AQA

Please write clearly in block capitals.

Centre number | | | | | | Candidate number | | | | |

Surname _____

Forename(s) _____

Candidate signature _____

I declare this is my own work.

Level 2 Certificate
FURTHER MATHEMATICS

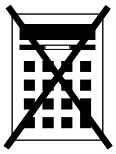
Paper 1 Non-Calculator

Time allowed: 1 hour 45 minutes

Materials

For this paper you must have:
- mathematical instruments.

You must **not** use a calculator.



Instructions
- Use black ink or black ball-point pen. Draw diagrams in pencil.
- Fill in the boxes at the top of this page.
- 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.
- 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.

For Examiner's Use	
Pages	Mark
2–3	
4–5	
6–7	
8–9	
10–11	
12–13	
14–15	
16–17	
18–19	
20–21	
22–23	
TOTAL	

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

1 Work out the distance between the points A (–3, 7) and B (5, 1)

[2 marks]

Answer _____ units

2 $y = x(2x^4 - 7x^3)$

Work out an expression for the rate of change of y with respect to x.

[3 marks]

Answer _____

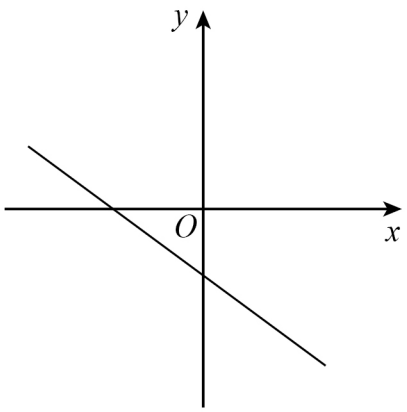
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3 Here are four sketch graphs.

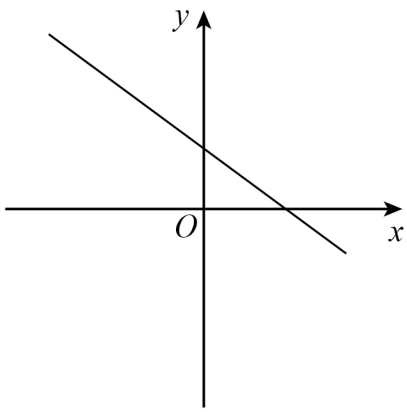
Circle the letter of the sketch graph that represents $3x + 2y = 5$

[1 mark]

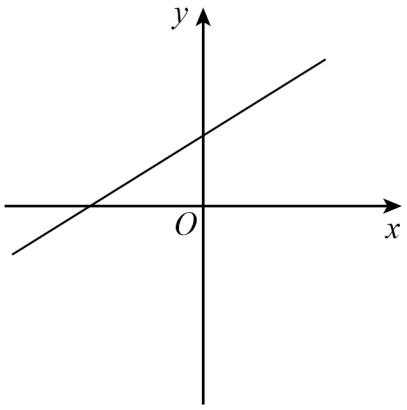
A



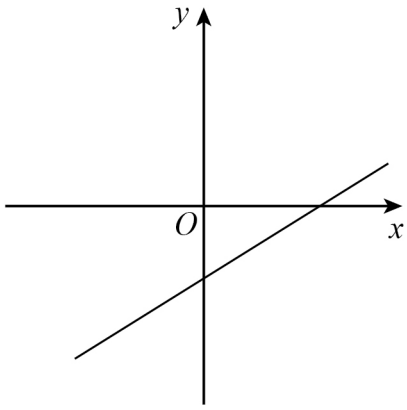
B



C



D



6

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4 (a) The function f is given by $f(x) = 3x - 5$

The range is $13 < f(x) < 19$

Work out the domain of the function.

[1 mark]

Answer _____

4 (b) The function g is given by $g(x) = x^2 - 4$ with domain $-1 < x < 3$

Work out the range of the function.

[2 marks]

Answer _____

4 (c) The function h is given by $h(x) = \frac{3 + x}{2}$

Work out $h^{-1}(x)$

[2 marks]

$h^{-1}(x) =$ _____

Do not write outside the box

5 The nth term of a sequence is $\dfrac{2n+47}{n+1}$

5 (a) A term of the sequence has a value of 5

Work out the value of n.

[2 marks]

Answer _____

5 (b) Write down the limiting value of the sequence as $n \to \infty$

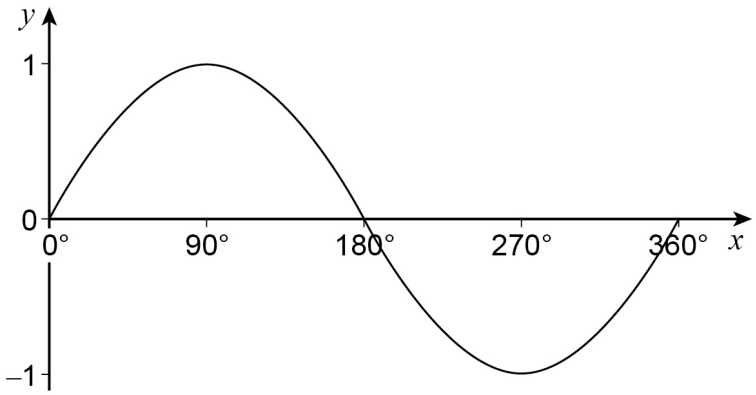
[1 mark]

Answer _____

8

Do not write outside the box

6 Here is a sketch of $y = \sin x$ for $0° \leqslant x \leqslant 360°$



You are given that $\sin 220° = -k$

Work out the two values of x for $0° \leqslant x \leqslant 360°$ for which $y = k$

[2 marks]

Answer _____ and _____

7 Solve $2x^2 + 4 > (2x - 3)(x + 1)$

[3 marks]

Answer _____

Do not write outside the box

8 Simplify $\sqrt{3}\left(\sqrt{75}+\sqrt{48}\right)$ writing your answer as an integer.

[2 marks]

Answer _____

9 Expand and simplify fully $(2x-5)(3x-4)(x+2)$

[3 marks]

Answer _____

10

Do not write outside the box

10 The first four terms of a quadratic sequence are

0 1 0 –3

Work out an expression for the nth term.

[3 marks]

Answer _____

Do not write outside the box

11 $\begin{pmatrix} 2 & 1 \\ 0 & 3 \end{pmatrix}\begin{pmatrix} a & b \\ 0 & 0.4 \end{pmatrix} = k\,\mathbf{I}$ where k is a constant and **I** is the identity matrix.

Work out the values of a and b.

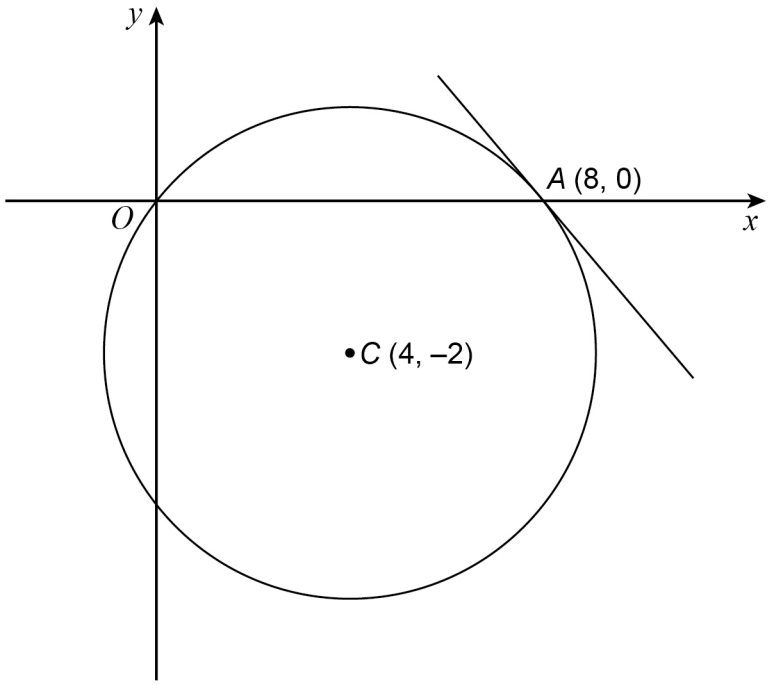
[4 marks]

Answer $a =$ _____ $b =$ _____

7

Do not write outside the box

12 A circle, centre C (4, –2), passes through the origin and point A (8, 0) on the x-axis.
The tangent at A is shown.



Not drawn accurately

12 (a) Work out the equation of the circle.

[2 marks]

Answer _____

Do not write outside the box

12 (b) Work out the equation of the tangent to the circle at A.

[3 marks]

Answer _____

Turn over for the next question

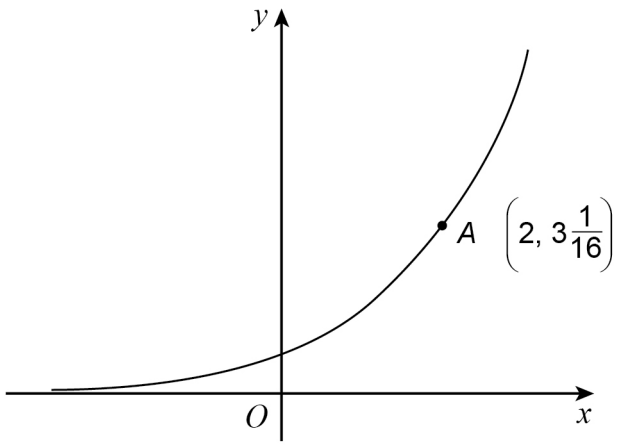
5

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13 Here is a sketch of $y = k^x$ where $k > 0$

$A\left(2, 3\frac{1}{16}\right)$ is a point on the curve.

Not drawn accurately



13 (a) Work out the value of k.

[2 marks]

Answer _____

13 (b) B is a point on the curve with x-coordinate -1

Work out the y-coordinate of B.

[1 mark]

Answer _____

Do not write outside the box

14 Solve the simultaneous equations.

$$4a - b + 3c = 27$$
$$3a + 2b - c = 5$$
$$2a - 5c = -7$$

Do **not** use trial and improvement.

You **must** show your working.

[5 marks]

$a =$ _____ $b =$ _____ $c =$ _____

8

Do not write outside the box

15 Work out the value of x where $0° \leqslant x \leqslant 90°$ for which $3 \tan^2 x = 1$

[2 marks]

Answer _____

Do not write outside the box

16 $f(x) = 200x^3 + 100x^2 - 18x - 9$

16 (a) Use the factor theorem to show that $(2x + 1)$ is a factor of $f(x)$.

[2 marks]

16 (b) Hence solve $f(x) = 0$

[3 marks]

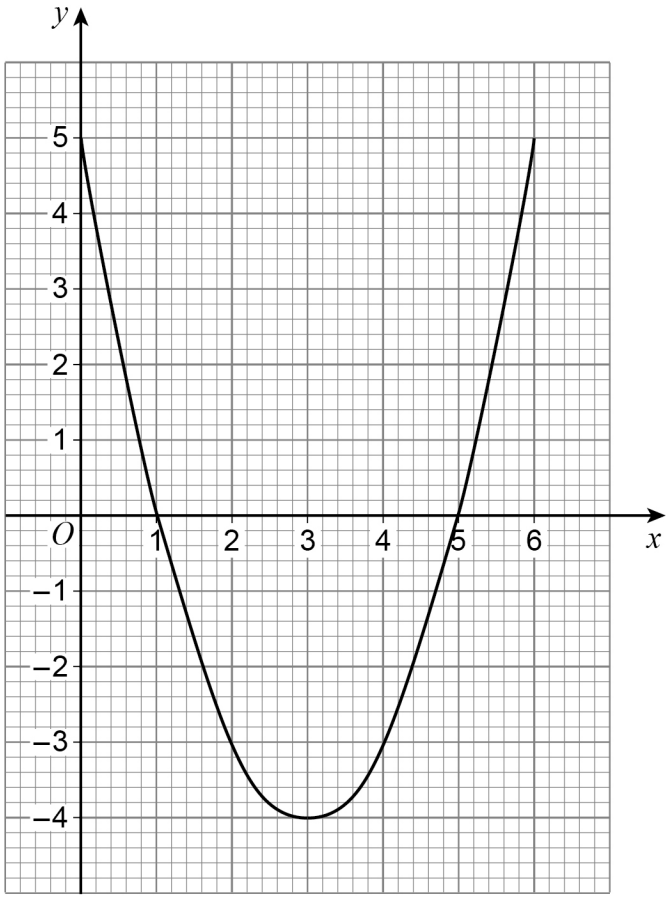
Answer _____

7

Turn over ►

Do not write outside the box

17 Here is the graph of $y = x^2 - 6x + 5$ for values of x between 0 and 6



By drawing a suitable **linear** graph on the grid, work out approximate solutions to

$$x^2 - 7x + 9 = 0$$

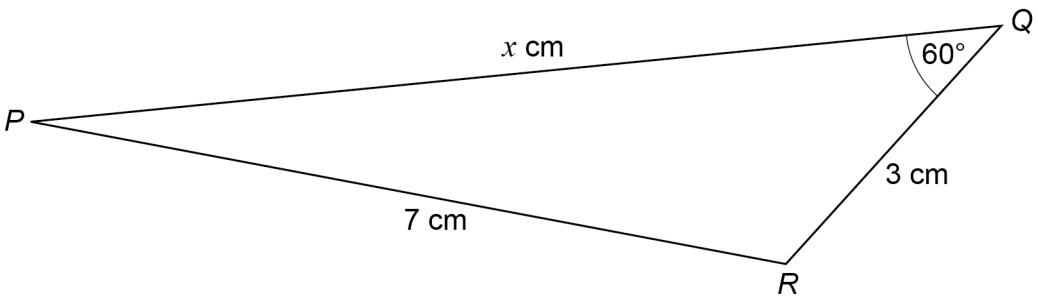
[3 marks]

Answer _____

Do not write outside the box

18 Here is a triangle.

Not drawn accurately



Use the cosine rule to work out the value of x.

[4 marks]

Answer _____

7

Turn over ►

Do not write outside the box

19 $y = f(x)$ is the graph of a cubic function.

$y < 0$ for $x < 5$

$y \geqslant 0$ for $x \geqslant 5$

The function is

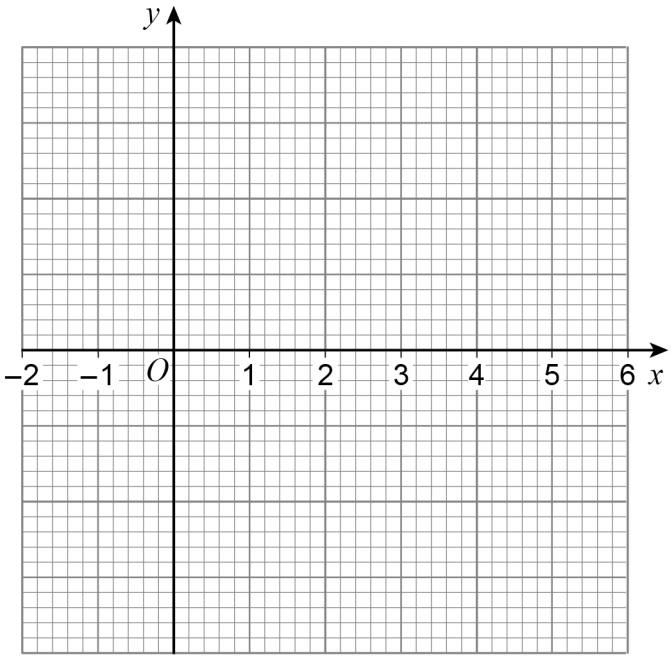
increasing for $x < -1$

decreasing for $-1 < x < 2$

increasing for $x > 2$

Draw a possible sketch of $y = f(x)$ for values of x from -2 to 6

[4 marks]



Do not write outside the box

20 Miriam's date of birth is 14/09/2006

She makes a 4-digit number code using digits from her date of birth.

The 4-digit number she makes must

not start with 0

have all different digits.

How many codes can she make?

[3 marks]

Answer _____

Turn over for the next question

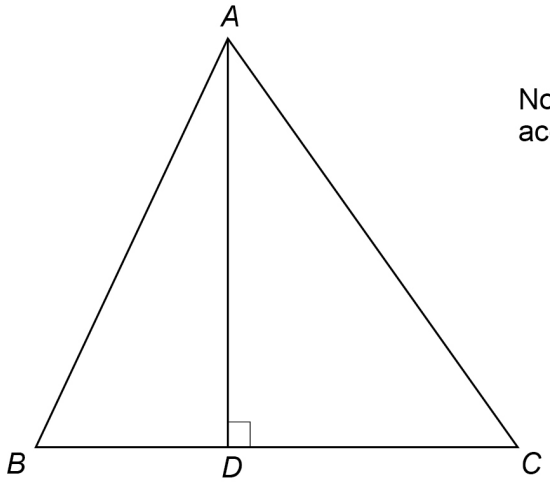
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21 *ABC* is a triangle.

The perpendicular from *A* meets *BC* at *D*.

BC = $(6 + 2\sqrt{7})$ cm



Not drawn accurately

Area of triangle *ABC* = $(13 + 3\sqrt{7})$ cm^2

Work out the length, in cm, of *AD*.

Give your answer in the form $a + b\sqrt{c}$ where a, b and c are integers.

[5 marks]

Answer _____ cm

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22 Solve $8^x = \dfrac{2^{56} - 4^{26}}{30}$

[4 marks]

$x =$ _____

Turn over for the next question

9

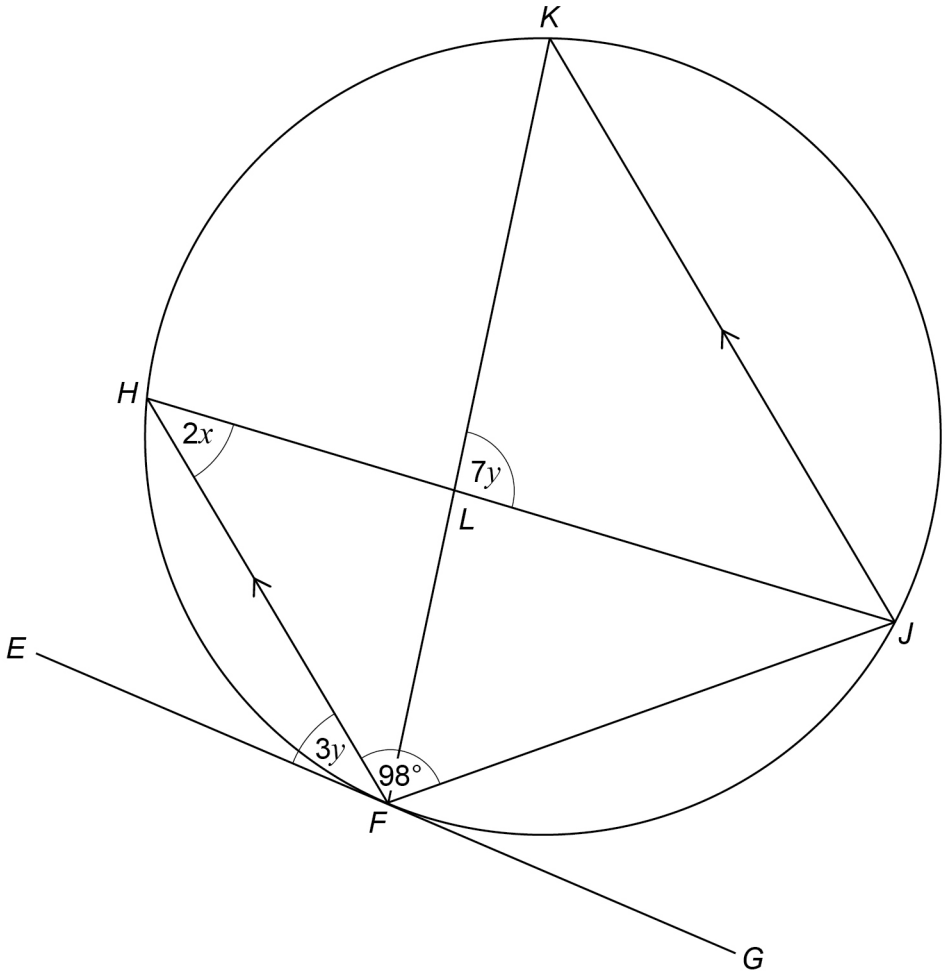
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23 *F, H, K* and *J* are points on a circle.

Chords *HJ* and *KF* intersect at *L*.

EFG is a tangent to the circle.

FH and *JK* are parallel.



Not drawn accurately

23 (a) Angle *FHJ* = $2x$

Give reasons why angle *FKJ* and angle *HJK* are also equal to $2x$.

[2 marks]

Angle *FKJ* _____

Angle *HJK* _____

Do not write outside the box

23 (b) Work out the values of x and y.

You **must** show your working.

Do **not** use trial and improvement.

[4 marks]

Answer $x =$ _____ $y =$ _____

END OF QUESTIONS

6

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