

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

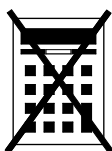
Afternoon

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	

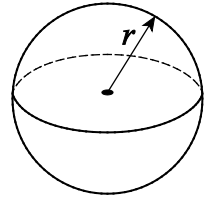


Formulae Sheet

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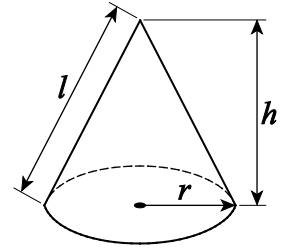
$$\text{Volume of sphere} = \frac{4}{3}\pi r^3$$

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



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

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



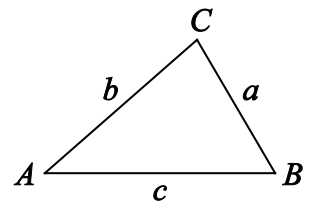
In any triangle ABC

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

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

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

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



The Quadratic Equation

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

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



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 $a =$ _____, $b =$ _____

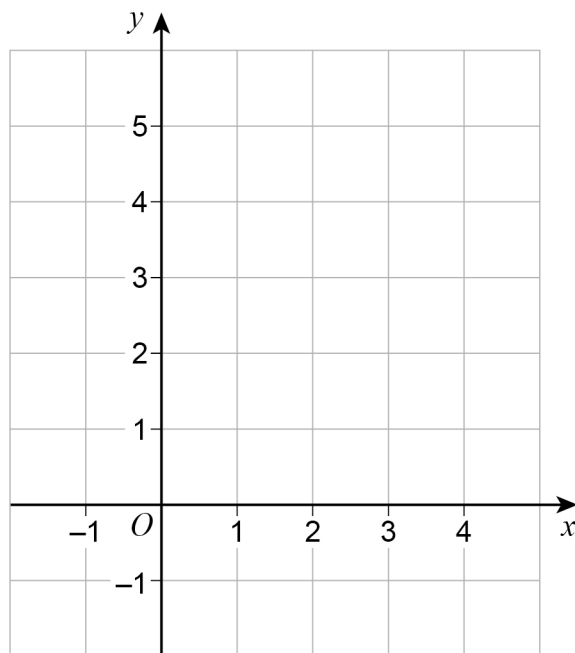


7 A function is given by

$$f(x) = -2x \quad -1 \leq x < 0$$
$$= x(4 - x) \quad 0 \leq x < 3$$
$$= 2x - 3 \quad 3 \leq x \leq 4$$

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

[4 marks]



8

ABC is a straight line.

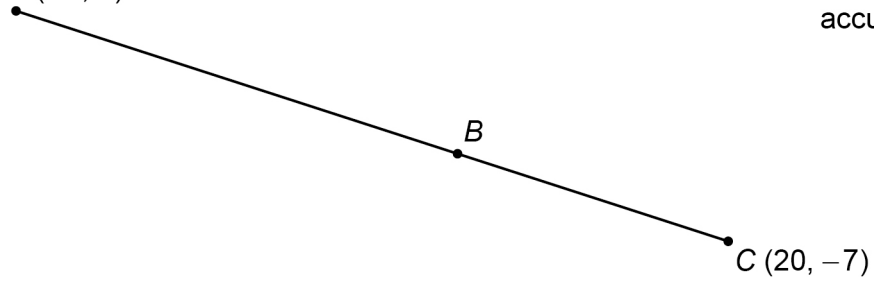
A is the point $(-4, 5)$

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

$AB : BC = 5 : 3$

$A(-4, 5)$

Not drawn
accurately



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 60π cm²

$$l = 3r$$

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 _____



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]

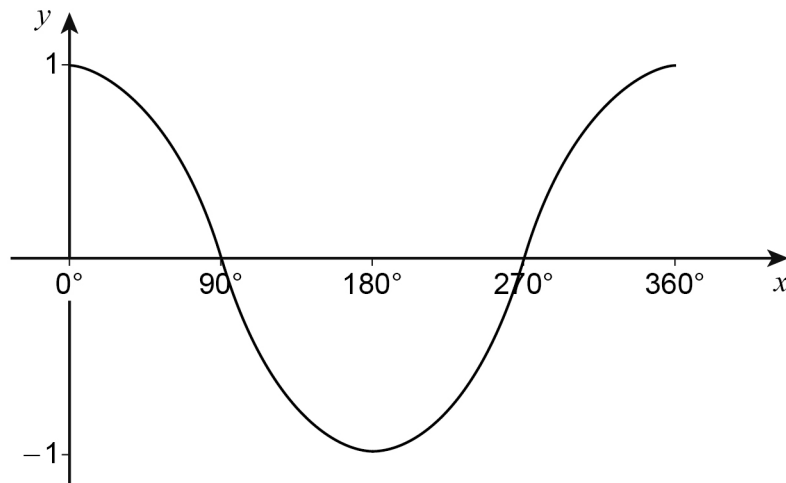
Answer _____

Turn over for the next question

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 _____

Turn over for the next question

6

Turn over ►



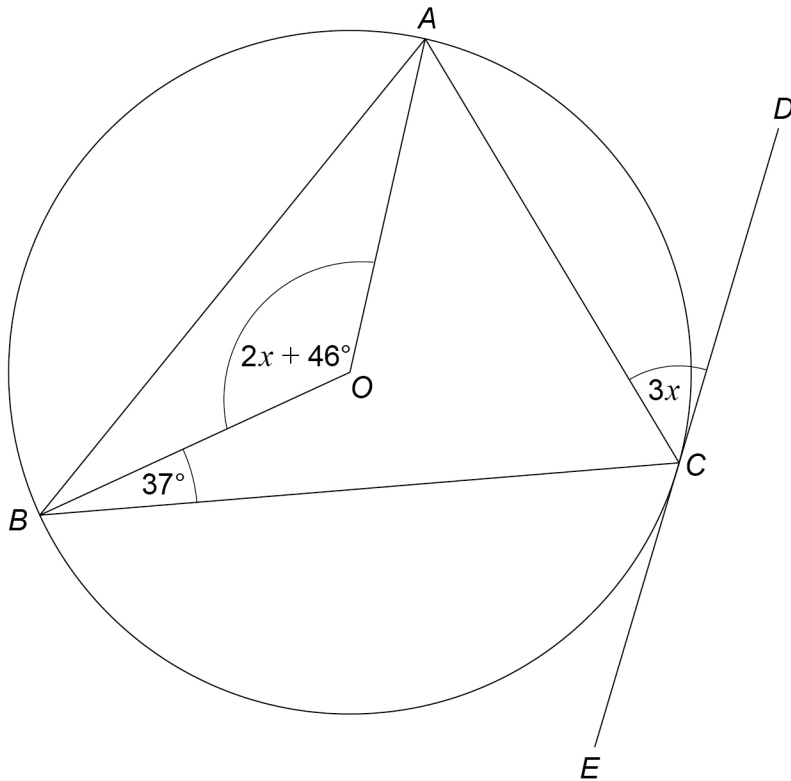
17 A , B and C are points on the circumference of a circle, centre O .

ECD is a tangent to the circle at C .

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

Angle $OBC = 37^\circ$

Angle $ACD = 3x$



Not drawn
accurately



Work out the value of x .

[4 marks]

Answer _____ degrees

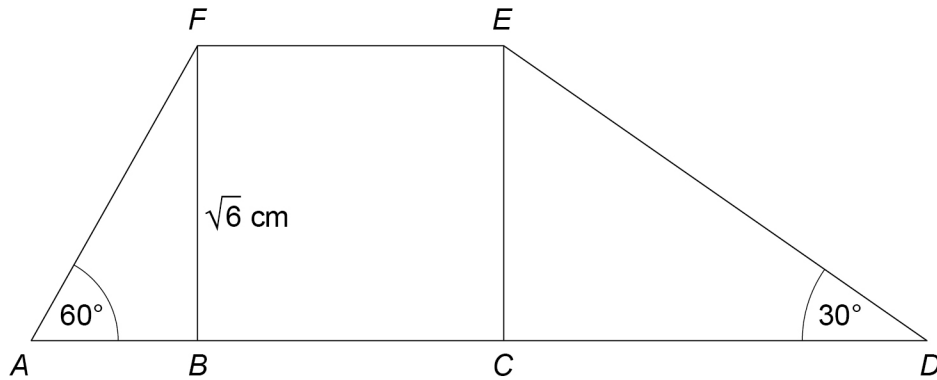
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4

Turn over ►



18

 $ADEF$ is a trapezium. $ABCD$ is a straight line. $BCEF$ is a square of side $\sqrt{6}$ cmNot drawn
accurately18 (a) Show that $AB = \sqrt{2}$ cm

[1 mark]

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

[1 mark]



19

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

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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