Solomon Practice Paper

Pure Mathematics 1A

Time allowed: 90 **minutes**

Centre: www.CasperYC.club

Name:

Teacher:

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

How I can achieve better:

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Last updated: May 5, 2023

1. Find the pairs of values (x, y) which satisfy the simultaneous equations: [6]

$$\begin{aligned} 2x - y &= 1 \\ 4x^2 + 4y + y^2 &= 9 \end{aligned}$$

2. (a) Prove that the quadratic equation [3]

$$x^2 + (m-1)x + m + 2 = 0$$

has real and distinct roots when

$$m^2 - 6m - 7 > 0.$$

(b) Hence, or otherwise, find the set of values of m for which [3]

$$x^2 + (m-1)x + m + 2 = 0$$

has real and distinct roots.

Total: 6

3. The first three terms of an arithmetic series are $(3p-5), (2p-2)$ and $(5p-1)$ respectively.

(a) Find the value of p. [3]

(b) Hence, find the sum of the first 10 terms of the series. [4]

Total: 7

4. (a) Show that the equation [2]

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

can be written as

$$2\cos^2(x) + \cos(x) - 1 = 0.$$

(b) Using your answer to part (a), find all the solutions of the equation [6]

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

in the interval $0 \leq x \leq 2\pi$, giving your answers in terms of π.

Total: 8

5.

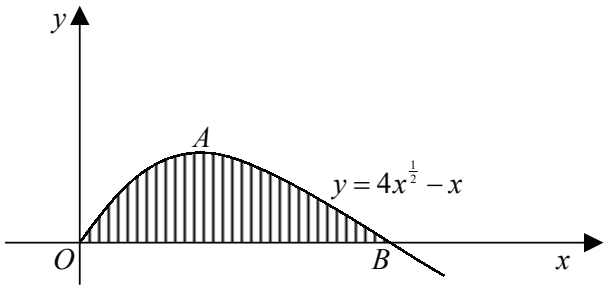
$$\mathrm{f}(x) \equiv x^3 - 5x^2 + 7x - 2.$$

(a) Show that $x = 2$ is a solution of the equation $\mathrm{f}(x) = 0$. [2]

(b) Find the other solutions of the equation $\mathrm{f}(x) = 0$, giving your answers correct to 2 decimal places. [7]

Total: 9

6. Figure shows part of the curve with equation $y = 4x^{\frac{1}{2}} - x$.



A is the maximum point of the curve and the curve crosses the x - axis at the point B.

(a) Find the coordinates of the point A. [5]

(b) Find the x - coordinate of the point B. [3]

(c) Show that the area of the shaded region enclosed by the curve and the x - axis is $\frac{128}{3}$. [5]

Total: 13

7. A and B are points with coordinates $(5, 2)$ and $(-1, 4)$ respectively.

(a) Find the equation of the line l which passes through the points A and B in the form $px + qy + r = 0$. [3]

(b) Find the coordinates of the midpoint of AB. [2]

(c) Hence, or otherwise, find the equation of the perpendicular bisector of AB. [3]

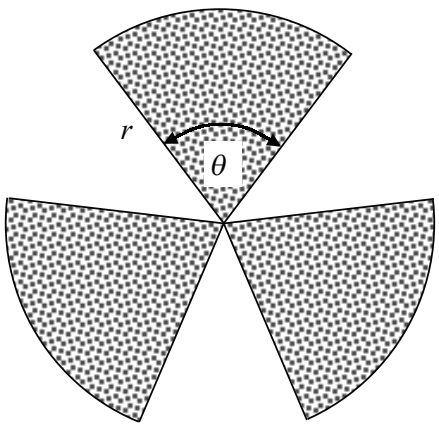
C is the point with coordinates $(3, 4)$.

Given that the points A, B and C lie on the circumference of a circle, centre D,

(d) find the coordinates of the point D. [5]

Total: 13

8. Figure shows the design for a hazard warning-symbol.



It consists of three identical sectors of a circle of radius r centimetres. The sectors are equally spaced and each subtends an angle θ radians at the centre.

Given that the area of the symbol is to be 48 cm^2,

(a) find an expression for θ in terms of r. [3]

(b) Hence, show that the perimeter of the shape, P cm, is given by [3]

$$P = 6r + \frac{96}{r}.$$

Given that r can vary,

(c) find the value of r for which P is a minimum and the corresponding value of P. [5]

(d) justify that your value of P is a minimum. [2]

Total: 13