

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.

**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]**

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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]

$-\frac{9}{7}$

$-\frac{7}{9}$

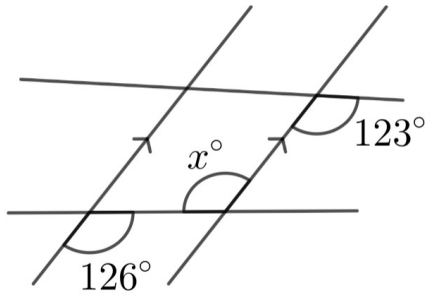
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$\frac{7}{9}$

$\frac{4}{5}$

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]**

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Answer \_\_\_\_\_

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

**[2 marks]**

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Answer \_\_\_\_\_

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

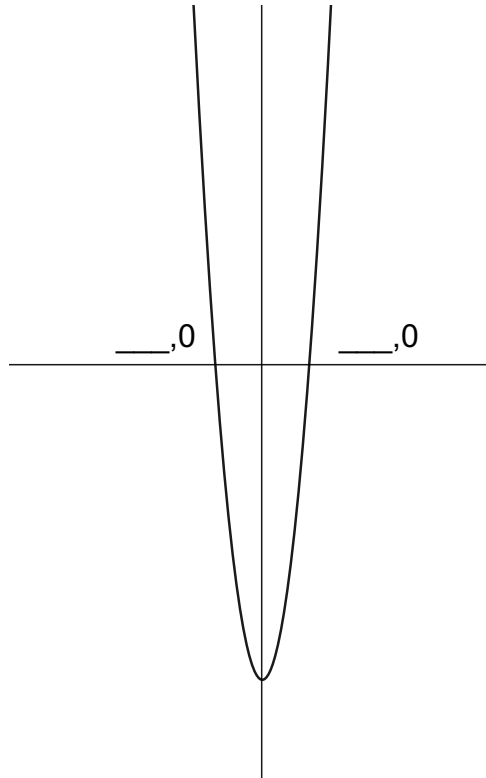
- a reflection in the line  $y$ -axis, followed by
- a rotation by  $90^\circ$  anti-clockwise about  $(0,0)$  is equivalent

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

**[3 marks]**

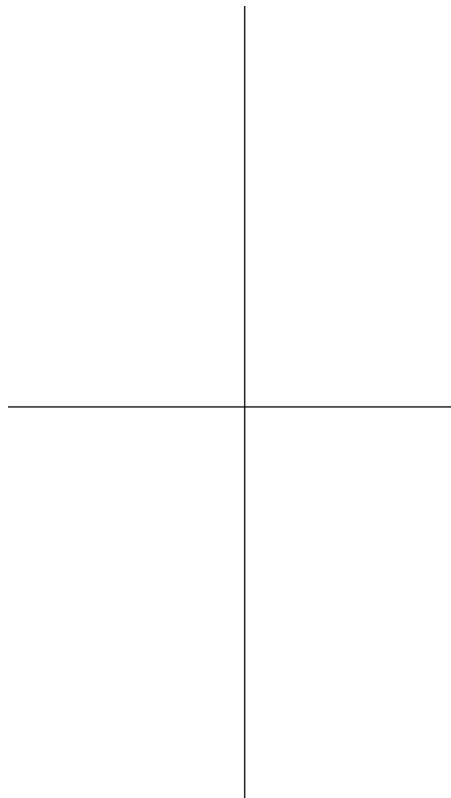
- 8 (a) The curve shown has equation  $y = 3x^2 - 12$ .  
Fill in the  $x$ -coordinates of the points where the curve intersects the  $x$ -axis.

[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]

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

[3 marks]

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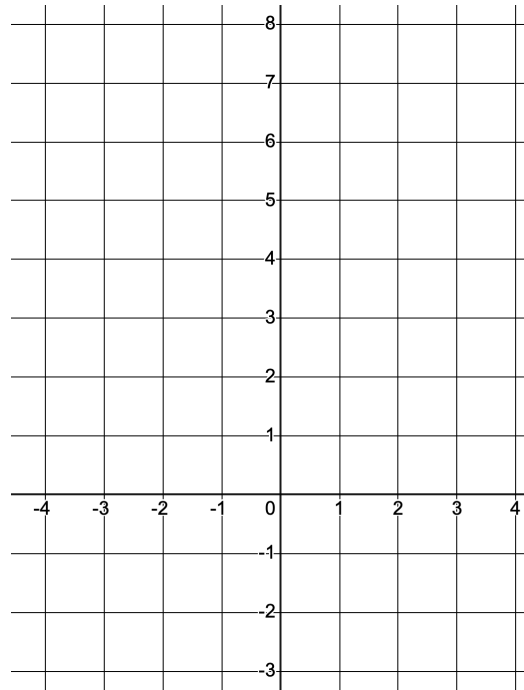
Answer \_\_\_\_\_

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]

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Answer \_\_\_\_\_

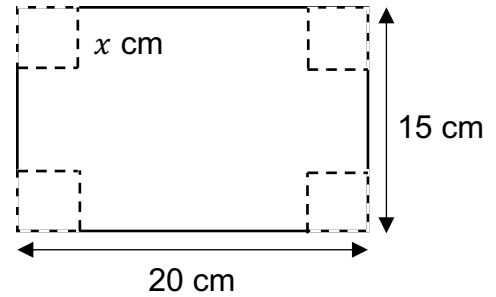








- 16** Squares of side length  $x$  cm are cut from a 20 cm by 15 cm rectangular piece of cardboard. The cardboard is then folded to create an open-topped box.



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

[1 mark]

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

[2 marks]

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

[4 marks]

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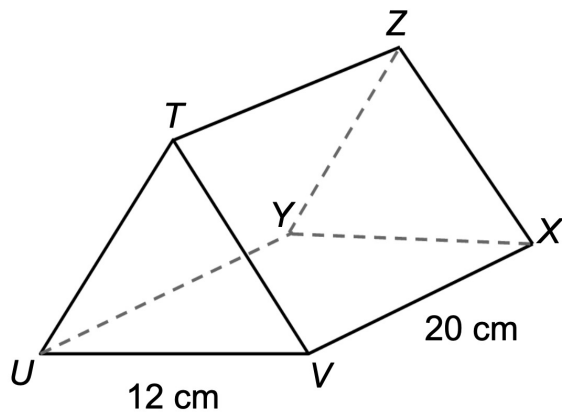


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Answer \_\_\_\_\_



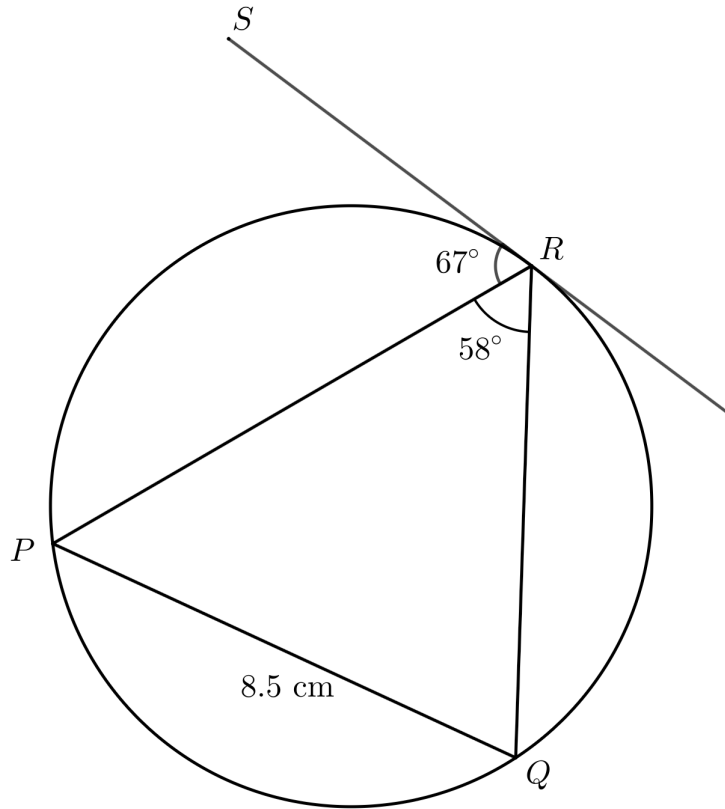
- 18** Here is a triangular prism. The triangular faces are equilateral.  
 $UV$  has length 12 cm and  $VX$  has length 20 cm.  
Work out the size of angle  $TXU$ , giving your answer to the nearest  $0.1^\circ$ .



[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]**

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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 \_\_\_\_\_