ and $\overset{\frown}{SR}$ are each one-sixth of a circle with radius 2. What is the area of the region shown?

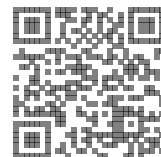**A)** $3\sqrt{3} - \pi$ **B)** $4\sqrt{3} - \frac{4\pi}{3}$ **C)** $2\sqrt{3}$ **D)** $4\sqrt{3} - \frac{2\pi}{3}$ **E)** $4 + \frac{4\pi}{3}$
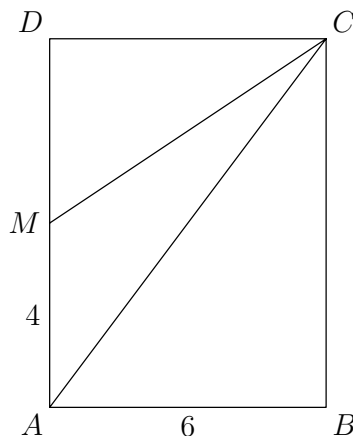
Q1. The longest professional tennis match lasted a total of 11 hours and 5 minutes. How many minutes is that?

A) 605 **B)** 655 **C)** 665 **D)** 1005 **E)** 1105

Q2. In rectangle $ABCD$, $AB = 6$ and $AD = 8$. Point M is the midpoint of $\overline{AD}$. What is the area of $\triangle AMC$?

A) 12 **B)** 15 **C)** 18 **D)** 20 **E)** 24

Q3. Four students take an exam. Three of their scores are $70, 80$, and 90. If the average of their four scores is 70, then what is the remaining score?

A) 40 **B)** 50 **C)** 55 **D)** 60 **E)** 70

Q4. When Cheenu was a boy he could run 15 miles in 3 hours and 30 minutes. As an old man he can now walk 10 miles in 4 hours. How many minutes longer does it take for him to travel a mile now compared to when he was a boy?

A) 6 **B)** 10 **C)** 15 **D)** 18 **E)** 30

Q5. When N is divided by 9, the remainder is 1.

When N is divided by 10, the remainder is 3.

What is the remainder when N is divided by 11?

A) 0 **B)** 2 **C)** 4 **D)** 5 **E)** 7

Q6. The following bar graph represents the length (in letters) of the names of 19 people. What is the median length of these names?
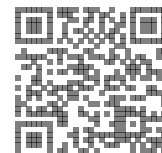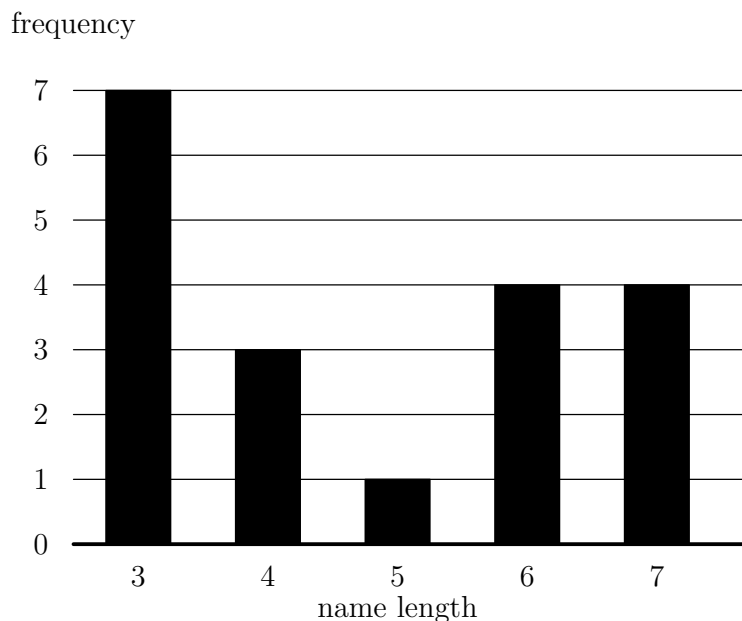
A) 3   **B)** 4   **C)** 5   **D)** 6   **E)** 7

Q7. Which of the following numbers is not a perfect square?

    A) 1^{2016} **B)** 2^{2017} **C)** 3^{2018} **D)** 4^{2019} **E)** 5^{2020}

Q8. Find the value of the expression

$$100 - 98 + 96 - 94 + 92 - 90 + \cdots + 8 - 6 + 4 - 2.$$

    A) 20   **B)** 40   **C)** 50   **D)** 80   **E)** 100

Q9. What is the sum of the distinct prime integer divisors of 2016?

    A) 9   **B)** 12   **C)** 16   **D)** 49   **E)** 63

Q10. Suppose that $a * b$ means $3a - b$. What is the value of x if

$$2 * (5 * x) = 1$$

    A) $\frac{1}{10}$ **B)** 2   **C)** $\frac{10}{3}$ **D)** 10   **E)** 14

Q11. Determine how many two-digit numbers satisfy the following property: when the number is added to the number obtained by reversing its digits, the sum is 132.

    A) 5   **B)** 7   **C)** 9   **D)** 11   **E)** 12

Q12. Jefferson Middle School has the same number of boys and girls. $\frac{3}{4}$ of the girls and $\frac{2}{3}$ of the boys went on a field trip. What fraction of the students on the field trip were girls?

    A) $\frac{1}{2}$ **B)** $\frac{9}{17}$ **C)** $\frac{7}{13}$ **D)** $\frac{2}{3}$ **E)** $\frac{14}{15}$

Q13. Two different numbers are randomly selected from the set $-2, -1, 0, 3, 4, 5$ and multiplied together. What is the probability that the product is 0?

    A) $\frac{1}{6}$ **B)** $\frac{1}{5}$ **C)** $\frac{1}{4}$ **D)** $\frac{1}{3}$ **E)** $\frac{1}{2}$

Q14. Karl's car uses a gallon of gas every 35 miles, and his gas tank holds 14 gallons when it is full. One day, Karl started with a full tank of gas, drove 350 miles, bought 8 gallons of gas, and continued driving to his destination. When he arrived, his gas tank was half full. How many miles did Karl drive that day?

    A) 525   **B)** 560   **C)** 595   **D)** 665   **E)** 735

Q15. What is the largest power of 2 that is a divisor of $13^4 - 11^4$?

    A) 8   **B)** 16   **C)** 32   **D)** 64   **E)** 128

Q16. Annie and Bonnie are running laps around a 400-meter oval track. They started together, but Annie has pulled ahead because she runs 25% faster than Bonnie. How many laps will Annie have run when she first passes Bonnie?

    A) $1\frac{1}{4}$ **B)** $3\frac{1}{3}$ **C)** 4   **D)** 5   **E)** 25

Q17. An ATM password at Fred's Bank is composed of four digits from 0 to 9, with repeated digits allowable. If no password may begin with the sequence $9, 1, 1$, then how many passwords are possible?

    A) 30   **B)** 7290   **C)** 9000   **D)** 9990   **E)** 9999

Q18. In an All-Area track meet, 216 sprinters enter a $100-$meter dash competition. The track has 6 lanes, so only 6 sprinters can compete at a time. At the end of each race, the five non-winners are eliminated, and the winner will compete again in a later race. How many races are needed to determine the champion sprinter?

    A) 36   **B)** 42   **C)** 43   **D)** 60   **E)** 72

Q19. The sum of 25 consecutive even integers is $10,000$. What is the largest of these 25 consecutive integers?
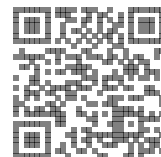
A) 360   **B)** 388   **C)** 412   **D)** 416   **E)** 424

Q20. The least common multiple of a and b is 12, and the least common multiple of b and c is 15. What is the least possible value of the least common multiple of a and c?

A) 20   **B)** 30   **C)** 60   **D)** 120   **E)** 180

Q21. A top hat contains 3 red chips and 2 green chips. Chips are drawn randomly, one at a time without replacement, until all 3 of the reds are drawn or until both green chips are drawn. What is the probability that the 3 reds are drawn?

A) $\dfrac{3}{10}$ **B)** $\dfrac{2}{5}$ **C)** $\dfrac{1}{2}$ **D)** $\dfrac{3}{5}$ **E)** $\dfrac{7}{10}$

Q22. Rectangle $DEFA$ below is a 3×4 rectangle with $DC = CB = BA$. What is the area of the "bat wings" (shaded area)?
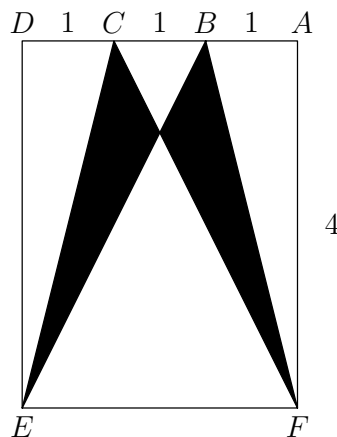
A) 2   **B)** $2\frac{1}{2}$ **C)** 3   **D)** $3\frac{1}{2}$ **E)** 5

Q23. Two congruent circles centered at points A and B each pass through the other circle's center. The line containing both A and B is extended to intersect the circles at points C and D. The circles intersect at two points, one of which is E. What is the degree measure of $\angle CED$?

A) 90   **B)** 105   **C)** 120   **D)** 135   **E)** 150

Q24. The digits 1, 2, 3, 4, and 5 are each used once to write a five-digit number $PQRST$. The three-digit number PQR is divisible by 4, the three-digit number QRS is divisible by 5, and the three-digit number RST is divisible by 3. What is P?

**A)** 1   **B)** 2   **C)** 3   **D)** 4   **E)** 5

Q25. A semicircle is inscribed in an isosceles triangle with base 16 and height 15 so that the diameter of the semicircle is contained in the base of the triangle as shown. What is the radius of the semicircle?
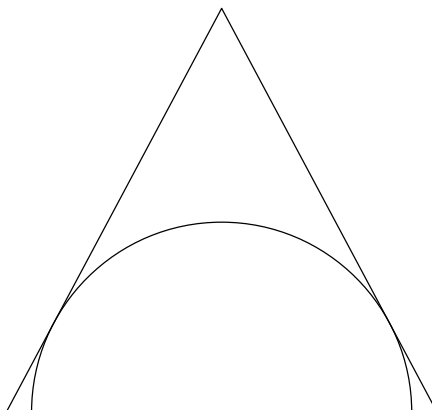
A) $4\sqrt{3}$ **B)** $\dfrac{120}{17}$ **C)** 10   **D)** $\dfrac{17\sqrt{2}}{2}$ **E)** $\dfrac{17\sqrt{3}}{2}$
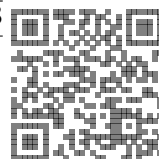
Q1. How many square yards of carpet are required to cover a rectangular floor that is 12 feet long and 9 feet wide? (There are 3 feet in a yard.)

    A) 12   **B)** 36   **C)** 108   **D)** 324   **E)** 972

Q2. Point O is the center of the regular octagon $ABCDEFGH$, and X is the midpoint of the side $\overline{AB}$. What fraction of the area of the octagon is shaded?
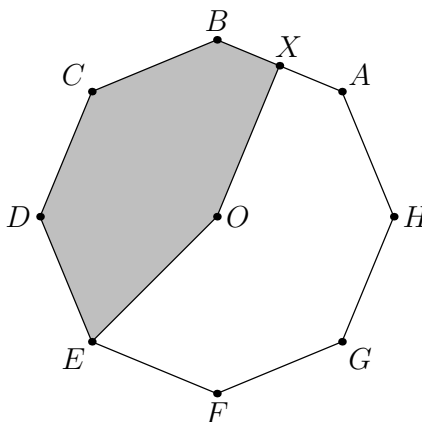
    A) $\frac{11}{32}$ **B)** $\frac{3}{8}$ **C)** $\frac{13}{32}$ **D)** $\frac{7}{16}$ **E)** $\frac{15}{32}$

Q3. Jack and Jill are going swimming at a pool that is one mile from their house. They leave home simultaneously. Jill rides her bicycle to the pool at a constant speed of 10 miles per hour. Jack walks to the pool at a constant speed of 4 miles per hour. How many minutes before Jack does Jill arrive?

    A) 5   **B)** 6   **C)** 8   **D)** 9   **E)** 10

Q4. The Dragonvale Middle School chess team consists of two boys and three girls. A photographer wants to take a picture of the team to appear in the local newspaper. She decides to have them sit in a row with a boy at each end and the three girls in the middle. How many such arrangements are possible?

    A) 2   **B)** 4   **C)** 5   **D)** 6   **E)** 12

Q5. Billy's basketball team scored the following points over the course of the first 11 games of the season:

$$42, 47, 53, 53, 58, 58, 58, 61, 64, 65, 73$$

If his team scores 40 in the 12th game, which of the following statistics will show an increase?

    A) range   **B)** median   **C)** mean   **D)** mode   **E)** mid-range

Q6. In $\triangle ABC$, $AB = BC = 29$, and $AC = 42$. What is the area of $\triangle ABC$?

    A) 100   **B)** 420   **C)** 500   **D)** 609   **E)** 701

Q7. Each of two boxes contains three chips numbered 1, 2, 3. A chip is drawn randomly from each box and the numbers on the two chips are multiplied. What is the probability that their product is even?

    A) $\frac{1}{9}$ **B)** $\frac{2}{9}$ **C)** $\frac{4}{9}$ **D)** $\frac{1}{2}$ **E)** $\frac{5}{9}$

Q8. What is the smallest whole number larger than the perimeter of any triangle with a side of length 5 and a side of length 19?

    A) 24   **B)** 29   **C)** 43   **D)** 48   **E)** 57

Q9. On her first day of work, Janabel sold one widget. On day two, she sold three widgets. On day three, she sold five widgets, and on each succeeding day, she sold two more widgets than she had sold on the previous day. How many widgets in total had Janabel sold after working 20 days?
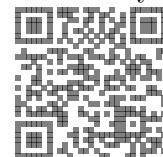
    A) 39   **B)** 40   **C)** 210   **D)** 400   **E)** 401

Q10. How many integers between 1000 and 9999 have four distinct digits?

   A) 3024   **B)** 4536   **C)** 5040   **D)** 6480   **E)** 6561

Q11. In the small country of Icosahedrontopia, all automobile license plates have four symbols. The first must be a vowel ($A, E, I, O,$ or U), the second and third must be two different letters among the 21 non-vowels, and the fourth must be a digit (0 through 9). If the symbols are chosen at random subject to these conditions, what is the probability that the plate will read "$AMC8$"?

   A) $\dfrac{1}{22,050}$ **B)** $\dfrac{1}{21,000}$ **C)** $\dfrac{1}{10,500}$ **D)** $\dfrac{1}{2,100}$ **E)** $\dfrac{1}{1,050}$

Q12. How many pairs of parallel edges, such as $\overline{AB}$ and $\overline{GH}$ or $\overline{EH}$ and $\overline{FG}$, does a cube have?
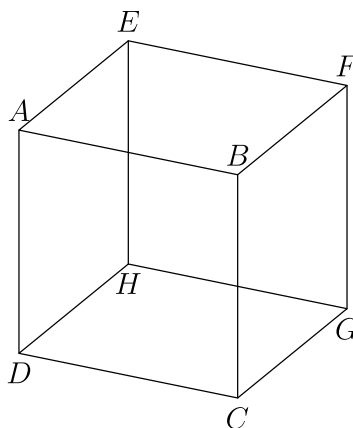
   A) 6   **B)** 12   **C)** 18   **D)** 24   **E)** 36

Q13. How many subsets of two elements can be removed from the set $\{1, 2, 3, 4, 5, 6, 7, 8, 9, 10, 11\}$ so that the mean (average) of the remaining numbers is 6?

   A) 1   **B)** 2   **C)** 3   **D)** 5   **E)** 6

Q14. Which of the following integers cannot be written as the sum of four consecutive odd integers?

   A) 16   **B)** 40   **C)** 72   **D)** 100   **E)** 200

Q15. At Euler Middle School, 198 students voted on two issues in a school referendum with the following results: 149 voted in favor of the first issue and 119 voted in favor of the second issue. If there were exactly 29 students who voted against both issues, how many students voted in favor of both issues?

   A) 49   **B)** 70   **C)** 79   **D)** 99   **E)** 149

Q16. In a middle-school mentoring program, a number of the sixth graders are paired with a ninth-grade student as a buddy. No ninth grader is assigned more than one sixth-grade buddy. If $\frac{1}{3}$ of all the ninth graders are paired with $\frac{2}{5}$ of all the sixth graders, what fraction of the total number of sixth and ninth graders have a buddy?

   A) $\dfrac{2}{15}$ **B)** $\dfrac{4}{11}$ **C)** $\dfrac{11}{30}$ **D)** $\dfrac{3}{8}$ **E)** $\dfrac{11}{15}$

Q17. Jeremy's father drives him to school in rush hour traffic in 20 minutes. One day there is no traffic, so his father can drive him 18 miles per hour faster and gets him to school in 12 minutes. How far in miles is it to school?

   **A)** 4   **B)** 6   **C)** 8   **D)** 9   **E)** 12

Q18. An arithmetic sequence is a sequence in which each term after the first is obtained by adding a constant to the previous term. For example, $2, 5, 8, 11, 14$ is an arithmetic sequence with five terms, in which the first term is 2 and the constant added is 3. Each row and each column in this 5×5 array is an arithmetic sequence with five terms. What is the value of X?
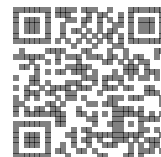
1				25
		X		
17				81

A) 21   **B)** 31   **C)** 36   **D)** 40   **E)** 42

Q19. A triangle with vertices as $A = (1,3)$, $B = (5,1)$, and $C = (4,4)$ is plotted on a 6×5 grid. What fraction of the grid is covered by the triangle?
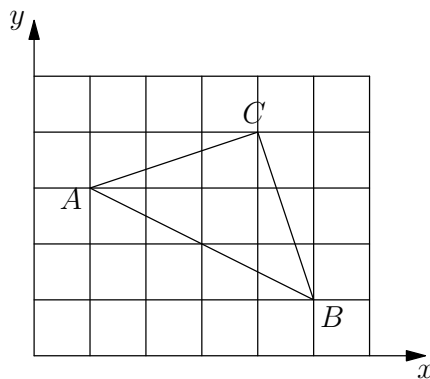

A) $\dfrac{1}{6}$ **B)** $\dfrac{1}{5}$ **C)** $\dfrac{1}{4}$ **D)** $\dfrac{1}{3}$ **E)** $\dfrac{1}{2}$

Q20. Ralph went to the store and bought 12 pairs of socks for a total of \$24. Some of the socks he bought cost \$1 a pair, some of the socks he bought cost \$3 a pair, and some of the socks he bought cost \$4 a pair. If he bought at least one pair of each type, how many pairs of \$1 socks did Ralph buy?

A) 4   **B)** 5   **C)** 6   **D)** 7   **E)** 8

Q21. In the given figure hexagon $ABCDEF$ is equiangular, $ABJI$ and $FEHG$ are squares with areas 18 and 32 respectively, $\triangle JBK$ is equilateral and $FE = BC$. What is the area of $\triangle KBC$?
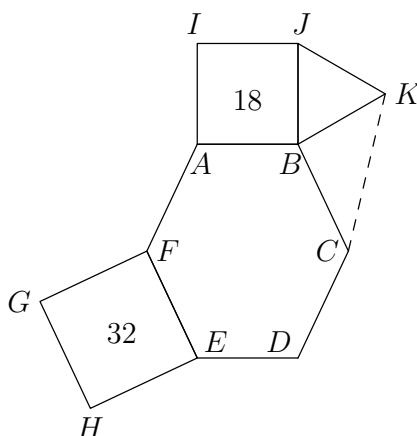
A) $6\sqrt{2}$ **B)** 9   **C)** 12   **D)** $9\sqrt{2}$ **E)** 32.

Q22. On June 1, a group of students are standing in rows, with 15 students in each row. On June 2, the same group is standing with all of the students in one long row. On June 3, the same group is standing with just one student in each row. On June 4, the same group is standing with 6 students in each row. This process continues through June 12 with a different number of students per row each day. However, on June 13, they cannot find a new way of organizing the students. What is the smallest possible number of students in the group?

A) 21   **B)** 30   **C)** 60   **D)** 90   **E)** 1080
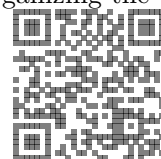
Q23. Tom has twelve slips of paper which he wants to put into five cups labeled A, B, C, D, E. He wants the sum of the numbers on the slips in each cup to be an integer. Furthermore, he wants the five integers to be consecutive and increasing from A to E. The numbers on the papers are $2, 2, 2, 2.5, 2.5, 3, 3, 3, 3, 3.5, 4$, and 4.5. If a slip with 2 goes into cup E and a slip with 3 goes into cup B, then the slip with 3.5 must go into what cup?

A) A **B)** B **C)** C **D)** D **E)** E

Q24. A baseball league consists of two four-team divisions. Each team plays every other team in its division N games. Each team plays every team in the other division M games with $N > 2M$ and $M > 4$. Each team plays a 76-game schedule. How many games does a team play within its own division?

A) 36 **B)** 48 **C)** 54 **D)** 60 **E)** 72

Q25. One-inch squares are cut from the corners of this 5 inch square. What is the area in square inches of the largest square that can fit into the remaining space?
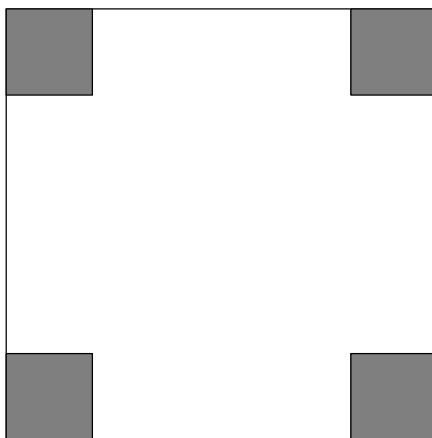
A) 9 **B)** $12\frac{1}{2}$ **C)** 15 **D)** $15\frac{1}{2}$ **E)** 17
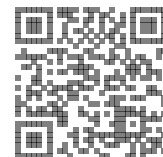
Q1. Harry and Terry are each told to calculate $8 - (2 + 5)$. Harry gets the correct answer. Terry ignores the parentheses and calculates $8 - 2 + 5$. If Harry's answer is H and Terry's answer is T, what is $H - T$?

    A) -10 **B)** -6 **C)** 0 **D)** 6 **E)** 10

Q2. Paul owes Paula 35 cents and has a pocket full of 5-cent coins, 10-cent coins, and 25-cent coins that he can use to pay her. What is the difference between the largest and the smallest number of coins he can use to pay her?

    A) 1   **B)** 2   **C)** 3   **D)** 4   **E)** 5

Q3. Isabella had a week to read a book for a school assignment. She read an average of 36 pages per day for the first three days and an average of 44 pages per day for the next three days. She then finished the book by reading 10 pages on the last day. How many pages were in the book?

    A) 240   **B)** 250   **C)** 260   **D)** 270   **E)** 280

Q4. The sum of two prime numbers is 85. What is the product of these two prime numbers?

    A) 85   **B)** 91   **C)** 115   **D)** 133   **E)** 166

Q5. Margie's car can go 32 miles on a gallon of gas, and gas currently costs \$4 per gallon. How many miles can Margie drive on \$20 worth of gas?

    A) 64   **B)** 128   **C)** 160   **D)** 320   **E)** 640

Q6. Six rectangles each with a common base width of 2 have lengths of $1, 4, 9, 16, 25,$ and 36. What is the sum of the areas of the six rectangles?

    A) 91   **B)** 93   **C)** 162   **D)** 182   **E)** 202

Q7. There are four more girls than boys in Ms. Raub's class of 28 students. What is the ratio of number of girls to the number of boys in her class?

    A) $3 : 4$ **B)** $4 : 3$ **C)** $3 : 2$ **D)** $7 : 4$ **E)** $2 : 1$

Q8. Eleven members of the Middle School Math Club each paid the same amount for a guest speaker to talk about problem solving at their math club meeting. They paid their guest speaker \$$\underline{1}\underline{A}\underline{2}$. What is the missing digit A of this 3-digit number?

    A) 0   **B)** 1   **C)** 2   **D)** 3   **E)** 4

Q9. In $\triangle ABC$, D is a point on side $\overline{AC}$ such that $BD = DC$ and $\angle BCD$ measures $70°$. What is the degree measure of $\angle ADB$?
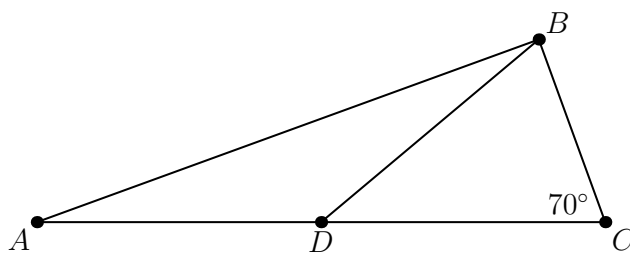
    A) 100   **B)** 120   **C)** 135   **D)** 140   **E)** 150

Q10. The first AMC 8 was given in 1985 and it has been given annually since that time. Samantha turned 12 years old the year that she took the seventh AMC 8. In what year was Samantha born?

    A) 1979   **B)** 1980   **C)** 1981   **D)** 1982   **E)** 1983

Q11. Jack wants to bike from his house to Jill's house, which is located three blocks east and two blocks north of Jack's house. After biking each block, Jack can continue either east or north, but he needs to avoid a dangerous intersection one block east and one block north of his house. In how many ways can he reach Jill's house by biking a total of five blocks?
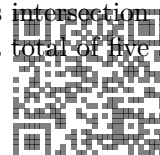
**A)** 4   **B)** 5   **C)** 6   **D)** 8   **E)** 10

Q12. A magazine printed photos of three celebrities along with three photos of the celebrities as babies. The baby pictures did not identify the celebrities. Readers were asked to match each celebrity with the correct baby pictures. What is the probability that a reader guessing at random will match all three correctly?

A) $\frac{1}{9}$ **B)** $\frac{1}{6}$ **C)** $\frac{1}{4}$ **D)** $\frac{1}{3}$ **E)** $\frac{1}{2}$

Q13. If n and m are integers and $n^2 + m^2$ is even, which of the following is impossible?

     A) n and m are even

     B) n and m are odd

     C) $n + m$ is even

     D) $n + m$ is odd

     E) none of these are impossible

Q14. Rectangle $ABCD$ and right triangle DCE have the same area. They are joined to form a trapezoid, as shown. What is DE?
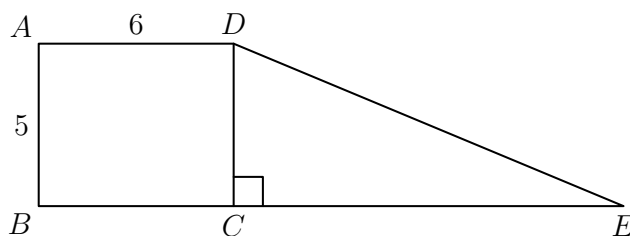
A) 12   **B)** 13   **C)** 14   **D)** 15   **E)** 16

Q15. The circumference of the circle with center O is divided into 12 equal arcs, marked the letters A through L as seen below. What is the number of degrees in the sum of the angles x and y?
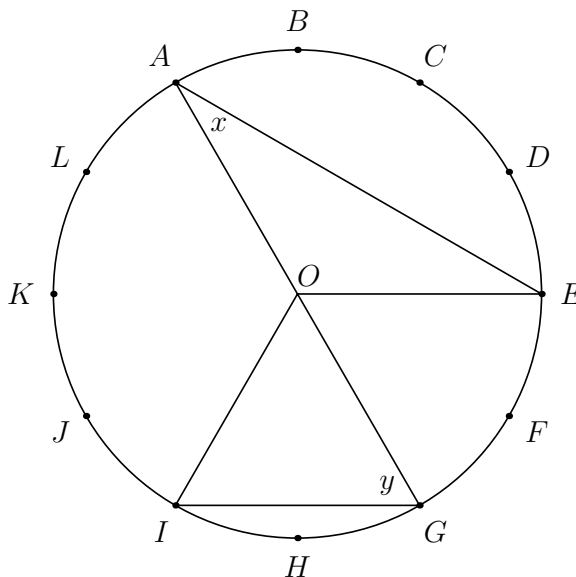
A) 75   **B)** 80   **C)** 90   **D)** 120   **E)** 150

Q16. The "Middle School Eight" basketball conference has 8 teams. Every season, each team plays every other conference team twice (home and away), and each team also plays 4 games against non-conference opponents. What is the total number of games in a season involving the "Middle School Eight" teams?

A) 60   **B)** 88   **C)** 96   **D)** 144   **E)** 160
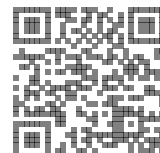
Q17. George walks 1 mile to school. He leaves home at the same time each day, walks at a steady speed of 3 miles per hour, and arrives just as school begins. Today he was distracted by the pleasant weather and walked the first $\frac{1}{2}$ mile at a speed of only 2 miles per hour. At how many miles per hour must George run the last $\frac{1}{2}$ mile in order to arrive just as school begins today?

   A) 4   **B)** 6   **C)** 8   **D)** 10   **E)** 12

Q18. Four children were born at City Hospital yesterday. Assume each child is equally likely to be a boy or a girl. Which of the following outcomes is most likely?

   A) all 4 are boys

   B) all 4 are girls

   C) 2 are girls and 2 are boys

   D) 3 are of one gender and 1 is of the other gender

   E) all of these outcomes are equally likely

Q19. A cube with 3-inch edges is to be constructed from 27 smaller cubes with 1-inch edges. Twenty-one of the cubes are colored red and 6 are colored white. If the 3-inch cube is constructed to have the smallest possible white surface area showing, what fraction of the surface area is white?

   A) $\dfrac{5}{54}$ **B)** $\dfrac{1}{9}$ **C)** $\dfrac{5}{27}$ **D)** $\dfrac{2}{9}$ **E)** $\dfrac{1}{3}$

Q20. Rectangle $ABCD$ has sides $CD = 3$ and $DA = 5$. A circle of radius 1 is centered at A, a circle of radius 2 is centered at B, and a circle of radius 3 is centered at C. Which of the following is closest to the area of the region inside the rectangle but outside all three circles?
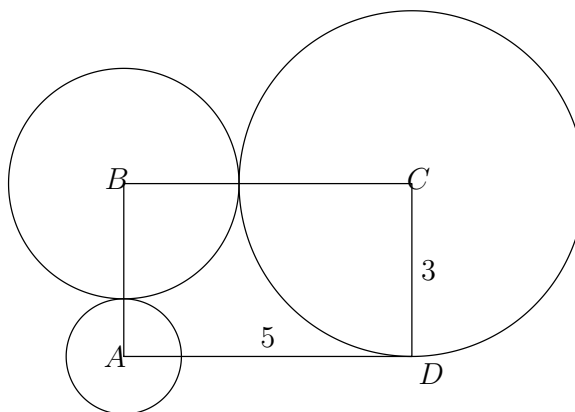
   A) 3.5   **B)** 4.0   **C)** 4.5   **D)** 5.0   **E)** 5.5

Q21. The 7-digit numbers $\underline{74A52B1}$ and $\underline{326AB4C}$ are each multiples of 3. Which of the following could be the value of C?

   A) 1   **B)** 2   **C)** 3   **D)** 5   **E)** 8

Q22. A 2-digit number is such that the product of the digits plus the sum of the digits is equal to the number. What is the units digit of the number?

   A) 1   **B)** 3   **C)** 5   **D)** 7   **E)** 9

Q23. Three members of the Euclid Middle School girls' softball team had the following conversation.

Ashley: I just realized that our uniform numbers are all 2-digit primes.

Brittany : And the sum of your two uniform numbers is the date of my birthday earlier this month.

Caitlin: That's funny. The sum of your two uniform numbers is the date of my birthday later this month.

Ashley: And the sum of your two uniform numbers is today's date.

What number does Caitlin wear?
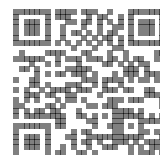
A) 11   **B)** 13   **C)** 17   **D)** 19   **E)** 23

Q24. One day the Beverage Barn sold 252 cans of soda to 100 customers, and every customer bought at least one can of soda. What is the maximum possible median number of cans of soda bought per customer on that day?

     A) 2.5   **B)** 3.0   **C)** 3.5   **D)** 4.0   **E)** 4.5

Q25. A straight one-mile stretch of highway, 40 feet wide, is closed. Robert rides his bike on a path composed of semicircles as shown. If he rides at 5 miles per hour, how many hours will it take to cover the one-mile stretch?

Note: 1 mile = 5280 feet
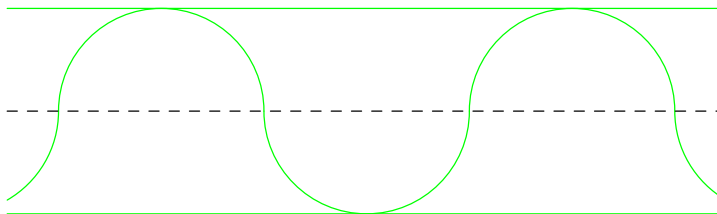
     A) $\dfrac{\pi}{11}$ **B)** $\dfrac{\pi}{10}$ **C)** $\dfrac{\pi}{5}$ **D)** $\dfrac{2\pi}{5}$ **E)** $\dfrac{2\pi}{3}$
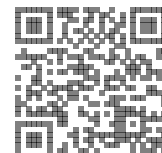
Q1. Danica wants to arrange her model cars in rows with exactly 6 cars in each row. She now has 23 model cars. What is the smallest number of additional cars she must buy in order to be able to arrange all her cars this way?

A) 1   **B)** 2   **C)** 3   **D)** 4   **E)** 5

Q2. A sign at the fish market says, "50% off, today only: half-pound packages for just $3 per package." What is the regular price for a full pound of fish, in dollars?

A) 6   **B)** 9   **C)** 10   **D)** 12   **E)** 15

Q3. What is the value of $4 \cdot (-1 + 2 - 3 + 4 - 5 + 6 - 7 + \cdots + 1000)$?

A) -10 **B)** 0   **C)** 1   **D)** 500   **E)** 2000

Q4. Eight friends ate at a restaurant and agreed to share the bill equally. Because Judi forgot her money, each of her seven friends paid an extra $2.50 to cover her portion of the total bill. What was the total bill?

A) $120   **B)** $128   **C)** $140   **D)** $144   **E)** $160

Q5. Hammie is in the 6th grade and weighs 106 pounds. His quadruplet sisters are tiny babies and weigh 5, 5, 6, and 8 pounds. Which is greater, the average (mean) weight of these five children or the median weight, and by how many pounds?

A) median, by 60

B) median, by 20

C) average, by 5

D) average, by 15

E) average, by 20

Q6. The number in each box below is the product of the numbers in the two boxes that touch it in the row above. For example, $30 = 6 \times 5$. What is the missing number in the top row?
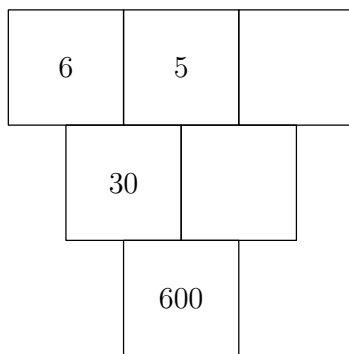
A) 2   **B)** 3   **C)** 4   **D)** 5   **E)** 6

Q7. Trey and his mom stopped at a railroad crossing to let a train pass. As the train began to pass, Trey counted 6 cars in the first 10 seconds. It took the train 2 minutes and 45 seconds to clear the crossing at a constant speed. Which of the following was the most likely number of cars in the train?

A) 60   **B)** 80   **C)** 100   **D)** 120   **E)** 140

Q8. A fair coin is tossed 3 times. What is the probability of at least two consecutive heads?

A) $\dfrac{1}{8}$ **B)** $\dfrac{1}{4}$ **C)** $\dfrac{3}{8}$ **D)** $\dfrac{1}{2}$ **E)** $\dfrac{3}{4}$
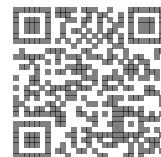
Q9. The Incredible Hulk can double the distance he jumps with each succeeding jump. If his first jump is 1 meter, the second jump is 2 meters, the third jump is 4 meters, and so on, then on which jump will he first be able to jump more than 1 kilometer?

A) 9th **B)** 10th **C)** 11th **D)** 12th **E)** 13th

Q10. What is the ratio of the least common multiple of 180 and 594 to the greatest common factor of 180 and 594?

A) 110 **B)** 165 **C)** 330 **D)** 625 **E)** 660

Q11. Ted's grandfather used his treadmill on 3 days this week. He went 2 miles each day. On Monday he jogged at a speed of 5 miles per hour. He walked at the rate of 3 miles per hour on Wednesday and at 4 miles per hour on Friday. If Grandfather had always walked at 4 miles per hour, he would have spent less time on the treadmill. How many minutes less?

A) 1 **B)** 2 **C)** 3 **D)** 4 **E)** 5

Q12. At the 2013 Winnebago County Fair a vendor is offering a "fair special" on sandals. If you buy one pair of sandals at the regular price of $50, you get a second pair at a 40% discount, and a third pair at half the regular price. Javier took advantage of the "fair special" to buy three pairs of sandals. What percentage of the $150 regular price did he save?

A) 25 **B)** 30 **C)** 33 **D)** 40 **E)** 45

Q13. When Clara totaled her scores, she inadvertently reversed the units digit and the tens digit of one score. By which of the following might her incorrect sum have differed from the correct one?

A) 45 **B)** 46 **C)** 47 **D)** 48 **E)** 49

Q14. Abe holds 1 green and 1 red jelly bean in his hand. Bob holds 1 green, 1 yellow, and 2 red jelly beans in his hand. Each randomly picks a jelly bean to show the other. What is the probability that the colors match?

A) $\dfrac{1}{4}$ **B)** $\dfrac{1}{3}$ **C)** $\dfrac{3}{8}$ **D)** $\dfrac{1}{2}$ **E)** $\dfrac{2}{3}$

Q15. If $3^p + 3^4 = 90$, $2^r + 44 = 76$, and $5^3 + 6^s = 1421$, what is the product of p, r, and s?

A) 27 **B)** 40 **C)** 50 **D)** 70 **E)** 90

Q16. A number of students from Fibonacci Middle School are taking part in a community service project. The ratio of 8th-graders to 6th-graders is 5 : 3, and the the ratio of 8th-graders to 7th-graders is 8 : 5. What is the smallest number of students that could be participating in the project?

A) 16 **B)** 40 **C)** 55 **D)** 79 **E)** 89

Q17. The sum of six consecutive positive integers is 2013. What is the largest of these six integers?

A) 335 **B)** 338 **C)** 340 **D)** 345 **E)** 350

Q18. Isabella uses one-foot cubical blocks to build a rectangular fort that is 12 feet long, 10 feet wide, and 5 feet high. The floor and the four walls are all one foot thick. How many blocks does the fort contain?
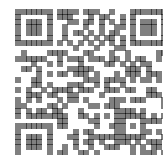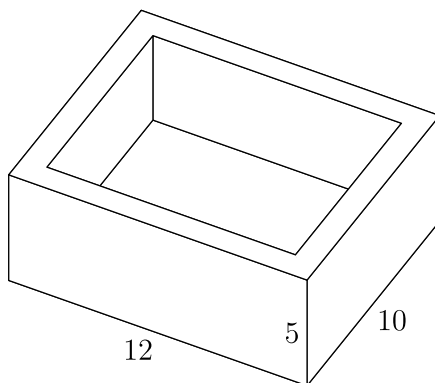
A) 204   **B)** 280   **C)** 320   **D)** 340   **E)** 600

Q19. Bridget, Cassie, and Hannah are discussing the results of their last math test. Hannah shows Bridget and Cassie her test, but Bridget and Cassie don't show theirs to anyone. Cassie says, 'I didn't get the lowest score in our class,' and Bridget adds, 'I didn't get the highest score.' What is the ranking of the three girls from highest to lowest?

     A) Hannah, Cassie, Bridget

     B) Hannah, Bridget, Cassie

     C) Cassie, Bridget, Hannah

     D) Cassie, Hannah, Bridget

     E) Bridget, Cassie, Hannah

Q20. A 1×2 rectangle is inscribed in a semicircle with the longer side on the diameter. What is the area of the semicircle?

     A) $\dfrac{\pi}{2}$ **B)** $\dfrac{2\pi}{3}$ **C)** π **D)** $\dfrac{4\pi}{3}$ **E)** $\dfrac{5\pi}{3}$

Q21. Samantha lives 2 blocks west and 1 block south of the southwest corner of City Park. Her school is 2 blocks east and 2 blocks north of the northeast corner of City Park. On school days she bikes on streets to the southwest corner of City Park, then takes a diagonal path through the park to the northeast corner, and then bikes on streets to school. If her route is as short as possible, how many different routes can she take?

     A) 3   **B)** 6   **C)** 9   **D)** 12   **E)** 18

Q22. Toothpicks are used to make a grid that is 60 toothpicks long and 32 toothpicks wide. How many toothpicks are used altogether?
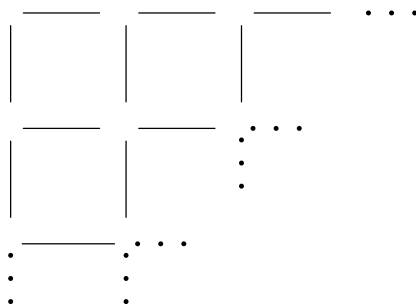
     A) 1920   **B)** 1952   **C)** 1980   **D)** 2013   **E)** 3932

Q23. Angle ABC of $\triangle ABC$ is a right angle. The sides of $\triangle ABC$ are the diameters of semicircles as shown. The area of the semicircle on $\overline{AB}$ equals 8π, and the arc of the semicircle on $\overline{AC}$ has length 8.5π. What is the radius of the semicircle on $\overline{BC}$?
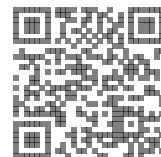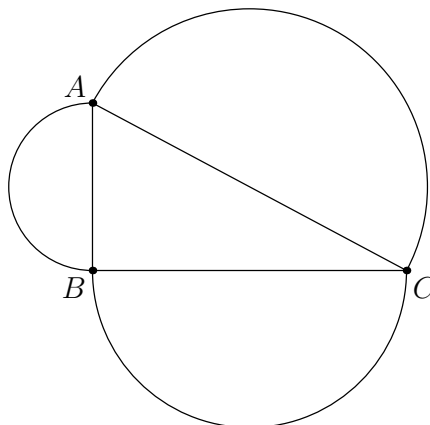
A) 7 **B)** 7.5 **C)** 8 **D)** 8.5 **E)** 9

Q24. Squares $ABCD$, $EFGH$, and $GHIJ$ are equal in area. Points C and D are the midpoints of sides IH and HE, respectively. What is the ratio of the area of the shaded pentagon $AJICB$ to the sum of the areas of the three squares?
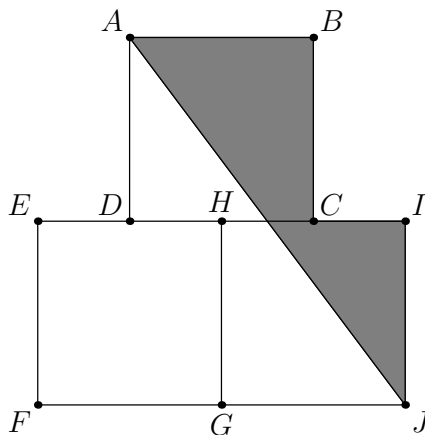
A) $\dfrac{1}{4}$ **B)** $\dfrac{7}{24}$ **C)** $\dfrac{1}{3}$ **D)** $\dfrac{3}{8}$ **E)** $\dfrac{5}{12}$

Q25. A ball with diameter 4 inches starts at point A to roll along the track shown. The track is comprised of 3 semicircular arcs whose radii are $R_1 = 100$ inches, $R_2 = 60$ inches, and $R_3 = 80$ inches, respectively. The ball always remains in contact with the track and does not slip. What is the distance the center of the ball travels over the course from A to B?

A) 238π **B)** 240π **C)** 260π **D)** 280π **E)** 500π
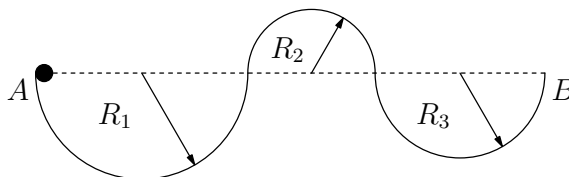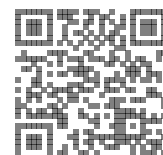
Q1. Rachelle uses 3 pounds of meat to make 8 hamburgers for her family. How many pounds of meat does she need to make 24 hamburgers for a neighborhood picnic?

A) 6 **B)** $6\frac{2}{3}$ **C)** $7\frac{1}{2}$ **D)** 8 **E)** 9

Q2. In the country of East Westmore, statisticians estimate there is a baby born every 8 hours and a death every day. To the nearest hundred, how many people are added to the population of East Westmore each year?

A) 600 **B)** 700 **C)** 800 **D)** 900 **E)** 1000

Q3. On February 13 "The Oshkosh Northwester" listed the length of daylight as 10 hours and 24 minutes, the sunrise was $6:57$AM, and the sunset as $8:15$PM. The length of daylight and sunrise were correct, but the sunset was wrong. When did the sun really set?

A) 5:10PM **B)** 5:21PM **C)** 5:41PM **D)** 5:57PM **E)** 6:03PM

Q4. Peter's family ordered a 12-slice pizza for dinner. Peter ate one slice and shared another slice equally with his brother Paul. What fraction of the pizza did Peter eat?

A) $\frac{1}{24}$ **B)** $\frac{1}{12}$ **C)** $\frac{1}{8}$ **D)** $\frac{1}{6}$ **E)** $\frac{1}{4}$

Q5. In the diagram, all angles are right angles and the lengths of the sides are given in centimeters. Note the diagram is not drawn to scale. What is , X in centimeters?
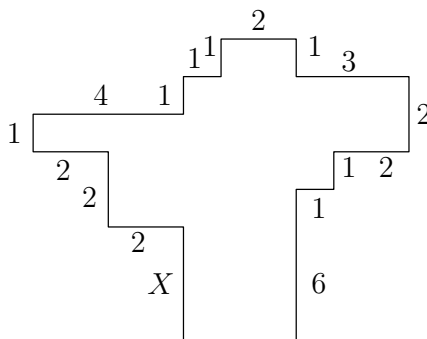
A) 1 **B)** 2 **C)** 3 **D)** 4 **E)** 5

Q6. A rectangular photograph is placed in a frame that forms a border two inches wide on all sides of the photograph. The photograph measures 8 inches high and 10 inches wide. What is the area of the border, in square inches?

A) 36 **B)** 40 **C)** 64 **D)** 72 **E)** 88

Q7. Isabella must take four 100-point tests in her math class. Her goal is to achieve an average grade of 95 on the tests. Her first two test scores were 97 and 91. After seeing her score on the third test, she realized she can still reach her goal. What is the lowest possible score she could have made on the third test?

A) 90 **B)** 92 **C)** 95 **D)** 96 **E)** 97

Q8. A shop advertises everything is "half price in today's sale". In addition, a coupon gives a 20% discount on sale prices. Using the coupon, the price today represents what percentage off the original price?

A) 10 **B)** 33 **C)** 40 **D)** 60 **E)** 70

Q9. The Fort Worth Zoo has a number of two-legged birds and a number of four-legged mammals. On one visit to the zoo, Margie counted 200 heads and 522 legs. How many of the animals that Margie counted were two-legged birds?
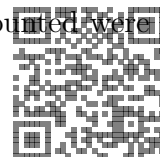
A) 61   **B)** 122   **C)** 139   **D)** 150   **E)** 161

Q10. How many 4-digit numbers greater than 1000 are there that use the four digits of 2012?

A) 6   **B)** 7   **C)** 8   **D)** 9   **E)** 12

Q11. The mean, median, and unique mode of the positive integers 3, 4, 5, 6, 6, 7, and x are all equal. What is the value of x?

A) 5   **B)** 6   **C)** 7   **D)** 11   **E)** 12

Q12. What is the units digit of 13^{2012}?

A) 1   **B)** 3   **C)** 5   **D)** 7   **E)** 9

Q13. Jamar bought some pencils costing more than a penny each at the school bookstore and paid \$1.43. Sharona bought some of the same pencils and paid \$1.87. How many more pencils did Sharona buy than Jamar?

A) 2   **B)** 3   **C)** 4   **D)** 5   **E)** 6

Q14. In the BIG N, a middle school football conference, each team plays every other team exactly once. If a total of 21 conference games were played during the 2012 season, how many teams were members of the BIG N conference?

A) 6   **B)** 7   **C)** 8   **D)** 9   **E)** 10

Q15. The smallest number greater than 2 that leaves a remainder of 2 when divided by 3, 4, 5, or 6 lies between what numbers?

A) 40 and 50   **B)** 51 and 55   **C)** 56 and 60   **D)** 61 and 65   **E)** 66 and 99

Q16. Each of the digits 0, 1, 2, 3, 4, 5, 6, 7, 8, and 9 is used only once to make two five-digit numbers so that they have the largest possible sum. Which of the following could be one of the numbers?

A) 76531   **B)** 86724   **C)** 87431   **D)** 96240   **E)** 97403

Q17. A square with integer side length is cut into 10 squares, all of which have integer side length and at least 8 of which have area 1. What is the smallest possible value of the length of the side of the original square?

A) 3   **B)** 4   **C)** 5   **D)** 6   **E)** 7

Q18. What is the smallest positive integer that is neither prime nor square and that has no prime factor less than 50?

A) 3127   **B)** 3133   **C)** 3137   **D)** 3139   **E)** 3149

Q19. In a jar of red, green, and blue marbles, all but 6 are red marbles, all but 8 are green, and all but 4 are blue. How many marbles are in the jar?

A) 6   **B)** 8   **C)** 9   **D)** 10   **E)** 18

Q20. What is the correct ordering of the three numbers $\dfrac{5}{19}$, $\dfrac{7}{21}$, and $\dfrac{9}{23}$, in increasing order?

A) $\dfrac{9}{23} < \dfrac{7}{21} < \dfrac{5}{19}$

B) $\dfrac{5}{19} < \dfrac{7}{21} < \dfrac{9}{23}$

C) $\dfrac{9}{23} < \dfrac{5}{19} < \dfrac{7}{21}$

D) $\dfrac{5}{19} < \dfrac{9}{23} < \dfrac{7}{21}$

E) $\dfrac{7}{21} < \dfrac{5}{19} < \dfrac{9}{23}$
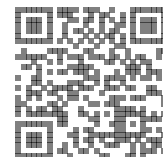
Q21. Marla has a large white cube that has an edge of 10 feet. She also has enough green paint to cover 300 square feet. Marla uses all the paint to create a white square centered on each face, surrounded by a green border. What is the area of one of the white squares, in square feet?

A) $5\sqrt{2}$ **B)** 10 **C)** $10\sqrt{2}$ **D)** 50 **E)** $50\sqrt{2}$

Q22. Let R be a set of nine distinct integers. Six of the elements are 2, 3, 4, 6, 9, and 14. What is the number of possible values of the median of R ?

A) 4 **B)** 5 **C)** 6 **D)** 7 **E)** 8

Q23. An equilateral triangle and a regular hexagon have equal perimeters. If the triangle's area is 4, what is the area of the hexagon?

A) 4 **B)** 5 **C)** 6 **D)** $4\sqrt{3}$ **E)** $6\sqrt{3}$

Q24. A circle of radius 2 is cut into four congruent arcs. The four arcs are joined to form the star figure shown. What is the ratio of the area of the star figure to the area of the original circle?
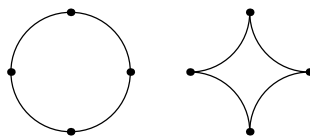
A) $\dfrac{4-\pi}{\pi}$ **B)** $\dfrac{1}{\pi}$ **C)** $\dfrac{\sqrt{2}}{\pi}$ **D)** $\dfrac{\pi-1}{\pi}$ **E)** $\dfrac{3}{\pi}$

Q25. A square with area 4 is inscribed in a square with area 5, with one vertex of the smaller square on each side of the larger square. A vertex of the smaller square divides a side of the larger square into two segments, one of length a, and the other of length b. What is the value of ab?
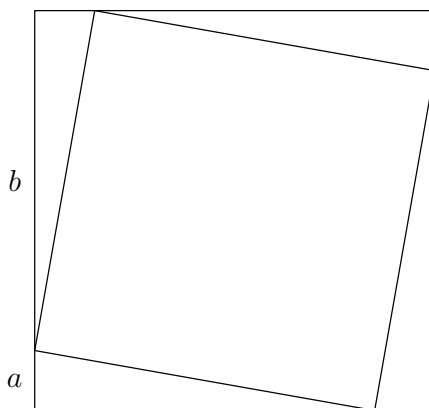
A) $\dfrac{1}{5}$ **B)** $\dfrac{2}{5}$ **C)** $\dfrac{1}{2}$ **D)** 1 **E)** 4
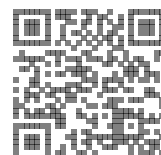
Q1. Margie bought 3 apples at a cost of 50 cents per apple. She paid with a 5-dollar bill. How much change did Margie receive?

A) $1.50 **B)** $2.00 **C)** $2.50 **D)** $3.00 **E)** $3.50

Q2. Karl's rectangular vegetable garden is 20 feet by 45 feet, and Makenna's is 25 feet by 40 feet. Whose garden is larger in area?

A) Karl's garden is larger by 100 square feet.

B) Karl's garden is larger by 25 square feet.

C) The gardens are the same size.

D) Makenna's garden is larger by 25 square feet.

E) Makenna's garden is larger by 100 square feet.

Q3. Extend the square pattern of 8 black and 17 white square tiles by attaching a border of black tiles around the square. What is the ratio of black tiles to white tiles in the extended pattern?
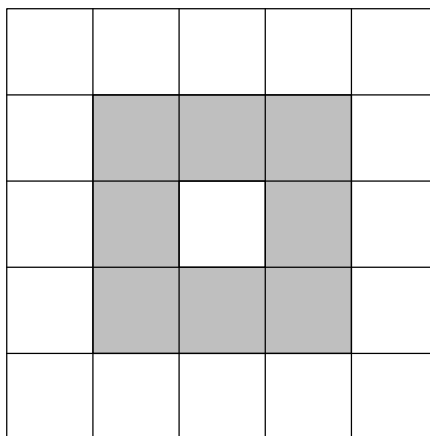
A) 8:17 **B)** 25:49 **C)** 36:25 **D)** 32:17 **E)** 36:17

Q4. Here is a list of the numbers of fish that Tyler caught in nine outings last summer:

$$2, 0, 1, 3, 0, 3, 3, 1, 2.$$

Which statement about the mean, median, and mode is true?

A) median < mean < mode

B) mean < mode < median

C) mean < median < mode

D) median < mode < mean

E) mode < median < mean

Q5. What time was it 2011 minutes after midnight on January 1, 2011?

A) January 1 at 9:31PM

B) January 1 at 11:51PM

C) January 2 at 3:11AM

D) January 2 at 9:31AM

E) January 2 at 6:01PM
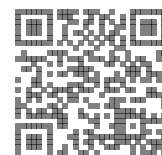
Q6. In a town of 351 adults, every adult owns a car, motorcycle, or both. If 331 adults own cars and 45 adults own motorcycles, how many of the car owners do not own a motorcycle?

A) 20   **B)** 25   **C)** 45   **D)** 306   **E)** 351

Q7. Each of the following four large congruent squares is subdivided into combinations of congruent triangles or rectangles and is partially **bolded**. What percent of the total area is partially bolded?
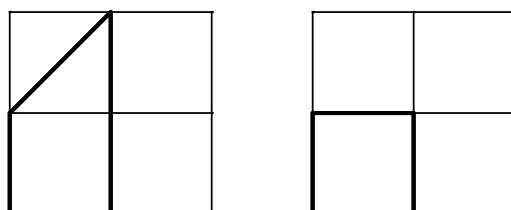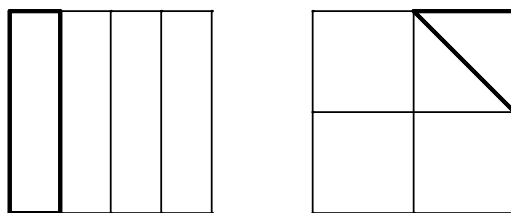
A) $12\frac{1}{2}$ **B)** 20   **C)** 25   **D)** $33\frac{1}{3}$ **E)** $37\frac{1}{2}$

Q8. Bag A has three chips labeled 1, 3, and 5. Bag B has three chips labeled 2, 4, and 6. If one chip is drawn from each bag, how many different values are possible for the sum of the two numbers on the chips?

A) 4   **B)** 5   **C)** 6   **D)** 7   **E)** 9

Q9. Carmen takes a long bike ride on a hilly highway. The graph indicates the miles traveled during the time of her ride. What is Carmen's average speed for her entire ride in miles per hour?
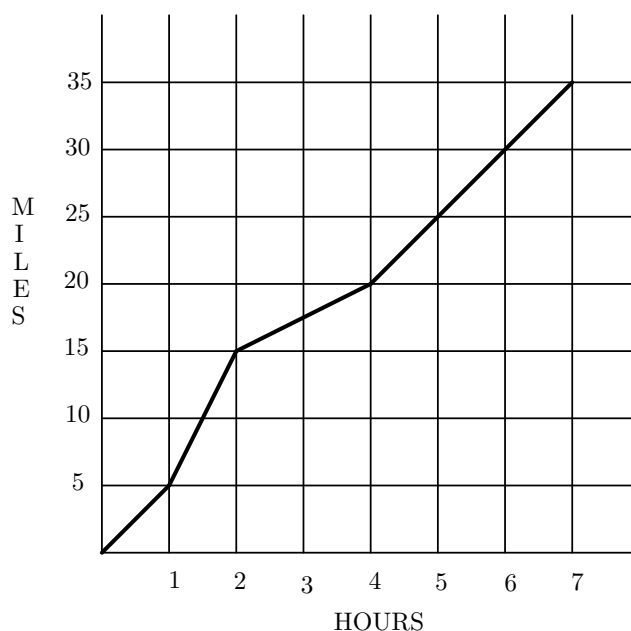
A) 2   **B)** 2.5   **C)** 4   **D)** 4.5   **E)** 5

Q10. The taxi fare in Gotham City is \$2.40 for the first $\frac{1}{2}$ mile and additional mileage charged at the rate \$0.20 for each additional 0.1 mile. You plan to give the driver a \$2 tip. How many miles can you ride for \$10?

    书山有路勤为径，学海无涯苦作舟。
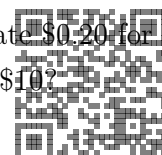
A) 3.0   **B)** 3.25   **C)** 3.3   **D)** 3.5   **E)** 3.75

Q11. The graph shows the number of minutes studied by both Asha (black bar) and Sasha (grey bar) in one week. On the average, how many more minutes per day did Sasha study than Asha?
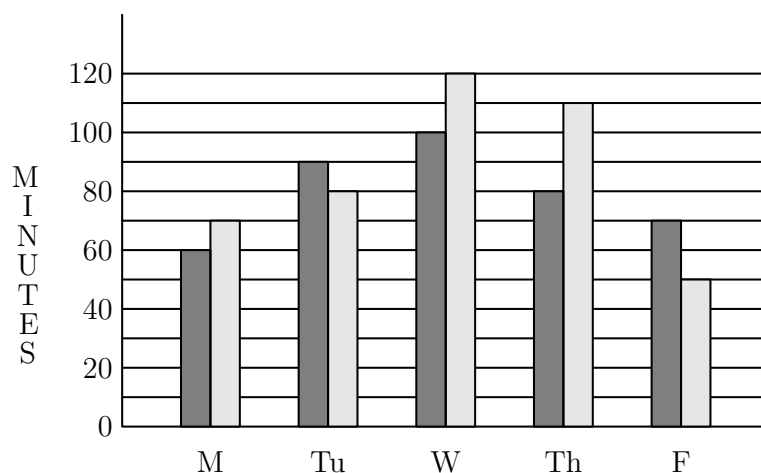
A) 6   **B)** 8   **C)** 9   **D)** 10   **E)** 12

Q12. Angie, Bridget, Carlos, and Diego are seated at random around a square table, one person to a side. What is the probability that Angie and Carlos are seated opposite each other?

A) $\dfrac{1}{4}$ **B)** $\dfrac{1}{3}$ **C)** $\dfrac{1}{2}$ **D)** $\dfrac{2}{3}$ **E)** $\dfrac{3}{4}$

Q13. Two congruent squares, $ABCD$ and $PQRS$, have side length 15. They overlap to form the 15 by 25 rectangle $AQRD$ shown. What percent of the area of rectangle $AQRD$ is shaded?
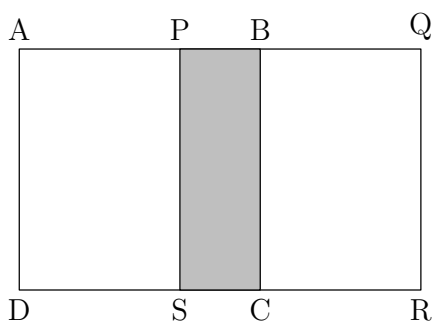
A) 15   **B)** 18   **C)** 20   **D)** 24   **E)** 25

Q14. There are 270 students at Colfax Middle School, where the ratio of boys to girls is $5 : 4$. There are 180 students at Winthrop Middle School, where the ratio of boys to girls is $4 : 5$. The two schools hold a dance and all students from both schools attend. What fraction of the students at the dance are girls?

A) $\dfrac{7}{18}$ **B)** $\dfrac{7}{15}$ **C)** $\dfrac{22}{45}$ **D)** $\dfrac{1}{2}$ **E)** $\dfrac{23}{45}$

Q15. How many digits are in the product $4^5 \cdot 5^{10}$?

A) 8   **B)** 9   **C)** 10   **D)** 11   **E)** 12

Q16. Let A be the area of the triangle with sides of length $25, 25$, and 30. Let B be the area of the triangle with sides of length $25, 25$, and 40. What is the relationship between A and B?

A) $A = \dfrac{9}{16}B$ **B)** $A = \dfrac{3}{4}B$ **C)** $A = B$ **D)** $A = \dfrac{4}{3}B$ **E)** $A = \dfrac{16}{9}B$
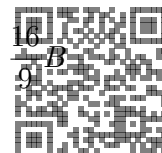
Q17. Let w, x, y, and z be whole numbers. If $2^w \cdot 3^x \cdot 5^y \cdot 7^z = 588$, then what does $2w + 3x + 5y + 7z$ equal?

   A) 21   **B)** 25   **C)** 27   **D)** 35   **E)** 56

Q18. A fair 6 sided die is rolled twice. What is the probability that the first number that comes up is greater than or equal to the second number?

   A) $\dfrac{1}{6}$ **B)** $\dfrac{5}{12}$ **C)** $\dfrac{1}{2}$ **D)** $\dfrac{7}{12}$ **E)** $\dfrac{5}{6}$

Q19. How many rectangles are in this figure?
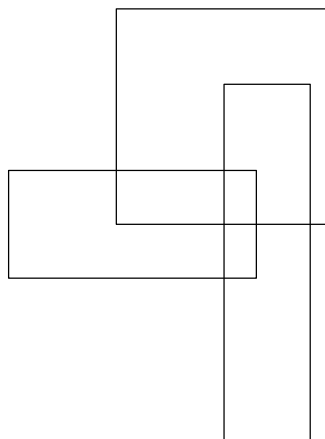
   A) 8   **B)** 9   **C)** 10   **D)** 11   **E)** 12

Q20. Quadrilateral $ABCD$ is a trapezoid, $AD = 15$, $AB = 50$, $BC = 20$, and the altitude is 12. What is the area of the trapezoid?
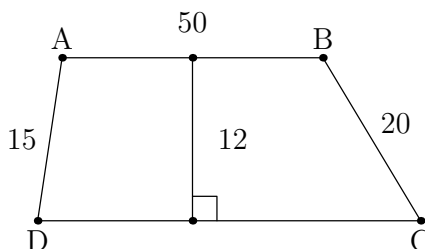
   A) 600   **B)** 650   **C)** 700   **D)** 750   **E)** 800

Q21. Students guess that Norb's age is $24, 28, 30, 32, 36, 38, 41, 44, 47$, and 49. Norb says, "At least half of you guessed too low, two of you are off by one, and my age is a prime number." How old is Norb?

   A) 29   **B)** 31   **C)** 37   **D)** 43   **E)** 48

Q22. What is the tens digit of 7^{2011}?

   A) 0   **B)** 1   **C)** 3   **D)** 4   **E)** 7

Q23. How many 4-digit positive integers have four different digits, where the leading digit is not zero, the integer is a multiple of 5, and 5 is the largest digit?

   A) 24   **B)** 48   **C)** 60   **D)** 84   **E)** 108

Q24. In how many ways can 10001 be written as the sum of two primes?

   A) 0   **B)** 1   **C)** 2   **D)** 3   **E)** 4
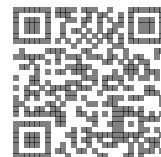
Q25. A circle with radius 1 is inscribed in a square and circumscribed about another square as shown. Which fraction is closest to the ratio of the circle's shaded area to the area between the two squares?
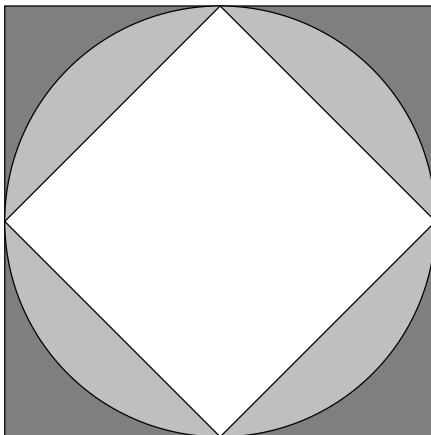
A) $\dfrac{1}{2}$ **B)** 1 **C)** $\dfrac{3}{2}$ **D)** 2 **E)** $\dfrac{5}{2}$
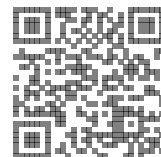
Q1. At Euclid Middle School the mathematics teachers are Mrs. Germain, Mr. Newton, and Mrs. Young. There are 11 students in Mrs. Germain's class, 8 students in Mr. Newton's class, and 9 students in Mrs. Young's class taking the AMC 8 this year. How many mathematics students at Euclid Middle School are taking the contest?

A) 26 **B)** 27 **C)** 28 **D)** 29 **E)** 30

Q2. If $a@b = \dfrac{a \times b}{a + b}$ for a, b positive integers, then what is 5@10?

A) $\dfrac{3}{10}$ **B)** 1 **C)** 2 **D)** $\dfrac{10}{3}$ **E)** 50

Q3. The graph shows the price of five gallons of gasoline during the first ten months of the year. By what percent is the highest price more than the lowest price?
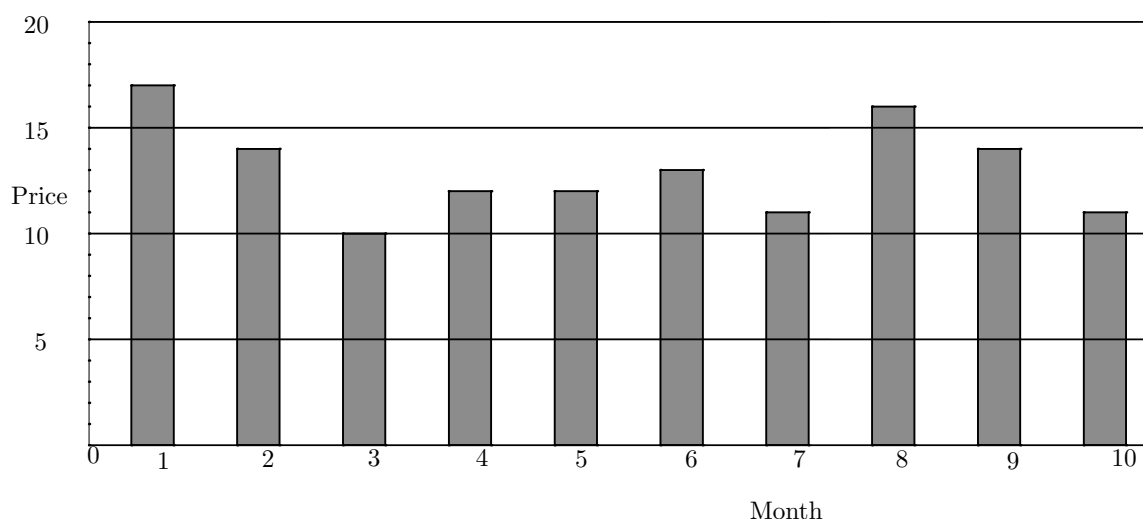
A) 50 **B)** 62 **C)** 70 **D)** 89 **E)** 100

Q4. What is the sum of the mean, median, and mode of the numbers $2, 3, 0, 3, 1, 4, 0, 3$?

A) 6.5 **B)** 7 **C)** 7.5 **D)** 8.5 **E)** 9

Q5. Alice needs to replace a light bulb located 10 centimeters below the ceiling in her kitchen. The ceiling is 2.4 meters above the floor. Alice is 1.5 meters tall and can reach 46 centimeters above the top of her head. Standing on a stool, she can just reach the light bulb. What is the height of the stool, in centimeters?

A) 32 **B)** 34 **C)** 36 **D)** 38 **E)** 40

Q6. Which of the following figures has the greatest number of lines of symmetry?

A) equilateral triangle **B)** non-square rhombus

C) non-square rectangle **D)** isosceles trapezoid

E) square

Q7. Using only pennies, nickels, dimes, and quarters, what is the smallest number of coins Freddie would need so he could pay any amount of money less than a dollar?

A) 6 **B)** 10 **C)** 15 **D)** 25 **E)** 99

Q8. As Emily is riding her bicycle on a long straight road, she spots Emerson skating in the same direction 1/2 mile in front of her. After she passes him, she can see him in her rear mirror until he is 1/2 mile behind her. Emily rides at a constant rate of 12 miles per hour, and Emerson skates at a constant rate of 8 miles per hour. For how many minutes can Emily see Emerson?
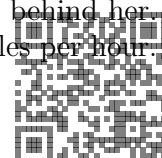
A) 6   **B)** 8   **C)** 12   **D)** 15   **E)** 16

Q9. Ryan got 80% of the problems correct on a 25-problem test, 90% on a 40-problem test, and 70% on a 10-problem test. What percent of all the problems did Ryan answer correctly?

    A) 64   **B)** 75   **C)** 80   **D)** 84   **E)** 86

Q10. Six pepperoni circles will exactly fit across the diameter of a 12-inch pizza when placed. If a total of 24 circles of pepperoni are placed on this pizza without overlap, what fraction of the pizza is covered by pepperoni?

    A) $\dfrac{1}{2}$ **B)** $\dfrac{2}{3}$ **C)** $\dfrac{3}{4}$ **D)** $\dfrac{5}{6}$ **E)** $\dfrac{7}{8}$

Q11. The top of one tree is 16 feet higher than the top of another tree. The heights of the two trees are in the ratio $3 : 4$. In feet, how tall is the taller tree?

    A) 48   **B)** 64   **C)** 80   **D)** 96   **E)** 112

Q12. Of the 500 balls in a large bag, 80% are red and the rest are blue. How many of the red balls must be removed so that 75% of the remaining balls are red?

    A) 25   **B)** 50   **C)** 75   **D)** 100   **E)** 150

Q13. The lengths of the sides of a triangle in inches are three consecutive integers. The length of the shortest side is 30% of the perimeter. What is the length of the longest side?

    A) 7   **B)** 8   **C)** 9   **D)** 10   **E)** 11

Q14. What is the sum of the prime factors of 2010?

    A) 67   **B)** 75   **C)** 77   **D)** 201   **E)** 210

Q15. A jar contains 5 different colors of gumdrops. 30% are blue, 20% are brown, 15% are red, 10% are yellow, and other 30 gumdrops are green. If half of the blue gumdrops are replaced with brown gumdrops, how many gumdrops will be brown?

    A) 35   **B)** 36   **C)** 42   **D)** 48   **E)** 64

Q16. A square and a circle have the same area. What is the ratio of the side length of the square to the radius of the circle?

    A) $\dfrac{\sqrt{\pi}}{2}$ **B)** $\sqrt{\pi}$ **C)** π **D)** 2π **E)** π^2

Q17. The diagram shows an octagon consisting of 10 unit squares. The portion below $\overline{PQ}$ is a unit square and a triangle with base 5. If $\overline{PQ}$ bisects the area of the octagon, what is the ratio $\dfrac{XQ}{QY}$?
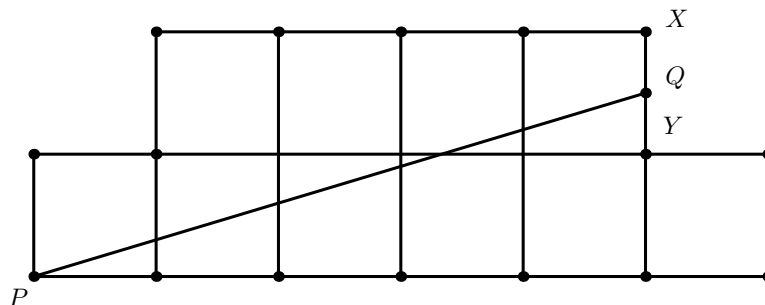
    A) $\dfrac{2}{5}$ **B)** $\dfrac{1}{2}$ **C)** $\dfrac{3}{5}$ **D)** $\dfrac{2}{3}$ **E)** $\dfrac{3}{4}$
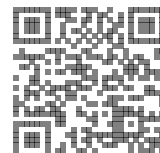
Q18. A decorative window is made up of a rectangle with semicircles at either end. The ratio of AD to AB is $3:2$. And AB is 30 inches. What is the ratio of the area of the rectangle to the combined area of the semicircles?
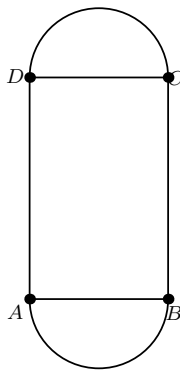
A) $2:3$ **B)** $3:2$ **C)** $6:\pi$ **D)** $9:\pi$ **E)** $30:\pi$

Q19. The two circles pictured have the same center C. Chord $\overline{AD}$ is tangent to the inner circle at B, AC is 10, and chord $\overline{AD}$ has length 16. What is the area between the two circles?

A) 36π **B)** 49π **C)** 64π **D)** 81π **E)** 100π
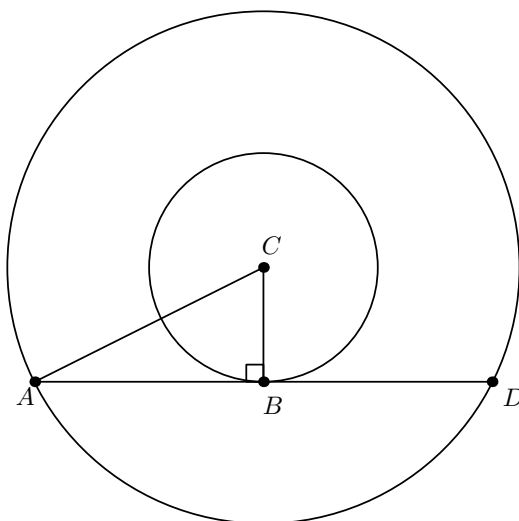
Q20. In a room, $2/5$ of the people are wearing gloves, and $3/4$ of the people are wearing hats. What is the minimum number of people in the room wearing both a hat and a glove?

A) 3   **B)** 5   **C)** 8   **D)** 15   **E)** 20

Q21. Hui is an avid reader. She bought a copy of the best seller "Math is Beautiful". On the first day, Hui read $1/5$ of the pages plus 12 more, and on the second day she read $1/4$ of the remaining pages plus 15 pages. On the third day she read $1/3$ of the remaining pages plus 18 pages. She then realized that there were only 62 pages left to read, which she read the next day. How many pages are in this book?

A) 120   **B)** 180   **C)** 240   **D)** 300   **E)** 360

Q22. The hundreds digit of a three-digit number is 2 more than the units digit. The digits of the three-digit number are reversed, and the result is subtracted from the original three-digit number. What is the units digit of the result?

A) 0   **B)** 2   **C)** 4   **D)** 6   **E)** 8

Q23. Semicircles POQ and ROS pass through the center O. What is the ratio of the combined areas of the two semicircles to the area of circle O?
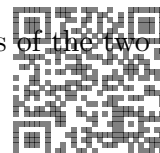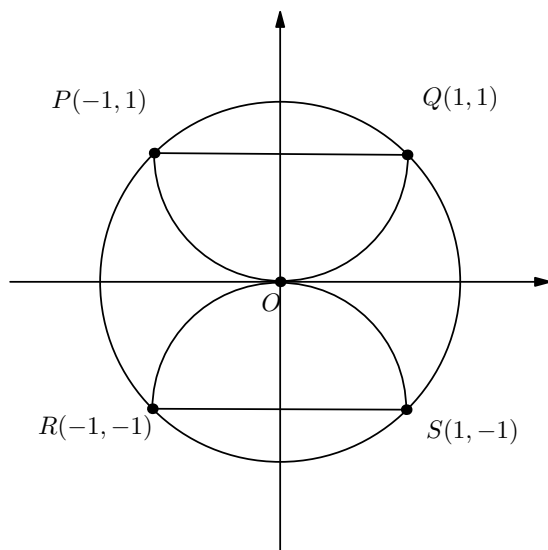
A) $\dfrac{\sqrt{2}}{4}$ **B)** $\dfrac{1}{2}$ **C)** $\dfrac{2}{\pi}$ **D)** $\dfrac{2}{3}$ **E)** $\dfrac{\sqrt{2}}{2}$

Q24. What is the correct ordering of the three numbers, 10^8, 5^{12}, and 2^{24}?

    A) $2^{24} < 10^8 < 5^{12}$

    B) $2^{24} < 5^{12} < 10^8$

    C) $5^{12} < 2^{24} < 10^8$

    D) $10^8 < 5^{12} < 2^{24}$

    E) $10^8 < 2^{24} < 5^{12}$

Q25. Everyday at school, Jo climbs a flight of 6 stairs. Jo can take the stairs 1, 2, or 3 at a time. For example, Jo could climb 3, then 1, then 2. In how many ways can Jo climb the stairs?

    A) 13   **B)** 18   **C)** 20   **D)** 22   **E)** 24
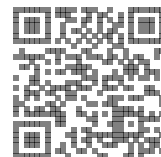
Q1. Bridget bought a bag of apples at the grocery store. She gave half of the apples to Ann. Then she gave Cassie 3 apples, keeping 4 apples for herself. How many apples did Bridget buy?

    A) 3   **B)** 4   **C)** 7   **D)** 11   **E)** 14

Q2. On average, for every 4 sports cars sold at the local dealership, 7 sedans are sold. The dealership predicts that it will sell 28 sports cars next month. How many sedans does it expect to sell?

    A) 7   **B)** 32   **C)** 35   **D)** 49   **E)** 112

Q3. The graph shows the constant rate at which Suzanna rides her bike. If she rides a total of a half an hour at the same speed, how many miles would she have ridden?
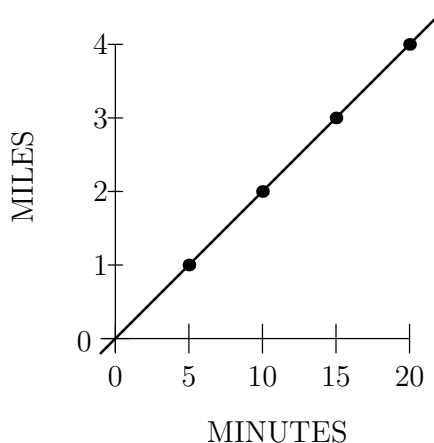
    A) 5   **B)** 5.5   **C)** 6   **D)** 6.5   **E)** 7

Q4. The five pieces shown below can be arranged to form four of the five figures shown in the choices. Which figure **cannot** be formed?
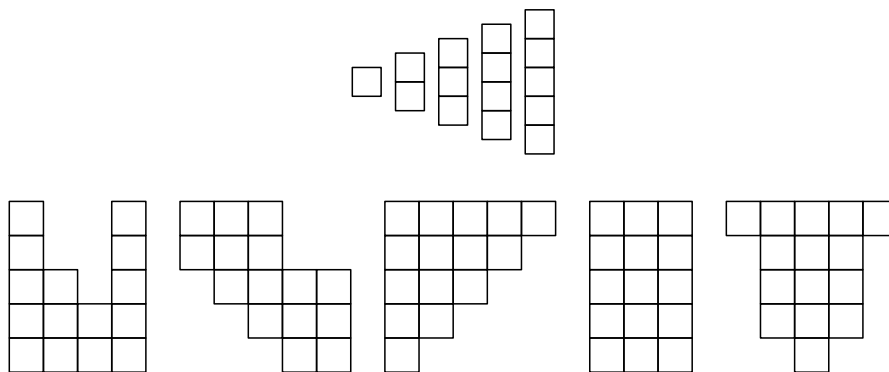
Q5. A sequence of numbers starts with 1, 2, and 3. The fourth number of the sequence is the sum of the previous three numbers in the sequence: $1 + 2 + 3 = 6$. In the same way, every number after the fourth is the sum of the previous three numbers. What is the eighth number in the sequence?

    A) 11   **B)** 20   **C)** 37   **D)** 68   **E)** 99

Q6. Steve's empty swimming pool will hold 24,000 gallons of water when full. It will be filled by 4 hoses, each of which supplies 2.5 gallons of water per minute. How many hours will it take to fill Steve's pool?

    A) 40   **B)** 42   **C)** 44   **D)** 46   **E)** 48

Q7. The triangular plot of ACD lies between Aspen Road, Brown Road and a railroad. Main Street runs east and west, and the railroad runs north and south. The numbers in the diagram indicate distances in miles. The width of the railroad track can be ignored. How many square miles are in the plot of land ACD?
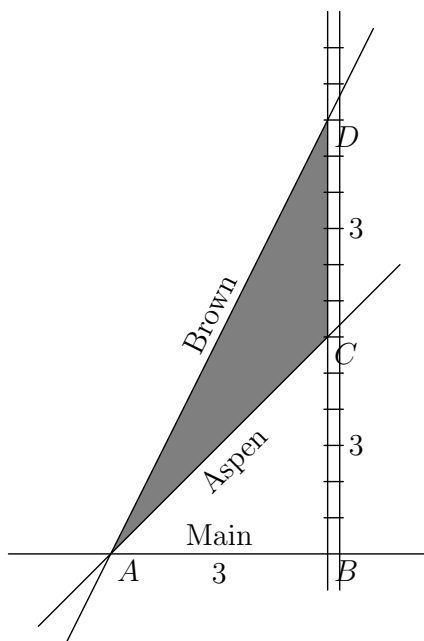
A) 2 **B)** 3 **C)** 4.5 **D)** 6 **E)** 9

Q8. The length of a rectangle is increased by 10% percent and the width is decreased by 10% percent. What percent of the old area is the new area?

A) 90 **B)** 99 **C)** 100 **D)** 101 **E)** 110

Q9. Construct a square on one side of an equilateral triangle. On one non-adjacent side of the square, construct a regular pentagon, as shown. On a non-adjacent side of the pentagon, construct a hexagon. Continue to construct regular polygons in the same way, until you construct an octagon. How many sides does the resulting polygon have?
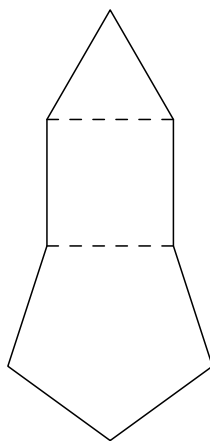
A) 21 **B)** 23 **C)** 25 **D)** 27 **E)** 29

Q10. On a checkerboard composed of 64 unit squares, what is the probability that a randomly chosen unit square does **not** touch the outer edge of the board?
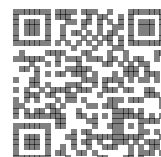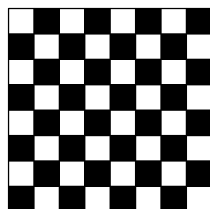
A) $\dfrac{1}{16}$ **B)** $\dfrac{7}{16}$ **C)** $\dfrac{1}{2}$ **D)** $\dfrac{9}{16}$ **E)** $\dfrac{49}{64}$

Q11. The Amaco Middle School bookstore sells pencils costing a whole number of cents. Some seventh graders each bought a pencil, paying a total of 1.43 dollars. Some of the 30 sixth graders each bought a pencil, and they paid a total of 1.95 dollars. How many more sixth graders than seventh graders bought a pencil?

A) 1   **B)** 2   **C)** 3   **D)** 4   **E)** 5

Q12. The two spinners shown are spun once and each lands on one of the numbered sectors. What is the probability that the sum of the numbers in the two sectors is prime?
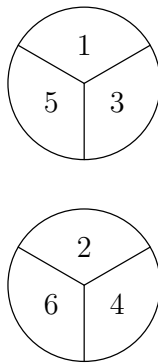
A) $\dfrac{1}{2}$ **B)** $\dfrac{2}{3}$ **C)** $\dfrac{3}{4}$ **D)** $\dfrac{7}{9}$ **E)** $\dfrac{5}{6}$

Q13. A three-digit integer contains one of each of the digits 1, 3, and 5. What is the probability that the integer is divisible by 5?

A) $\dfrac{1}{6}$ **B)** $\dfrac{1}{3}$ **C)** $\dfrac{1}{2}$ **D)** $\dfrac{2}{3}$ **E)** $\dfrac{5}{6}$

Q14. Austin and Temple are 50 miles apart along Interstate 35. Bonnie drove from Austin to her daughter's house in Temple, averaging 60 miles per hour. Leaving the car with her daughter, Bonnie rode a bus back to Austin along the same route and averaged 40 miles per hour on the return trip. What was the average speed for the round trip, in miles per hour?

A) 46   **B)** 48   **C)** 50   **D)** 52   **E)** 54

Q15. A recipe that makes 5 servings of hot chocolate requires 2 squares of chocolate, $\dfrac{1}{4}$ cup sugar, 1 cup water and 4 cups milk. Jordan has 5 squares of chocolate, 2 cups of sugar, lots of water, and 7 cups of milk. If she maintains the same ratio of ingredients, what is the greatest number of servings of hot chocolate she can make?

A) $5\dfrac{1}{8}$ **B)** $6\dfrac{1}{4}$ **C)** $7\dfrac{1}{2}$ **D)** $8\dfrac{3}{4}$ **E)** $9\dfrac{7}{8}$

Q16. How many 3-digit positive integers have digits whose product equals 24?

A) 12   **B)** 15   **C)** 18   **D)** 21   **E)** 24

Q17. The positive integers x and y are the two smallest positive integers for which the product of 360 and x is a square and the product of 360 and y is a cube. What is the sum of x and y?

A) 80   **B)** 85   **C)** 115   **D)** 165   **E)** 610

Q18. The diagram represents a 7-foot-by-7-foot floor that is tiled with 1-square-foot black tiles and white tiles. Notice that the corners have white tiles. If a 15-foot-by-15-foot floor is to be tiled in the same manner, how many white tiles will be needed?
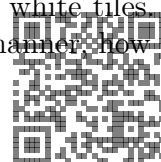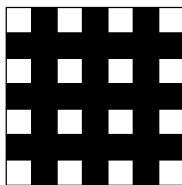
A) 49   **B)** 57   **C)** 64   **D)** 96   **E)** 126

Q19. Two angles of an isosceles triangle measure 70° and $x°$. What is the sum of the three possible values of x?

A) 95   **B)** 125   **C)** 140   **D)** 165   **E)** 180

Q20. How many non-congruent triangles have vertices at three of the eight points in the array shown below?
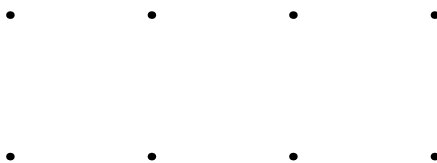
A) 5   **B)** 6   **C)** 7   **D)** 8   **E)** 9

Q21. Andy and Bethany have a rectangular array of numbers greater than zero with 40 rows and 75 columns. Andy adds the numbers in each row. The average of his 40 sums is A. Bethany adds the numbers in each column. The average of her 75 sums is B. Using only the answer choices given, what is the value of $\dfrac{A}{B}$?

A) $\dfrac{64}{225}$ **B)** $\dfrac{8}{15}$ **C)** 1   **D)** $\dfrac{15}{8}$ **E)** $\dfrac{225}{64}$

Q22. How many whole numbers between 1 and 1000 do **not** contain the digit 1?

A) 512   **B)** 648   **C)** 720   **D)** 728   **E)** 800

Q23. On the last day of school, Mrs. Awesome gave jelly beans to her class. She gave each boy as many jelly beans as there were boys in the class. She gave each girl as many jelly beans as there were girls in the class. She brought 400 jelly beans, and when she finished, she had six jelly beans left. There were two more boys than girls in her class. How many students were in her class?

A) 26   **B)** 28   **C)** 30   **D)** 32   **E)** 34

Q24. The letters A, B, C and D represent digits. If
$$\begin{array}{r} A\ B \\ +\ C\ A \\ \hline D\ A \end{array} \quad \text{and} \quad \begin{array}{r} A\ B \\ -\ C\ A \\ \hline A \end{array}$$
, what digit does D represent?

A) 5   **B)** 6   **C)** 7   **D)** 8   **E)** 9

Q25. A one-cubic-foot cube is cut into four pieces by three cuts parallel to the top face of the cube. The first cut is $\dfrac{1}{2}$ foot from the top face. The second cut is $\dfrac{1}{3}$ foot below the first cut, and the third cut is $\dfrac{1}{17}$ foot below the second cut. From the top to the bottom the pieces are labeled A, B, C, and D. The pieces are then glued together end to end as shown in the second diagram. What is the total surface area of this solid in square feet?

A
1/2
B
1/17
C   1/3
D

D
A
B
C
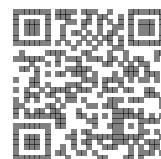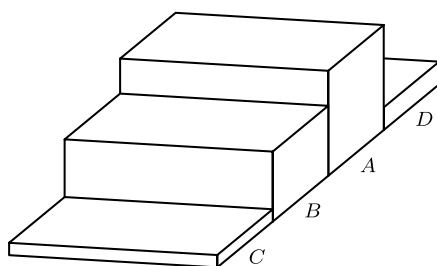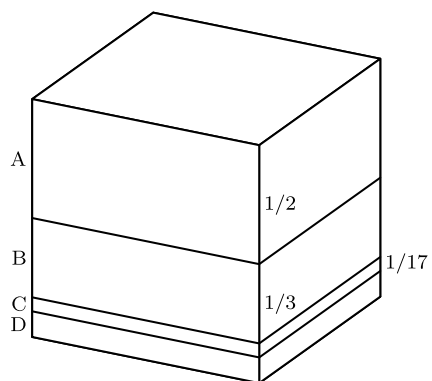
A) 6   **B)** 7   **C)** $\dfrac{419}{51}$ **D)** $\dfrac{158}{17}$ **E)** 11
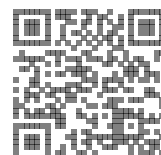
Q1. Susan had 50 dollars to spend at the carnival. She spent 12 dollars on food and twice as much on rides. How many dollars did she have left to spend?

A) 12 **B)** 14 **C)** 26 **D)** 38 **E)** 50

Q2. The ten-letter code BEST OF LUCK represents the ten digits $0-9$, in order. What 4-digit number is represented by the code word CLUE?

A) 8671 **B)** 8672 **C)** 9781 **D)** 9782 **E)** 9872

Q3. If February is a month that contains Friday the 13th, what day of the week is February 1?

A) Sunday **B)** Monday **C)** Wednesday **D)** Thursday **E)** Saturday

Q4. In the figure, the outer equilateral triangle has area 16, the inner equilateral triangle has area 1, and the three trapezoids are congruent. What is the area of one of the trapezoids?
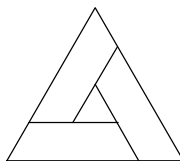
A) 3 **B)** 4 **C)** 5 **D)** 6 **E)** 7

Q5. Barney Schwinn notices that the odometer on his bicycle reads 1441, a palindrome, because it reads the same forward and backward. After riding 4 more hours that day and 6 the next, he notices that the odometer shows another palindrome, 1661. What was his average speed in miles per hour?

A) 15 **B)** 16 **C)** 18 **D)** 20 **E)** 22

Q6. In the figure, what is the ratio of the area of the grey squares to the area of the white squares?
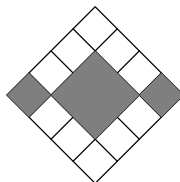
A) 3:10 **B)** 3:8 **C)** 3:7 **D)** 3:5 **E)** 1:1

Q7. If $\dfrac{3}{5} = \dfrac{M}{45} = \dfrac{60}{N}$, what is $M + N$?

A) 27 **B)** 29 **C)** 45 **D)** 105 **E)** 127

Q8. Candy sales from the Boosters Club from January through April are shown. What were the average sales per month in dollars?
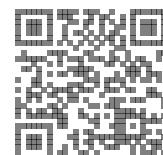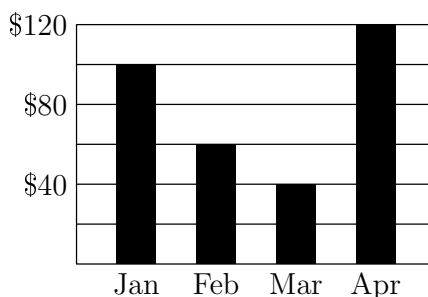
A) 60 **B)** 70 **C)** 75 **D)** 80 **E)** 85

Q9. In 2005 Tycoon Tammy invested 100 dollars for two years. During the first year her investment suffered a 15% loss, but during the second year the remaining investment showed a 20% gain. Over the two-year period, what was the change in Tammy's investment?

A) 5% loss **B)** 2% loss **C)** 1% gain **D)** 2% gain **E)** 5% gain

Q10. The average age of the 6 people in Room A is 40. The average age of the 4 people in Room B is 25. If the two groups are combined, what is the average age of all the people?

A) 32.5 **B)** 33 **C)** 33.5 **D)** 34 **E)** 35

Q11. Each of the 39 students in the eighth grade at Lincoln Middle School has one dog or one cat or both a dog and a cat. Twenty students have a dog and 26 students have a cat. How many students have both a dog and a cat?

A) 7 **B)** 13 **C)** 19 **D)** 39 **E)** 46

Q12. A ball is dropped from a height of 3 meters. On its first bounce it rises to a height of 2 meters. It keeps falling and bouncing to $\frac{2}{3}$ of the height it reached in the previous bounce. On which bounce will it not rise to a height of 0.5 meters?

A) 3 **B)** 4 **C)** 5 **D)** 6 **E)** 7

Q13. Mr. Harman needs to know the combined weight in pounds of three boxes he wants to mail. However, the only available scale is not accurate for weights less than 100 pounds or more than 150 pounds. So the boxes are weighed in pairs in every possible way. The results are 122, 125 and 127 pounds. What is the combined weight in pounds of the three boxes?

A) 160 **B)** 170 **C)** 187 **D)** 195 **E)** 354

Q14. Three *A*s, three *B*s, and three *C*s are placed in the nine spaces so that each row and column contain one of each letter. If *A* is placed in the upper left corner, how many arrangements are possible?

A) 2 **B)** 3 **C)** 4 **D)** 5 **E)** 6

Q15. In Theresa's first 8 basketball games, she scored 7, 4, 3, 6, 8, 3, 1 and 5 points. In her ninth game, she scored fewer than 10 points and her points-per-game average for the nine games was an integer. Similarly in her tenth game, she scored fewer than 10 points and her points-per-game average for the 10 games was also an integer. What is the product of the number of points she scored in the ninth and tenth games?

A) 35 **B)** 40 **C)** 48 **D)** 56 **E)** 72

Q16. A shape is created by joining seven unit cubes, as shown. What is the ratio of the volume in cubic units to the surface area in square units?
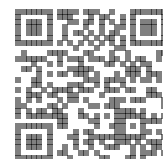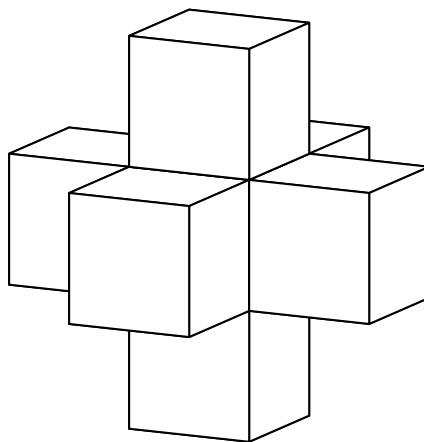
A) $1:6$ **B)** $7:36$ **C)** $1:5$ **D)** $7:30$ **E)** $6:25$

Q17. Ms.Osborne asks each student in her class to draw a rectangle with integer side lengths and a perimeter of 50 units. All of her students calculate the area of the rectangle they draw. What is the difference between the largest and smallest possible areas of the rectangles?

A) 76   **B)** 120   **C)** 128   **D)** 132   **E)** 136

Q18. Two circles that share the same center have radii 10 meters and 20 meters. An aardvark runs along the path shown, starting at A and ending at K. How many meters does the aardvark run?
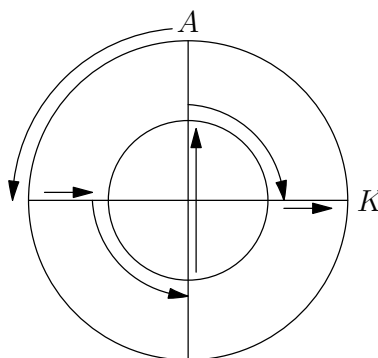
A) $10\pi + 20$ **B)** $10\pi + 30$ **C)** $10\pi + 40$ **D)** $20\pi + 20$ **E)** $20\pi + 40$

Q19. Eight points are spaced around at intervals of one unit around a 2×2 square, as shown. Two of the 8 points are chosen at random. What is the probability that the two points are one unit apart?
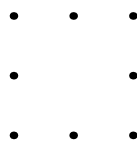
A) $\dfrac{1}{4}$ **B)** $\dfrac{2}{7}$ **C)** $\dfrac{4}{11}$ **D)** $\dfrac{1}{2}$ **E)** $\dfrac{4}{7}$

Q20. The students in Mr. Neatkin's class took a penmanship test. Two-thirds of the boys and $\dfrac{3}{4}$ of the girls passed the test, and an equal number of boys and girls passed the test. What is the minimum possible number of students in the class?

A) 12   **B)** 17   **C)** 24   **D)** 27   **E)** 36

Q21. Jerry cuts a wedge from a 6-cm cylinder of bologna as shown by the dashed curve. Which answer choice is closest to the volume of his wedge in cubic centimeters?
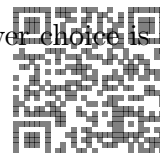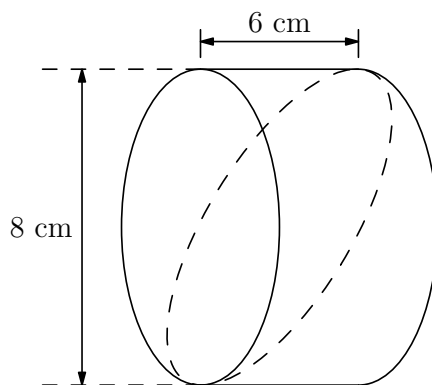
A) 48   **B)** 75   **C)** 151   **D)** 192   **E)** 603

Q22. For how many positive integer values of n are both $\dfrac{n}{3}$ and $3n$ three-digit whole numbers?

    A) 12   **B)** 21   **C)** 27   **D)** 33   **E)** 34

Q23. In square $ABCE$, $AF = 2FE$ and $CD = 2DE$. What is the ratio of the area of $\triangle BFD$ to the area of square $ABCE$?
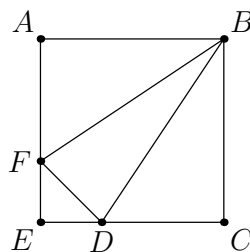
    A) $\dfrac{1}{6}$ **B)** $\dfrac{2}{9}$ **C)** $\dfrac{5}{18}$ **D)** $\dfrac{1}{3}$ **E)** $\dfrac{7}{20}$

Q24. Ten tiles numbered 1 through 10 are turned face down. One tile is turned up at random, and a die is rolled. What is the probability that the product of the numbers on the tile and the die will be a square?

    A) $\dfrac{1}{10}$ **B)** $\dfrac{1}{6}$ **C)** $\dfrac{11}{60}$ **D)** $\dfrac{1}{5}$ **E)** $\dfrac{7}{30}$

Q25. Margie's winning art design is shown. The smallest circle has radius 2 inches, with each successive circle's radius increasing by 2 inches. Approximately what percent of the design is black?

    A) 42   **B)** 44   **C)** 45   **D)** 46   **E)** 48
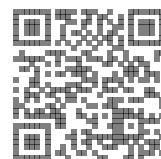
Q1. Theresa's parents have agreed to buy her tickets to see her favorite band if she spends an average of 10 hours per week helping around the house for 6 weeks. For the first 5 weeks she helps around the house for 8, 11, 7, 12 and 10 hours. How many hours must she work for the final week to earn the tickets?

A) 9 **B)** 10 **C)** 11 **D)** 12 **E)** 13

Q2. 650 students were surveyed about their pasta preferences. The choices were lasagna, manicotti, ravioli and spaghetti. The results of the survey are displayed in the bar graph. What is the ratio of the number of students who preferred spaghetti to the number of students who preferred manicotti?
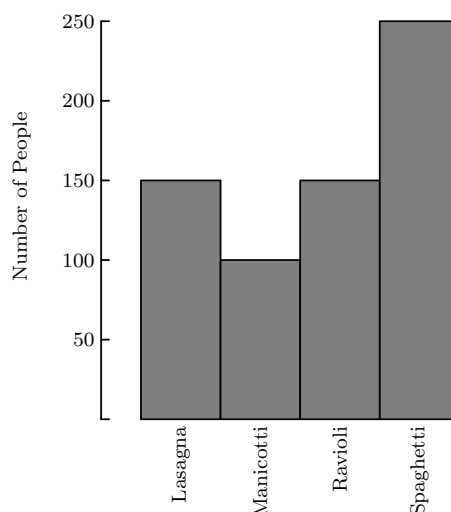
A) $\dfrac{2}{5}$ **B)** $\dfrac{1}{2}$ **C)** $\dfrac{5}{4}$ **D)** $\dfrac{5}{3}$ **E)** $\dfrac{5}{2}$

Q3. What is the sum of the two smallest prime factors of 250?

A) 2 **B)** 5 **C)** 7 **D)** 10 **E)** 12

Q4. A haunted house has six windows. In how many ways can Georgie the Ghost enter the house by one window and leave by a different window?

A) 12 **B)** 15 **C)** 18 **D)** 30 **E)** 36

Q5. Chandler wants to buy a 500 dollar mountain bike. For his birthday, his grandparents send him 50 dollars, his aunt sends him 35 dollars and his cousin gives him 15 dollars. He earns 16 dollars per week for his paper route. He will use all of his birthday money and all of the money he earns from his paper route. In how many weeks will he be able to buy the mountain bike?

A) 24 **B)** 25 **C)** 26 **D)** 27 **E)** 28

Q6. The average cost of a long-distance call in the USA in 1985 was 41 cents per minute, and the average cost of a long-distance call in the USA in 2005 was 7 cents per minute. Find the approximate percent decrease in the cost per minute of a long-distance call.

A) 7 **B)** 17 **C)** 34 **D)** 41 **E)** 80

Q7. The average age of 5 people in a room is 30 years. An 18-year-old person leaves the room. What is the average age of the four remaining people?

A) 25 **B)** 26 **C)** 29 **D)** 33 **E)** 36

Q8. In trapezoid $ABCD$, AD is perpendicular to DC, $AD = AB = 3$, and $DC = 6$. In addition, E is on DC and BE is parallel to AD. Find the area of $\triangle BEC$.
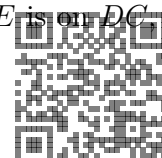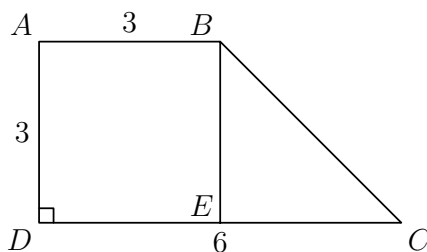
A) 3　　　　**B)** 4.5　　　　**C)** 6　　　　**D)** 9　　　　**E)** 18

Q9. To complete the grid below, each of the digits 1 through 4 must occur once in each row and once in each column. What number will occupy the lower right-hand square?

A) 1　　　　　　**B)** 2　　　　　　**C)** 3　　　　　　**D)** 4

E) cannot be determined

Q10. For any positive integer n, $\boxed{n}$ to be the sum of the positive factors of n. For example, $\boxed{6} = 1 + 2 + 3 + 6 = 12$. Find $\boxed{\boxed{11}}$.

A) 13　　　　**B)** 20　　　　**C)** 24　　　　**D)** 28　　　　**E)** 30

Q11. Tiles I, II, III and IV are translated so one tile coincides with each of the rectangles A, B, C and D. In the final arrangement, the two numbers on any side common to two adjacent tiles must be the same. Which of the tiles is translated to Rectangle C?
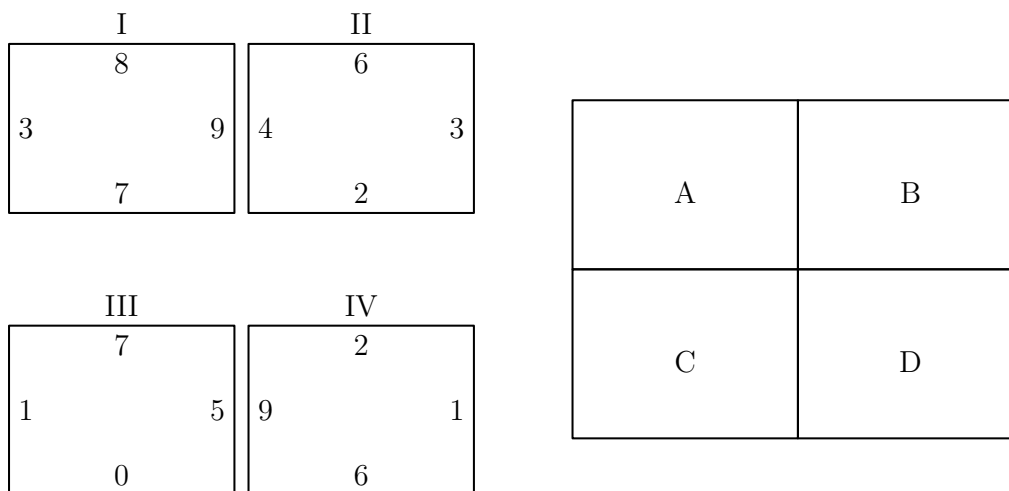
A) I　　　　　　**B)** II　　　　　　**C)** III　　　　　　**D)** IV

4 cannot be determined

Q12. A unit hexagram is composed of a regular hexagon of side length 1 and its 6 equilateral triangular extensions, as shown in the diagram. What is the ratio of the area of the extensions to the area of the original hexagon?
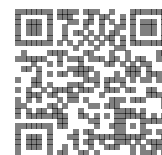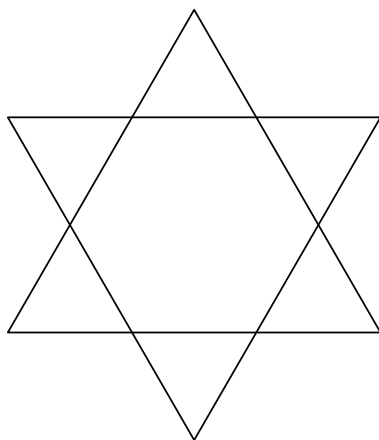
A) 1:1　　　　**B)** 6:5　　　　**C)** 3:2　　　　**D)** 2:1　　　　**E)** 3:1

Q13. Sets A and B, shown in the Venn diagram, have the same number of elements. Their union has 2007 elements and their intersection has 1001 elements. Find the number of elements in A.
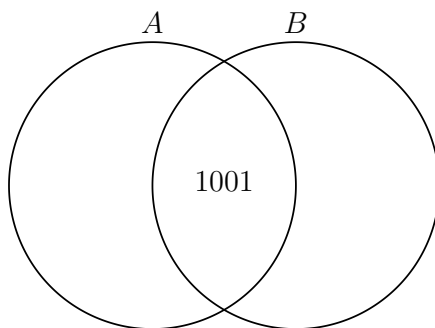
A) 503　　　　**B)** 1006　　　　**C)** 1504　　　　**D)** 1507　　　　**E)** 1510

Q14. The base of isosceles $\triangle ABC$ is 24 and its area is 60. What is the length of one of the congruent sides?

A) 5　　　　**B)** 8　　　　**C)** 13　　　　**D)** 14　　　　**E)** 18

Q15. Let a, b and c be numbers with $0 < a < b < c$. Which of the following is impossible?

A) $a + c < b$　　　**B)** $a \cdot b < c$　　　**C)** $a + b < c$　　　**D)** $a \cdot c < b$　　　**E)** $\dfrac{b}{c} = a$

Q16. Amanda draws five circles with radii $1, 2, 3, 4$ and 5. Then for each circle she plots the point (C, A), where C is its circumference and A is its area. Which of the following could be her graph?
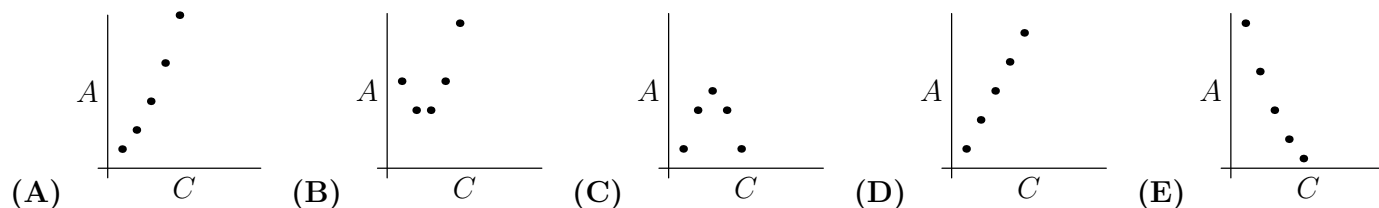
Q17. A mixture of 30 liters of paint is 25% red tint, 30% yellow tint and 45% water. Five liters of yellow tint are added to the original mixture. What is the percent of yellow tint in the new mixture?

A) 25　　　　**B)** 35　　　　**C)** 40　　　　**D)** 45　　　　**E)** 50

Q18. The product of the two 99-digit numbers $303, 030, 303, \ldots, 030, 303$ and $505, 050, 505, \ldots, 050, 505$ has thousands digit A and units digit B. What is the sum of A and B?

A) 3　　　　**B)** 5　　　　**C)** 6　　　　**D)** 8　　　　**E)** 10
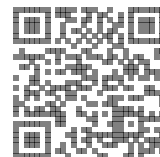
Q19. Pick two consecutive positive integers whose sum is less than 100. Square both of those integers and then find the difference of the squares. Which of the following could be the difference?

A) 2   **B)** 64   **C)** 79   **D)** 96   **E)** 131

Q20. Before the district play, the Unicorns had won 45% of their basketball games. During district play, they won six more games and lost two, to finish the season having won half their games. How many games did the Unicorns play in all?

A) 48   **B)** 50   **C)** 52   **D)** 54   **E)** 60

Q21. Two cards are dealt from a deck of four red cards labeled A, B, C, D and four green cards labeled A, B, C, D. A winning pair is two of the same color or two of the same letter. What is the probability of drawing a winning pair?

A) $\dfrac{2}{7}$ **B)** $\dfrac{3}{8}$ **C)** $\dfrac{1}{2}$ **D)** $\dfrac{4}{7}$ **E)** $\dfrac{5}{8}$

Q22. A lemming sits at a corner of a square with side length 10 meters. The lemming runs 6.2 meters along a diagonal toward the opposite corner. It stops, makes a 90° right turn and runs 2 more meters. A scientist measures the shortest distance between the lemming and each side of the square. What is the average of these four distances in meters?

A) 2   **B)** 4.5   **C)** 5   **D)** 6.2   **E)** 7

Q23. What is the area of the shaded pinwheel shown in the 5×5 grid?
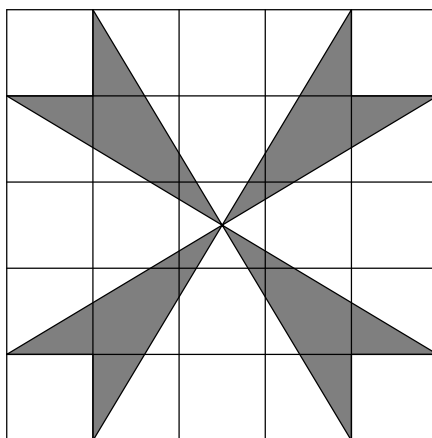
A) 4   **B)** 6   **C)** 8   **D)** 10   **E)** 12

Q24. A bag contains four pieces of paper, each labeled with one of the digits 1, 2, 3 or 4, with no repeats. Three of these pieces are drawn, one at a time without replacement, to construct a three-digit number. What is the probability that the three-digit number is a multiple of 3?

A) $\dfrac{1}{4}$ **B)** $\dfrac{1}{3}$ **C)** $\dfrac{1}{2}$ **D)** $\dfrac{2}{3}$ **E)** $\dfrac{3}{4}$

Q25. On the dart board shown in the figure below, the outer circle has radius 6 and the inner circle has radius 3. Three radii divide each circle into three congruent regions, with point values shown. The probability that a dart will hit a given region is proportional to the area of the region. When two darts hit this board, the score is the sum of the point values in the regions. What is the probability that the score is odd?
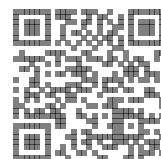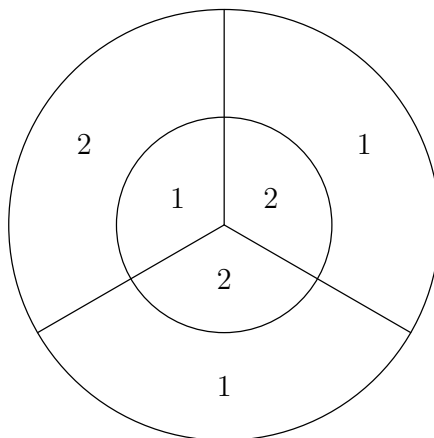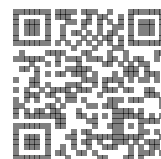
**A)** $\dfrac{17}{36}$ **B)** $\dfrac{35}{72}$ **C)** $\dfrac{1}{2}$ **D)** $\dfrac{37}{72}$ **E)** $\dfrac{19}{36}$

Q1. Mindy made three purchases for: $1.98 dollars, $5.04 dollars, and $9.89 dollars. What was her total, to the nearest dollar?

A) 10   **B)** 15   **C)** 16   **D)** 17   **E)** 18

Q2. On the AMC 8 contest Billy answers 13 questions correctly, answers 7 questions incorrectly and doesn't answer the last 5. What is his score?

A) 1   **B)** 6   **C)** 13   **D)** 19   **E)** 26

Q3. Elisa swims laps in the pool. When she first started, she completed 10 laps in 25 minutes. Now, she can finish 12 laps in 24 minutes. By how many minutes has she improved her lap time?

A) $\dfrac{1}{2}$ **B)** $\dfrac{3}{4}$ **C)** 1   **D)** 2   **E)** 3

Q4. Initially, a spinner points west. Chenille moves it clockwise $2\dfrac{1}{4}$ revolutions and then counterclockwise $3\dfrac{3}{4}$ revolutions. In what direction does the spinner point after the two moves?
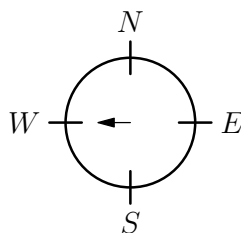
A) north   **B)** east   **C)** south

D) west   **E)** northwest

Q5. Points A, B, C and D are midpoints of the sides of the larger square. If the larger square has area 60, what is the area of the smaller square?
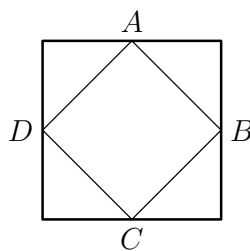
A) 15   **B)** 20   **C)** 24   **D)** 30   **E)** 40

Q6. The letter T is formed by placing two 2×4 inch rectangles next to each other, as shown. What is the perimeter of the T, in inches?
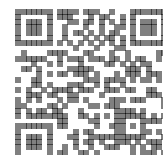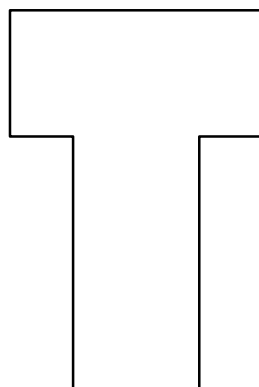
A) 12   **B)** 16   **C)** 20   **D)** 22   **E)** 24

Q7. Circle X has a radius of π. Circle Y has a circumference of 8π. Circle Z has an area of 9π. List the circles in order from smallest to largest radius.

    A) X, Y, Z   **B)** Z, X, Y   **C)** Y, X, Z   **D)** Z, Y, X   **E)** X, Z, Y

Q8. The table shows some of the results of a survey by radiostation KAMC. What percentage of the males surveyed listen to the station?

	Listen	Don't Listen	Total
Males	?	26	?
Females	58	?	96
Total	136	64	200

    A) 39   **B)** 48   **C)** 52   **D)** 55   **E)** 75

Q9. What is the product of $\dfrac{3}{2} \times \dfrac{4}{3} \times \dfrac{5}{4} \times \cdots \times \dfrac{2006}{2005}$?

    A) 1   **B)** 1002   **C)** 1003   **D)** 2005   **E)** 2006

Q10. Jorge's teacher asks him to plot all the ordered pairs (w, l) of positive integers for which w is the width and l is the length of a rectangle with area 12. What should his graph look like?
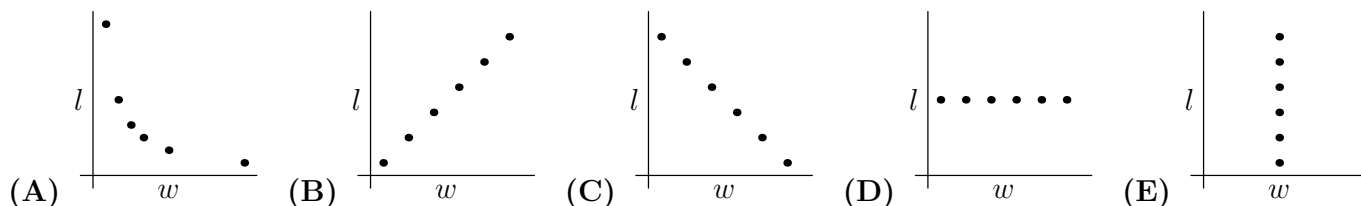
Q11. How many two-digit numbers have digits whose sum is a perfect square?

    A) 13   **B)** 16   **C)** 17   **D)** 18   **E)** 19

Q12. Antonette gets 70% on a 10-problem test, 80% on a 20-problem test and 90% on a 30-problem test. If the three tests are combined into one 60-problem test, which percent is closest to her overall score?

    A) 40   **B)** 77   **C)** 80   **D)** 83   **E)** 87

Q13. Cassie leaves Escanaba at 8:30 AM heading for Marquette on her bike. She bikes at a uniform rate of 12 miles per hour. Brian leaves Marquette at 9:00 AM heading for Escanaba on his bike. He bikes at a uniform rate of 16 miles per hour. They both bike on the same 62-mile route between Escanaba and Marquette. At what time in the morning do they meet?

    A) 10:00   **B)** 10:15   **C)** 10:30   **D)** 11:00   **E)** 11:30

Q14. Problems 14, 15 and 16 involve Mrs. Reed's English assignment. A Novel Assignment The students in Mrs. Reed's English class are reading the same 760-page novel. Three friends, Alice, Bob and Chandra, are in the class. Alice reads a page in 20 seconds, Bob reads a page in 45 seconds and Chandra reads a page in 30 seconds. If Bob and Chandra both read the whole book, Bob will spend how many more seconds reading than Chandra?

   **A)** 7,600   **B)** 11,400   **C)** 12,500   **D)** 15,200   **E)** 22,800
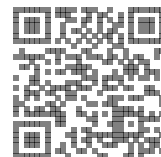
Q15. Chandra and Bob, who each have a copy of the book, decide that they can save time by "team reading" the novel. In this scheme, Chandra will read from page 1 to a certain page and Bob will read from the next page through page 760, finishing the book. When they are through they will tell each other about the part they read. What is the last page that Chandra should read so that she and Bob spend the same amount of time reading the novel?

A) 425　　　　**B)** 444　　　　**C)** 456　　　　**D)** 484　　　　**E)** 506

Q16. Before Chandra and Bob start reading, Alice says she would like to team read with them. If they divide the book into three sections so that each reads for the same length of time, how many seconds will each have to read?

A) 6400　　　　**B)** 6600　　　　**C)** 6800　　　　**D)** 7000　　　　**E)** 7200

Q17. Jeff rotates spinners P, Q and R and adds the resulting numbers. What is the probability that his sum is an odd number?
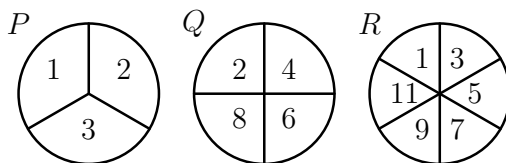
A) $\dfrac{1}{4}$　　　　**B)** $\dfrac{1}{3}$　　　　**C)** $\dfrac{1}{2}$　　　　**D)** $\dfrac{2}{3}$　　　　**E)** $\dfrac{3}{4}$

Q18. A cube with 3-inch edges is made using 27 cubes with 1-inch edges. Nineteen of the smaller cubes are white and eight are black. If the eight black cubes are placed at the corners of the larger cube, what fraction of the surface area of the larger cube is white?

A) $\dfrac{1}{9}$　　　　**B)** $\dfrac{1}{4}$　　　　**C)** $\dfrac{4}{9}$　　　　**D)** $\dfrac{5}{9}$　　　　**E)** $\dfrac{19}{27}$

Q19. Triangle ABC is an isosceles triangle with $\overline{AB} = \overline{BC}$. Point D is the midpoint of both $\overline{BC}$ and $\overline{AE}$, and $\overline{CE}$ is 11 units long. Triangle ABD is congruent to triangle ECD. What is the length of $\overline{BD}$?
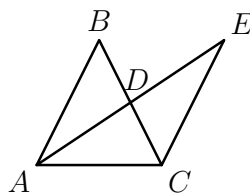
A) 4　　　　**B)** 4.5　　　　**C)** 5　　　　**D)** 5.5　　　　**E)** 6

Q20. A singles tournament had six players. Each player played every other player only once, with no ties. If Helen won 4 games, Ines won 3 games, Janet won 2 games, Kendra won 2 games and Lara won 2 games, how many games did Monica win?

A) 0　　　　**B)** 1　　　　**C)** 2　　　　**D)** 3　　　　**E)** 4

Q21. An aquarium has a rectangular base that measures 100 cm by 40 cm and has a height of 50 cm. The aquarium is filled with water to a depth of 37 cm. A rock with volume 1000cm³ is then placed in the aquarium and completely submerged. By how many centimeters does the water level rise?

A) 0.25　　　　**B)** 0.5　　　　**C)** 1　　　　**D)** 1.25　　　　**E)** 2.5

Q22. Three different one-digit positive integers are placed in the bottom row of cells. Numbers in adjacent cells are added and the sum is placed in the cell above them. In the second row, continue the same process to obtain a number in the top cell. What is the difference between the largest and smallest numbers possible in the top cell?
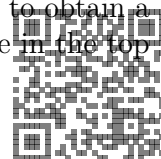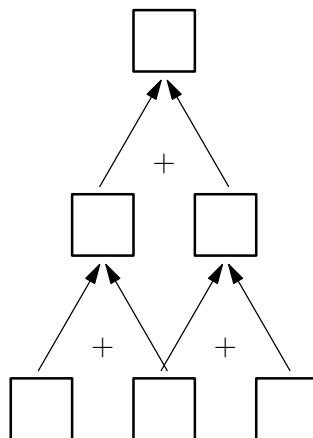
A) 16   **B)** 24   **C)** 25   **D)** 26   **E)** 35

Q23. A box contains gold coins. If the coins are equally divided among six people, four coins are left over. If the coins are equally divided among five people, three coins are left over. If the box holds the smallest number of coins that meets these two conditions, how many coins are left when equally divided among seven people?

A) 0   **B)** 1   **C)** 2   **D)** 3   **E)** 5

Q24. In the multiplication problem below A, B, C, D and are different digits. What is $A + B$?

$$\begin{array}{cccc} & A & B & A \\ \times & & C & D \\ \hline C & D & C & D \end{array}$$

A) 1   **B)** 2   **C)** 3   **D)** 4   **E)** 9

Q25. Barry wrote 6 different numbers, one on each side of 3 cards, and laid the cards on a table, as shown. The sums of the two numbers on each of the three cards are equal. The three numbers on the hidden sides are prime numbers. What is the average of the hidden prime numbers?
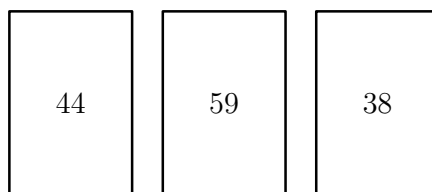
A) 13   **B)** 14   **C)** 15   **D)** 16   **E)** 17
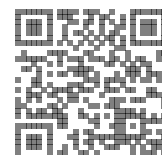
Q1. Connie multiplies a number by 2 and gets 60 as her answer. However, she should have divided the number by 2 to get the correct answer. What is the correct answer?

A) 7.5 **B)** 15 **C)** 30 **D)** 120 **E)** 240

Q2. Karl bought five folders from Pay-A-Lot at a cost of $2.50 each. Pay-A-Lot had a 20%-off sale the following day. How much could Karl have saved on the purchase by waiting a day?

A) $1.00 **B)** $2.00 **C)** $2.50 **D)** $2.75 **E)** $5.00

Q3. What is the minimum number of small squares that must be colored black so that a line of symmetry lies on the diagonal $\overline{BD}$ of square $ABCD$?
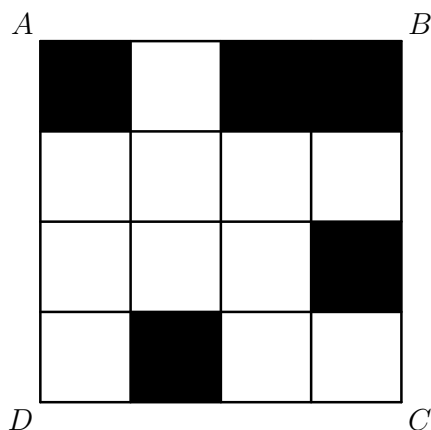
A) 1 **B)** 2 **C)** 3 **D)** 4 **E)** 5

Q4. A square and a triangle have equal perimeters. The lengths of the three sides of the triangle are 6.1 cm, 8.2 cm and 9.7 cm. What is the area of the square in square centimeters?

A) 24 **B)** 25 **C)** 36 **D)** 48 **E)** 64

Q5. Soda is sold in packs of 6, 12 and 24 cans. What is the minimum number of packs needed to buy exactly 90 cans of soda?

A) 4 **B)** 5 **C)** 6 **D)** 8 **E)** 15

Q6. Suppose d is a digit. For how many values of d is $2.00d5 > 2.005$?

A) 0 **B)** 4 **C)** 5 **D)** 6 **E)** 10

Q7. Bill walks $\frac{1}{2}$ mile south, then $\frac{3}{4}$ mile east, and finally $\frac{1}{2}$ mile south. How many miles is he, in a direct line, from his starting point?

A) 1 **B)** $1\frac{1}{4}$ **C)** $1\frac{1}{2}$ **D)** $1\frac{3}{4}$ **E)** 2

Q8. Suppose m and n are positive odd integers. Which of the following must also be an odd integer?

A) $m + 3n$ **B)** $3m - n$ **C)** $3m^2 + 3n^2$ **D)** $(nm + 3)^2$ **E)** $3mn$

Q9. In quadrilateral $ABCD$, sides $\overline{AB}$ and $\overline{BC}$ both have length 10, sides $\overline{CD}$ and $\overline{DA}$ both have length 17, and the measure of angle ADC is 60°. What is the length of diagonal $\overline{AC}$?
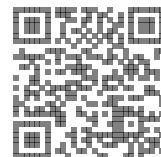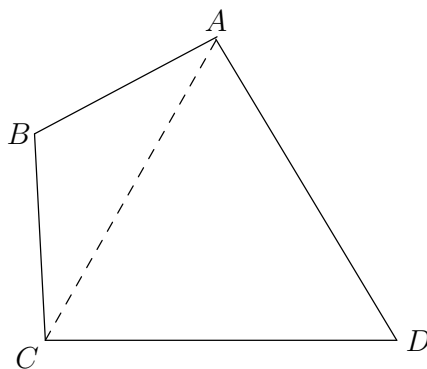
A) 13.5   **B)** 14   **C)** 15.5   **D)** 17   **E)** 18.5

Q10. Joe had walked half way from home to school when he realized he was late. He ran the rest of the way to school. He ran 3 times as fast as he walked. Joe took 6 minutes to walk half way to school. How many minutes did it take Joe to get from home to school?

**A)** 7   **B)** 7.3   **C)** 7.7   **D)** 8   **E)** 8.3

Q11. The sales tax rate in Bergville is 6%. During a sale at the Bergville Coat Closet, the price of a coat is discounted 20% from its \$90.00 price. Two clerks, Jack and Jill, calculate the bill independently. Jack rings up \$90.00 and adds 6% sales tax, then subtracts 20% from this total. Jill rings up \$90.00, subtracts 20% of the price, then adds 6% of the discounted price for sales tax. What is Jack's total minus Jill's total?

A) \$ − 1.06   **B)** \$ − 0.53   **C)** \$0   **D)** \$0.53   **E)** \$1.06

Q12. Big Al, the ape, ate 100 bananas from May 1 through May 5. Each day he ate six more bananas than on the previous day. How many bananas did Big Al eat on May 5?

A) 20   **B)** 22   **C)** 30   **D)** 32   **E)** 34

Q13. The area of polygon $ABCDEF$ is 52 with $AB = 8$, $BC = 9$ and $FA = 5$. What is $DE + EF$?
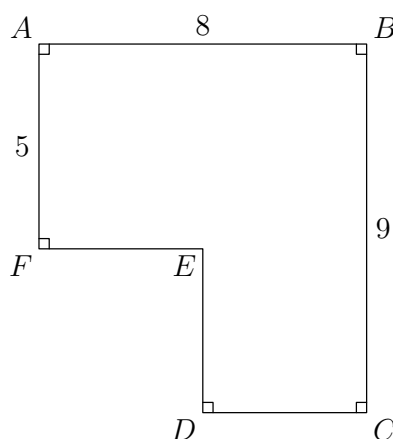
A) 7   **B)** 8   **C)** 9   **D)** 10   **E)** 11

Q14. The Little Twelve Basketball Conference has two divisions, with six teams in each division. Each team plays each of the other teams in its own division twice and every team in the other division once. How many conference games are scheduled?

A) 80   **B)** 96   **C)** 100   **D)** 108   **E)** 192

Q15. How many different isosceles triangles have integer side lengths and perimeter 23?

A) 2   **B)** 4   **C)** 6   **D)** 9   **E)** 11
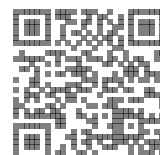
Q16. A five-legged Martian has a drawer full of socks, each of which is red, white or blue, and there are at least five socks of each color. The Martian pulls out one sock at a time without looking. How many socks must the Martian remove from the drawer to be certain there will be 5 socks of the same color?

A) 6   **B)** 9   **C)** 12   **D)** 13   **E)** 15

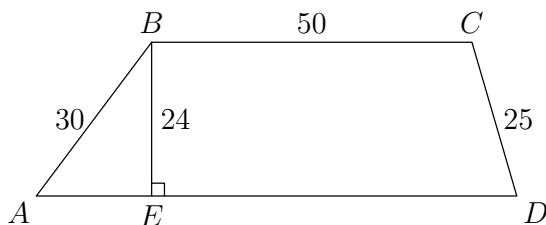**Q17**. The results of a cross-country team's training run are graphed below. Which student has the greatest average speed?
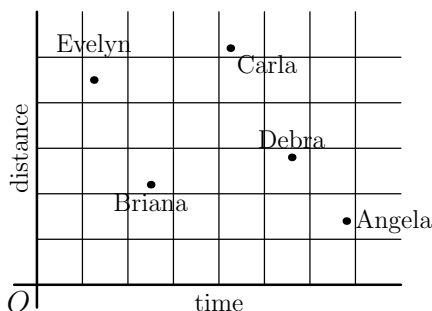
A) Angela   **B)** Briana   **C)** Carla   **D)** Debra   **E)** Evelyn

Q18. How many three-digit numbers are divisible by 13?

A) 7   **B)** 67   **C)** 69   **D)** 76   **E)** 77

Q19. What is the perimeter of trapezoid $ABCD$?

A) 180   **B)** 188   **C)** 196   **D)** 200   **E)** 204

Q20. Alice and Bob play a game involving a circle whose circumference is divided by 12 equally-spaced points. The points are numbered clockwise, from 1 to 12. Both start on point 12. Alice moves clockwise and Bob, counterclockwise. In a turn of the game, Alice moves 5 points clockwise and Bob moves 9 points counterclockwise. The game ends when they stop on the same point. How many turns will this take?

A) 6   **B)** 8   **C)** 12   **D)** 14   **E)** 24

Q21. How many distinct triangles can be drawn using three of the dots below as vertices?
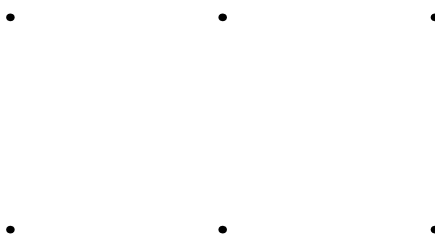
A) 9   **B)** 12   **C)** 18   **D)** 20   **E)** 24

Q22. A company sells detergent in three different sized boxes: small (S), medium (M) and large (L). The medium size costs 50% more than the small size and contains 20% less detergent than the large size. The large size contains twice as much detergent as the small size and costs 30% more than the medium size. Rank the three sizes from best to worst buy.
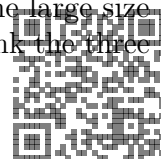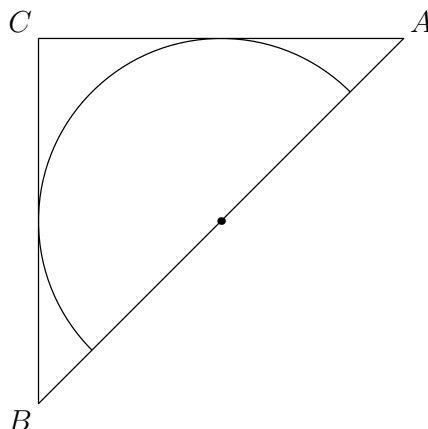
A) SML   **B)** LMS   **C)** MSL   **D)** LSM   **E)** MLS

Q23. Isosceles right triangle ABC encloses a semicircle of area 2π. The circle has its center O on hypotenuse $\overline{AB}$ and is tangent to sides $\overline{AC}$ and $\overline{BC}$. What is the area of triangle ABC?

A) 6   **B)** 8   **C)** 3π **D)** 10   **E)** 4π

Q24. A certain calculator has only two keys [+1] and [x2]. When you press one of the keys, the calculator automatically displays the result. For instance, if the calculator originally displayed 9 and you pressed [+1], it would display 10. If you then pressed [x2], it would display 20. Starting with the display 1, what is the fewest number of keystrokes you would need to reach 200?

A) 8   **B)** 9   **C)** 10   **D)** 11   **E)** 12

Q25. A square with side length 2 and a circle share the same center. The total area of the regions that are inside the circle and outside the square is equal to the total area of the regions that are outside the circle and inside the square. What is the radius of the circle?
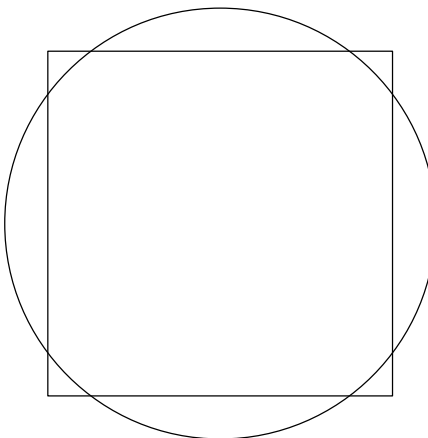
A) $\dfrac{2}{\sqrt{\pi}}$ **B)** $\dfrac{1+\sqrt{2}}{2}$ **C)** $\dfrac{3}{2}$ **D)** $\sqrt{3}$ **E)** $\sqrt{\pi}$
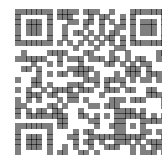
Q1. On a map, a 12-centimeter length represents 72 kilometers. How many kilometers does a 17-centimeter length represent?

A) 6   **B)** 102   **C)** 204   **D)** 864   **E)** 1224

Q2. How many different four-digit numbers can be formed be rearranging the four digits in 2004?

A) 4   **B)** 6   **C)** 16   **D)** 24   **E)** 81

Q3. Twelve friends met for dinner at Oscar's Overstuffed Oyster House, and each ordered one meal. The portions were so large, there was enough food for 18 people. If they shared, how many meals should they have ordered to have just enough food for the 12 of them?

A) 8   **B)** 9   **C)** 10   **D)** 15   **E)** 18

Q4. Ms. Hamilton's eighth-grade class wants to participate in the annual three-person-team basketball tournament. Lance, Sally, Joy, and Fred are chosen for the team. In how many ways can the three starters be chosen?

A) 2   **B)** 4   **C)** 6   **D)** 8   **E)** 10

Q5. The losing team of each game is eliminated from the tournament. If sixteen teams compete, how many games will be played to determine the winner?

A) 4   **B)** 7   **C)** 8   **D)** 15   **E)** 16

Q6. After Sally takes 20 shots, she has made 55% of her shots. After she takes 5 more shots, she raises her percentage to 56%. How many of the last 5 shots did she make?

A) 1   **B)** 2   **C)** 3   **D)** 4   **E)** 5

Q7. An athlete's target heart rate, in beats per minute, is 80% of the theoretical maximum heart rate. The maximum heart rate is found by subtracting the athlete's age, in years, from 220. To the nearest whole number, what is the target heart rate of an athlete who is 26 years old?

A) 134   **B)** 155   **C)** 176   **D)** 194   **E)** 243

Q8. Find the number of two-digit positive integers whose digits total 7.

A) 6   **B)** 7   **C)** 8   **D)** 9   **E)** 10

Q9. The average of the five numbers in a list is 54. The average of the first two numbers is 48. What is the average of the last three numbers?

A) 55   **B)** 56   **C)** 57   **D)** 58   **E)** 59

Q10. Handy Aaron helped a neighbor $1\frac{1}{4}$ hours on Monday, 50 minutes on Tuesday, from 8:20 to 10:45 on Wednesday morning, and a half-hour on Friday. He is paid \$3 per hour. How much did he earn for the week?

A) \$8   **B)** \$9   **C)** \$10   **D)** \$12   **E)** \$15

Q11. The numbers $-2, 4, 6, 9$ and 12 are rearranged according to these rules:

(1) The largest isn't first, but it is in one of the first three places.

(2) The smallest isn't last, but it is in one of the last three places.

(3) The median isn't first or last.

What is the average of the first and last numbers?

A) 3.5   **B)** 5   **C)** 6.5   **D)** 7.5   **E)** 8
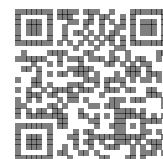
Q12. Niki usually leaves her cell phone on. If her cell phone is on but she is not actually using it, the battery will last for 24 hours. If she is using it constantly, the battery will last for only 3 hours. Since the last recharge, her phone has been on 9 hours, and during that time she has used it for 60 minutes. If she doesn't use it any more but leaves the phone on, how many more hours will the battery last?

A) 7 **B)** 8 **C)** 11 **D)** 14 **E)** 15

Q13. Amy, Bill and Celine are friends with different ages. Exactly one of the following statements is true.

(i) Bill is the oldest.

(ii) Amy is not the oldest.

(iii) Celine is not the youngest.

Rank the friends from the oldest to youngest.

A) Bill, Amy, Celine

B) Amy, Bill, Celine

C) Celine, Amy, Bill

D) Celine, Bill, Amy

E) Amy, Celine, Bill

Q14. What is the area enclosed by the geoboard quadrilateral below?
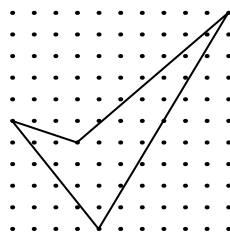
A) 15 **B)** $18\frac{1}{2}$ **C)** $22\frac{1}{2}$ **D)** 27 **E)** 41

Q15. Thirteen black and six white hexagonal tiles were used to create the figure below. If a new figure is created by attaching a border of white tiles with the same size and shape as the others, what will be the difference between the total number of white tiles and the total number of black tiles in the new figure?
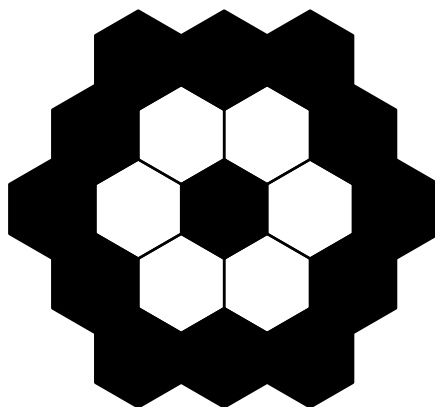
A) 5 **B)** 7 **C)** 11 **D)** 12 **E)** 18

Q16. Two 600 mL pitchers contain orange juice. One pitcher is 1/3 full and the other pitcher is 2/5 full. Water is added to fill each pitcher completely, then both pitchers are poured into one large container. What fraction of the mixture in the large container is orange juice?
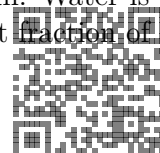
A) $\dfrac{1}{8}$ **B)** $\dfrac{3}{16}$ **C)** $\dfrac{11}{30}$ **D)** $\dfrac{11}{19}$ **E)** $\dfrac{11}{15}$

Q17. Three friends have a total of 6 identical pencils, and each one has at least one pencil. In how many ways can this happen?

A) 1 **B)** 3 **C)** 6 **D)** 10 **E)** 12

Q18. Five friends compete in a dart-throwing contest. Each one has two darts to throw at the same circular target, and each individual's score is the sum of the scores in the target regions that are hit. The scores for the target regions are the whole numbers 1 through 10. Each throw hits the target in a region with a different value. The scores are: Alice 16 points, Ben 4 points, Cindy 7 points, Dave 11 points, and Ellen 17 points. Who hits the region worth 6 points?

A) Alice **B)** Ben **C)** Cindy **D)** Dave **E)** Ellen

Q19. A whole number larger than 2 leaves a remainder of 2 when divided by each of the numbers 3, 4, 5, and 6. The smallest such number lies between which two numbers?

A) 40 and 49

B) 60 and 79

C) 100 and 129

D) 210 and 249

E) 320 and 369

Q20. Two-thirds of the people in a room are seated in three-fourths of the chairs. The rest of the people are standing. If there are 6 empty chairs, how many people are in the room?

A) 12 **B)** 18 **C)** 24 **D)** 27 **E)** 36

Q21. Spinners A and B are spun. On each spinner, the arrow is equally likely to land on each number. What is the probability that the product of the two spinners' numbers is even?
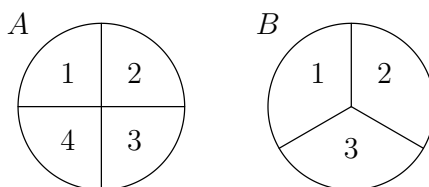
A) $\dfrac{1}{4}$ **B)** $\dfrac{1}{3}$ **C)** $\dfrac{1}{2}$ **D)** $\dfrac{2}{3}$ **E)** $\dfrac{3}{4}$

Q22. At a party there are only single women and married men with their wives. The probability that a randomly selected woman is single is $\dfrac{2}{5}$. What fraction of the people in the room are married men?

**A)** $\dfrac{1}{3}$ **B)** $\dfrac{3}{8}$ **C)** $\dfrac{2}{5}$ **D)** $\dfrac{5}{12}$ **E)** $\dfrac{3}{5}$

Q23. Tess runs counterclockwise around rectangular block $JKLM$. She lives at corner J. Which graph could represent her straight-line distance from home?

(A) time　　**(B)** time　　**(C)** time

(D) time　　**(E)** time
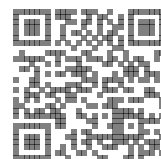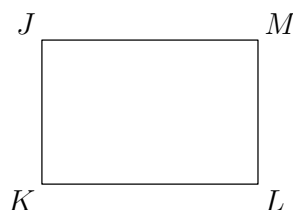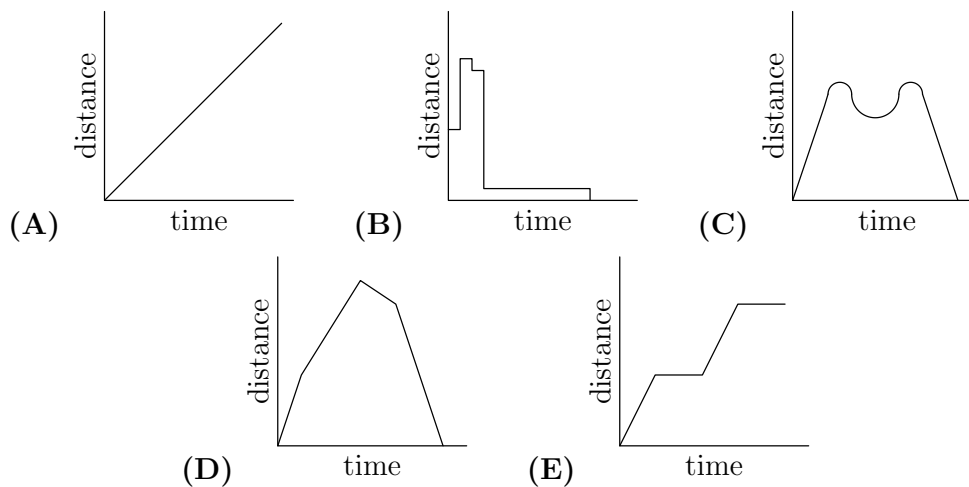
Q24. In the figure, $ABCD$ is a rectangle and $EFGH$ is a parallelogram. Using the measurements given in the figure, what is the length d of the segment that is perpendicular to $\overline{HE}$ and $\overline{FG}$?
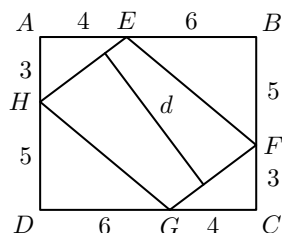

A) 6.8　　　　**B)** 7.1　　　　**C)** 7.6　　　　**D)** 7.8　　　　**E)** 8.1

Q25. Two 4×4 squares intersect at right angles, bisecting their intersecting sides, as shown. The circle's diameter is the segment between the two points of intersection. What is the area of the shaded region created by removing the circle from the squares?
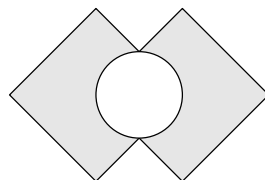
A) $16 - 4\pi$　　　**B)** $16 - 2\pi$　　　**C)** $28 - 4\pi$　　　**D)** $28 - 2\pi$　　　**E)** $32 - 2\pi$
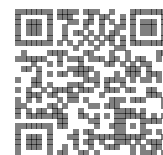
Q1. Jamie counted the number of edges of a cube, Jimmy counted the numbers of corners, and Judy counted the number of faces. They then added the three numbers. What was the resulting sum?

A) 12   **B)** 16   **C)** 20   **D)** 22   **E)** 26

Q2. Which of the following numbers has the smallest prime factor?

A) 55   **B)** 57   **C)** 58   **D)** 59   **E)** 61

Q3. A burger at Ricky C's weighs 120 grams, of which 30 grams are filler. What percent of the burger is not filler?

A) 60%   **B)** 65%   **C)** 70%   **D)** 75%   **E)** 90%

Q4. A group of children riding on bicycles and tricycles rode past Billy Bob's house. Billy Bob counted 7 children and 19 wheels. How many tricycles were there?

A) 2   **B)** 4   **C)** 5   **D)** 6   **E)** 7

Q5. If 20% of a number is 12, what is 30% of the same number?

A) 15   **B)** 18   **C)** 20   **D)** 24   **E)** 30

Q6. Given the areas of the three squares in the figure, what is the area of the interior triangle?
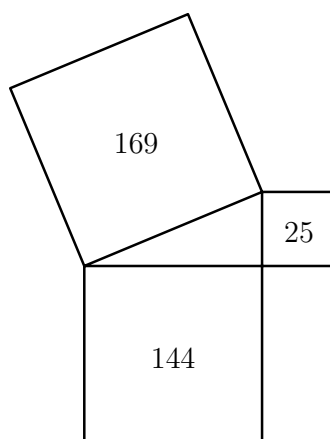
A) 13   **B)** 30   **C)** 60   **D)** 300   **E)** 1800

Q7. Blake and Jenny each took four 100-point tests. Blake averaged 78 on the four tests. Jenny scored 10 points higher than Blake on the first test, 10 points lower than him on the second test, and 20 points higher on both the third and fourth tests. What is the difference between Jenny's average and Blake's average on these four tests?

A) 10   **B)** 15   **C)** 20   **D)** 25   **E)** 40
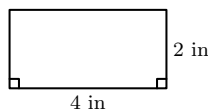
Q8. **Bake Sale**

Four friends, Art, Roger, Paul and Trisha, bake cookies, and all cookies have the same thickness. The shapes of the cookies differ, as shown.
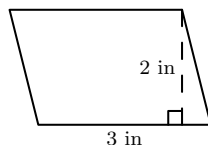∘ Art's cookies are trapezoids.
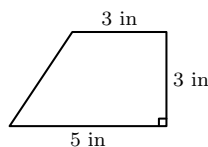
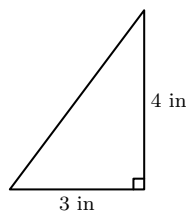∘ Roger's cookies are rectangles.

2 in

4 in
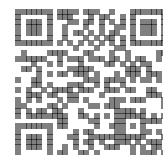
○ Paul's cookies are parallelograms.

2 in

3 in

○ Trisha's cookies are triangles.

4 in

3 in

Each friend uses the same amount of dough, and Art makes exactly 12 cookies.
Who gets the fewest cookies from one batch of cookie dough?

A) Art   **B)** Roger   **C)** Paul

D) Trisha   **E)** There is a tie for fewest.

Q9. Each friend uses the same amount of dough, and Art makes exactly 12 cookies. Art's cookies sell for 60 cents each. To earn the same amount from a single batch, how much should one of Roger's cookies cost in cents?

A) 18   **B)** 25   **C)** 40   **D)** 75   **E)** 90

Q10. How many cookies will be in one batch of Trisha's cookies?

A) 10   **B)** 12   **C)** 16   **D)** 18   **E)** 24

Q11. Business is a little slow at Lou's Fine Shoes, so Lou decides to have a sale. On Friday, Lou increases all of Thursday's prices by 10 percent. Over the weekend, Lou advertises the sale: "Ten percent off the listed price. Sale starts Monday." How much does a pair of shoes cost on Monday that cost 40 dollars on Thursday?

A) 36   **B)** 39.60   **C)** 40   **D)** 40.40   **E)** 44

Q12. When a fair six-sided dice is tossed on a table top, the bottom face cannot be seen. What is the probability that the product of the faces that can be seen is divisible by 6?

A) $\dfrac{1}{3}$ **B)** $\dfrac{1}{2}$ **C)** $\dfrac{2}{3}$ **D)** $\dfrac{5}{6}$ **E)** 1

Q13. Fourteen white cubes are put together to form the figure on the right. The complete surface of the figure, including the bottom, is painted red. The figure is then separated into individual cubes. How many of the individual cubes have exactly four red faces?

      非淡泊无以明志，非宁静无以致远。
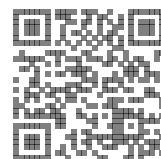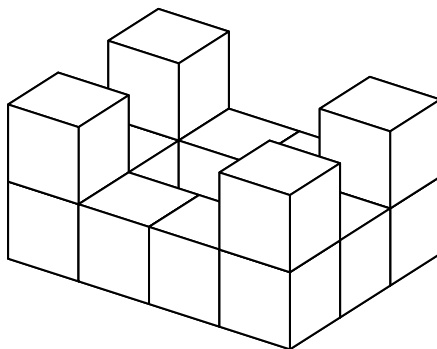
A) 4   **B)** 6   **C)** 8   **D)** 10   **E)** 12

Q14. In this addition problem, each letter stands for a different digit.

$$
\begin{array}{cccc}
 & T & W & O \\
+ & T & W & O \\
\hline
F & O & U & R
\end{array}
$$

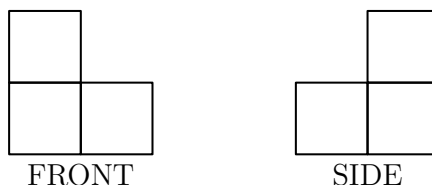If $T = 7$ and the letter O represents an even number, what is the only possible value for W?

A) 0   **B)** 1   **C)** 2   **D)** 3   **E)** 4

Q15. A figure is constructed from unit cubes. Each cube shares at least one face with another cube. What is the minimum number of cubes needed to build a figure with the front and side views shown?

FRONT   SIDE

A) 3   **B)** 4   **C)** 5   **D)** 6   **E)** 7

Q16. Ali, Bonnie, Carlo, and Dianna are going to drive together to a nearby theme park. The car they are using has 4 seats: 1 Driver seat, 1 front passenger seat, and 2 back passenger seat. Bonnie and Carlo are the only ones who know how to drive the car. How many possible seating arrangements are there?

A) 2   **B)** 4   **C)** 6   **D)** 12   **E)** 24

Q17. The six children listed below are from two families of three siblings each. Each child has blue or brown eyes and black or blond hair. Children from the same family have at least one of these characteristics in common. Which two children are Jim's siblings?

Child	Eye Color	Hair Color
Benjamin	Blue	Black
Jim	Brown	Blonde
Nadeen	Brown	Black
Austin	Blue	Blonde
Tevyn	Blue	Black
Sue	Blue	Blonde

**A)** Nadeen and Austin   **B)** Benjamin and Sue   **C)** Benjamin and Austin

D) Nadeen and Tevyn   **E)** Austin and Sue

Q18. Each of the twenty dots on the graph below represents one of Sarah's classmates. Classmates who are friends are connected with a line segment. For her birthday party, Sarah is inviting only the following: all of her friends and all of those classmates who are friends with at least one of her friends. How many classmates will not be invited to Sarah's party?
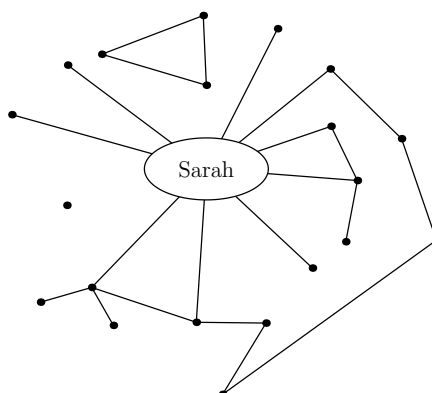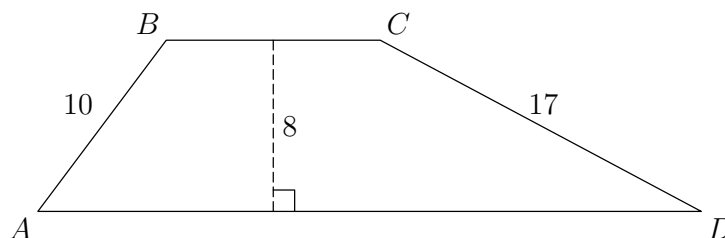
A) 1   **B)** 4   **C)** 5   **D)** 6   **E)** 7

Q19. How many integers between 1000 and 2000 have all three of the numbers 15, 20, and 25 as factors?

A) 1   **B)** 2   **C)** 3   **D)** 4   **E)** 5

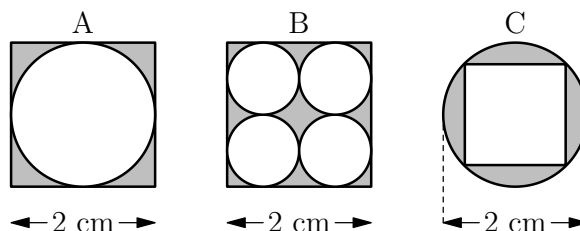**Q20**. What is the measure of the acute angle formed by the hands of the clock at 4:20 PM?

A) 0   **B)** 5   **C)** 8   **D)** 10   **E)** 12

Q21. The area of trapezoid $ABCD$ is 164 cm^2. The altitude is 8 cm, AB is 10 cm, and CD is 17 cm. What is BC, in centimeters?

A) 9   **B)** 10   **C)** 12   **D)** 15   **E)** 20

Q22. The following figures are composed of squares and circles. Which figure has a shaded region with largest area?

A) A only   **B)** B only   **C)** C only   **D)** both A and B   **E)** all are equal

Q23. In the pattern below, the cat moves clockwise through the four squares and the mouse moves counterclockwise through the eight exterior segments of the four squares.
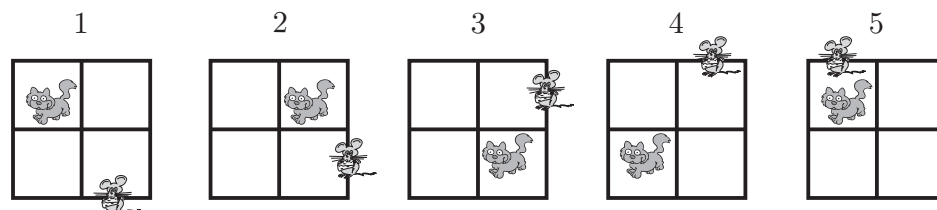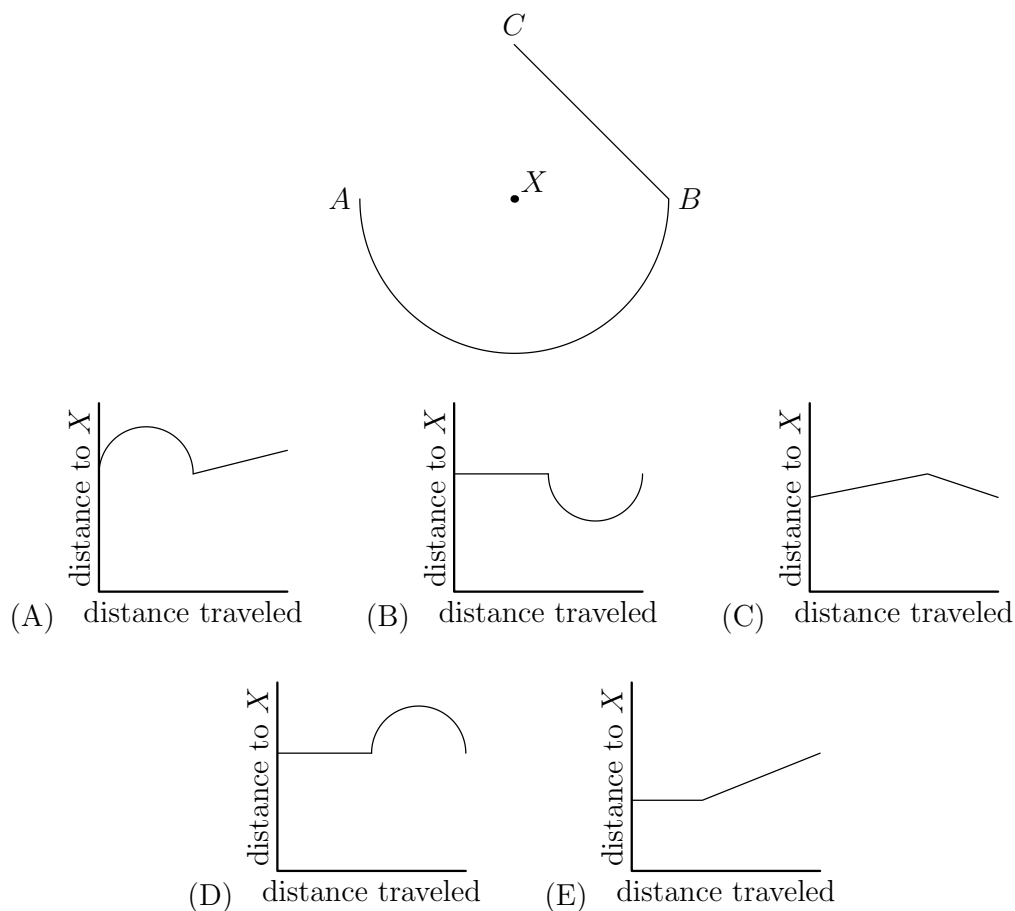

If the pattern is continued, where would the cat and mouse be after the 247th move?
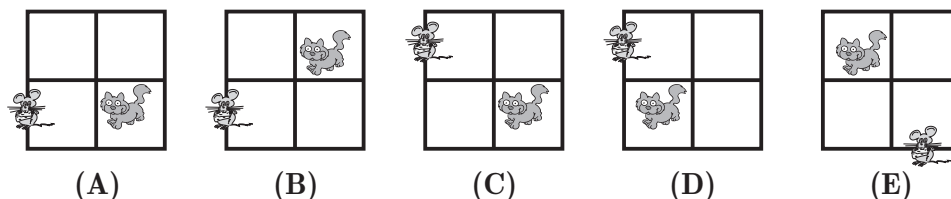
Q24. A ship travels from point A to point B along a semicircular path, centered at Island X. Then it travels along a straight path from B to C. Which of these graphs best shows the ship's distance from Island X as it moves along its course?

C

A $\bullet X$ B

distance to X

(A)   distance traveled   (B)   distance traveled   (C)   distance traveled

(D)   distance traveled   (E)   distance traveled
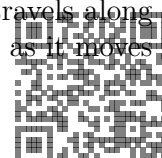
Q25. In the figure, the area of square $WXYZ$ is 25 cm^2. The four smaller squares have sides 1 cm long, either parallel to or coinciding with the sides of the large square. In $\triangle ABC$, $AB = AC$, and when $\triangle ABC$ is folded over side $\overline{BC}$, point A coincides with O, the center of square $WXYZ$. What is the area of $\triangle ABC$, in square centimeters?

W X

B

A

$\bullet O$

C

Z Y
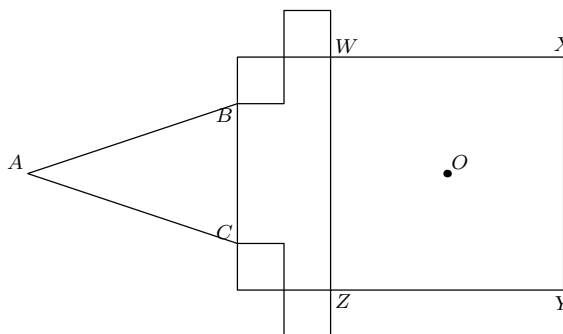
A) $\dfrac{15}{4}$ **B)** $\dfrac{21}{4}$ **C)** $\dfrac{27}{4}$ **D)** $\dfrac{21}{2}$ **E)** $\dfrac{27}{2}$
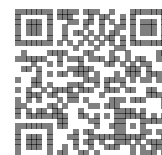
Q1. A circle and two distinct lines are drawn on a sheet of paper. What is the largest possible number of points of intersection of these figures?

A) 2 **B)** 3 **C)** 4 **D)** 5 **E)** 6

Q2. How many different combinations of $5 bills and $2 bills can be used to make a total of $17? Order does not matter in this problem.

A) 2 **B)** 3 **C)** 4 **D)** 5 **E)** 6

Q3. What is the smallest possible average of four distinct positive even integers?

A) 3 **B)** 4 **C)** 5 **D)** 6 **E)** 7

Q4. The year 2002 is a palindrome (a number that reads the same from left to right as it does from right to left). What is the product of the digits of the next year after 2002 that is a palindrome?

A) 0 **B)** 4 **C)** 9 **D)** 16 **E)** 25

Q5. Carlos Montado was born on Saturday, November 9, 2002. On what day of the week will Carlos be 706 days old?

A) Monday **B)** Wednesday **C)** Friday **D)** Saturday **E)** Sunday

Q6. A birdbath is designed to overflow so that it will be self-cleaning. Water flows in at the rate of 20 milliliters per minute and drains at the rate of 18 milliliters per minute. One of these graphs shows the volume of water in the birdbath during the filling time and continuing into the overflow time. Which one is it?
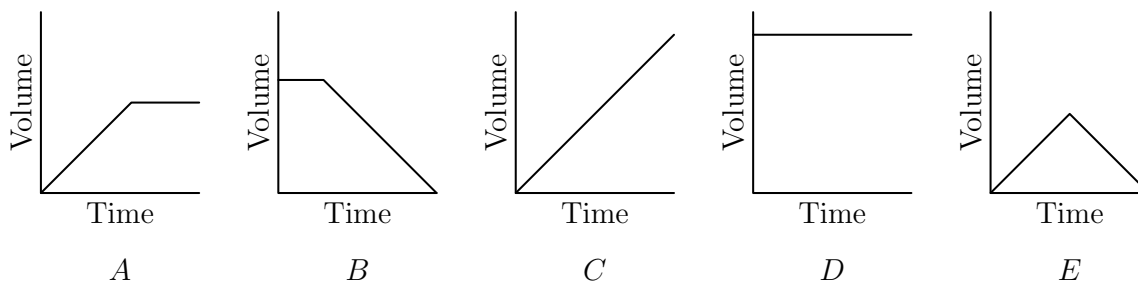
A) A **B)** B **C)** C **D)** D **E)** E

Q7. The students in Mrs. Sawyer's class were asked to do a taste test of five kinds of candy. Each student chose one kind of candy. A bar graph of their preferences is shown. What percent of her class chose candy E?

SWEET TOOTH
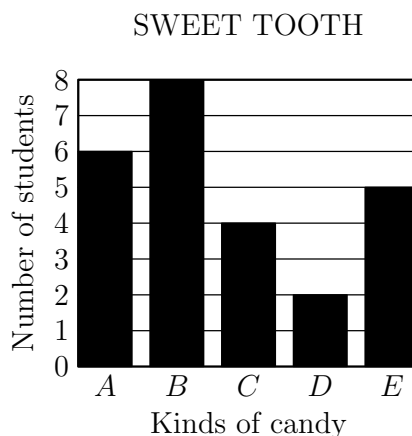
A) 5 **B)** 12 **C)** 15 **D)** 16 **E)** 20
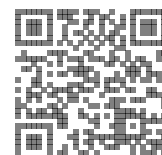
Q8. Problems 8,9 and 10 use the data found in the accompanying paragraph and table:

Juan organizes the stamps in his collection by country and by the decade in which they were issued. The prices he paid for them at a stamp shop were: Brazil and France, 6 cents each, Peru 4 cents each, and Spain 5 cents each. (Brazil and Peru are South American countries and France and Spain are in Europe.)

Number of Stamps by Decade

Country	50s	60s	70s	80s
Brazil	4	7	12	8
France	8	4	12	15
Peru	6	4	6	10
Spain	3	9	13	9

Juan's Stamp Collection

How many of his European stamps were issued in the '80s?

A) 9   **B)** 15   **C)** 18   **D)** 24   **E)** 42

Q9. In dollars and cents, how much did his South American stampes issued before the 70s cost him?

A) $0.40   **B)** $1.06   **C)** $1.80   **D)** $2.38   **E)** $2.64

Q10. The average price of his 70s stamps is closest to

A) 3.5 cents   **B)** 4 cents   **C)** 4.5 cents   **D)** 5 cents   **E)** 5.4 cents

Q11. A sequence of squares is made of identical square tiles. The edge of each square is one tile length longer than the edge of the previous square. The first three squares are shown. How many more tiles does the seventh square require than the sixth?
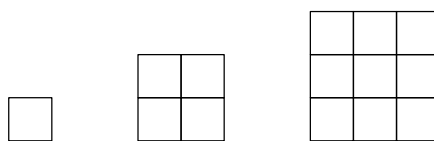
A) 11   **B)** 12   **C)** 13   **D)** 14   **E)** 15

Q12. A board game spinner is divided into three regions labeled A, B and C. The probability of the arrow stopping on region A is $\frac{1}{3}$ and on region B is $\frac{1}{2}$. The probability of the arrow stopping on region C is:

A) $\frac{1}{12}$ **B)** $\frac{1}{6}$ **C)** $\frac{1}{5}$ **D)** $\frac{1}{3}$ **E)** $\frac{2}{5}$

Q13. For his birthday, Bert gets a box that holds 125 jellybeans when filled to capacity. A few weeks later, Carrie gets a larger box full of jellybeans. Her box is twice as high, twice as wide and twice as long as Bert's. Approximately, how many jellybeans did Carrie get?

A) 250   **B)** 500   **C)** 625   **D)** 750   **E)** 1000

Q14. A merchant offers a large group of items at 30% off. Later, the merchant takes 20% off these sale prices and claims that the final price of these items is 50% off the original price. The total discount is

A) 35%   **B)** 44%   **C)** 50%   **D)** 56%   **E)** 60%

Q15. Which of the following polygons has the largest area?
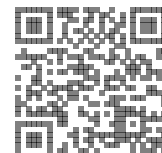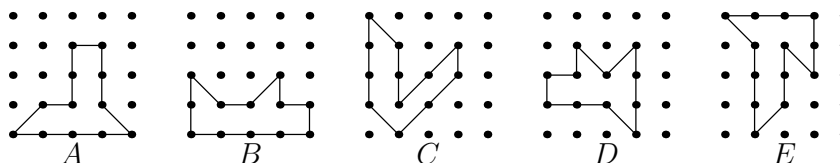
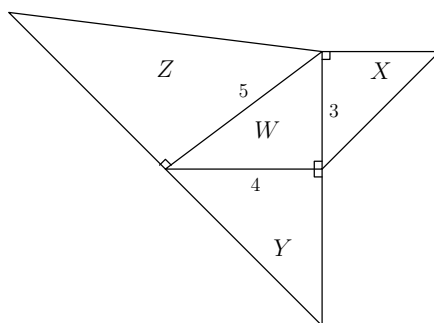**A)** A   **B)** B   **C)** C   **D)** D   **E)** E

Q16. Right isosceles triangles are constructed on the sides of a 3-4-5 right triangle, as shown. A capital letter represents the area of each triangle. Which one of the following is true?

A) $X + Z = W + Y$ **B)** $W + X = Z$ **C)** $3X + 4Y = 5Z$

D) $X + W = \frac{1}{2}(Y + Z)$ **E)** $X + Y = Z$

Q17. In a mathematics contest with ten problems, a student gains 5 points for a correct answer and loses 2 points for an incorrect answer. If Olivia answered every problem and her score was 29, how many correct answers did she have?

A) 5   **B)** 6   **C)** 7   **D)** 8   **E)** 9

Q18. Gage skated 1 hr 15 min each day for 5 days and 1 hr 30 min each day for 3 days. How long would he have to skate the ninth day in order to average 85 minutes of skating each day for the entire time?

A) 1 hr   **B)** 1 hr 10 min   **C)** 1 hr 20 min

D) 1 hr 40 min   **E)** 2 hr

Q19. How many whole numbers between 99 and 999 contain exactly one 0?

A) 72   **B)** 90   **C)** 144   **D)** 162   **E)** 180

Q20. The area of triangle XYZ is 8 square inches. Points A and B are midpoints of congruent segments $\overline{XY}$ and $\overline{XZ}$. Altitude $\overline{XC}$ bisects $\overline{YZ}$. What is the area (in square inches) of the shaded region?
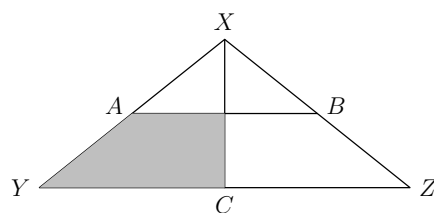
A) $1\frac{1}{2}$ **B)** 2   **C)** $2\frac{1}{2}$ **D)** 3   **E)** $3\frac{1}{2}$

Q21. Harold tosses a coin four times. The probability that he gets at least as many heads as tails is
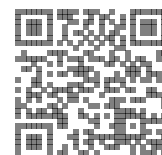
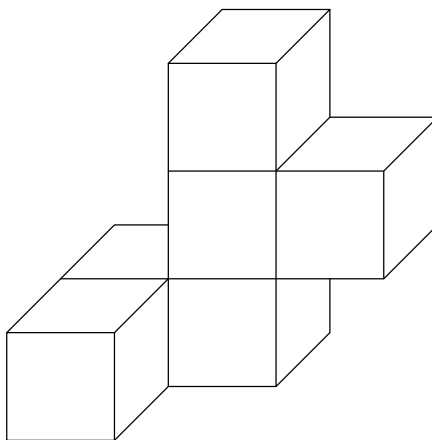**A)** $\frac{5}{16}$ **B)** $\frac{3}{8}$ **C)** $\frac{1}{2}$ **D)** $\frac{5}{8}$ **E)** $\frac{11}{16}$
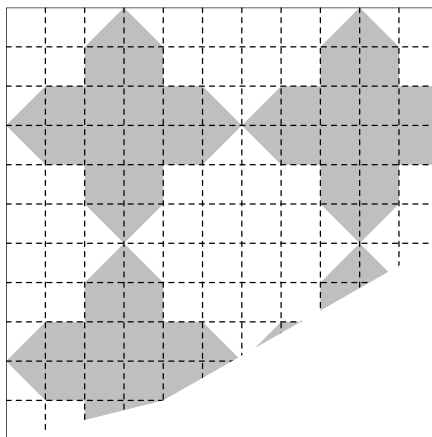
Q22. Six cubes, each an inch on an edge, are fastened together, as shown. Find the total surface area in square inches. Include the top, bottom and sides.

A) 18   **B)** 24   **C)** 26   **D)** 30   **E)** 36

Q23. A corner of a tiled floor is shown. If the entire floor is tiled in this way and each of the four corners looks like this one, then what fraction of the tiled floor is made of darker tiles?


A) $\dfrac{1}{3}$ **B)** $\dfrac{4}{9}$ **C)** $\dfrac{1}{2}$ **D)** $\dfrac{5}{9}$ **E)** $\dfrac{5}{8}$

Q24. Miki has a dozen oranges of the same size and a dozen pears of the same size. Miki uses her juicer to extract 8 ounces of pear juice from 3 pears and 8 ounces of orange juice from 2 oranges. She makes a pear-orange juice blend from an equal number of pears and oranges. What percent of the blend is pear juice?

A) 30   **B)** 40   **C)** 50   **D)** 60   **E)** 70

Q25. Loki, Moe, Nick and Ott are good friends. Ott had no money, but the others did. Moe gave Ott one-fifth of his money, Loki gave Ott one-fourth of his money and Nick gave Ott one-third of his money. Each gave Ott the same amount of money. What fractional part of the group's money does Ott now have?

A) $\dfrac{1}{10}$ **B)** $\dfrac{1}{4}$ **C)** $\dfrac{1}{3}$ **D)** $\dfrac{2}{5}$ **E)** $\dfrac{1}{2}$
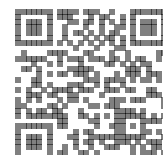
Q1. Casey's shop class is making a golf trophy. He has to paint 300 dimples on a golf ball. If it takes him 2 seconds to paint one dimple, how many minutes will he need to do his job?

   A) 4   **B)** 6   **C)** 8   **D)** 10   **E)** 12

Q2. I'm thinking of two whole numbers. Their product is 24 and their sum is 11. What is the larger number?

   A) 3   **B)** 4   **C)** 6   **D)** 8   **E)** 12

Q3. Granny Smith has \$63. Elberta has \$2 more than Anjou and Anjou has one-third as much as Granny Smith. How many dollars does Elberta have?

   A) 17   **B)** 18   **C)** 19   **D)** 21   **E)** 23

Q4. The digits 1, 2, 3, 4 and 9 are each used once to form the smallest possible **even** five-digit number. The digit in the tens place is

   A) 1   **B)** 2   **C)** 3   **D)** 4   **E)** 9

Q5. On a dark and stormy night Snoopy suddenly saw a flash of lightning. Ten seconds later he heard the sound of thunder. The speed of sound is 1088 feet per second and one mile is 5280 feet. Estimate, to the nearest half-mile, how far Snoopy was from the flash of lightning.

   A) 1   **B)** $1\frac{1}{2}$ **C)** 2   **D)** $2\frac{1}{2}$ **E)** 3

Q6. Six trees are equally spaced along one side of a straight road. The distance from the first tree to the fourth is 60 feet. What is the distance in feet between the first and last trees?

   A) 90   **B)** 100   **C)** 105   **D)** 120   **E)** 140

Q7. To promote her school's annual Kite Olympics, Genevieve makes a small kite and a large kite for a bulletin board display. The kites look like the one in the diagram. For her small kite Genevieve draws the kite on a one-inch grid. For the large kite she triples both the height and width of the entire grid.
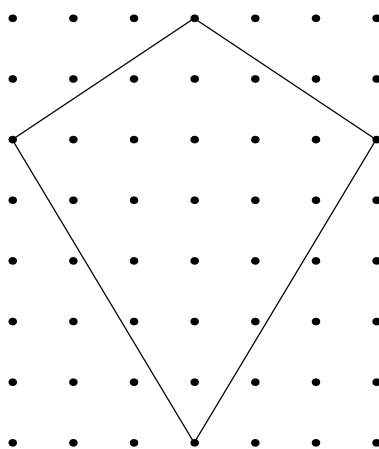
What is the number of square inches in the area of the small kite?

   A) 21   **B)** 22   **C)** 23   **D)** 24   **E)** 25

Q8. Genevieve puts bracing on her large kite in the form of a cross connecting opposite corners of the kite. How many inches of bracing material does she need?

   A) 30   **B)** 32   **C)** 35   **D)** 38   **E)** 39

Q9. The large kite is covered with gold foil. The foil is cut from a rectangular piece that just covers the entire grid. How many square inches of waste material are cut off from the four corners?
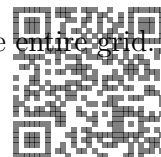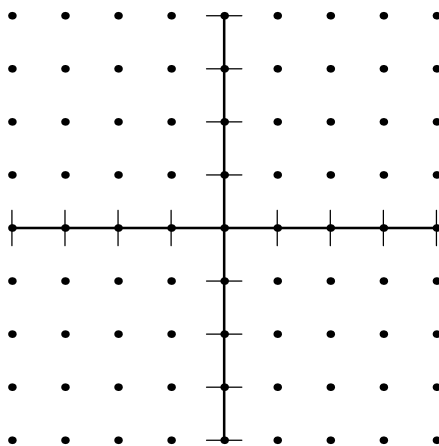
A) 63   **B)** 72   **C)** 180   **D)** 189   **E)** 264

Q10. A collector offers to buy state quarters for 2000% of their face value. At that rate how much will Bryden get for his four state quarters?

    A) 20 dollars   **B)** 50 dollars   **C)** 200 dollars   **D)** 500 dollars   **E)** 2000 dollars

Q11. Points A, B, C and D have these coordinates: $A(3,2)$, $B(3,-2)$, $C(-3,-2)$ and $D(-3,0)$. The area of quadrilateral $ABCD$ is

    A) 12   **B)** 15   **C)** 18   **D)** 21   **E)** 24

Q12. If $a \otimes b = \dfrac{a+b}{a-b}$, then $(6 \otimes 4) \otimes 3 =$

    A) 4   **B)** 13   **C)** 15   **D)** 30   **E)** 72

Q13. Of the 36 students in Richelle's class, 12 prefer chocolate pie, 8 prefer apple, and 6 prefer blueberry. Half of the remaining students prefer cherry pie and half prefer lemon. For Richelle's pie graph showing this data, how many degrees should she use for cherry pie?

    A) 10   **B)** 20   **C)** 30   **D)** 50   **E)** 72

Q14. Tyler has entered a buffet line in which he chooses one kind of meat, two different vegetables and one dessert. If the order of food items is not important, how many different meals might he choose?

Meat: beef, chicken, pork

**Vegetables:** baked beans, corn, potatoes, tomatoes

**Dessert:** brownies, chocolate cake, chocolate pudding, ice cream

    A) 4   **B)** 24   **C)** 72   **D)** 80   **E)** 144

Q15. Homer began peeling a pile of 44 potatoes at the rate of 3 potatoes per minute. Four minutes later Christen joined him and peeled at the rate of 5 potatoes per minute. When they finished, how many potatoes had Christen peeled?

    A) 20   **B)** 24   **C)** 32   **D)** 33   **E)** 40

Q16. A square piece of paper, 4 inches on a side, is folded in half vertically. Both layers are then cut in half parallel to the fold. Three new rectangles are formed, a large one and two small ones. What is the ratio of the perimeter of one of the small rectangles to the perimeter of the large rectangle?
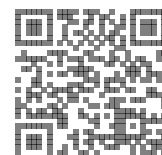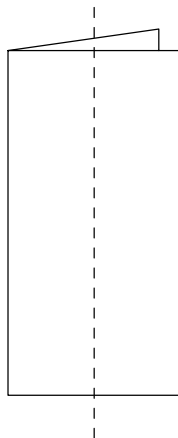
A) $\dfrac{1}{3}$ **B)** $\dfrac{1}{2}$ **C)** $\dfrac{3}{4}$ **D)** $\dfrac{4}{5}$ **E)** $\dfrac{5}{6}$

Q17. For the game show "Who Wants To Be A Millionaire?", the dollar values of each question are shown in the following table (where $K = 1000$).

Question	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15
Value	100	200	300	500	1K	2K	4K	8K	16K	32K	64K	125K	250K	500K	1000K

Between which two questions is the percent increase of the value the smallest?

A) From 1 to 2   **B)** From 2 to 3   **C)** From 3 to 4

D) From 11 to 12   **E)** From 14 to 15

Q18. Two dice are thrown. What is the probability that the product of the two numbers is a multiple of 5?

A) $\dfrac{1}{36}$ **B)** $\dfrac{1}{18}$ **C)** $\dfrac{1}{6}$ **D)** $\dfrac{11}{36}$ **E)** $\dfrac{1}{3}$

Q19. Car M traveled at a constant speed for a given time. This is shown by the dashed line. Car N traveled at twice the speed for the same distance. If Car M and Car N's speed and time are shown as solid line, which graph illustrates this?
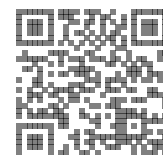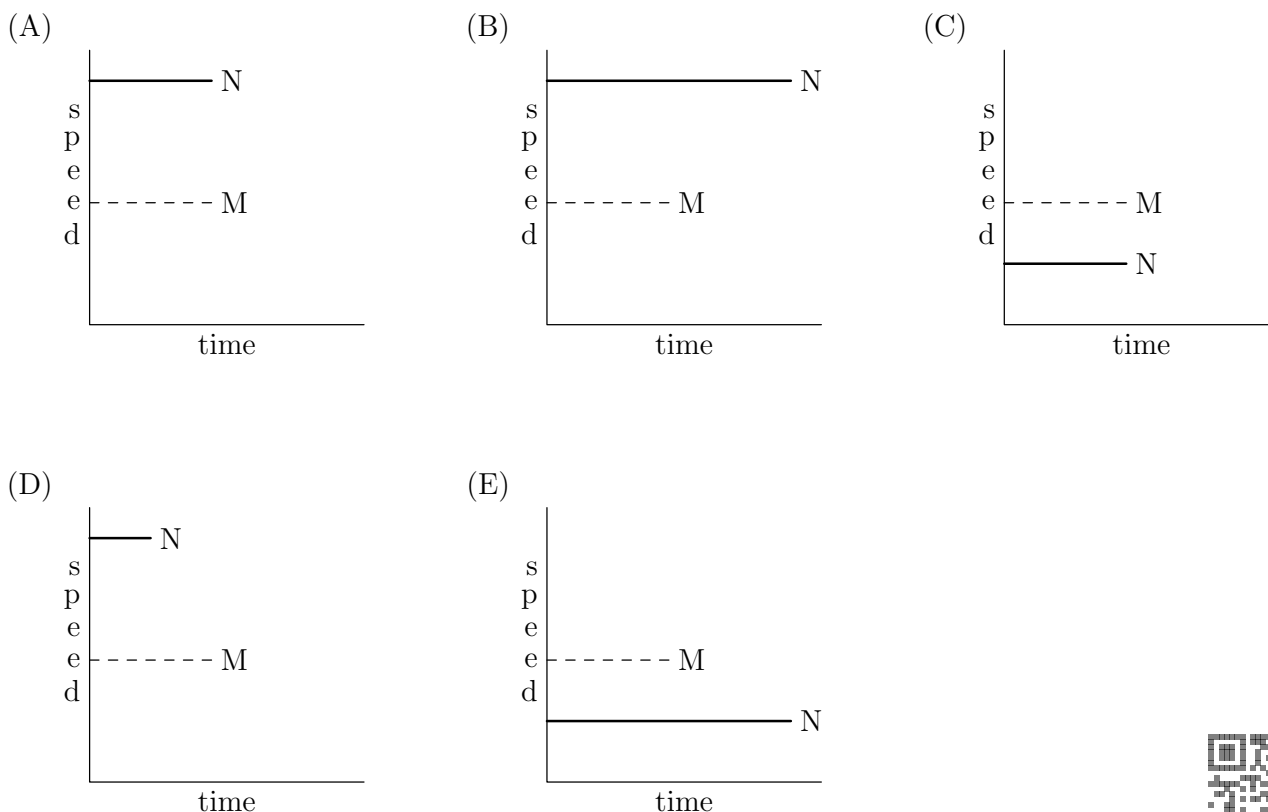
Q20. Kaleana shows her test score to Quay, Marty and Shana, but the others keep theirs hidden.

Quay thinks, "At least two of us have the same score."
Marty thinks, "I didn't get the lowest score."
Shana thinks, "I didn't get the highest score."

List the scores from lowest to highest for Marty (M), Quay (Q) and Shana (S).

A) S,Q,M   **B)** Q,M,S   **C)** Q,S,M   **D)** M,S,Q   **E)** S,M,Q

Q21. The mean of a set of five different positive integers is 15. The median is 18. The maximum possible value of the largest of these five integers is

A) 19   **B)** 24   **C)** 32   **D)** 35   **E)** 40

Q22. On a twenty-question test, each correct answer is worth 5 points, each unanswered question is worth 1 point and each incorrect answer is worth 0 points. Which of the following scores is **NOT** possible?

A) 90   **B)** 91   **C)** 92   **D)** 95   **E)** 97

Q23. Points R, S and T are vertices of an equilateral triangle, and points X, Y and Z are midpoints of its sides. How many noncongruent triangles can be drawn using any three of these six points as vertices?

S

Y Z

R X T

A) 1   **B)** 2   **C)** 3   **D)** 4   **E)** 20

Q24. Each half of this figure is composed of 3 red triangles, 5 blue triangles and 8 white triangles. When the upper half is folded down over the centerline, 2 pairs of red triangles coincide, as do 3 pairs of blue triangles. There are 2 red-white pairs. How many white pairs coincide?
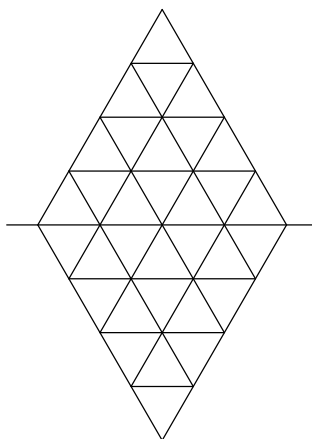
A) 4   **B)** 5   **C)** 6   **D)** 7   **E)** 9

Q25. There are 24 four-digit whole numbers that use each of the four digits 2, 4, 5 and 7 exactly once. Only one of these four-digit numbers is a multiple of another one. Which of the following is it?

A) 5724   **B)** 7245   **C)** 7254   **D)** 7425   **E)** 7542
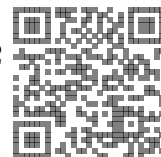
Q1. Aunt Anna is 42 years old. Caitlin is 5 years younger than Brianna, and Brianna is half as old as Aunt Anna. How old is Caitlin?

    A) 15   **B)** 16   **C)** 17   **D)** 21   **E)** 37

Q2. Which of these numbers is less than its reciprocal?

    A) -2 **B)** -1 **C)** 0   **D)** 1   **E)** 2

Q3. How many whole numbers lie in the interval between $\dfrac{5}{3}$ and 2π?

    A) 2   **B)** 3   **C)** 4   **D)** 5   **E)** infinitely many

Q4. In 1960 only 5% of the working adults in Carlin City worked at home. By 1970 the "at-home" work force had increased to 8%. In 1980 there were approximately 15% working at home, and in 1990 there were 30%. The graph that best illustrates this is:
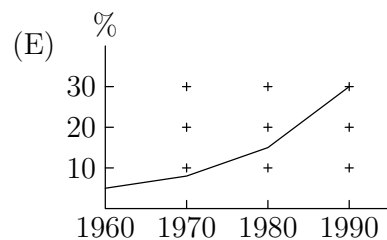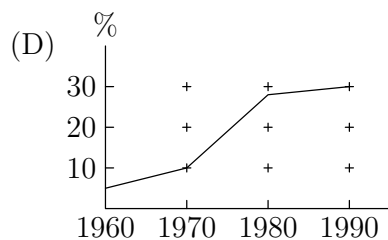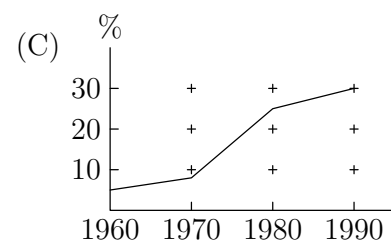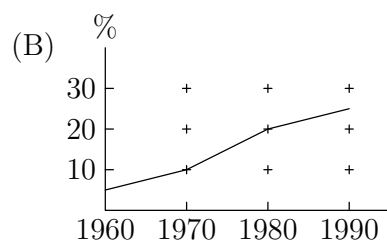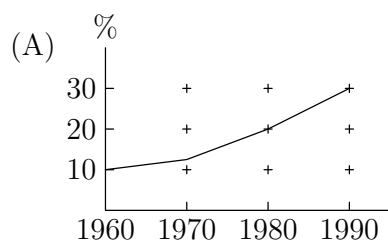
Q5. Each principal of Lincoln High School serves exactly one 3-year term. What is the maximum number of principals this school could have during an 8-year period?

    A) 2   **B)** 3   **C)** 4   **D)** 5   **E)** 8

Q6. Figure $ABCD$ is a square. Inside this square three smaller squares are drawn with the side lengths as labeled. The area of the shaded L-shaped region is
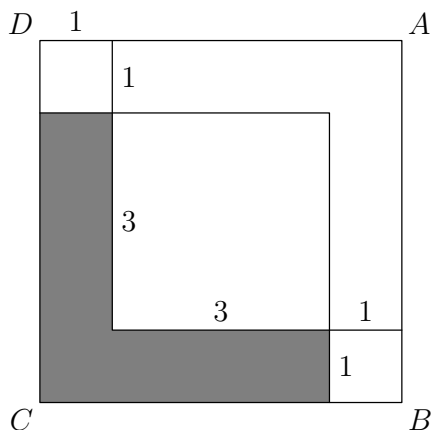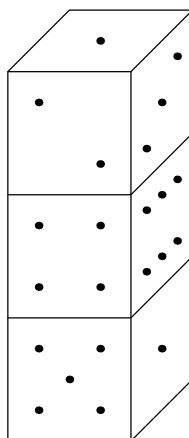

    A) 7   **B)** 10   **C)** 12.5   **D)** 14   **E)** 15
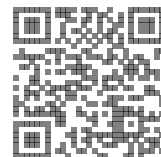
Q7. What is the minimum possible product of three different numbers of the set $\{-8, -6, -4, 0, 3, 5, 7\}$?

   **A)** -336 **B)** -280 **C)** -210 **D)** -192 **E)** 0

Q8. Three dice with faces numbered 1 through 6 are stacked as shown. Seven of the eighteen faces are visible, leaving eleven faces hidden (back, bottom, between). The total number of dots NOT visible in this view is

    A) 21   **B)** 22   **C)** 31   **D)** 41   **E)** 53

Q9. Three-digit powers of 2 and 5 are used in this "cross-number" puzzle. What is the only possible digit for the outlined square?

ACROSS   **DOWN**
2.2^m **1**.5^n
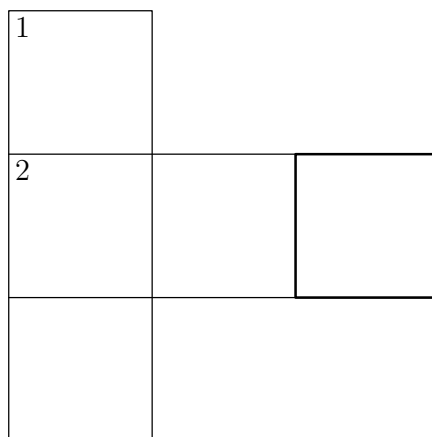
    A) 0   **B)** 2   **C)** 4   **D)** 6   **E)** 8

Q10. Ara and Shea were once the same height. Since then Shea has grown 20% while Ara has grown half as many inches as Shea. Shea is now 60 inches tall. How tall, in inches, is Ara now?

    A) 48   **B)** 51   **C)** 52   **D)** 54   **E)** 55

Q11. The number 64 has the property that it is divisible by its unit digit. How many whole numbers between 10 and 50 have this property?

    A) 15   **B)** 16   **C)** 17   **D)** 18   **E)** 20

Q12. A block wall 100 feet long and 7 feet high will be constructed using blocks that are 1 foot high and either 2 feet long or 1 foot long (no blocks may be cut). The vertical joins in the blocks must be staggered as shown, and the wall must be even on the ends. What is the smallest number of blocks needed to build this wall?
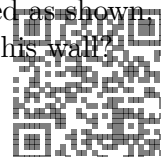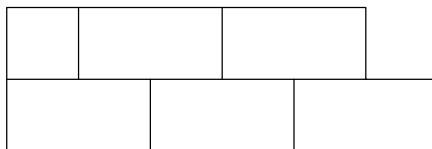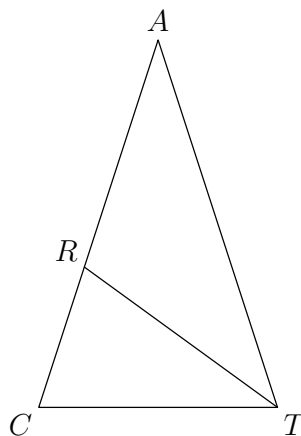
A) 344   **B)** 347   **C)** 350   **D)** 353   **E)** 356

Q13. In triangle CAT, we have $\angle ACT = \angle ATC$ and $\angle CAT = 36°$. If $\overline{TR}$ bisects $\angle ATC$, then $\angle CRT =$

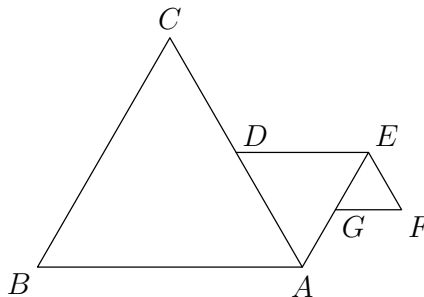**A)** 36°   **B)** 54°   **C)** 72°   **D)** 90°   **E)** 108°

Q14. What is the units digit of $19^{19} + 99^{99}$?

A) 0   **B)** 1   **C)** 2   **D)** 8   **E)** 9

Q15. Triangles ABC, ADE, and EFG are all equilateral. Points D and G are midpoints of $\overline{AC}$ and $\overline{AE}$, respectively. If $AB = 4$, what is the perimeter of figure $ABCDEFG$?

A) 12   **B)** 13   **C)** 15   **D)** 18   **E)** 21

Q16. In order for Mateen to walk a kilometer (1000m) in his rectangular backyard, he must walk the length 25 times or walk its perimeter 10 times. What is the area of Mateen's backyard in square meters?
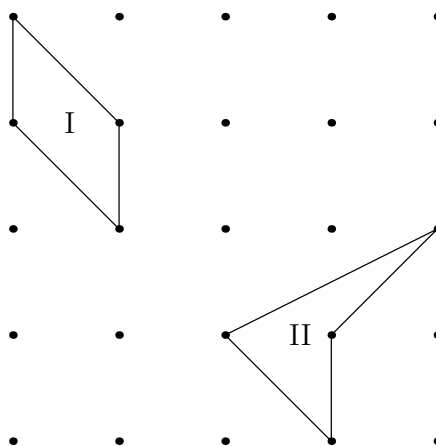
A) 40   **B)** 200   **C)** 400   **D)** 500   **E)** 1000

Q17. The operation $\otimes$ is defined for all nonzero numbers by $a \otimes b = \dfrac{a^2}{b}$. Determine $[(1 \otimes 2) \otimes 3] - [1 \otimes (2 \otimes 3)]$.

A) $-\dfrac{2}{3}$ **B)** $-\dfrac{1}{4}$ **C)** 0   **D)** $\dfrac{1}{4}$ **E)** $\dfrac{2}{3}$

Q18. Consider these two geoboard quadrilaterals. Which of the following statements is true?
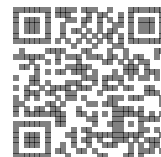
A) The area of quadrilateral I is more than the area of quadrilateral II.

B) The area of quadrilateral I is less than the area of quadrilateral II.

C) The quadrilaterals have the same area and the same perimeter.

D) The quadrilaterals have the same area, but the perimeter of I is more than the perimeter of II.

E) The quadrilaterals have the same area, but the perimeter of I is less than the perimeter of II.

Q19. Three circular arcs of radius 5 units bound the region shown. Arcs AB and AD are quarter-circles, and arc BCD is a semicircle. What is the area, in square units, of the region?
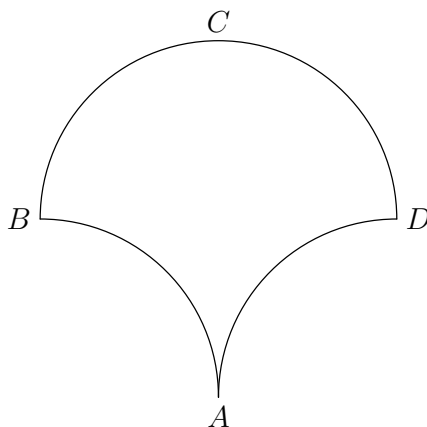
A) 25   **B)** $10 + 5\pi$ **C)** 50   **D)** $50 + 5\pi$ **E)** 25π

Q20. You have nine coins: a collection of pennies, nickels, dimes, and quarters having a total value of \$1.02, with at least one coin of each type. How many dimes must you have?

A) 1   **B)** 2   **C)** 3   **D)** 4   **E)** 5

Q21. Keiko tosses one penny and Ephraim tosses two pennies. The probability that Ephraim gets the same number of heads that Keiko gets is

A) $\dfrac{1}{4}$ **B)** $\dfrac{3}{8}$ **C)** $\dfrac{1}{2}$ **D)** $\dfrac{2}{3}$ **E)** $\dfrac{3}{4}$

Q22. A cube has edge length 2. Suppose that we glue a cube of edge length 1 on top of the big cube so that one of its faces rests entirely on the top face of the larger cube. The percent increase in the surface area (sides, top, and bottom) from the original cube to the new solid formed is closest to
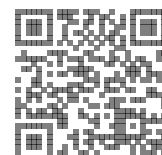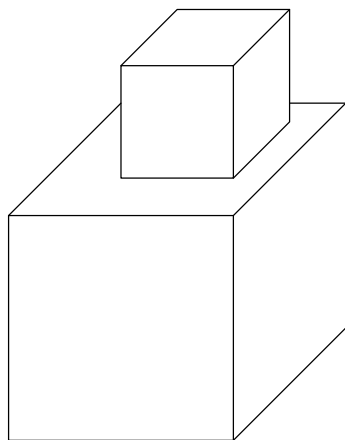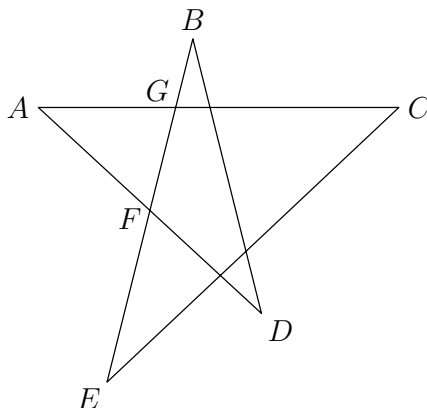
A) 10   B) 15   C) 17   D) 21   E) 25

Q23. There is a list of seven numbers. The average of the first four numbers is 5, and the average of the last four numbers is 8. If the average of all seven numbers is $6\frac{4}{7}$, then the number common to both sets of four numbers is
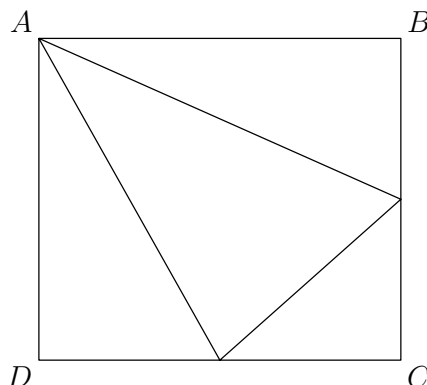
A) $5\frac{3}{7}$ B) 6   C) $6\frac{4}{7}$ D) 7   E) $7\frac{3}{7}$

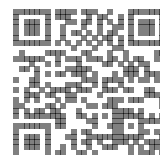**Q24**. If $\angle A = 20°$ and $\angle AFG = \angle AGF$, then $\angle B + \angle D =$

A) 48°   B) 60°   C) 72°   D) 80°   E) 90°

Q25. The area of rectangle $ABCD$ is 72 units squared. If point A and the midpoints of $\overline{BC}$ and $\overline{CD}$ are joined to form a triangle, the area of that triangle is
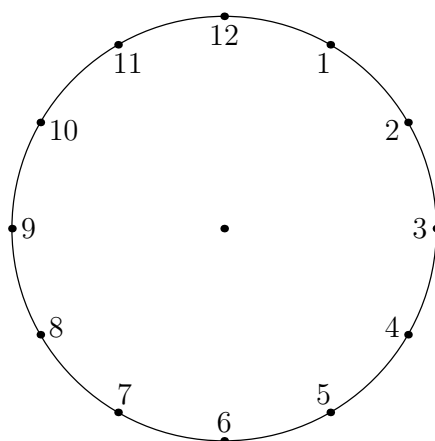
A) 21   B) 27   C) 30   D) 36   E) 40

Q1. $(6?3) + 4 - (2 - 1) = 5$. To make this statement true, the question mark between the 6 and the 3 should be replaced by

  A) $\div$ **B)** $\times$ **C)** $+$ **D)** $-$ **E)** None of these

Q2. What is the degree measure of the smaller angle formed by the hands of a clock at 10 o'clock?
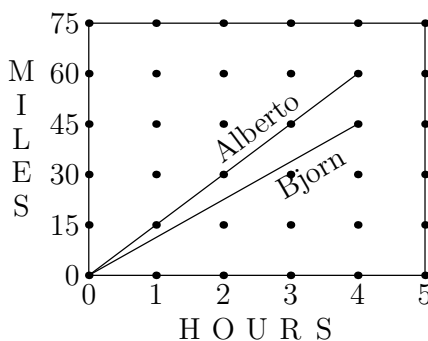

  A) 30   **B)** 45   **C)** 60   **D)** 75   **E)** 90

Q3. Which triplet of numbers has a sum NOT equal to 1?

  A) $(1/2, 1/3, 1/6)$ **B)** $(2, -2, 1)$ **C)** $(0.1, 0.3, 0.6)$

  D) $(1.1, -2.1, 1.0)$ **E)** $(-3/2, -5/2, 5)$

Q4. The diagram shows the miles traveled by bikers Alberto and Bjorn. After four hours, about how many more miles has Alberto biked than Bjorn?

 **A)** 15   **B)** 20   **C)** 25   **D)** 30   **E)** 35

Q5. A rectangular garden 60 feet long and 20 feet wide is enclosed by a fence. To make the garden larger, while using the same fence, its shape is changed to a square. By how many square feet does this enlarge the garden?

  A) 100   **B)** 200   **C)** 300   **D)** 400   **E)** 500

Q6. Bo, Coe, Flo, Jo, and Moe have different amounts of money. Neither Jo nor Bo has as much money as Flo. Both Bo and Coe have more than Moe. Jo has more than Moe, but less than Bo. Who has the least amount of money?

  A) Bo   **B)** Coe   **C)** Flo   **D)** Jo   **E)** Moe

Q7. The third exit on a highway is located at milepost 40 and the tenth exit is at milepost 160. There is a service center on the highway located three-fourths of the way from the third exit to the tenth exit. At what milepost would you expect to find this service center?
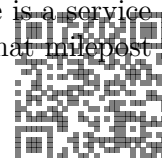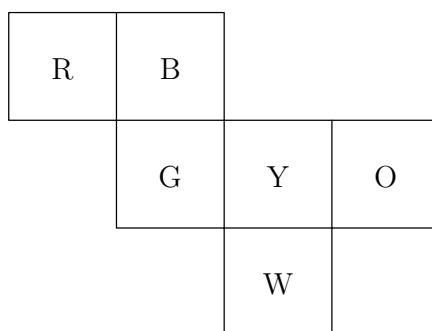
A) 90   **B)** 100   **C)** 110   **D)** 120   **E)** 130

Q8. Six squares are colored, front and back, (R = red, B = blue, O = orange, Y = yellow, G = green, and W = white). They are hinged together as shown, then folded to form a cube. The face opposite the white face is
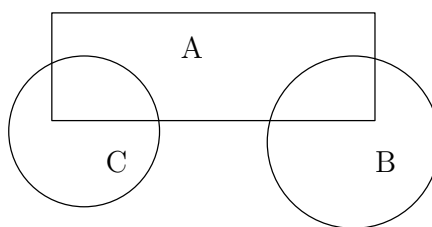

A) B   **B)** G   **C)** O   **D)** R   **E)** Y

Q9. Three flower beds overlap as shown. Bed A has 500 plants, bed B has 450 plants, and bed C has 350 plants. Beds A and B share 50 plants, while beds A and C share 100. The total number of plants is


A) 850   **B)** 1000   **C)** 1150   **D)** 1300   **E)** 1450

Q10. A complete cycle of a traffic light takes 60 seconds. During each cycle the light is green for 25 seconds, yellow for 5 seconds, and red for 30 seconds. At a randomly chosen time, what is the probability that the light will NOT be green?

A) $\dfrac{1}{4}$ **B)** $\dfrac{1}{3}$ **C)** $\dfrac{5}{12}$ **D)** $\dfrac{1}{2}$ **E)** $\dfrac{7}{12}$

Q11. Each of the five numbers 1, 4, 7, 10, and 13 is placed in one of the five squares so that the sum of the three numbers in the horizontal row equals the sum of the three numbers in the vertical column. The largest possible value for the horizontal or vertical sum is
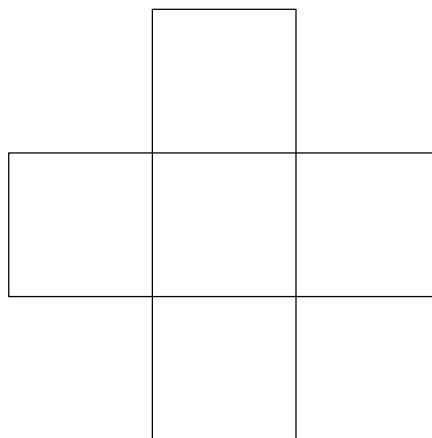
A) 20   **B)** 21   **C)** 22   **D)** 24   **E)** 30

Q12. The ratio of the number of games won to the number of games lost (no ties) by the Middle School Middies is 11/4. To the nearest whole percent, what percent of its games did the team lose?
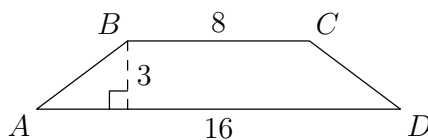
A) 24%   **B)** 27%   **C)** 36%   **D)** 45%   **E)** 73%

Q13. The average age of the 40 members of a computer science camp is 17 years. There are 20 girls, 15 boys, and 5 adults. If the average age of the girls is 15 and the average age of the boys is 16, what is the average age of the adults?

    A) 26   **B)** 27   **C)** 28   **D)** 29   **E)** 30

Q14. In trapezoid $ABCD$, the sides AB and CD are equal. The perimeter of $ABCD$ is

    A) 27   **B)** 30   **C)** 32   **D)** 34   **E)** 48

Q15. Bicycle license plates in Flatville each contain three letters. The first is chosen from the set C,H,L,P,R, the second from A,I,O, and the third from D,M,N,T. When Flatville needed more license plates, they added two new letters. The new letters may both be added to one set or one letter may be added to one set and one to another set. What is the largest possible number of ADDITIONAL license plates that can be made by adding two letters?

    A) 24   **B)** 30   **C)** 36   **D)** 40   **E)** 60

Q16. Tori's mathematics test had 75 problems: 10 arithmetic, 30 algebra, and 35 geometry problems. Although she answered 70% of the arithmetic, 40% of the algebra, and 60% of the geometry problems correctly, she did not pass the test because she got less than 60% of the problems right. How many more problems would she have needed to answer correctly to earn a 60% passing grade?

    A) 1   **B)** 5   **C)** 7   **D)** 9   **E)** 11

Q17. At Central Middle School the 108 students who take the AMC 8 meet in the evening to talk about problems and eat an average of two cookies apiece. Walter and Gretel are baking Bonnie's Best Bar Cookies this year. Their recipe, which makes a pan of 15 cookies, lists this items: $1\frac{1}{2}$ cups of flour, 2 eggs, 3 tablespoons butter, $\frac{3}{4}$ cups sugar, and 1 package of chocolate drops. They will make only full recipes, not partial recipes. Walter can buy eggs by the half-dozen. How many half-dozens should he buy to make enough cookies? (Some eggs and some cookies may be left over.)

    A) 1   **B)** 2   **C)** 5   **D)** 7   **E)** 15

Q18. At Central Middle School the 108 students who take the AMC8 meet in the evening to talk about problems and eat an average of two cookies apiece. Walter and Gretel are baking Bonnie's Best Bar Cookies this year. Their recipe, which makes a pan of 15 cookies, lists this items: $1\frac{1}{2}$ cups flour, 2 eggs, 3 tablespoons butter, $\frac{3}{4}$ cups sugar, and 1 package of chocolate drops. They will make only full recipes, not partial recipes. They learn that a big concert is scheduled for the same night and attendance will be down 25%. How many recipes of cookies should they make for their smaller party?

    A) 6   **B)** 8   **C)** 9   **D)** 10   **E)** 11

Q19. At Central Middle School the 108 students who take the AMC10 meet in the evening to talk about food and eat an average of two cookies apiece. Hansel and Gretel are baking Bonnie's Best Bar Cookies this year. Their recipe, which makes a pan of 15 cookies, lists this items: $1\frac{1}{2}$ cups flour, 2 eggs, 3 tablespoons butter, $\frac{3}{4}$ cups sugar, and 1 package of chocolate drops. They will not make full recipes, not partial recipes. Hansel and Gretel must make enough pans of cookies to supply 216 cookies. There are 8 tablespoons in a stick of butter. How many sticks of butter will be needed? (Some butter may be left over, of course.)

A) 5   **B)** 6   **C)** 7   **D)** 8   **E)** 9

Q20. Figure 1 is called a "stack map". The numbers tell how many cubes are stacked in each position. Fig. 2 shows these cubes, and Fig. 3 shows the view of the stacked cubes as seen from the front. Which of the following is the front view for the stack map in Fig. 4?
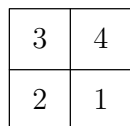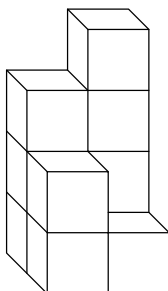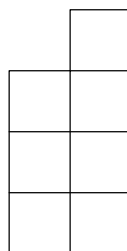
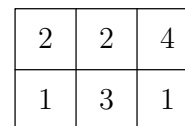

Figure 1   Figure 2   Figure 3   Figure 4
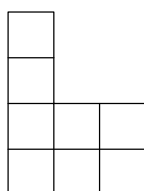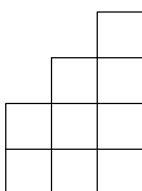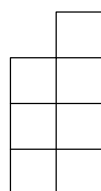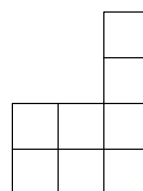
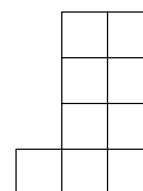(A)   (B)   (C)   (D)   (E)
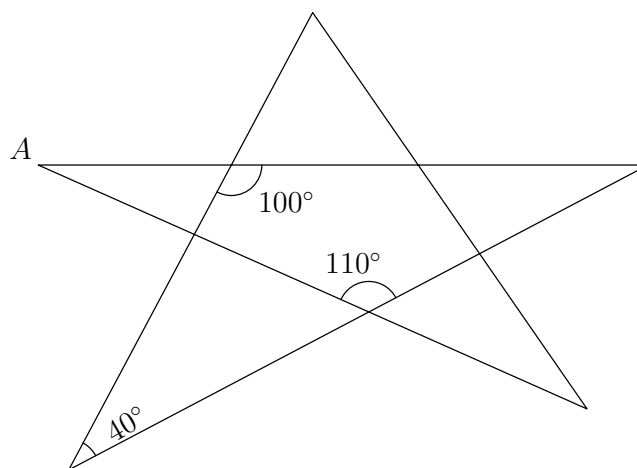
Q21. The degree measure of angle A is

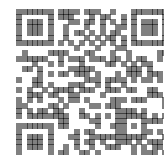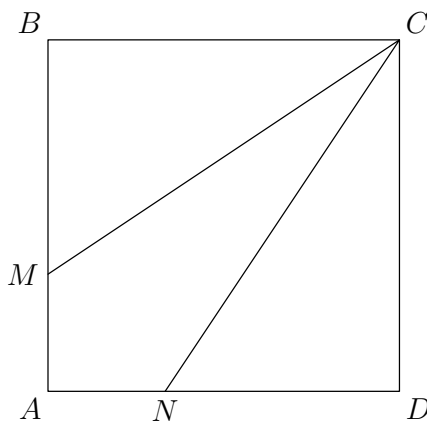**A)** 20   **B)** 30   **C)** 35   **D)** 40   **E)** 45

Q22. In a far-off land three fish can be traded for two loaves of bread and a loaf of bread can be traded for four bags of rice. How many bags of rice is one fish worth?

A) $\dfrac{3}{8}$ **B)** $\dfrac{1}{2}$ **C)** $\dfrac{3}{4}$ **D)** $2\dfrac{2}{3}$ **E)** $3\dfrac{1}{3}$

Q23. Square $ABCD$ has sides of length 3. Segments CM and CN divide the square's area into three equal parts. How long is segment CM?
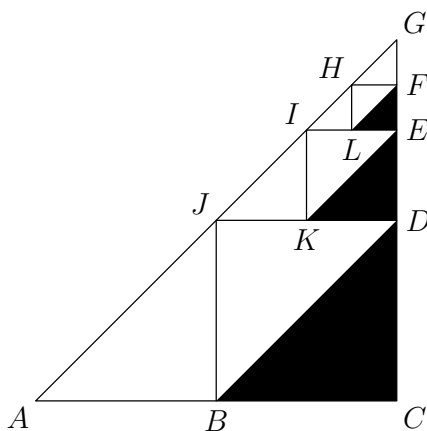
A) $\sqrt{10}$　　　　**B)** $\sqrt{12}$　　　　**C)** $\sqrt{13}$　　　　**D)** $\sqrt{14}$　　　　**E)** $\sqrt{15}$
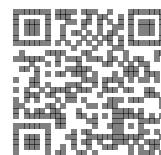
Q24. When 1999^{2000} is divided by 5, the remainder is

A) 4　　　　**B)** 3　　　　**C)** 2　　　　**D)** 1　　　　**E)** 0

Q25. Points B, D, and J are midpoints of the sides of right triangle ACG. Points K, E, I are midpoints of the sides of triangle JDG, etc. If the dividing and shading process is done 100 times (the first three are shown) and $AC = CG = 6$, then the total area of the shaded triangles is nearest

A) 6　　　　**B)** 7　　　　**C)** 8　　　　**D)** 9　　　　**E)** 10

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