Solomon Practice Paper

Core Mathematics 2C

Time allowed: 90 **minutes**

Question	Points	Score
1	4	
2	5	
3	7	
4	8	
5	9	
6	9	
7	10	
8	10	
9	13	
Total:	75	

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Name:

Teacher:

How I can achieve better:

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Last updated: May 5, 2023

1. Find the coefficient of x^2 in the expansion of [4]

$$(1+x)(1-x)^6.$$

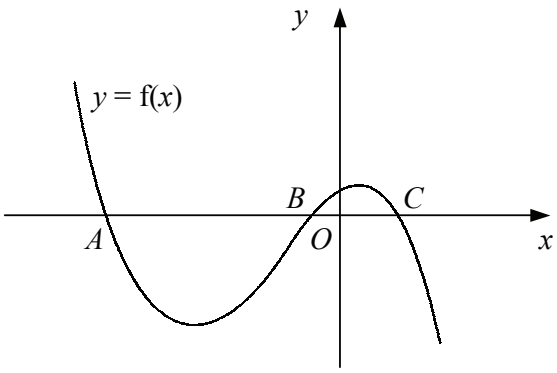
2. A geometric series has common ratio $\frac{1}{3}$.
   Given that the sum of the first four terms of the series is 200,

   (a) find the first term of the series, [3]

   (b) find the sum to infinity of the series. [2]

Total: 5

3. Figure shows the curve $y = \mathrm{f}(x)$ where $\mathrm{f}(x) = 4 + 5x + kx^2 - 2x^3$, and k is a constant.



The curve crosses the x-axis at the points A, B and C. Given that A has coordinates $(-4, 0)$,

(a) show that $k = -7$, [2]

(b) find the coordinates of B and C. [5]

Total: 7

4. (a) i. Sketch the curve $y = \sin(x - 30)^\circ$ for x in the interval $-180 \leq x \leq 180$. [4]

   ii. Write down the coordinates of the turning points of the curve in this interval.

   (b) Find all values of x in the interval $-180 \leq x \leq 180$ for which [4]

$$\sin(x - 30)^\circ = 0.35,$$

giving your answers to 1 decimal place.

Total: 8

5. (a) Evaluate $\log_3(27) - \log_8(4)$. [4]

   (b) Solve the equation $4^x - 3(2^{x+1}) = 0$. [5]

Total: 9

6.

$$\mathrm{f}(x) = 2 - x + 3x^{\frac{2}{3}}, \quad x > 0.$$

(a) Find $\mathrm{f}'(x)$ and $\mathrm{f}''(x)$. [3]

(b) Find the coordinates of the turning point of the curve $y = \mathrm{f}(x)$. [4]

(c) Determine whether the turning point is a maximum or minimum point. [2]

Total: 9

7. The points P, Q and R have coordinates $(-5, 2), (-3, 8)$ and $(9, 4)$ respectively.

   (a) Show that $\angle PQR = 90°$. [4]

   Given that P, Q and R all lie on circle C,

   (b) find the coordinates of the centre of C, [3]

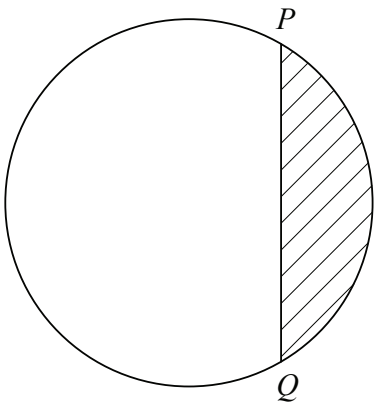
   (c) show that the equation of C can be written in the form [3]

$$x^2 + y^2 - 4x - 6y = k,$$

   where k is an integer to be found.

Total: 10

8. Figure shows a circle of radius 12 cm which passes through the points P and Q.



The chord PQ subtends an angle of 120° at the centre of the circle.

(a) Find the exact length of the major arc PQ. [2]

(b) Show that the perimeter of the shaded minor segment is given by $k(2\pi + 3\sqrt{3})$cm, where k is an integer to be found. [4]

(c) Find, to 1 decimal place, the area of the shaded minor segment as a percentage of the area of the circle. [4]

Total: 10

9. The finite region R is bounded by the curve $y = 1 + 3\sqrt{x}$, the x-axis and the lines $x = 2$ and $x = 8$.

   (a) Use the trapezium rule with three intervals of equal width to estimate to 3 significant figures the area of R. [6]

   (b) Use integration to find the exact area of R in the form $a + b\sqrt{2}$. [5]

   (c) Find the percentage error in the estimate made in part (a). [2]

Total: 13