# Edexcel (U.K.) Pre 2017

# Questions By Topic

## S1 Chap05 Probability


Compiled By: Dr Yu

Editors: Betül, Signal, Vivian


www.CasperYC.club

Last updated: February 7, 2026




DrYuFromShanghai@QQ.com

Leave blank

**7.** In a school there are 148 students in Years 12 and 13 studying Science, Humanities or Arts subjects. Of these students, 89 wear glasses and the others do not. There are 30 Science students of whom 18 wear glasses. The corresponding figures for the Humanities students are 68 and 44 respectively.

A student is chosen at random.

Find the probability that this student

(a) is studying Arts subjects,

**(4)**

(b) does not wear glasses, given that the student is studying Arts subjects.

**(2)**

Amongst the Science students, 80% are right-handed. Corresponding percentages for Humanities and Arts students are 75% and 70% respectively.

A student is again chosen at random.

(c) Find the probability that this student is right-handed.

**(3)**

(d) Given that this student is right-handed, find the probability that the student is studying Science subjects.

**(3)**

Leave blank

**6.** A group of 100 people produced the following information relating to three attributes. The attributes were wearing glasses, being left handed and having dark hair.
Glasses were worn by 36 people, 28 were left handed and 36 had dark hair. There were 17 who wore glasses and were left handed, 19 who wore glasses and had dark hair and 15 who were left handed and had dark hair. Only 10 people wore glasses, were left handed and had dark hair.

(a) Represent these data on a Venn diagram.

**(6)**

A person was selected at random from this group.

Find the probability that this person

(b) wore glasses but was not left handed and did not have dark hair,

**(1)**

(c) did not wear glasses, was not left handed and did not have dark hair,

**(1)**

(d) had only two of the attributes,

**(2)**

(e) wore glasses given that they were left handed and had dark hair.

**(3)**

**2.** In a factory, machines $A$, $B$ and $C$ are all producing metal rods of the same length. Machine $A$ produces 35% of the rods, machine $B$ produces 25% and the rest are produced by machine $C$. Of their production of rods, machines $A$, $B$ and $C$ produce 3%, 6% and 5% defective rods respectively.

(a) Draw a tree diagram to represent this information.

**(3)**

(b) Find the probability that a randomly selected rod is

(i) produced by machine $A$ and is defective,

(ii) is defective.

**(5)**

(c) Given that a randomly selected rod is defective, find the probability that it was produced by machine $C$.

**(3)**

Leave blank

**4.** A survey of the reading habits of some students revealed that, on a regular basis, 25% read quality newspapers, 45% read tabloid newspapers and 40% do not read newspapers at all.

(a) Find the proportion of students who read both quality and tabloid newspapers.

**(3)**

(b) In the space on page 13 draw a Venn diagram to represent this information.

**(3)**

A student is selected at random. Given that this student reads newspapers on a regular basis,

(c) find the probability that this student only reads quality newspapers.

**(3)**

Leave blank

**5.** The following shows the results of a wine tasting survey of 100 people.

96 like wine $A$,
93 like wine $B$,
96 like wine $C$,
92 like $A$ and $B$,
91 like $B$ and $C$,
93 like $A$ and $C$,
90 like all three wines.

(a) Draw a Venn Diagram to represent these data.

**(6)**

Find the probability that a randomly selected person from the survey likes

(b) none of the three wines,

**(1)**

(c) wine $A$ but not wine $B$,

**(2)**

(d) any wine in the survey except wine $C$,

**(2)**

(e) exactly two of the three kinds of wine.

**(2)**

Given that a person from the survey likes wine $A$,

(f) find the probability that the person likes wine $C$.

**(3)**

Leave blank

**7.** Tetrahedral dice have four faces. Two fair tetrahedral dice, one red and one blue, have faces numbered 0, 1, 2, and 3 respectively. The dice are rolled and the numbers face down on the two dice are recorded. The random variable $R$ is the score on the red die and the random variable $B$ is the score on the blue die.

(a) Find P($R$=3 and $B$=0).

**(2)**

The random variable $T$ is $R$ multiplied by $B$.

(b) Complete the diagram below to represent the sample space that shows all the possible values of $T$.

| | | | | |
|---|---|---|---|---|
| **3** | | | | |
| **2** | | 2 | | |
| **1** | 0 | | | |
| **0** | | | | |
| $B$ \ $R$ | **0** | **1** | **2** | **3** |

**Sample space diagram of *T***

**(3)**

(c) The table below represents the probability distribution of the random variable $T$.

| $t$ | 0 | 1 | 2 | 3 | 4 | 6 | 9 |
|---|---|---|---|---|---|---|---|
| P($T$=$t$) | $a$ | $b$ | 1/8 | 1/8 | $c$ | 1/8 | $d$ |

Find the values of $a$, $b$, $c$ and $d$.

**(3)**

Find the values of

(d) E($T$),

**(2)**

(e) Var($T$).

**(4)**

Leave blank

**1.** A disease is known to be present in 2% of a population. A test is developed to help determine whether or not someone has the disease.

Given that a person has the disease, the test is positive with probability 0.95

Given that a person does not have the disease, the test is positive with probability 0.03

(a) Draw a tree diagram to represent this information.

**(3)**

A person is selected at random from the population and tested for this disease.

(b) Find the probability that the test is positive.

**(3)**

A doctor randomly selects a person from the population and tests him for the disease. Given that the test is positive,

(c) find the probability that he does not have the disease.

**(2)**

(d) Comment on the usefulness of this test.

**(1)**

Leave blank

**2.** A group of office workers were questioned for a health magazine and $\frac{2}{5}$ were found to take regular exercise. When questioned about their eating habits $\frac{2}{3}$ said they always eat breakfast and, of those who always eat breakfast $\frac{9}{25}$ also took regular exercise.

Find the probability that a randomly selected member of the group

(a) always eats breakfast and takes regular exercise,

**(2)**

(b) does not always eat breakfast and does not take regular exercise.

**(4)**

(c) Determine, giving your reason, whether or not always eating breakfast and taking regular exercise are statistically independent.

**(2)**

Leave blank

**2.** On a randomly chosen day the probability that Bill travels to school by car, by bicycle or on foot is $\frac{1}{2}$, $\frac{1}{6}$ and $\frac{1}{3}$ respectively. The probability of being late when using these methods of travel is $\frac{1}{5}$, $\frac{2}{5}$ and $\frac{1}{10}$ respectively.

(a) Draw a tree diagram to represent this information.

**(3)**

(b) Find the probability that on a randomly chosen day

(i) Bill travels by foot and is late,

(ii) Bill is not late.

**(4)**

(c) Given that Bill is late, find the probability that he did not travel on foot.

**(4)**

Leave blank

**7.** (a) Given that $P(A) = a$ and $P(B) = b$ express $P(A \cup B)$ in terms of $a$ and $b$ when

(i) $A$ and $B$ are mutually exclusive,
(ii) $A$ and $B$ are independent.

**(2)**

Two events $R$ and $Q$ are such that

$P(R \cap Q') = 0.15$, $P(Q) = 0.35$ and $P(R|Q) = 0.1$

Find the value of

(b) $P(R \cup Q)$,

**(1)**

(c) $P(R \cap Q)$,

**(2)**

(d) $P(R)$.

**(2)**

Leave blank

**1.** A jar contains 2 red, 1 blue and 1 green bead. Two beads are drawn at random from the jar without replacement.

(a) In the space below, draw a tree diagram to illustrate all the possible outcomes and associated probabilities. State your probabilities clearly.

**(3)**

(b) Find the probability that a blue bead and a green bead are drawn from the jar.

**(2)**

Leave blank

**4.** There are 180 students at a college following a general course in computing. Students on this course can choose to take up to three extra options.

112 take systems support,
70 take developing software,
81 take networking,
35 take developing software and systems support,
28 take networking and developing software,
40 take systems support and networking,
4 take all three extra options.

(a) In the space below, draw a Venn diagram to represent this information.
**(5)**

A student from the course is chosen at random.

Find the probability that this student takes

(b) none of the three extra options,
**(1)**

(c) networking only.
**(1)**

Students who want to become technicians take systems support and networking. Given that a randomly chosen student wants to become a technician,

(d) find the probability that this student takes all three extra options.
**(2)**

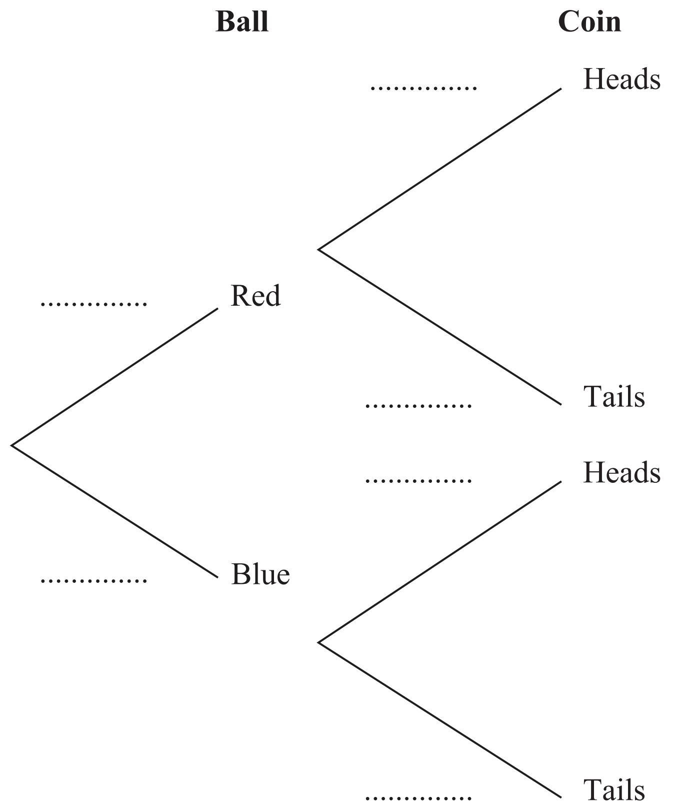
Leave blank

**2.** An experiment consists of selecting a ball from a bag and spinning a coin. The bag contains 5 red balls and 7 blue balls. A ball is selected at random from the bag, its colour is noted and then the ball is returned to the bag.

When a red ball is selected, a biased coin with probability $\frac{2}{3}$ of landing heads is spun.

When a blue ball is selected a fair coin is spun.

(a) Complete the tree diagram below to show the possible outcomes and associated probabilities.




**(2)**

Shivani selects a ball and spins the appropriate coin.

(b) Find the probability that she obtains a head.

**(2)**

Given that Tom selected a ball at random and obtained a head when he spun the appropriate coin,

(c) find the probability that Tom selected a red ball.

**(3)**

Shivani and Tom each repeat this experiment.

(d) Find the probability that the colour of the ball Shivani selects is the same as the colour of the ball Tom selects.

**(3)**

Leave blank

**4.** The Venn diagram in Figure 1 shows the number of students in a class who read any of 3 popular magazines $A$, $B$ and $C$.

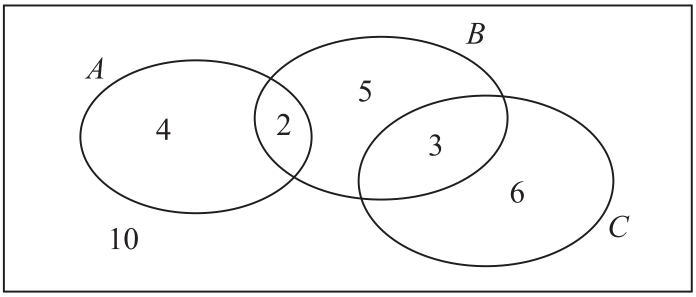



**Figure 1**

One of these students is selected at random.

(a) Show that the probability that the student reads more than one magazine is $\frac{1}{6}$.
**(2)**

(b) Find the probability that the student reads $A$ or $B$ (or both).
**(2)**

(c) Write down the probability that the student reads both $A$ and $C$.
**(1)**

Given that the student reads at least one of the magazines,

(d) find the probability that the student reads $C$.
**(2)**

(e) Determine whether or not reading magazine $B$ and reading magazine $C$ are statistically independent.
**(3)**

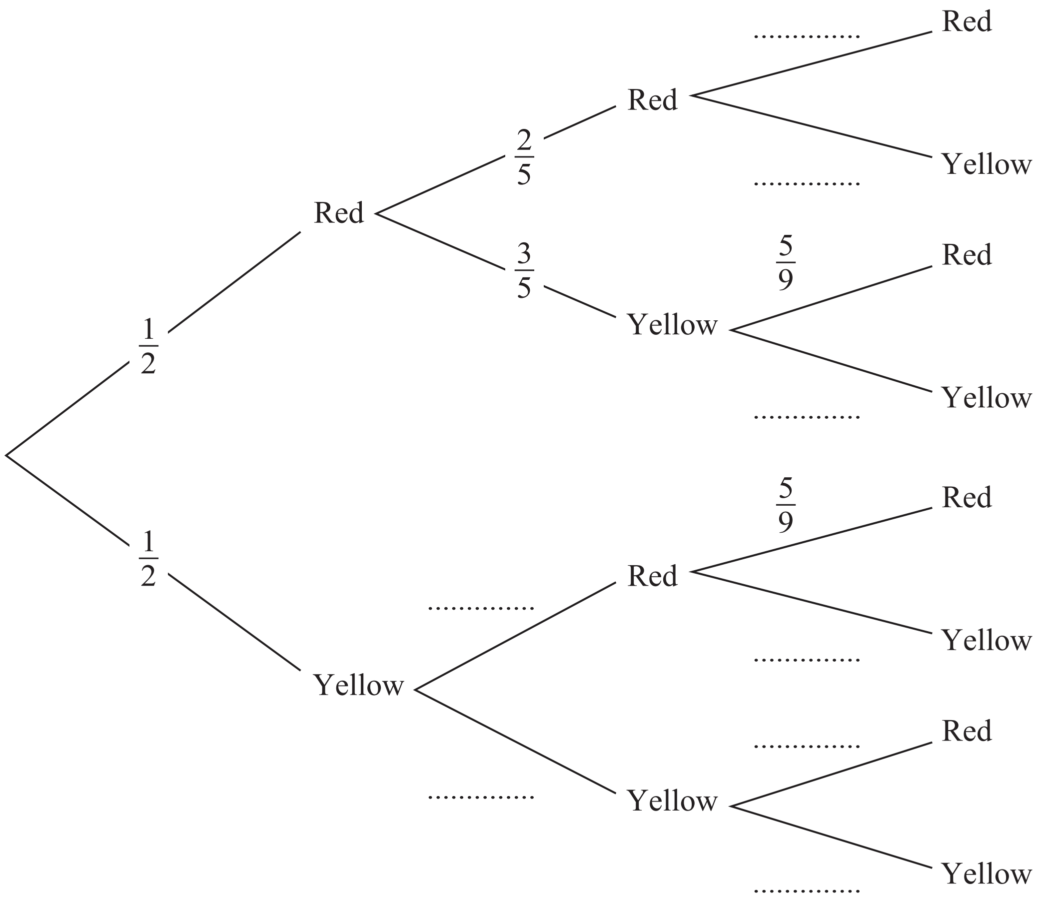
Leave blank

**7.** The bag $P$ contains 6 balls of which 3 are red and 3 are yellow.
The bag $Q$ contains 7 balls of which 4 are red and 3 are yellow.
A ball is drawn at random from bag $P$ and placed in bag $Q$. A second ball is drawn at random from bag $P$ and placed in bag $Q$.
A third ball is then drawn at random from the 9 balls in bag $Q$.

The event $A$ occurs when the 2 balls drawn from bag $P$ are of the same colour.
The event $B$ occurs when the ball drawn from bag $Q$ is red.

(a) Complete the tree diagram shown below.

**(4)**




(b) Find P($A$)

**(3)**

(c) Show that $P(B) = \frac{5}{9}$

**(3)**

(d) Show that $P(A \cap B) = \frac{2}{9}$

**(2)**

(e) Hence find $P(A \cup B)$

**(2)**

(f) Given that all three balls drawn are the same colour, find the probability that they are all red.

**(3)**

Leave blank

**6.** Jake and Kamil are sometimes late for school.
The events $J$ and $K$ are defined as follows

$J$ = the event that Jake is late for school
$K$ = the event that Kamil is late for school

$P(J) = 0.25$, $P(J \cap K) = 0.15$ and $P(J' \cap K') = 0.7$

On a randomly selected day, find the probability that

(a) at least one of Jake or Kamil are late for school,
**(1)**

(b) Kamil is late for school.
**(2)**

Given that Jake is late for school,

(c) find the probability that Kamil is late.
**(3)**

The teacher suspects that Jake being late for school and Kamil being late for school are linked in some way.

(d) Determine whether or not $J$ and $K$ are statistically independent.
**(2)**

(e) Comment on the teacher's suspicion in the light of your calculation in (d).
**(1)**

Leave blank

**8.** A spinner is designed so that the score $S$ is given by the following probability distribution.

| $s$ | 0 | 1 | 2 | 4 | 5 |
|---|---|---|---|---|---|
| $P(S = s)$ | $p$ | 0.25 | 0.25 | 0.20 | 0.20 |

(a) Find the value of $p$.
**(2)**

(b) Find $E(S)$.
**(2)**

(c) Show that $E(S^2) = 9.45$
**(2)**

(d) Find $Var(S)$.
**(2)**

Tom and Jess play a game with this spinner. The spinner is spun repeatedly and $S$ counters are awarded on the outcome of each spin. If $S$ is even then Tom receives the counters and if $S$ is odd then Jess receives them. The first player to collect 10 or more counters is the winner.

(e) Find the probability that Jess wins after 2 spins.
**(2)**

(f) Find the probability that Tom wins after exactly 3 spins.
**(4)**

(g) Find the probability that Jess wins after exactly 3 spins.
**(3)**

Leave blank

**2.** (a) State in words the relationship between two events $R$ and $S$ when $P(R \cap S) = 0$ **(1)**

The events $A$ and $B$ are independent with $P(A) = \frac{1}{4}$ and $P(A \cup B) = \frac{2}{3}$

Find

(b) $P(B)$ **(4)**

(c) $P(A' \cap B)$ **(2)**

(d) $P(B' | A)$ **(2)**

Leave blank

**6.** The following shows the results of a survey on the types of exercise taken by a group of 100 people.

65 run
48 swim
60 cycle
40 run and swim
30 swim and cycle
35 run and cycle
25 do all three

(a) Draw a Venn Diagram to represent these data.
**(4)**

Find the probability that a randomly selected person from the survey

(b) takes none of these types of exercise,
**(2)**

(c) swims but does not run,
**(2)**

(d) takes at least two of these types of exercise.
**(2)**

Jason is one of the above group.
Given that Jason runs,

(e) find the probability that he swims but does not cycle.
**(3)**

Leave blank

**4.**

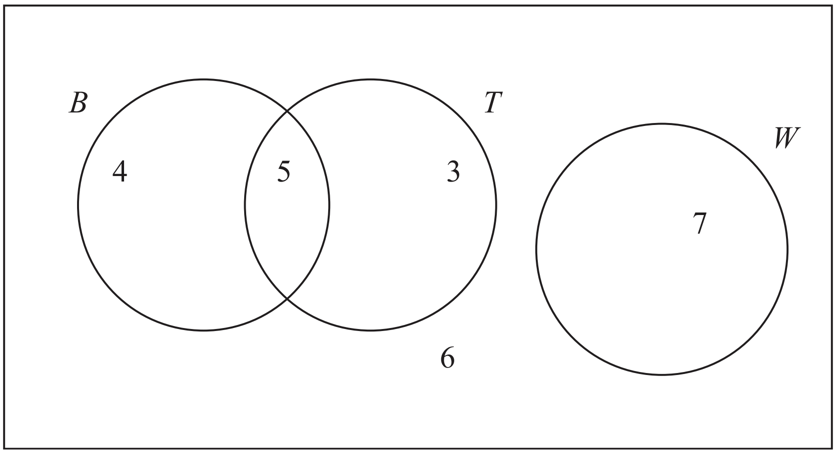



**Figure 1**

Figure 1 shows how 25 people travelled to work.

Their travel to work is represented by the events

$B$ bicycle

$T$ train

$W$ walk

(a) Write down 2 of these events that are mutually exclusive. Give a reason for your answer. **(2)**

(b) Determine whether or not $B$ and $T$ are independent events. **(3)**

One person is chosen at random.

Find the probability that this person

(c) walks to work, **(1)**

(d) travels to work by bicycle and train. **(1)**

(e) Given that this person travels to work by bicycle, find the probability that they will also take the train. **(2)**

Leave blank

**7.** A manufacturer carried out a survey of the defects in their soft toys. It is found that the probability of a toy having poor stitching is 0.03 and that a toy with poor stitching has a probability of 0.7 of splitting open. A toy without poor stitching has a probability of 0.02 of splitting open.

(a) Draw a tree diagram to represent this information.

**(3)**

(b) Find the probability that a randomly chosen soft toy has exactly one of the two defects, poor stitching or splitting open.

**(3)**

The manufacturer also finds that soft toys can become faded with probability 0.05 and that this defect is independent of poor stitching or splitting open. A soft toy is chosen at random.

(c) Find the probability that the soft toy has none of these 3 defects.

**(2)**

(d) Find the probability that the soft toy has exactly one of these 3 defects.

**(4)**

Leave blank

**7.** Given that

$$P(A) = 0.35\ ,\quad P(B) = 0.45\quad \text{and}\quad P(A \cap B) = 0.13$$

find

(a) $P(A \cup B)$

**(2)**

(b) $P(A' \mid B')$

**(2)**

The event $C$ has $P(C) = 0.20$

The events $A$ and $C$ are mutually exclusive and the events $B$ and $C$ are independent.

(c) Find $P(B \cap C)$

**(2)**

(d) Draw a Venn diagram to illustrate the events $A$, $B$ and $C$ and the probabilities for each region.

**(4)**

(e) Find $P\left([B \cup C]'\right)$

**(2)**

Leave blank

**3.** In a company the 200 employees are classified as full-time workers, part-time workers or contractors.
The table below shows the number of employees in each category and whether they walk to work or use some form of transport.

| | Walk | Transport |
|---|---|---|
| Full-time worker | 2 | 8 |
| Part-time worker | 35 | 75 |
| Contractor | 30 | 50 |

The events $F$, $H$ and $C$ are that an employee is a full-time worker, part-time worker or contractor respectively. Let $W$ be the event that an employee walks to work.

An employee is selected at random.

Find

(a) $\mathrm{P}(H)$ **(2)**

(b) $\mathrm{P}\left([F \cap W]'\right)$ **(2)**

(c) $\mathrm{P}(W \mid C)$ **(2)**

Let $B$ be the event that an employee uses the bus.
Given that 10% of full-time workers use the bus, 30% of part-time workers use the bus and 20% of contractors use the bus,

(d) draw a Venn diagram to represent the events $F$, $H$, $C$ and $B$, **(4)**

(e) find the probability that a randomly selected employee uses the bus to travel to work. **(2)**

Leave blank

**6.**

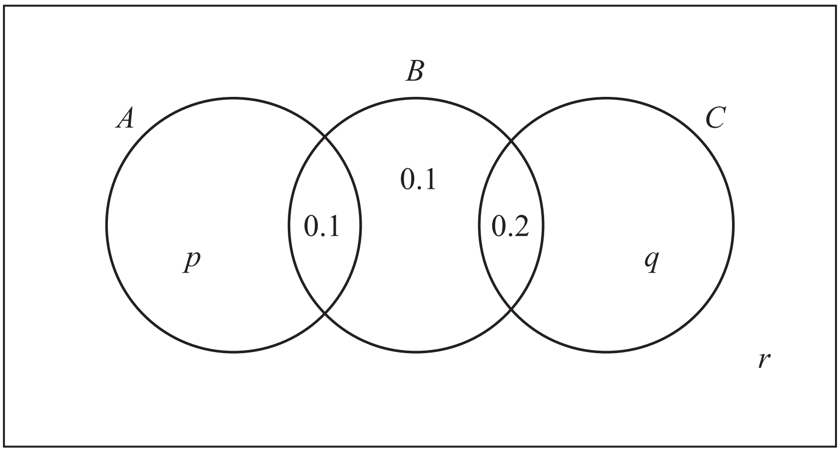



**Figure 1**

The Venn diagram in Figure 1 shows three events $A$, $B$ and $C$ and the probabilities associated with each region of $B$. The constants $p$, $q$ and $r$ each represent probabilities associated with the three separate regions outside $B$.

The events $A$ and $B$ are independent.

(a) Find the value of $p$.

**(3)**

Given that $\mathrm{P}(B|C) = \frac{5}{11}$

(b) find the value of $q$ and the value of $r$.

**(4)**

(c) Find $\mathrm{P}(A \cup C|B)$.

**(2)**