

Name:

Practice Paper for AQA Level 2 Certificate
FURTHER MATHEMATICS
Paper 2 Calculator

Time allowed: 1 hour 45 minutes

Materials

For this paper you must have:

- a calculator
- mathematical instruments.

Instructions

- Use black ink or black ball-point pen. Draw diagrams in pencil.
- Answer **all** questions.
- You must answer the questions in the spaces provided. Do not write outside the box around each page or on blank pages.
- Do all rough work in this book. Cross through any work you do not want to be marked.
- In all calculations, show clearly how you work out your answer.

Information

- The marks for questions are shown in brackets
- The maximum mark for this paper is 80.
- You may ask for more graph paper and tracing paper.
These must be tagged securely to this answer book.

Copies of this paper and worked solutions can be found at [bossmaths.com/level2fmpractice](https://www.bossmaths.com/level2fmpractice), also accessible via this QR code.



8365/2

Answer **all** questions in the spaces provided.

- 1** A has coordinates $(3,5)$ and B has coordinates $(11,29)$. P lies on the line through A and B such that the ratio of the distance AB to the distance AP is $4:5$. Find the coordinates of P .

[3 marks]

Answer _____

- 2** The first terms of a linear sequence are:

$$9a - 2b, 5a + b, a + 4b, \dots$$

Work out an expression for the n th term of this sequence.

[3 marks]

Answer _____

3

$$f(x) = \frac{5x - 4}{7x + 9}$$

Which value of x can **not** be in the domain of $f(x)$?
Circle your answer.

[1 mark]

$-\frac{9}{7}$

$-\frac{7}{9}$

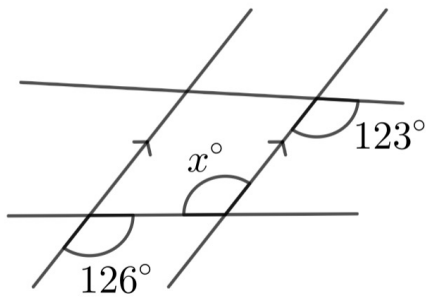
0

$\frac{7}{9}$

$\frac{4}{5}$

4 Write down the value of x .

[1 mark]



$x = \underline{\hspace{2cm}}$

5 $f(x) = 3x^3 - 4x + 25$

Find the set of values of x for which $f(x)$ is decreasing.

[3 marks]

Answer _____

6 Solve $\frac{6}{x} = 1 + \frac{1}{x^2}$, giving your solutions to 3 significant figures.

[2 marks]

Answer _____

7 Use **matrix multiplication** to show that, in the x - y plane,

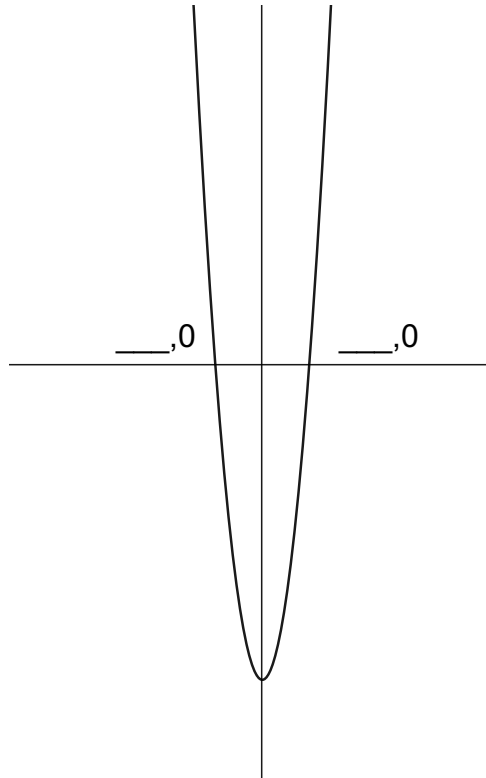
- a reflection in the line y -axis, followed by
- a rotation by 90° anti-clockwise about $(0,0)$ is equivalent

is equivalent to a reflection in the line $y = -x$

[3 marks]

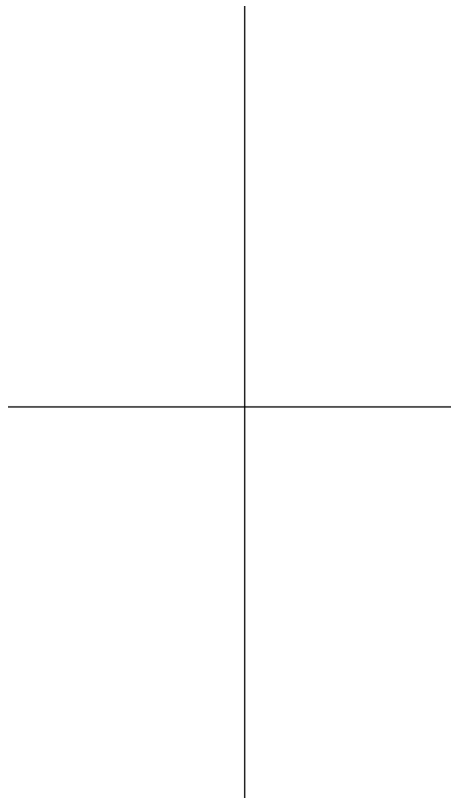
- 8 (a) The curve shown has equation $y = 3x^2 - 12$.
Fill in the x -coordinates of the points where the curve intersects the x -axis.

[2 marks]



- (b) Hence, or otherwise, sketch the curve with equation $y = x^3 - 12x + 1$.
Clearly show any stationary points and label the coordinates of these points.

[3 marks]



9 Show that $\frac{\cos^2\theta + \tan\theta + \sin^2\theta}{\sin\theta} \equiv \frac{1}{\cos\theta} + \frac{1}{\sin\theta}$

[3 marks]

10 Rearrange $v = \sqrt{\frac{3+4w}{u+1}}$ to make u the subject

[3 marks]

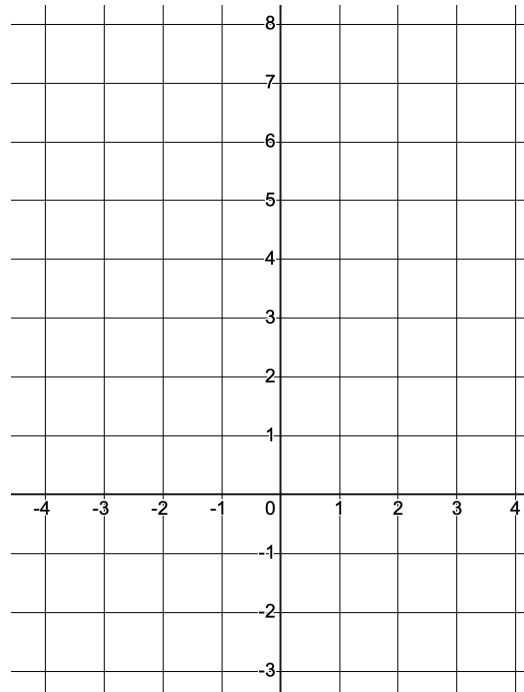
Answer _____

11 (a) A function f is given by

$$\begin{aligned} f(x) &= -2x && x < -1 \\ &= x + 3 && -1 \leq x < 2 \\ &= -x^2 + 4x + 1 && x \geq 2 \end{aligned}$$

Plot $y = f(x)$ on the axes given.

[3 marks]



(b) Work out **all** the values of x for which $f(x) = 3$.

[4 marks]

Answer _____

- 12** Given that $(x + 3)$ is a factor of $x^3 - 2x^2 - 2px + 3p^2$ where p is a constant, find the two possible values of p .

[4 marks]

$$p = \text{_____}, p = \text{_____}$$

- 14 The following curve and straight line intersect at two points. Find the midpoint of these two points of intersection.

$$\begin{aligned}x^2 + 7xy + 4y^2 - 256 &= 0 \\ x - y - 8 &= 0\end{aligned}$$

Do **not** use trial and improvement.
You **must** show your working.

[6 marks]

Answer _____

15

PQRS is a kite.

P has coordinates $(0,6)$.

Q has coordinates $(-4, -1)$.

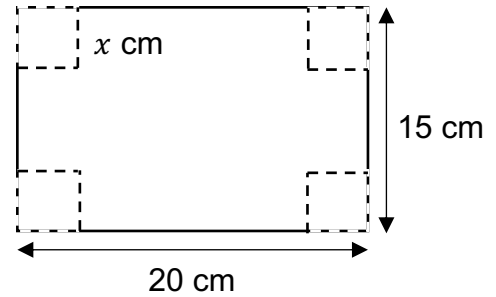
R has coordinates $(5, -4)$.

Find the equation of the straight line that passes through *Q* and *S*, giving your answer in the form $ax + by + c = 0$.

[4 marks]

Answer _____

- 16** Squares of side length x cm are cut from a 20 cm by 15 cm rectangular piece of cardboard. The cardboard is then folded to create an open-topped box.



- (a) Explain why x must be less than 7.5 cm.

[1 mark]

- (b) Show that $V = 4x^3 - 70x^2 + 300x$, for $x < 7.5$, where V is the volume of the box in cm^3 .

[2 marks]

- (c) Use calculus to work out the maximum possible volume of the box, giving your answer correct to 3 significant figures.

[4 marks]

Answer _____

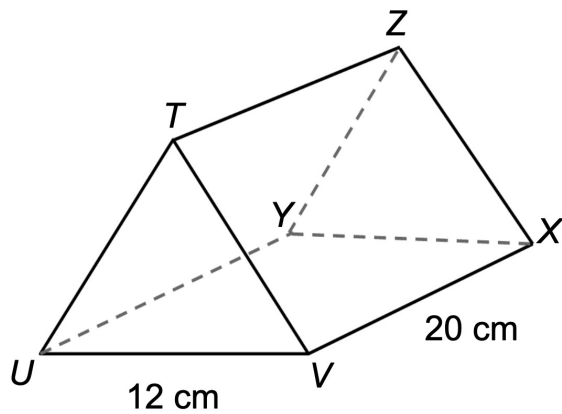
- 17 The first term of a quadratic sequence is 4.
The second term of this sequence is 3.
The fourth term of this sequence is 7.
The fifth term of this sequence is 12.

Find an expression for the n th term of this sequence.

[6 marks]

Answer _____

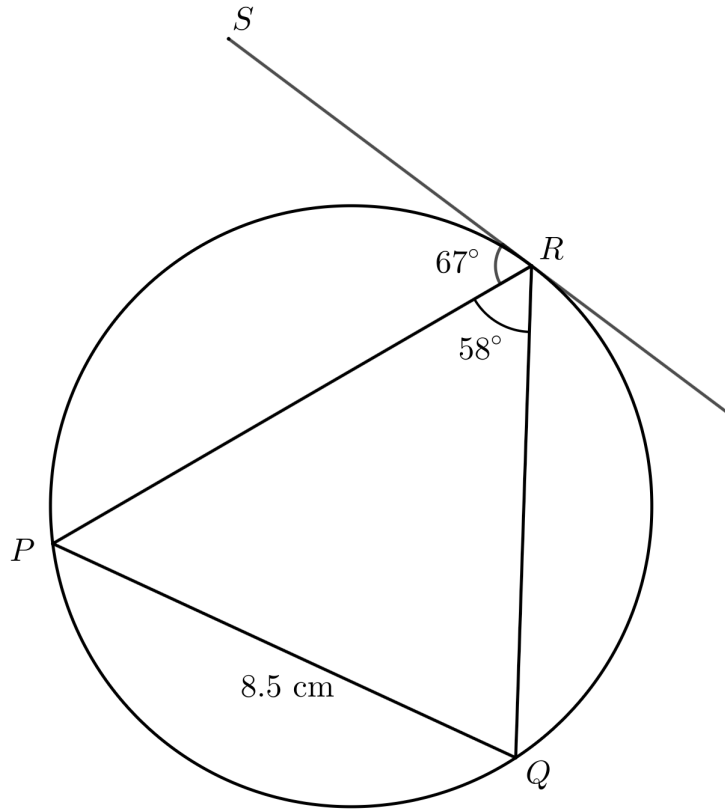
- 18** Here is a triangular prism. The triangular faces are equilateral.
 UV has length 12 cm and VX has length 20 cm.
Work out the size of angle TXU , giving your answer to the nearest 0.1° .



[5 marks]

Answer _____

- 19** The diagram shows a circle with points P , Q , and R on its circumference. The line shown is tangent to the circle at the point R .
 Angle $SRP = 67^\circ$
 Angle $PRQ = 58^\circ$
 Chord PQ has length 8.5 cm.
 Find the length of chord QR , giving your answer correct to 3 significant figures.



Not drawn accurately.

[4 marks]

Answer _____ cm

- 20** A circle has a radius of $\sqrt{356}$. The line with equation $y = \frac{8}{5}x - 33$ is tangent to this circle at the point $(20, -1)$.

Find the coordinates of the centre of the circle.

[6 marks]

Answer _____