

Please write clearly in block capitals.

Centre number

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Candidate number

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Surname

Forename(s)

Candidate signature

Level 2 Certificate FURTHER MATHEMATICS

Paper 1 Non-Calculator

Friday 14 June 2019

Afternoon

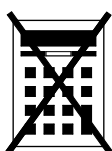
Time allowed: 1 hour 30 minutes

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	



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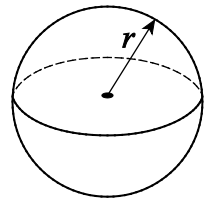
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Formulae Sheet

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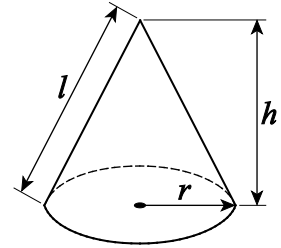
$$\text{Volume of sphere} = \frac{4}{3} \pi r^3$$

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

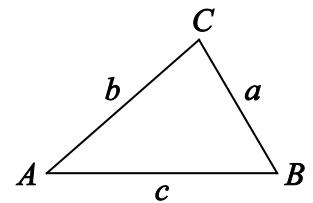


$$\text{Volume of cone} = \frac{1}{3} \pi r^2 h$$

$$\text{Curved surface area of cone} = \pi r l$$

In any triangle ABC

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



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

$$\text{Cosine rule} \quad a^2 = b^2 + c^2 - 2bc \cos A$$

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

The Quadratic Equation

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

Trigonometric Identities

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



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

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- 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

Turn over ►



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

Give your answer in its simplest form.

[2 marks]

Answer _____



- 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 $p =$ _____, $k =$ _____



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

[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]

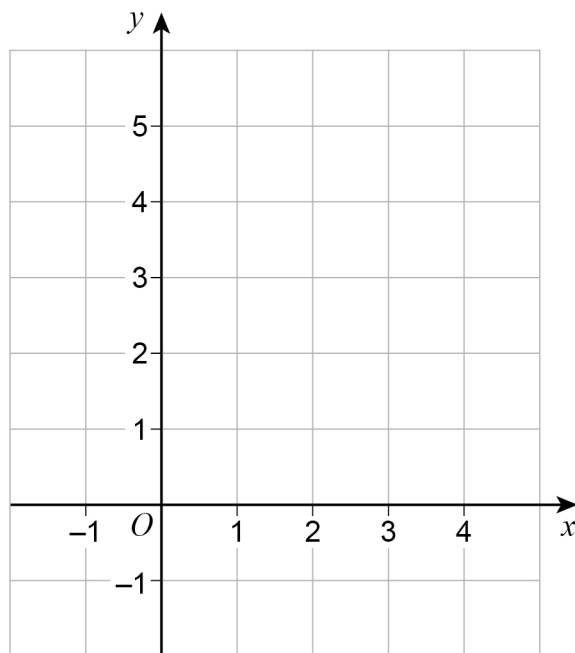
Answer $a =$ _____, $b =$ _____



7 A function is given by $f(x) = -2x \quad -1 \leq x < 0$
 $= x(4 - x) \quad 0 \leq x < 3$
 $= 2x - 3 \quad 3 \leq x \leq 4$

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

[4 marks]



8

ABC is a straight line.

A is the point $(-4, 5)$

C is the point $(20, -7)$

$AB : BC = 5 : 3$

$A (-4, 5)$

Not drawn
accurately

B

$C (20, -7)$

Work out the coordinates of B .

[4 marks]

Answer (_____ , _____)



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



11

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

The curved surface area is $60\pi \text{ cm}^2$

$$l = 3r$$

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 _____



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

Work out the value of a .

You **must** show your working.

[5 marks]

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Answer

Turn over for the next question



[4 marks]

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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 _____

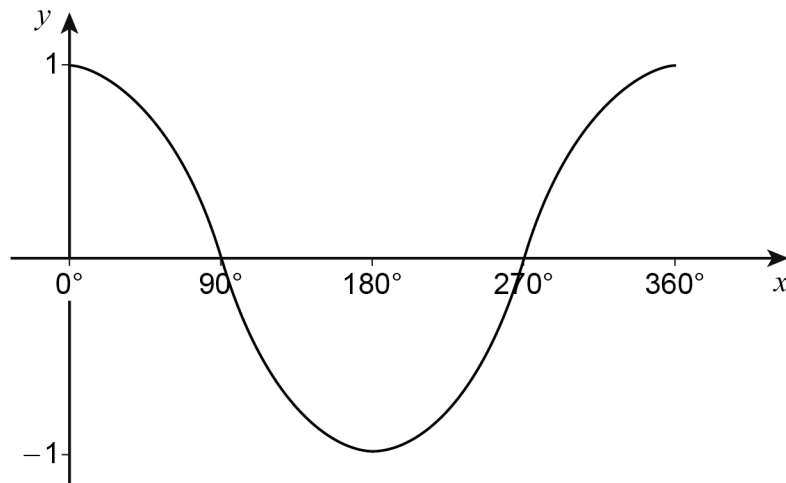
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8

Turn over ►



15 Here is a sketch graph of $y = \cos x$ for $0^\circ \leq x \leq 360^\circ$



You are given that $\cos 36^\circ = 0.8090$

Solve $\cos x = -0.8090$ for $0^\circ \leq x \leq 360^\circ$

[2 marks]

Answer _____



16

Rationalise the denominator and simplify fully

$$\frac{21 - 11\sqrt{5}}{3 - \sqrt{5}}$$

[4 marks]

Answer _____

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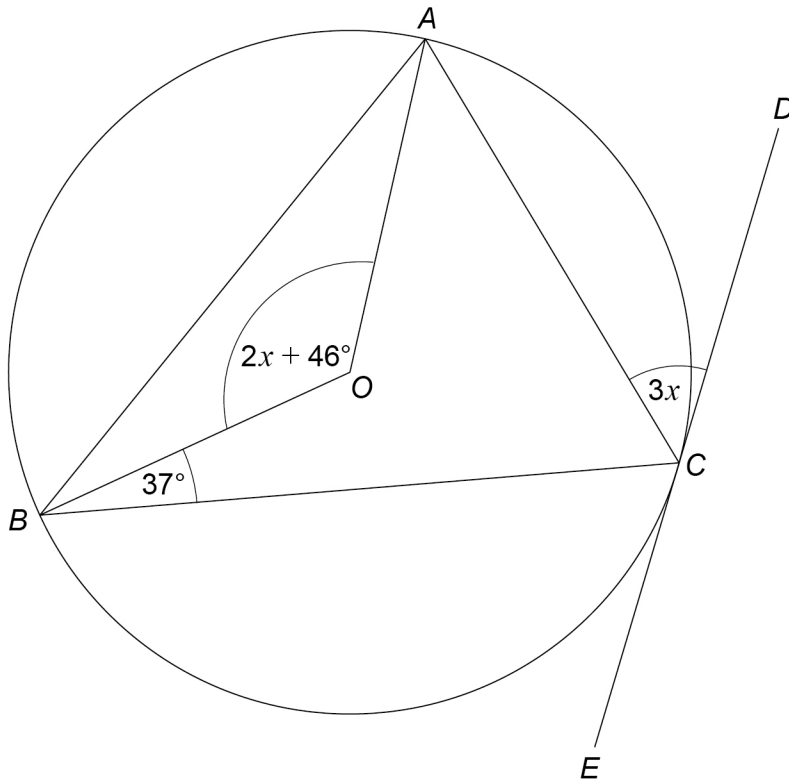
17 A , B and C are points on the circumference of a circle, centre O .

ECD is a tangent to the circle at C .

Angle $AOB = 2x + 46^\circ$

Angle $OBC = 37^\circ$

Angle $ACD = 3x$



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accurately



Work out the value of x .

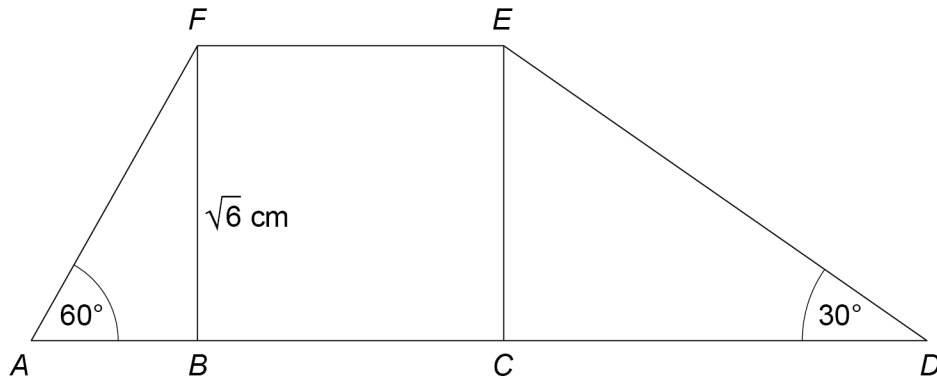
[4 marks]

Answer _____ degrees

Turn over for the next question



18

 $ADEF$ is a trapezium. $ABCD$ is a straight line. $BCEF$ is a square of side $\sqrt{6}$ cm18 (a) Show that $AB = \sqrt{2}$ cm

[1 mark]

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

[1 mark]



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

Turn over ►



19

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

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

You **must** show your working.

[6 marks]

Answer _____

END OF QUESTIONS



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



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