Solomon Practice Paper

Pure Mathematics 1K

Time allowed: 90 **minutes**

Centre: www.CasperYC.club

Name:

Teacher:

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

How I can achieve better:

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1. (a) Express each of the following in the form 3^p, where p is a function of x: [3]

   i. 9^{2x-3}

   ii. 27^{x+2}

   (b) Hence, or otherwise, solve the equation [2]

$$9^{2x-3} = 27^{x+2}.$$

Total: 5

2. (a) Given that [3]

$$x^2 - 5x + 6 \equiv A(x + B)^2 + C,$$

   find the values of A, B and C.

   (b) Hence, or otherwise, write down the coordinates of the turning point of the curve with equation [2]

$$y = x^2 - 5x + 6.$$

Total: 5

3. The curve $y = 2\sin(3x + k)$, with x measured in degrees, passes through the point $(10, \sqrt{3})$.

   (a) Given that $0 < k < 90°$, show that $k = 30$. [3]

   (b) Solve the equation $y = \sqrt{2}$ for values of x in the interval $0 \leq x \leq 180°$ [5]

Total: 8

4. The line l passes through the points $A(5, 1)$ and $B(11, 19)$.

   (a) Find the equation of the line l in the form $ax + by + c = 0$. [3]

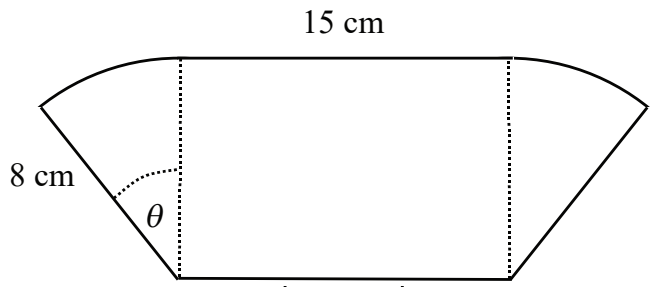
   The line m passes through the midpoint of AB and has a gradient of $\frac{2}{3}$.

   (b) Find an equation of the line m. [3]

   (c) Find the area of the triangle enclosed by the lines l, m and the y-axis. [3]

Total: 9

5. Figure shows a component cut from a metal sheet.



The shape consists of a rectangle of width 15 cm and two circular sectors of radius 8 cm and angle θ.

(a) Given that the perimeter of the shape is 57.4 cm, show that $\theta = 0.7125$ radians. [3]

(b) Calculate the area of the shape correct to 2 decimal places. [2]

Figure shows how the component is made by cutting four pieces from a rectangular piece of metal sheet.

(c) Calculate the percentage of the rectangular sheet that is cut off. [4]

Total: 9

6.

$$\mathrm{f}(x) \equiv 4x - 3 + \frac{9}{x}.$$

(a) Prove that the equation $\mathrm{f}(x) = 0$ has no real roots. [3]

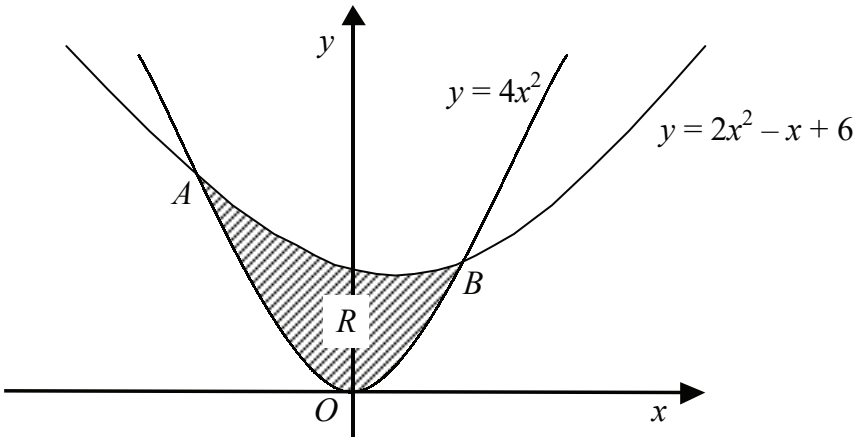
(b) Solve the equation $\mathrm{f}'(x) = 0$. [3]

(c) Hence, find the coordinates of the stationary points of the curve $y = \mathrm{f}(x)$ and determine their nature. [5]

(d) State the set of values of x for which $\mathrm{f}(x)$ is an increasing function. [1]

Total: 12

7. Figure shows the curves $y = 4x^2$ and $y = 2x^2 - x + 6$ which intersect at the points A and B.



(a) Find the coordinates of the points A and B. [5]

(b) Find, using integration, the area of the shaded region, R, enclosed by the two curves. [7]

Total: 12

8. (a) Find the sum of the odd numbers between 50 and 500. [5]

   (b) The 3rd, 4th and 5th terms of a geometric series are given by $(x+4), (4x-5)$ and $(2x+1)$respectively. [10]

   i. Show that one possible value of x is $\frac{1}{2}$, and find the other possible value.

   ii. Find the common ratio and first term of the series for which $x = \frac{1}{2}$.

   iii. Find the sum to infinity of this series.

Total: 15