Solomon Practice Paper

Pure Mathematics 1H

Time allowed: 90 **minutes**

Centre: www.CasperYC.club

Name:

Teacher:

Question	Points	Score
1	6	
2	6	
3	8	
4	9	
5	9	
6	10	
7	12	
8	15	
Total:	75	

How I can achieve better:

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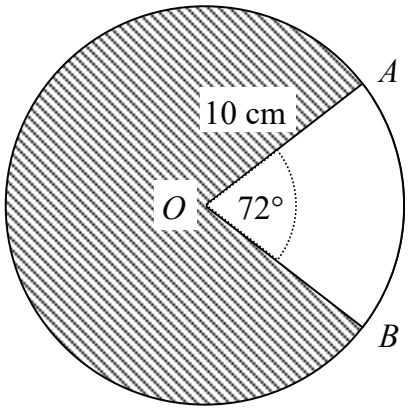
Last updated: May 5, 2023

1. Figure shows a circle, centre O, of radius 10 cm.



Points A and B are on the circumference of the circle and the acute angle AOB is 72°.

Giving your answers in terms of π, calculate

(a) the perimeter of the unshaded minor sector, [3]

(b) the area of the shaded major sector. [3]

Total: 6

2. Given that [6]

$$x(x^2 - A)\left(x - \frac{2}{x}\right) \equiv \left(x^2 + B\right)^2$$

Find the value of the constants A and B.

3. The line $x - 2y + 8 = 0$ crosses the x-axis at the point P and the y-axis at the point Q.

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

(b) State the coordinates of the midpoint of PQ. [1]

Given that P and Q are diagonally opposite corners of a square,

(c) find an equation of the line that passes through the other two corners of the square. [4]

Total: 8

4. (a) Solve the equation [3]

$$3x - \frac{2}{x} = 5.$$

(b) Hence find the values of θ in the interval $-180° \leq \theta \leq 180°$ for which [6]

$$3\tan(\theta) - \frac{2}{\tan(\theta)} = 5.$$

Give your answers correct to 1 decimal place.

Total: 9

5.

$$\mathrm{f}(x) \equiv 2x^2 + 4px + q.$$

Given that the curve $y = \mathrm{f}(x)$ does not intersect the x-axis,

(a) prove that $2p^2 - q < 0$. [3]

Given also that the curve $y = \mathrm{f}(x)$ passes through the point $(2, 18)$,

(b) find an expression for q in terms of p. [2]

(c) Using your answers to parts (a) and (b), find the set of possible values of p. [4]

Total: 9

6. The sum, S_n, of the first n terms of a sequence is given by $S_n = 5n^2 + 2n$.

(a) Evaluate S_3 and S_4. [3]

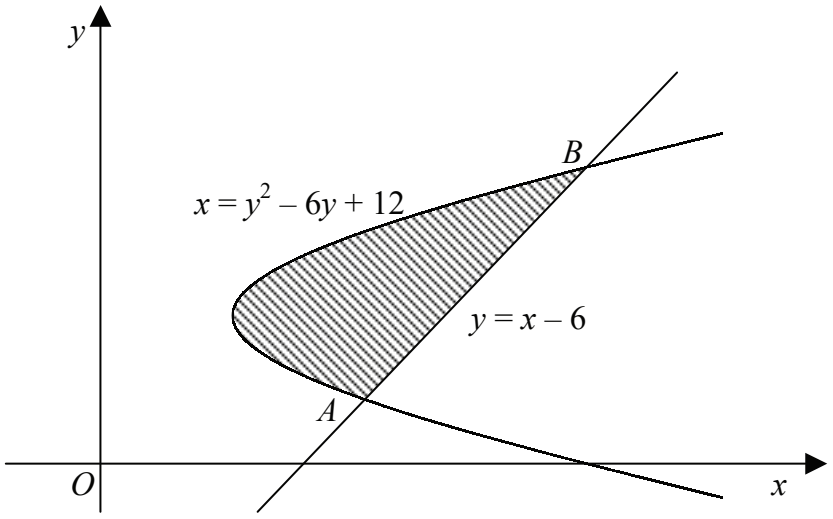
(b) Write down the value of the fourth term of the sequence. [1]

(c) Show that the sum of the first $(n-1)$ terms is given by $S_{n-1} = 5n^2 - 8n + 3$. [3]

(d) Hence, or otherwise find an expression for the nth term of the sequence in terms of n. [3]

Total: 10

7. Figure shows the curve $x = y^2 - 6y + 12$ and the line $y = x - 6$.



The line and the curve intersect at the points A and B.

(a) Find the coordinates of the points A and B. [7]

(b) Hence show that the area of the shaded region enclosed by the curve and the line is $\frac{125}{6}$. [5]

Total: 12

8.

$$\mathrm{f}(x) \equiv x^2 - 4\sqrt{x}, \quad x \geq 0.$$

(a) Solve the equation $\mathrm{f}(x) = 0$, giving your solutions to an appropriate degree of accuracy. [4]

The curve $y = \mathrm{f}(x)$ has a stationary point, P.

(b) Find $\mathrm{f}'(x)$ and determine the coordinates of the point P. [5]

(c) Find $\mathrm{f}''(x)$ and hence show that P is a minimum point of the curve. [3]

(d) Sketch the curve $y = \mathrm{f}(x)$, labelling P and the coordinates of any points where the curve crosses the coordinate axes. [3]

Total: 15