

SKETCHING QUADRATIC GRAPHS: INTERPRETING AND WORKING BACKWARDS

GRADE 8

AtoZrevision



Examination practice questions

You should have:

A ruler, protractor, compasses, a pen, pencil, eraser, calculator.
For some questions, you may need tracing paper.

Instructions

- Use **black** ink or ball-point pen.
- Answer the questions in the spaces provided – *there may be more space than you need*.
- **Calculators may be used.**

Information

- The marks for each question are shown in brackets.
- If the number of marks for two similar questions isn't the same, this is likely due to them being modelled on different specifications. In this case, it is worth considering both mark schemes.
- Use the number of marks for each question as a guide as to how much time to spend on each question. As a rough guide, you can multiply the number of marks by 1.2 to see how many minutes you should spend on a question.
- Questions will generally get more challenging as the document progresses. Some of the latter questions will go beyond the core grade level for this topic.

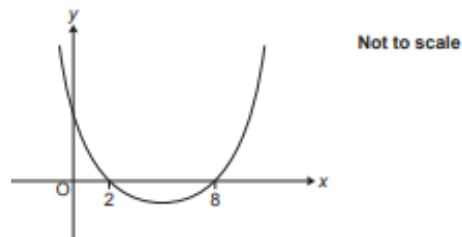
Advice

- Read each question carefully before you start to answer it.
- Don't forget to have fun.
- Check your answers at the end.

Q1.

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This is a sketch of the graph of $y = x^2 - 10x + 16$



Write down the value of the y -intercept.

16

(1 mark)

Q2.

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A curve has the equation $y = 2x^2 - 8x - 5$.

Find the coordinates of the point where the curve intercepts the y -axis.

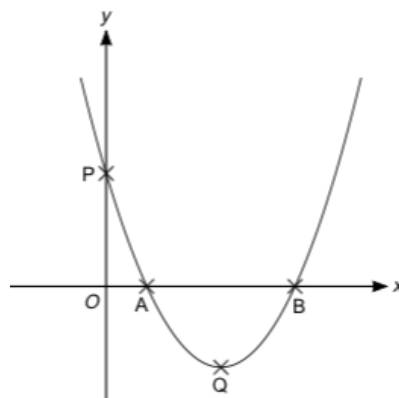
(0, -5)

(1 mark)

Q3.

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This is a sketch of the graph of $y = (x - 1)(x - 3)$.



Work out the coordinates of point P.

$$x^2 - 4x + 3$$

A1

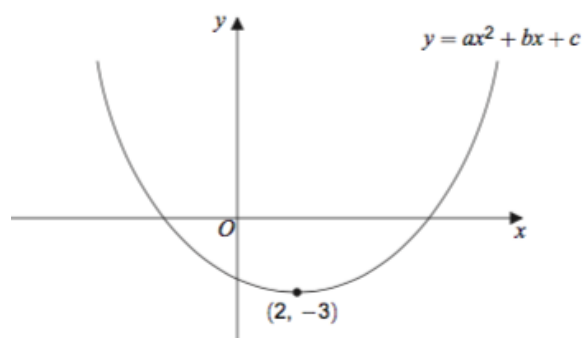
(0, 3)

(2 marks)

Q4.

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A sketch of $y = ax^2 + bx + c$ is shown. The minimum point is $(2, -3)$



State whether the value of c is positive, negative, or zero.

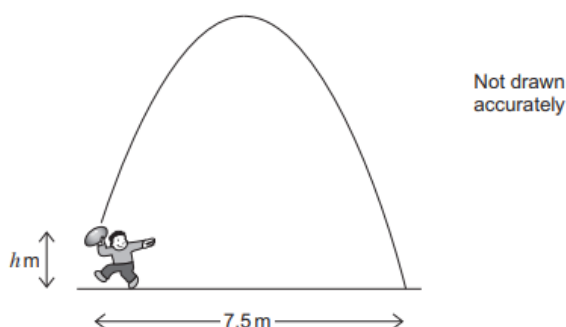
NEGATIVE

(1 mark)

Q5.

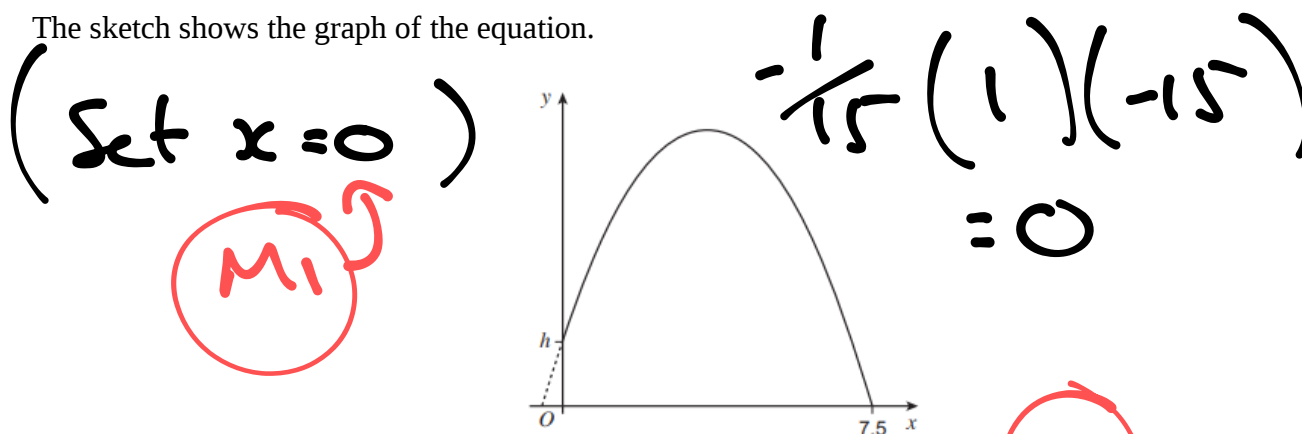
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The diagram shows a ball being thrown from a height h metres above level ground. It lands 7.5 metres from where it was thrown.



The path of the ball can be modelled by the equation $y = -\frac{1}{15}(2x + 1)(2x - 15)$

The sketch shows the graph of the equation.

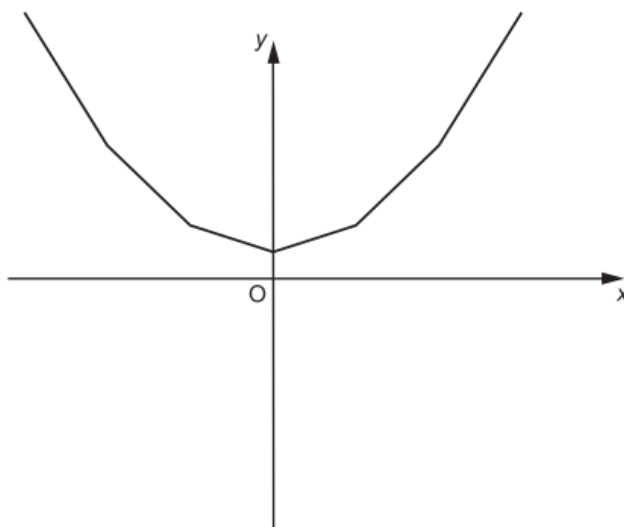


Work out the value of h .

$h = \dots\dots\dots$ m

(2 marks)

Oliver has sketched the graph of $y = x^2$ below.



Tick **two** correct comments about the accuracy of his sketch.

It does not match the graph of $y = x^2$

There are no markings on the graph

B1

✓ It should go through (0,0)

B1

✓ It should be a smooth line

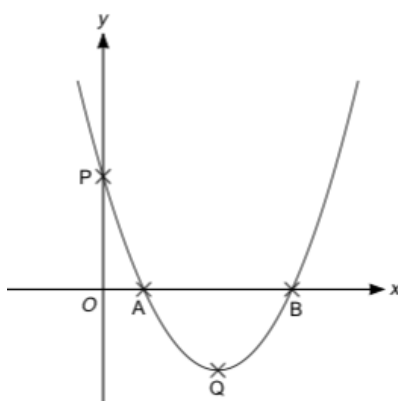
It is meant to be a smooth curve

(2 marks)

Q7.

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This is a sketch of the graph of $y = (x - 1)(x - 3)$.



Write down the coordinates of points A and B.

$\textcircled{B_1}$
 $\textcircled{B_1}$

1	0	
(.....)	(.....)	
3	0	
(.....)	(.....)	

(2 marks)

Q8.

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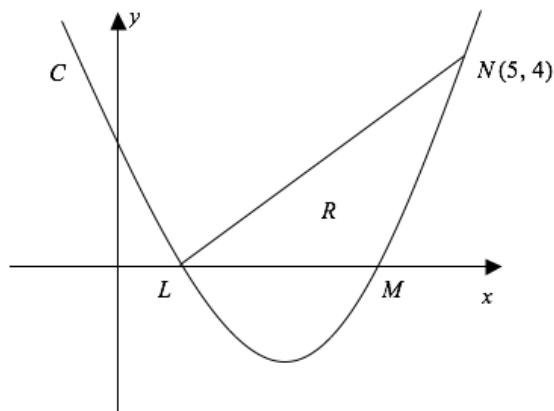


Figure 2

The curve C has equation $y = x^2 - 5x + 4$. It cuts the x -axis at the points L and M as shown in Figure 2.

Find the coordinates of the point L and the point M .

$$(x - 4)(x - 1)$$

$\textcircled{B_1}$
 $\textcircled{B_1}$

0	4	
(.....)	(.....)	
0	1	
(.....)	(.....)	

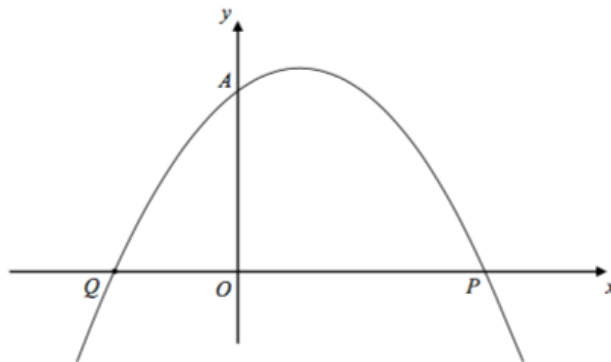
(2 marks)

Q9.

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A sketch of the curve $y = (x + 1)(2 - x)$ is shown.

A(0, 2), P(2, 0) and Q are points on the curve.



Write down the coordinates of point Q.

$$x = -1$$

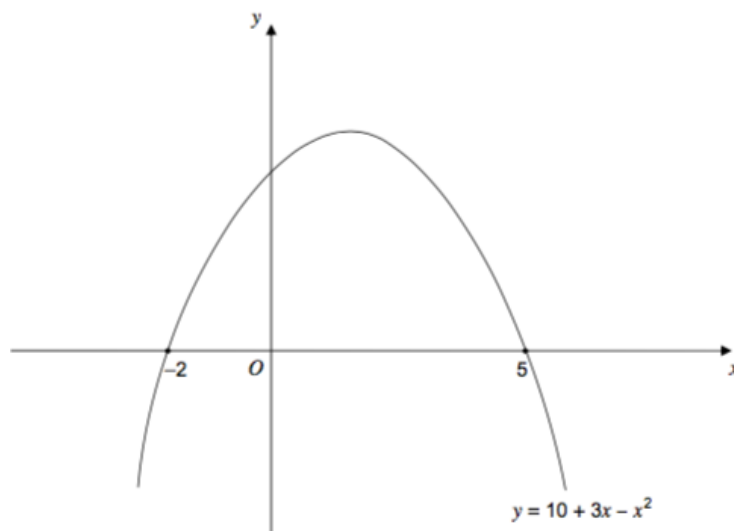
$$(-1, 0)$$

(1 mark)

Q10.

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Here is a sketch of $y = 10 + 3x - x^2$



Write down the two solutions of $10 + 3x - x^2 = 0$

$$x = -2$$

$$x = 5$$

$$\begin{array}{l} \textcircled{B1} \\ x = \dots -2 \\ \textcircled{B1} \\ x = \dots 5 \end{array}$$

(2 marks)

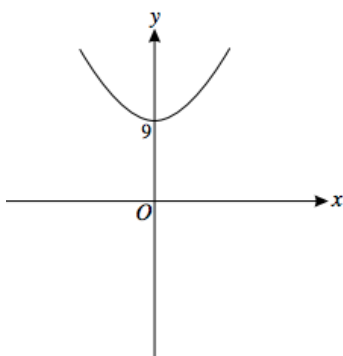


Fig. 1

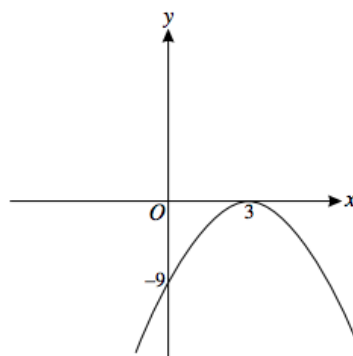


Fig. 2

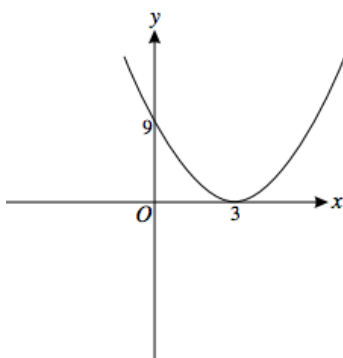


Fig. 3

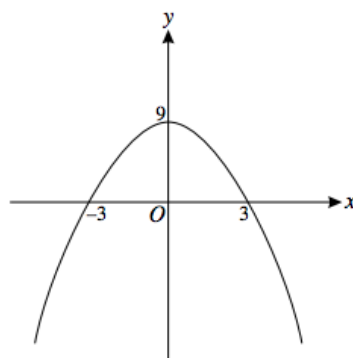


Fig. 4

Each diagram shows a quadratic curve.

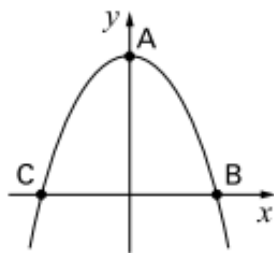
Give the equation of each curve.

M1 SUPPORTING
CALCULATIONS
FOR EACH GRAPH

A1 F1 $y = x^2 + 9$
A1 F2 $y = -(x-3)^2$
A1 F3 $y = (x-3)^2$
A1 F4 $y = (x+3)(x-3)$

(8 marks)

The diagram shows a sketch of the curve $y = 16 - x^2$



What are the coordinates of points A, B and C?

$$(4 + x)(4 - x)$$

$(0, 16)$
 $(-4, 0)$
 $(4, 0)$

(3 marks)

A curve has the equation $y = 2x^2 - 8x - 5$.

Find the x coordinates of the two points where the curve intercepts the x -axis.

$$x = \frac{-8 \pm \sqrt{64 - (4 \times 2 \times -5)}}{2 \times 2}$$

(M1)

$$x = 2 + \sqrt{\frac{13}{2}} \quad (A1)$$

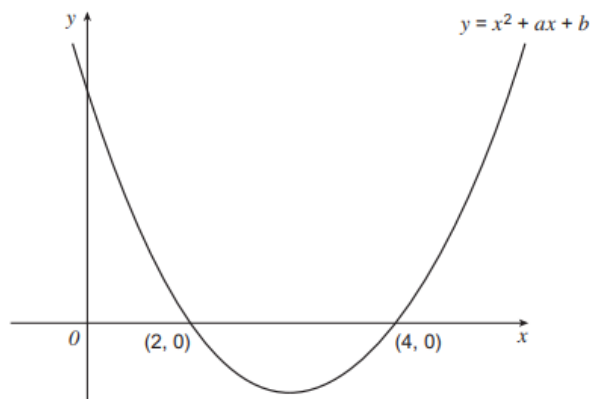
$$x = 2 - \sqrt{\frac{13}{2}} \quad (A1)$$

$x = \dots\dots\dots$

$x = \dots\dots\dots$

(3 marks)

The diagram shows a sketch of the graph of $y = x^2 + ax + b$
 The graph crosses the x -axis at $(2,0)$ and $(4,0)$.



Work out the value of b .

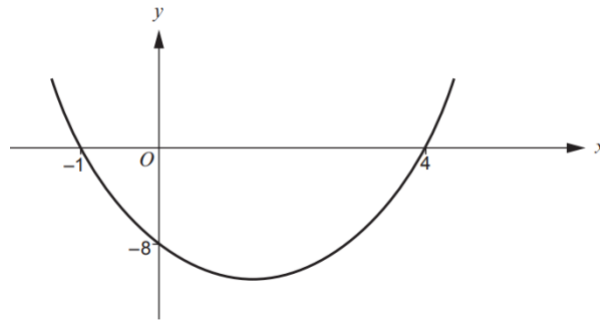
$$\begin{aligned} & \left[(x-2)(x-4) \right] \quad \text{M}_1 \quad \text{ATTEMPT TO FACTORISE} \\ & \quad \text{A}_1 \\ & x^2 - 6x + 8 \\ & \quad \text{M}_1 \end{aligned}$$

A₁

8

$b = \dots\dots\dots$

(4 marks)



The diagram shows a sketch of a graph of a quadratic function.

Find the equation of this curve.

$(x+1)(x-4)$ B1

$[x^2 - 3x - 4]$ BUT y INTERCEPT IS -8

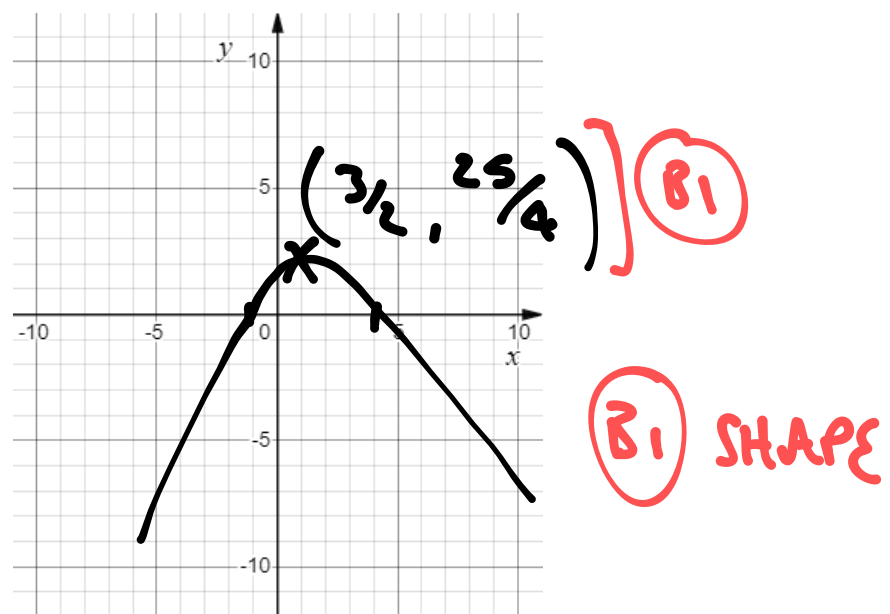
$(\times 2)$
 $2x^2 - 6x - 8$ A1
 $y = \dots\dots\dots$

(3 marks)

A curve is defined by the equation $y = -x^2 + 3x + 4$

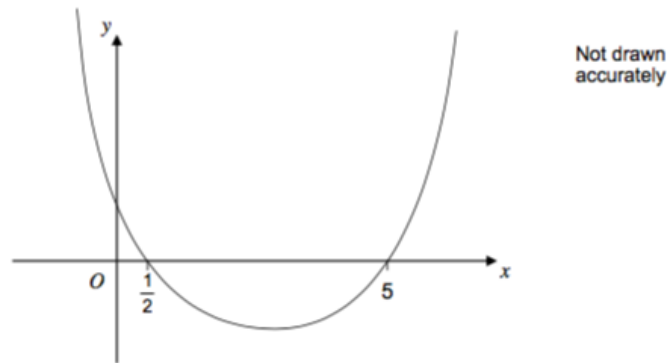
It can be shown that the **coordinates** of the points where the curve crosses the x -axis are $(-1,0)$ and $(4,0)$ and the coordinates of the turning point are $(\frac{3}{2}, \frac{25}{4})$.

Sketch the curve on the axes below.



(2 marks)

The diagram shows a quadratic graph that intersects the x -axis when $x = \frac{1}{2}$ and $x = 5$.



Work out the equation of the quadratic graph.

Give your answer in the form $y = x^2 + bx + c$ where b and c are constants.

$$(2x - 1)(x - 5) \quad] \quad \textcircled{M_1}$$

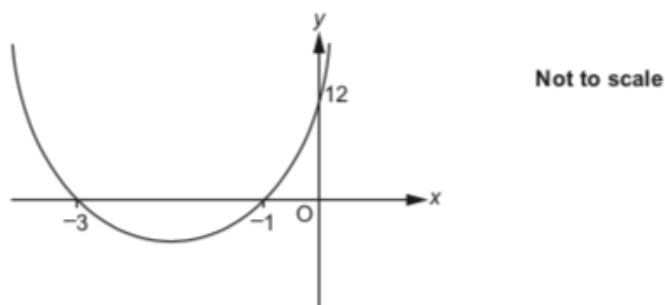
$$2x^2 - 10x - x + 5 \quad] \quad \textcircled{M_1}$$

$$2x^2 - 11x + 5 \quad] \quad \textcircled{A_1}$$

$y = \dots\dots\dots$

(3 marks)

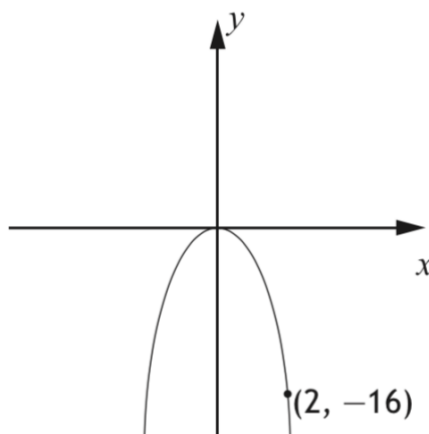
The sketch shows part of a graph which has equation $y = ax^2 + bx + c$.



Find the values of a , b and c .

$(x+1)(x+3)$ (B1)
(B1) $[x^2 + 4x + 3]$ y INTERCEPT IS 12
 $4x^2 + 16x + 12$ (B1)
 $a = 4, b = 16, c = 12$
 (3 marks)

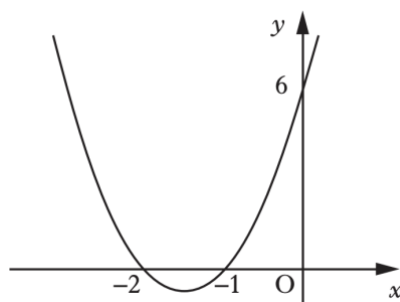
The graph with equation $y = kx^2$ is shown below.
 The point $(2, -16)$ lies on the graph.



Determine the value of k .

$-16 = k \times 2^2$ (M1)
 $\therefore k = -4$ (A1)
 $k = -4$
 (2 marks)

A parabola intersects the axes at $x = -2$, $x = -1$ and $y = 6$, as shown in the diagram.

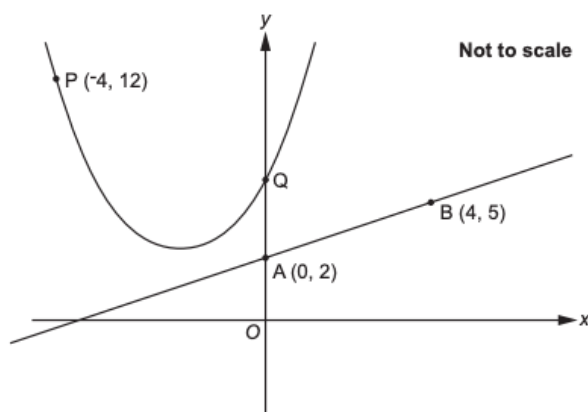


What is the equation of the parabola?

$$\begin{aligned}
 &(x+2)(x-1) \quad \text{[m1]} \\
 &x^2 + x - 2 \quad \text{[m1]} \\
 &\therefore 3(x+2)(x-1) \quad \text{[m1]}
 \end{aligned}$$

(3 marks)

The diagram shows a straight line that passes through points A and B , and a curve that passes through points P and Q .



The equation of the curve is $y = x^2 + kx + 8$.

Find the value of k .

$$\begin{aligned}
 &12 = 16 - 4k + 8 \quad \text{[m1]} \\
 &12 = 24 - 4k \\
 &[4k = 12 \quad \therefore k = 3 \quad \text{[A1]}
 \end{aligned}$$

$k = \dots\dots\dots$
(3 marks)

QUESTIONS FROM MATHEMATICAL COMPETITIONS

Q1.

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What is the lowest positive integer for which $x^2 - 52x - 52$ is positive?

Circle the correct answer.

26

27

51

52

53

54

$$f(0) = -52$$

$$f(52) = -52$$

$$(x - 26)^2 - 26^2 - 52$$

MIN POINT IS $x = 26$
WHICH IS THE L.O. SYMMETRY.

$\therefore x = 0$ TO $x = 52$ ARE
NEGATIVE.

$$f(53) = 1$$

$\therefore$ IT'S THE FIRST POSITIVE
SOLUTION..