A

AQA

Surname _____

Other Names _____

Centre Number _____

Candidate Number _____

Candidate Signature _____

I declare this is my own work.

Level 2 Certificate

FURTHER MATHEMATICS

Paper 1 Non-Calculator

8365/1

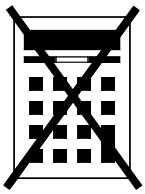
Time allowed: 1 hour 45 minutes

At the top of the page, write your surname and other names, your centre number, your candidate number and add your signature.

[Turn over]

For this paper you must have:
- **mathematical instruments**
- **the Formulae Sheet (enclosed).**

You must NOT use a calculator.



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 on blank pages.**
- **If you need extra space for your answer(s), use the lined pages at the end of this book. Write the question number against your answer(s).**
- **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.**

DO NOT TURN OVER UNTIL TOLD TO DO SO

Answer ALL questions in the spaces provided.

1 **(x + 1) is increased by 20%**

Its value is now the same as (x + 6)

Work out the value of x. [3 marks]

Answer _____

2 The point (–6, –4) lies on a straight line with gradient $\frac{3}{2}$

Work out the coordinates of the point where the line crosses the y-axis. [2 marks]

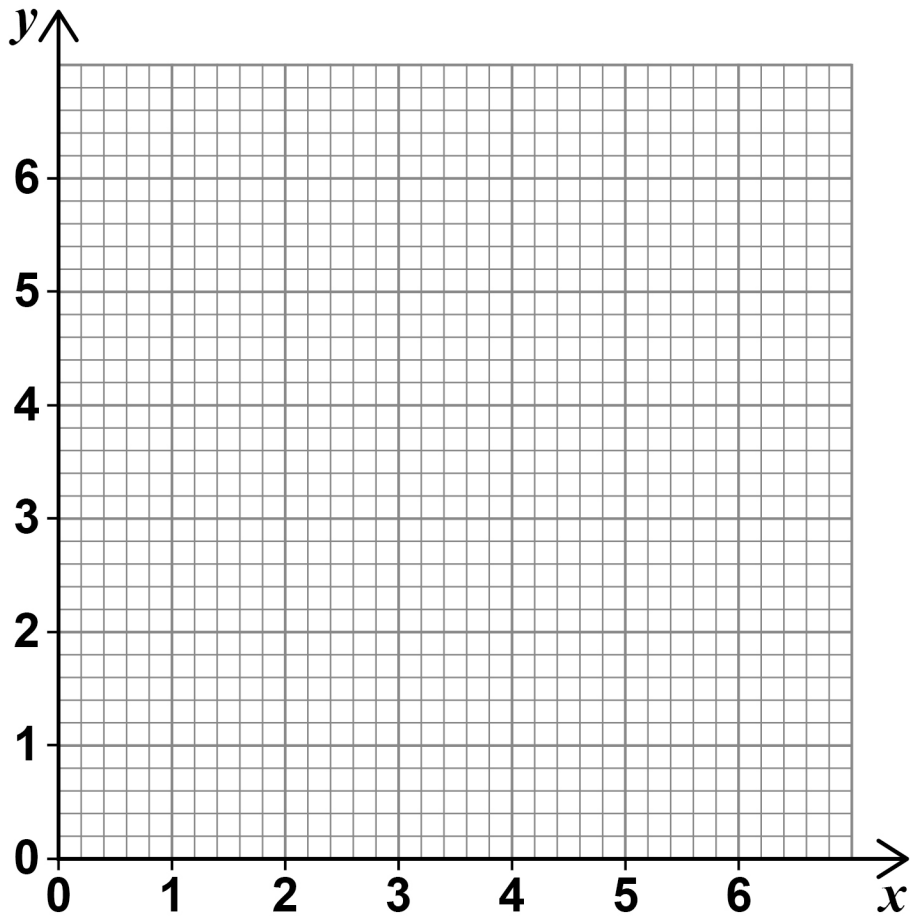
Answer (_____ , _____)

3 (a) $f(x) = 4 - x \qquad 0 \leqslant x < 1$

$= 4x - x^2 \qquad 1 \leqslant x < 4$

$= 2x - 8 \qquad 4 \leqslant x \leqslant 6$

On the grid, draw the graph of $y = f(x)$
[4 marks]



3 (b) $g(x) = 6 - 3x$

Work out $g^{-1}(x)$. **[2 marks]**

Answer _____

11

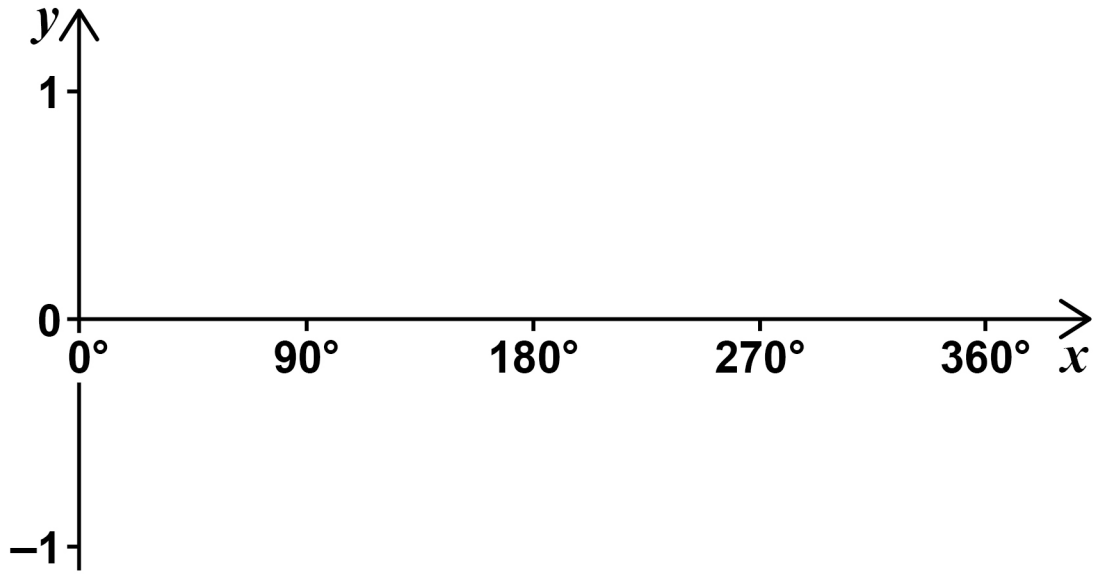
4(a) Circle the value of $\tan^2 30°$

[1 mark]

$\frac{1}{4}$ $\frac{1}{3}$ $\frac{1}{2}$ $\frac{3}{4}$

4(b) On the axes, sketch

$y = \cos x$ for $0° \leqslant x \leqslant 360°$ [2 marks]



5 $(3x + a)(5x - 4) \equiv 15x^2 - 2x + b$

Work out the values of a and b. [3 marks]

$a =$ _____ $b =$ _____

[Turn over]

6 $y = 2x^4\left(x^3 + 2 - \frac{3}{x}\right)$

Work out $\frac{dy}{dx}$ **[3 marks]**

$\frac{dy}{dx} =$

9

BLANK PAGE

[Turn over]

7 ABC is a right-angled triangle with vertices

A (–1, 5), B (–2, 5) and C $\left(-1, 5\frac{3}{4}\right)$

Work out the length of BC. [3 marks]

Answer _____ units

[Turn over]

8 **Use MATRIX MULTIPLICATION to show that, in the x-y plane,**

- **a rotation, 90° anticlockwise about the origin, followed by**
- **a reflection in the line $y = x$**

is equivalent to a reflection in the x-axis.
[3 marks]

9 (a) **A quadratic sequence starts –2 –1 4 13**

Work out an expression for the nth term. [3 marks]

Answer _____

9(b) **A different quadratic sequence has nth term $n^2 + 10n$**

Use an algebraic method to work out how many terms in the sequence are less than 2000

Do NOT use trial and improvement.

You MUST show your working. [3 marks]

Answer _____

10 **Rationalise and simplify fully** $\dfrac{\sqrt{3}}{3+\sqrt{3}}$ **[3 marks]**

Answer _____

11 **Expand and simplify fully** $(3 + 2x)^5$ **[4 marks]**

Answer _____

12 The nth term of a sequence is $\frac{3n^2}{n^2 + 2}$

12 (a) One term in the sequence is $\frac{32}{11}$

Work out the value of n. [2 marks]

Answer _____

12 (b) **Write down the limiting value of the sequence as $n \to \infty$ [1 mark]**

Answer _____

[Turn over]

13 Simplify fully $(6x^3y^{-2} + 9x^5y) \div 3x^2y^{-3}$
[3 marks]

Answer _____

14 Rearrange $ef = \frac{5e + 4}{3}$ to make e the subject.

[3 marks]

Answer _____

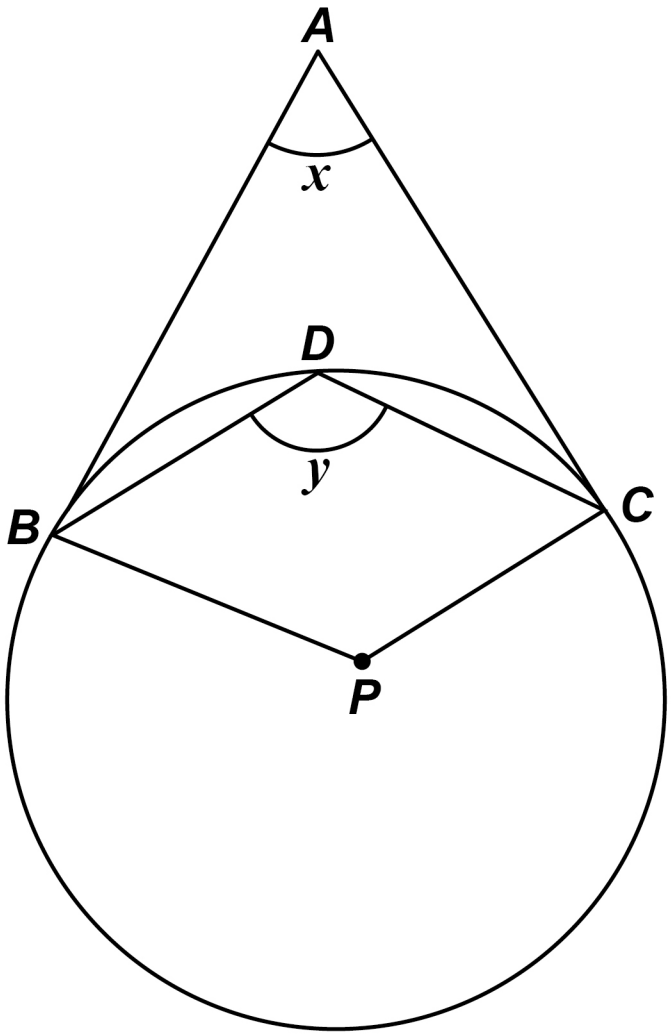
[Turn over]

9

15 *B*, *C* and *D* are points on a circle, centre *P*.

AB and *AC* are tangents to the circle.

The diagram is not drawn accurately.



Prove that $y = 90 + \frac{x}{2}$ [5 marks]

16 **Solve the simultaneous equations**

$$x - y = \frac{19}{4}$$

$$xy = -3$$

Do NOT use trial and improvement.

You MUST show your working. [6 marks]

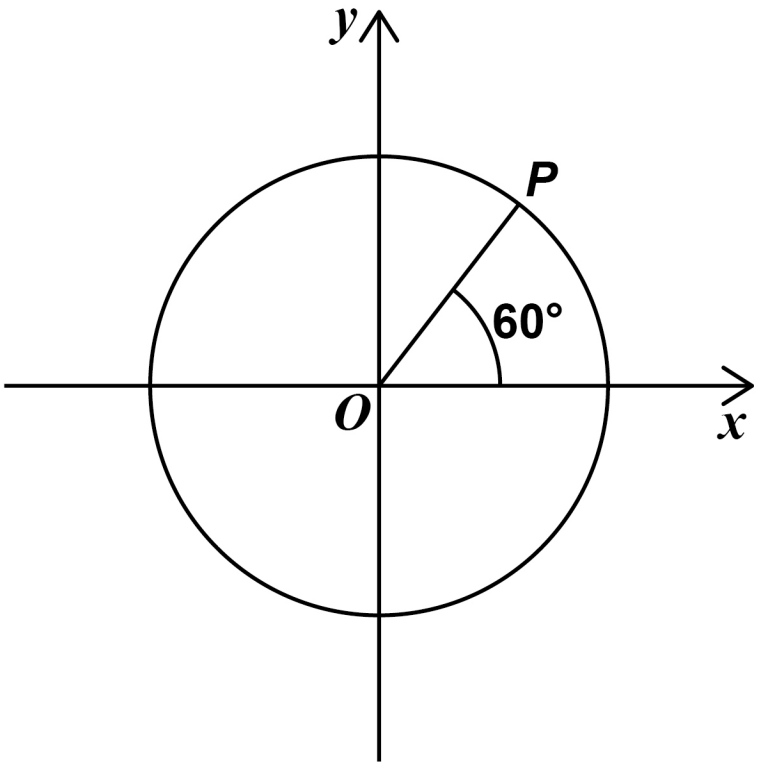
Answer _____

11

17 The point P lies on the circle $x^2 + y^2 = 16$

The line OP is at an angle of 60° to the positive x-axis.

The diagram is not drawn accurately.



17 (a) Show that the coordinates of point P are $(2, 2\sqrt{3})$ [2 marks]

[Turn over]

17 (b) **Work out the equation of the tangent to the circle at *P*.**

Write your answer in the form $x + ay = b$ where a and b are constants. [4 marks]

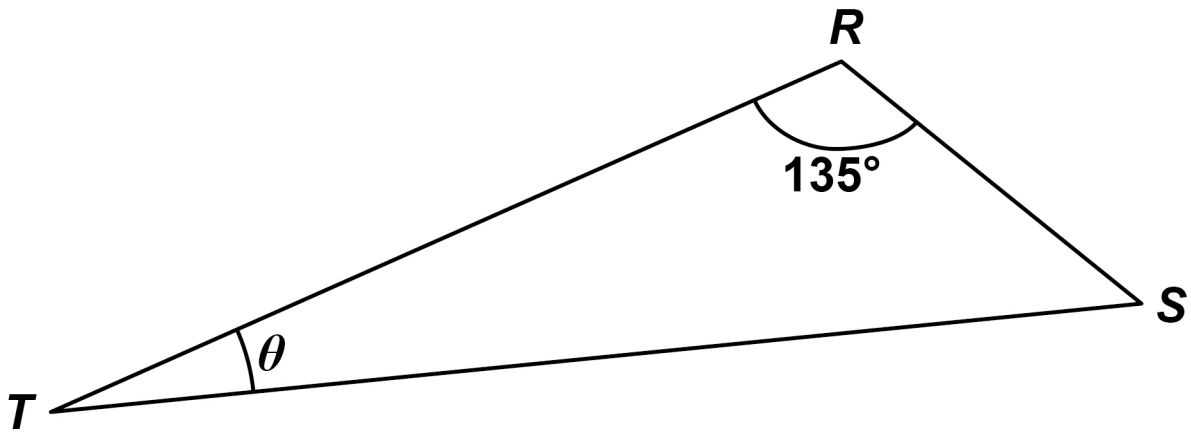
Answer _____

[Turn over]

6

18 In triangle RST $RS : ST = 1 : 4$

The diagram is not drawn accurately.



Work out the exact value of sin θ. [3 marks]

Answer _____

[Turn over]

19 Write $6x^2 - 24x + 17$ in the form $a(x + b)^2 + c$ where a, b and c are integers. [3 marks]

Answer _____

6

[Turn over]

20 The curve $y = x^4 - 18x^2$ has three stationary points.

Work out the coordinates of the three stationary points and determine their nature.

You MUST show your working. [6 marks]

Stationary point (_____ , _____)

Nature _____

Stationary point (_____ , _____)

Nature _____

Stationary point (_____ , _____)

Nature _____

21 Show that $\dfrac{4\cos^2 x + 3\sin^2 x - 4}{\cos^2 x} \equiv -\tan^2 x$

[3 marks]

END OF QUESTIONS

9

Additional page, if required.
Write the question numbers in the left-hand margin.

Additional page, if required.
Write the question numbers in the left-hand margin.

BLANK PAGE

For Examiner's Use	
Pages	Mark
4–7	
8–10	
12–15	
16–19	
20–23	
24–27	
28–31	
32–35	
36–39	
TOTAL	

Copyright information

For confidentiality purposes, all acknowledgements of third-party copyright material are published in a separate booklet. This booklet is published after each live examination series and is available for free download from www.aqa.org.uk.

Permission to reproduce all copyright material has been applied for. In some cases, efforts to contact copyright-holders may have been unsuccessful and AQA will be happy to rectify any omissions of acknowledgements. If you have any queries please contact the Copyright Team.

Copyright © 2022 AQA and its licensors. All rights reserved.