Solomon Practice Paper

Core Mathematics 2D

Time allowed: 90 **minutes**

Question	Points	Score
1	4	
2	4	
3	6	
4	8	
5	8	
6	9	
7	9	
8	13	
9	14	
Total:	75	

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Name:

Teacher:

How I can achieve better:

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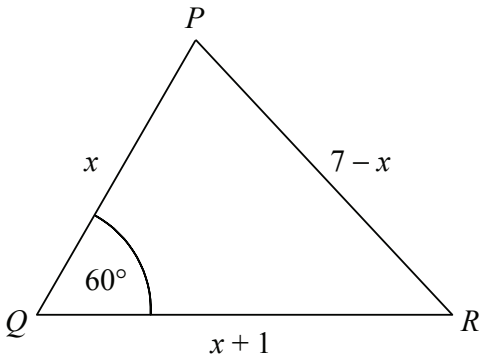
Last updated: May 5, 2023

1. Expand $(3-2x)^4$ in ascending powers of x and simplify each coefficient. [4]

2. Figure shows triangle PQR in which $PQ = x$, $PR = 7-x$, $QR = x+1$ and $PQR = 60°$. [4]



Using the cosine rule, find the value of x.

3. Find the coordinates of the stationary point of the curve with equation [6]

$$y = x + \frac{4}{x^2}.$$

4. Find all values of x in the interval $0° \leq x < 360°$ for which [8]

$$2\sin^2(x) - 2\cos(x) - \cos^2(x) = 1.$$

5. (a) Sketch the curve $y = 5^{x-1}$, showing the coordinates of any points of intersection with the coordinate axes. [2]

(b) Find, to 3 significant figures, the x-coordinates of the points where the curve $y = 5^{x-1}$ intersects [6]

i. the straight line $y = 10$,

ii. the curve $y = 2^x$.

Total: 8

6.

$$\mathrm{f}(x) = 2x^3 + 3x^2 - 6x + 1.$$

(a) Find the remainder when $\mathrm{f}(x)$ is divided by $(2x-1)$. [2]

(b) i. Find the remainder when $\mathrm{f}(x)$ is divided by $(x+2)$. [7]

ii. Hence, or otherwise, solve the equation $2x^3 + 3x^2 - 6x - 8 = 0$, giving your answers to 2 decimal places where appropriate.

Total: 9

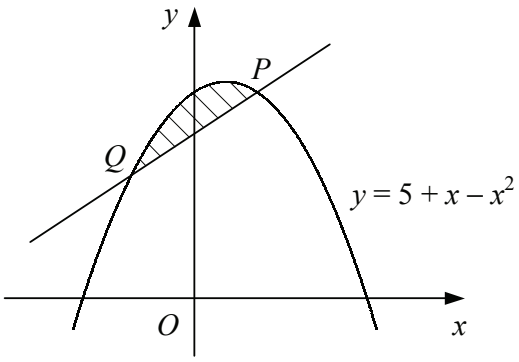
7. (a) Prove that the sum of the first n terms of a geometric series with first term a and common ratio r is given by [4]

$$\frac{a(1-r^n)}{1-r}.$$

(b) Evaluate $\sum_{r=1}^{12} 5 \times 2^r$. [5]

Total: 9

8. Figure shows the curve with equation $y = 5 + x - x^2$ and the normal to the curve at the point $P(1, 5)$.



(a) Find an equation for the normal to the curve at P in the form $y = mx + c$. [5]

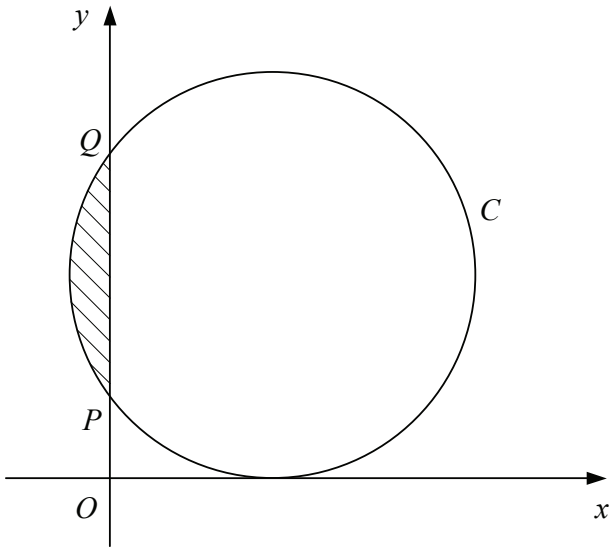
(b) Find the coordinates of the point Q, where the normal to the curve at P intersects the curve again. [2]

(c) Show that the area of the shaded region bounded by the curve and the straight line PQ is $\frac{4}{3}$. [6]

Total: 13

9. Figure shows the circle C with equation

$$x^2 + y^2 - 8x - 10y + 16 = 0.$$



(a) Find the coordinates of the centre and the radius of C. [3]

C crosses the y-axis at the points P and Q.

(b) Find the coordinates of P and Q. [3]

The chord PQ subtends an angle of θ at the centre of C.

(c) Using the cosine rule, show that $\cos(\theta) = \frac{7}{25}$. [4]

(d) Find the area of the shaded minor segment bounded by C and the chord PQ. [4]

Total: 14