AQA

Please write clearly in block capitals.

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

Surname _____

Forename(s) _____

Candidate signature _____

Level 2 Certificate
FURTHER MATHEMATICS

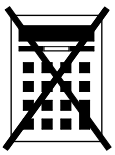
Paper 1 Non-Calculator

Friday 14 June 2019 Afternoon Time allowed: 1 hour 30 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.

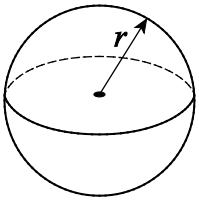
Information
- The marks for questions are shown in brackets.
- The maximum mark for this paper is 70.
- You may ask for more answer paper, graph paper and tracing paper. These must be tagged securely to this answer book.

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

Formulae Sheet

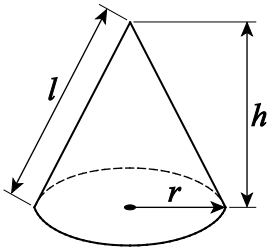
Volume of sphere $= \frac{4}{3}\pi r^3$

Surface area of sphere $= 4\pi r^2$



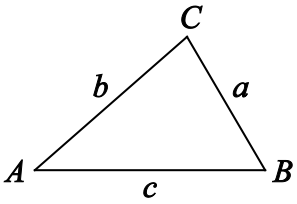
Volume of cone $= \frac{1}{3}\pi r^2 h$

Curved surface area of cone $= \pi r l$



In any triangle ABC

Area of triangle $= \frac{1}{2}ab \sin C$



Sine rule $\frac{a}{\sin A} = \frac{b}{\sin B} = \frac{c}{\sin C}$

Cosine rule $a^2 = b^2 + c^2 - 2bc \cos A$

$$\cos A = \frac{b^2 + c^2 - a^2}{2bc}$$

The Quadratic Equation

The solutions of $ax^2 + bx + c = 0$, where $a \neq 0$, are given by $x = \frac{-b \pm \sqrt{(b^2 - 4ac)}}{2a}$

Trigonometric Identities

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

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

Do not write outside the box

1 A straight line passes through the points (−2, 11) and (1, 2)

Work out the equation of the line.

Give your answer in the form $y = mx + c$

[3 marks]

Answer _____

Turn over for the next question

3

Do not write outside the box

2 Write $\frac{5}{6a}+\frac{a}{4}$ as a single fraction.

Give your answer in its simplest form.

[2 marks]

Answer _____

Do not write outside the box

3 Work out the **smallest** integer value of x that satisfies the inequality $8 - 5x < 26$

[2 marks]

Answer _____

4 $p(x - 1) + 2(3x + k) \equiv 4(x + 2)$ where p and k are integers.

Work out the values of p and k.

[4 marks]

Answer $p =$ _____ , $k =$ _____

8

Do not write outside the box

5 Solve $\sqrt[3]{\left(2\sqrt{x}-10\right)}=2$

[3 marks]

$x =$ _____

6 The transformation matrix $\begin{pmatrix} 2a & b \\ -b & -a \end{pmatrix}$ maps the point (3, 4) onto the point (8, −7)

Work out the values of a and b.

[5 marks]

Answer $a =$ _____ , $b =$ _____

Do not write outside the box

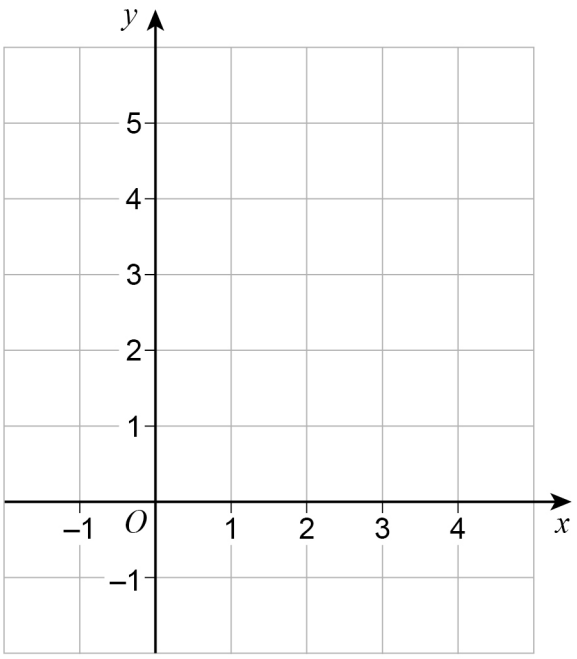
7 A function is given by $f(x) = -2x \quad -1 \leqslant x < 0$

$= x(4 - x) \quad 0 \leqslant x < 3$

$= 2x - 3 \quad 3 \leqslant x \leqslant 4$

Draw the graph of $y = f(x)$ on the grid.

[4 marks]



12

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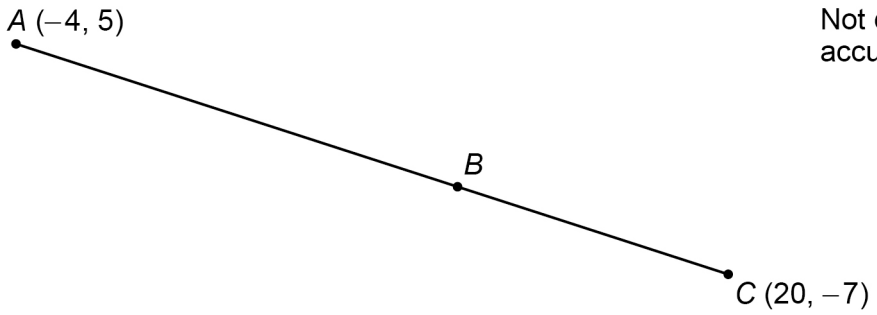
8 *ABC* is a straight line.

A is the point (−4, 5)

C is the point (20, −7)

AB : *BC* = 5 : 3



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Work out the coordinates of *B*.

[4 marks]

Answer (_____ , _____)

Do not write outside the box

9 $y = 2x(x^2 - 5x)$

Circle the expression for $\frac{dy}{dx}$

[1 mark]

$2(2x - 5)$ $6x^2 - 20$ $3x^2 - 10x$ $6x^2 - 20x$

10 Factorise fully $6x^2 + 26xy - 20y^2$

[3 marks]

Answer _____

Turn over for the next question

8

Do not write outside the box

11 A cone has base radius r cm, perpendicular height h cm and slant height l cm

The curved surface area is 60π cm^2

$l = 3r$

Work out the value of h.

Give your answer in the form $a\sqrt{10}$ where a is an integer greater than 1

You **must** show your working.

[5 marks]

Answer _____

Do not write outside the box

12 A curve has the equation $y = x^3 + ax^2 - 7$ where a is a constant.

The gradient of the curve when $x = 4$ is **twice** the gradient of the curve when $x = -1$

Work out the value of a.

You **must** show your working.

[5 marks]

Answer _____

Turn over for the next question

10

Do not write outside the box

13 Prove that $(3x + 5)^2 - 5x(x + 10) \geqslant 0$ for all values of x.

[4 marks]

Do not write outside the box

14 Here are two transformations.

A Rotation 90° clockwise about the origin.

B Reflection in the line $y = x$

Use matrix multiplication to work out the single matrix which represents the combined transformation A followed by B.

[4 marks]

Answer _____

Turn over for the next question

8

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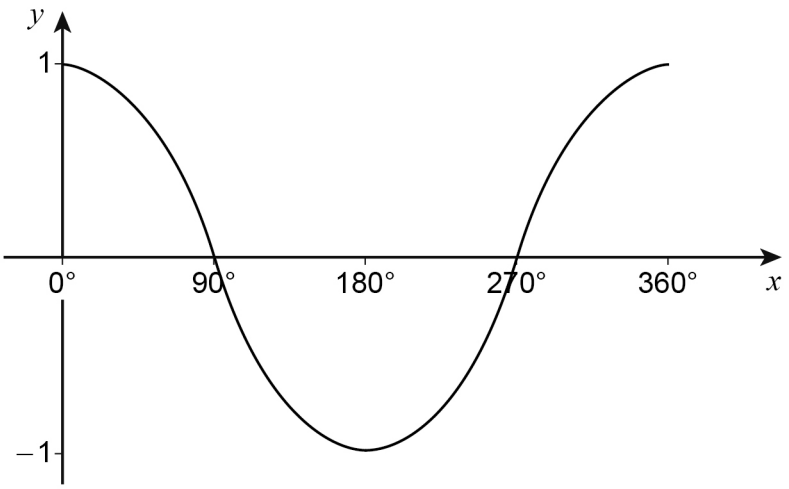
15 Here is a sketch graph of $y = \cos x$ for $0° \leqslant x \leqslant 360°$



You are given that $\cos 36° = 0.8090$

Solve $\cos x = -0.8090$ for $0° \leqslant x \leqslant 360°$

[2 marks]

Answer _____

Do not write outside the box

16 Rationalise the denominator and simplify fully $\dfrac{21-11\sqrt{5}}{3-\sqrt{5}}$

[4 marks]

Answer _____

Turn over for the next question

6

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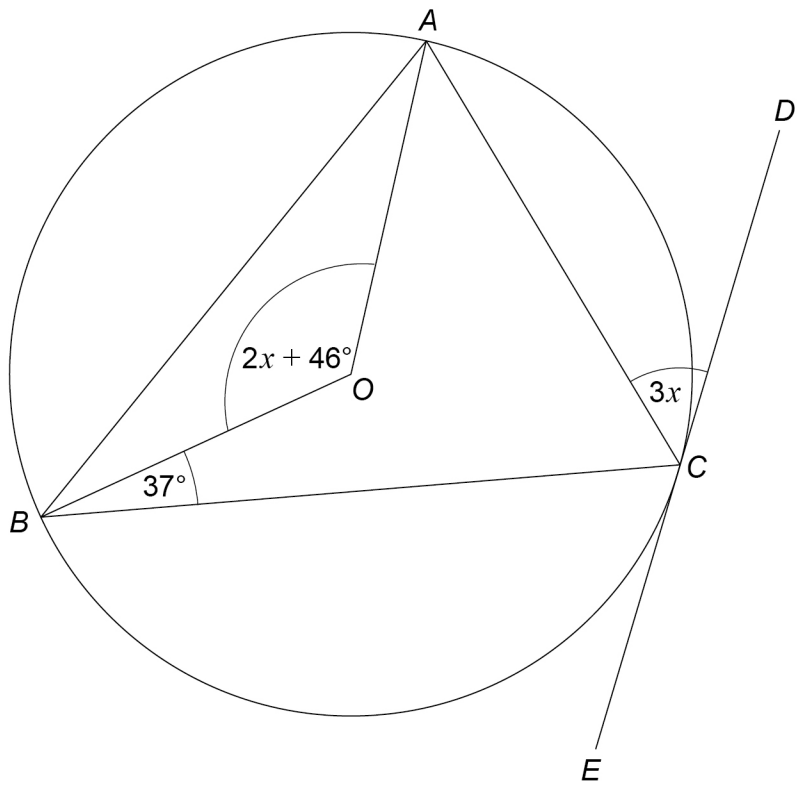
17 *A*, *B* and *C* are points on the circumference of a circle, centre *O*.

ECD is a tangent to the circle at *C*.

Angle *AOB* = $2x + 46°$

Angle *OBC* = 37°

Angle *ACD* = $3x$



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Work out the value of x.

[4 marks]

Answer _____ degrees

Turn over for the next question

4

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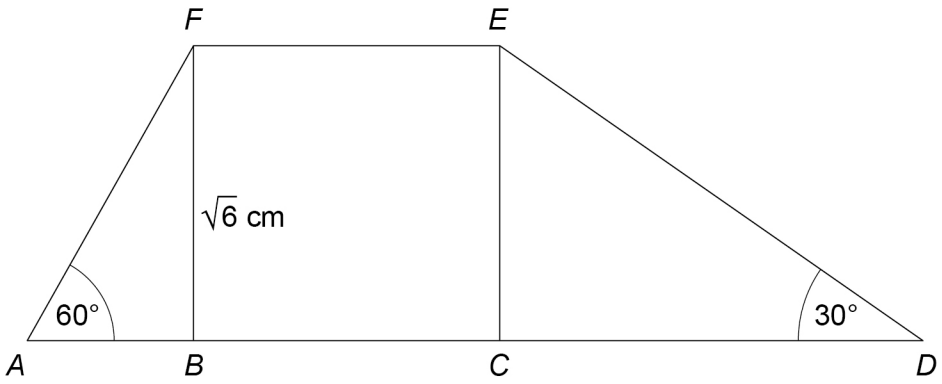
18 *ADEF* is a trapezium.

ABCD is a straight line.

BCEF is a square of side $\sqrt{6}$ cm



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18 (a) Show that $AB = \sqrt{2}$ cm

[1 mark]

18 (b) Show that $DE = 2\sqrt{6}$ cm

[1 mark]

Do not write outside the box

18 (c) Work out the perimeter of the trapezium *ADEF*.

Give your answer in the form $t\sqrt{2} + w\sqrt{6}$ where t and w are integers.

You **must** show your working.

[3 marks]

Answer _____ cm

Turn over for the next question

5

Do not write outside the box

19 $f(x) = \dfrac{x-3}{2x}$

Solve $f(x+1) - f(2x) = 0.5$

You **must** show your working.

[6 marks]

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Answer _____

END OF QUESTIONS

6

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