Solomon Practice Paper

Pure Mathematics 1B

Time allowed: 90 **minutes**

Centre: www.CasperYC.club

Name:

Teacher:

Question	Points	Score
1	4	
2	5	
3	8	
4	9	
5	12	
6	12	
7	12	
8	13	
Total:	75	

How I can achieve better:

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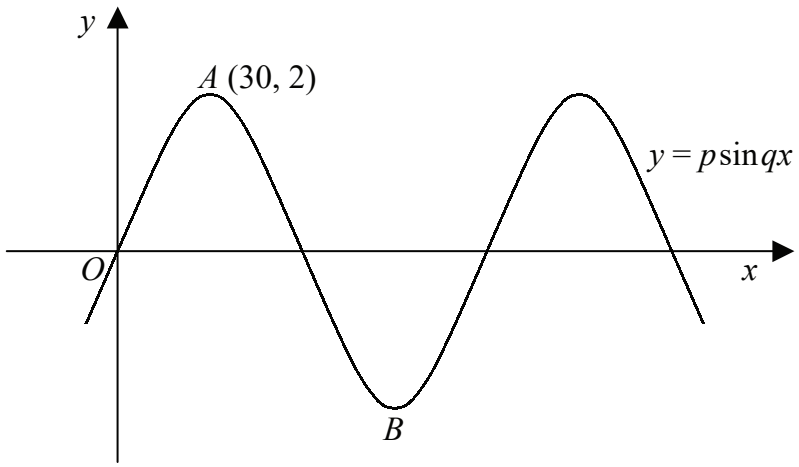
Last updated: May 5, 2023

1. Find the set of values of y for which [4]

$$y^2 + 5y > 24.$$

2. Figure shows part of the curve $y = p\sin(qx)$, where x is measured in degrees.



The first maximum for $x > 0$ occurs at the point $A(30, 2)$.

(a) Find the values of p and q. [2]

(b) State the period of the curve. [1]

(c) Find the coordinates of the point B, the first minimum on the curve for $x > 0$. [2]

Total: 5

3. (a) Prove that [3]

$$a^2 + b^2 \geq 2ab$$

for all real values of a and b.

(b) Prove that [3]

$$x^2 \geq 4y(x - y)$$

for all real values of x and y.

(c) State the relationship between x and y for which [2]

$$x^2 = 4y(x - y).$$

Total: 8

4.

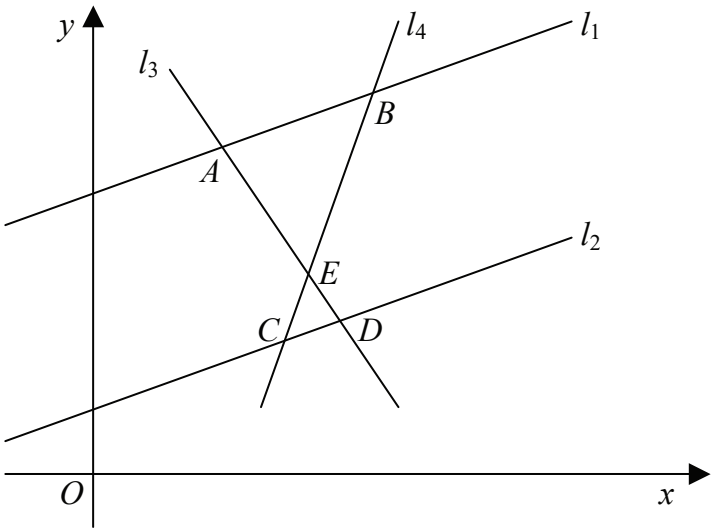
$$\mathrm{f}(x) \equiv x^2 - 4\sqrt{3}x + 9.$$

(a) Solve the equation $\mathrm{f}(x) = 0$, giving your answers exactly in terms of surds. [5]

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

Total: 9

5. Figure shows the four lines l_1, l_2, l_3 and l_4.



Line l_1 passes through the points $A(3, 8)$ and $B(7, 10)$.

Line l_2 passes through the points $C(4, 3)$ and $D(6, 4)$.

(a) Find an equation of the line l_1 in the form $ax + by + c = 0$. [3]

(b) Prove that the line l_2 is parallel to the line l_1. [2]

(c) Calculate the lengths AB and CD giving your answers in surd form. [3]

Line l_3 passes through the points A and D.

Line l_4 passes through the points B and C.

Lines l_3 and l_4 intersect at the point E.

(d) By using your answer to part (c), or otherwise, show that the area of triangle ABE is four times the area of triangle CDE. [4]

Total: 12

6. The first term of an arithmetic series is $2x$ and the seventh term of the series is x.

   (a) Find the common difference of the series in terms of x. [3]

   Given that the tenth term of the series is 4,

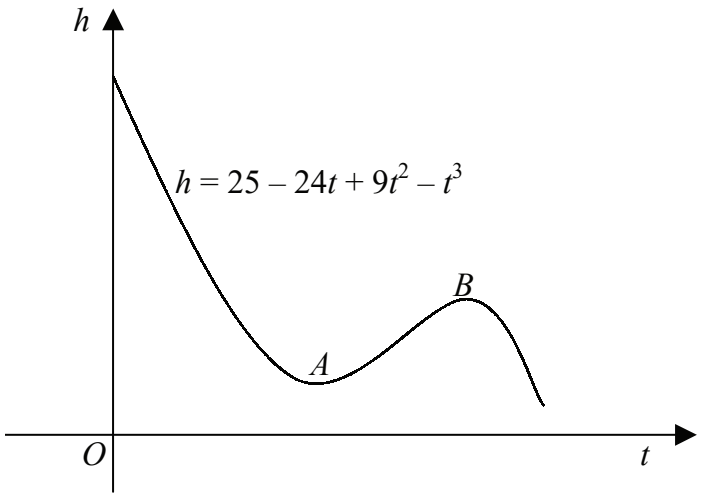
   (b) show that $x = 8$. [3]

   Given also that the sum of the first n terms of the series is 100,

   (c) find two possible values of n. [6]

Total: 12

7. Figure shows the height h, in metres, of a roller coaster trolley, t seconds after the start of a ride.



The height changes according to the equation $h = 25 - 24t + 9t^2 - t^3$.

(a) Find the change in the trolley's height during the first second of its motion. [3]

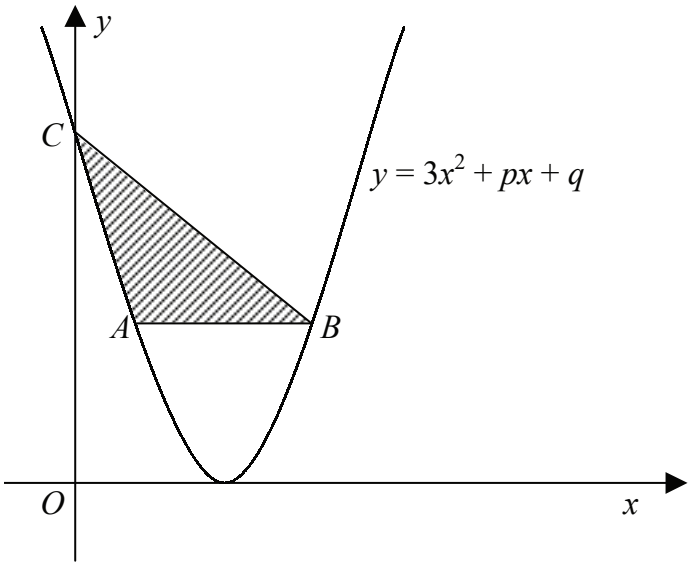
The height of the trolley decreases until the point labelled A on the graph. It then increases until the point labelled B, before again decreasing.

(b) Find the value of t at the point A. [5]

(c) How much height does the trolley gain between the points A and B? [4]

Total: 12

8. Figure shows part of the curve with equation $y = 3x^2 + px + q$ which passes through the points $A(1, 12)$ and $B(5, 12)$.



(a) Find the values of p and q. [5]

(b) State the coordinates of the point C where the curve intersects the y - axis. [1]

(c) Find the area of the shaded region bounded by the curve and the lines AB and BC. [7]

Total: 13