

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

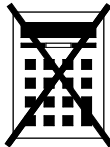
Paper 1 Non-Calculator

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	



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

box

- 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 _____

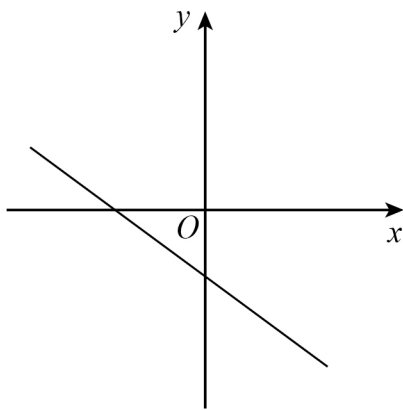


3 Here are four sketch graphs.

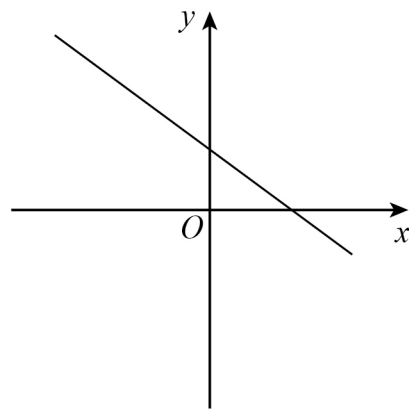
Circle the letter of the sketch graph that represents $3x + 2y = 5$

[1 mark]

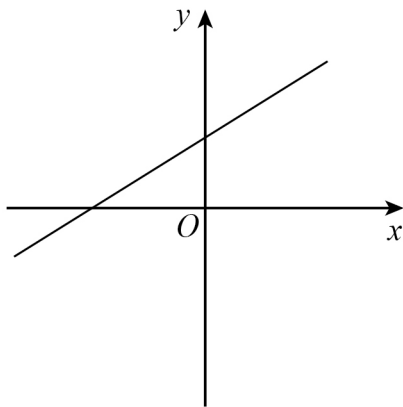
A



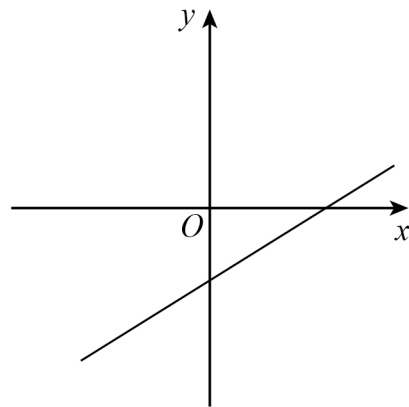
B



C



D



box

6

Turn over ►



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]

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



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

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 $n \rightarrow \infty$

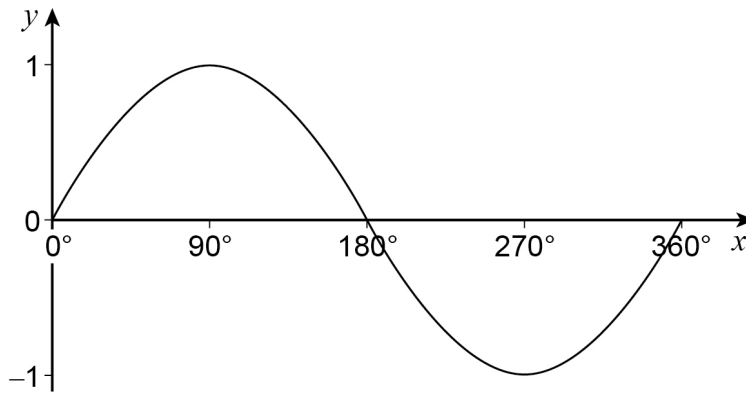
[1 mark]

Answer _____

box



6 Here is a sketch of $y = \sin x$ for $0^\circ \leq x \leq 360^\circ$



You are given that $\sin 220^\circ = -k$

Work out the two values of x for $0^\circ \leq x \leq 360^\circ$ for which $y = k$

[2 marks]

Answer _____ and _____

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

[3 marks]

Answer _____



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

[2 marks]

Answer _____

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

[3 marks]

Answer _____

box



10

The first four terms of a quadratic sequence are

 $0 \quad 1 \quad 0 \quad -3$ Work out an expression for the n th term.**[3 marks]**

Answer _____

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 \mathbf{I} is the identity matrix.Work out the values of a and b .**[4 marks]**

box

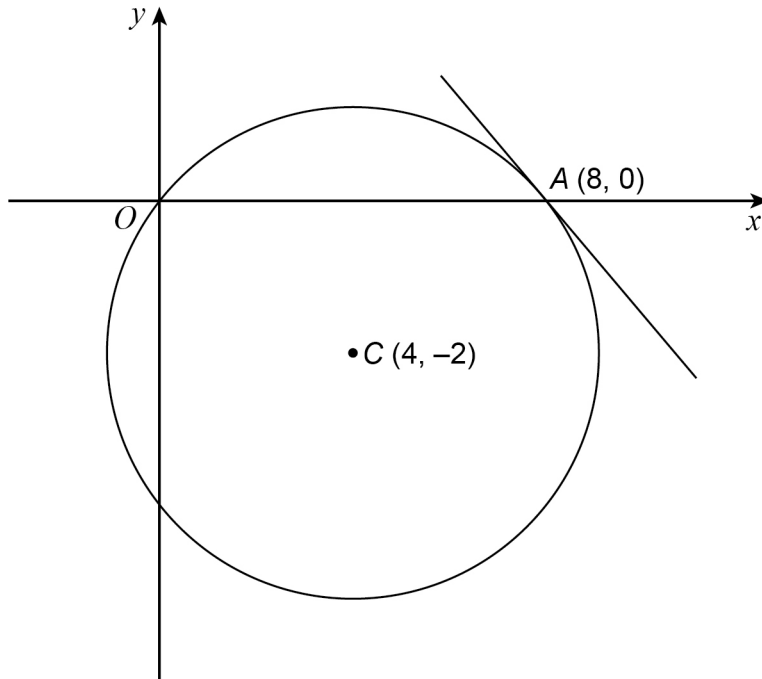
Answer $a =$ _____ $b =$ _____

7

Turn over ►



- 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.



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

[2 marks]

Answer _____



12 (b)

Work out the equation of the tangent to the circle at A.

[3 marks]

box

Answer _____

Turn over for the next question

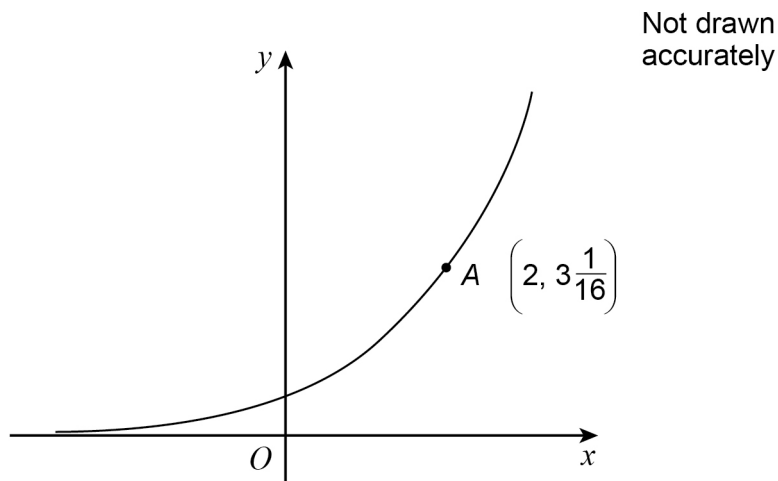
5

Turn over ►



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.



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 _____



15

Work out the value of x where $0^\circ \leq x \leq 90^\circ$ for which $3 \tan^2 x = 1$ **[2 marks]**

box

Answer _____



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 _____

box

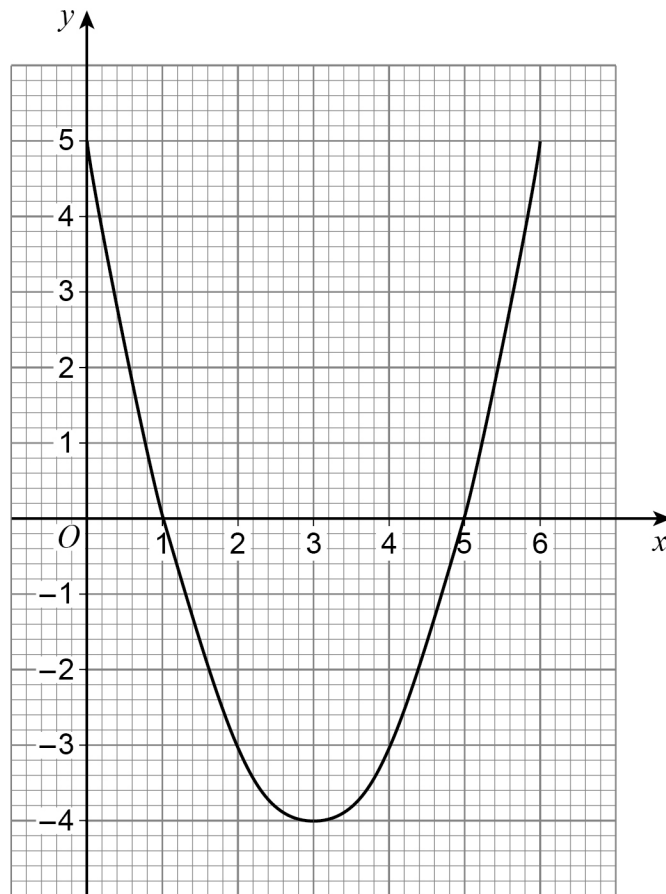
7

Turn over ►



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

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

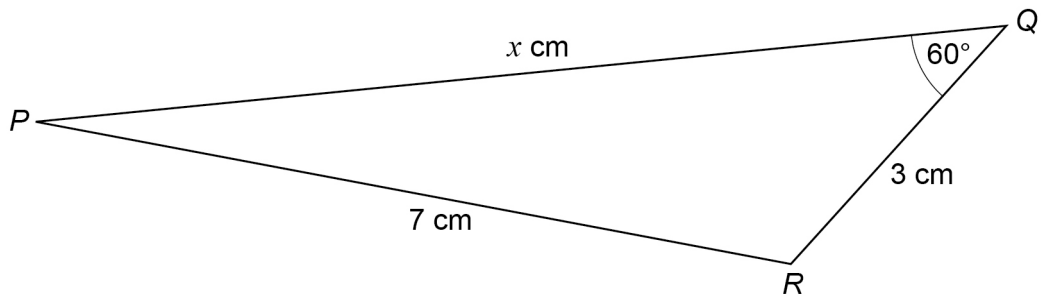
[3 marks]

Answer _____



18

Here is a triangle.

Not drawn
accuratelyUse the cosine rule to work out the value of x .

[4 marks]

Answer _____

box

7

Turn over ►



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

$$y < 0 \quad \text{for} \quad x < 5$$

$$y \geq 0 \quad \text{for} \quad x \geq 5$$

The function is

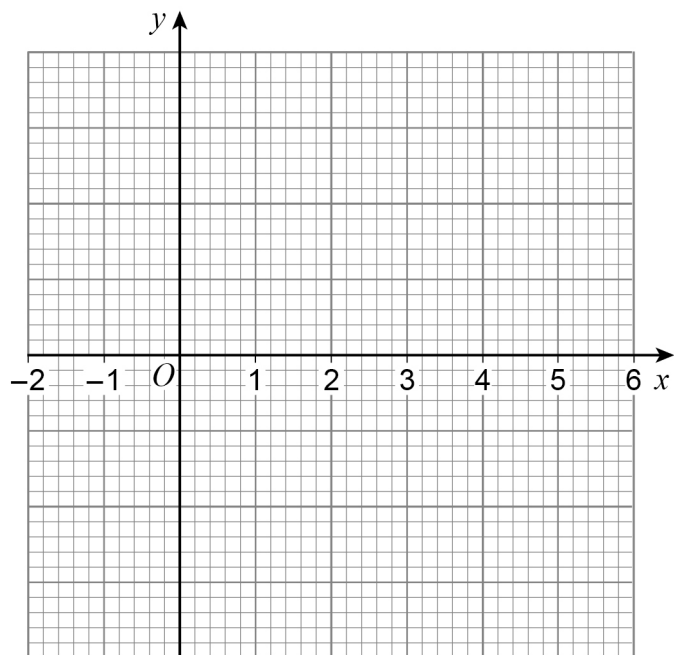
$$\text{increasing for } x < -1$$

$$\text{decreasing for } -1 < x < 2$$

$$\text{increasing for } x > 2$$

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

[4 marks]



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

box

7

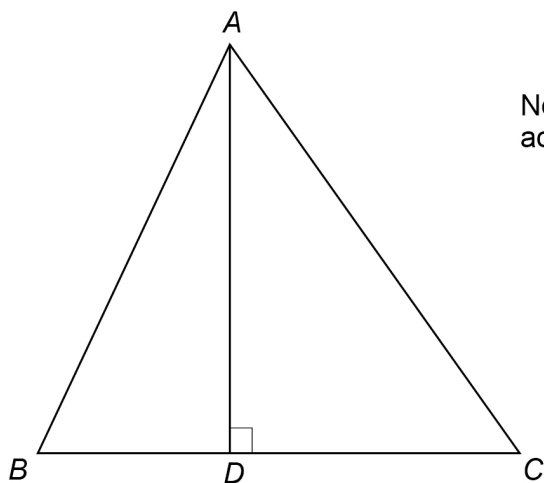
Turn over ►

21

ABC is a triangle.

The perpendicular from A meets BC at D .

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



Not drawn
accurately

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

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



22

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

[4 marks]

$x =$ _____

Turn over for the next question

box

9

Turn over ►



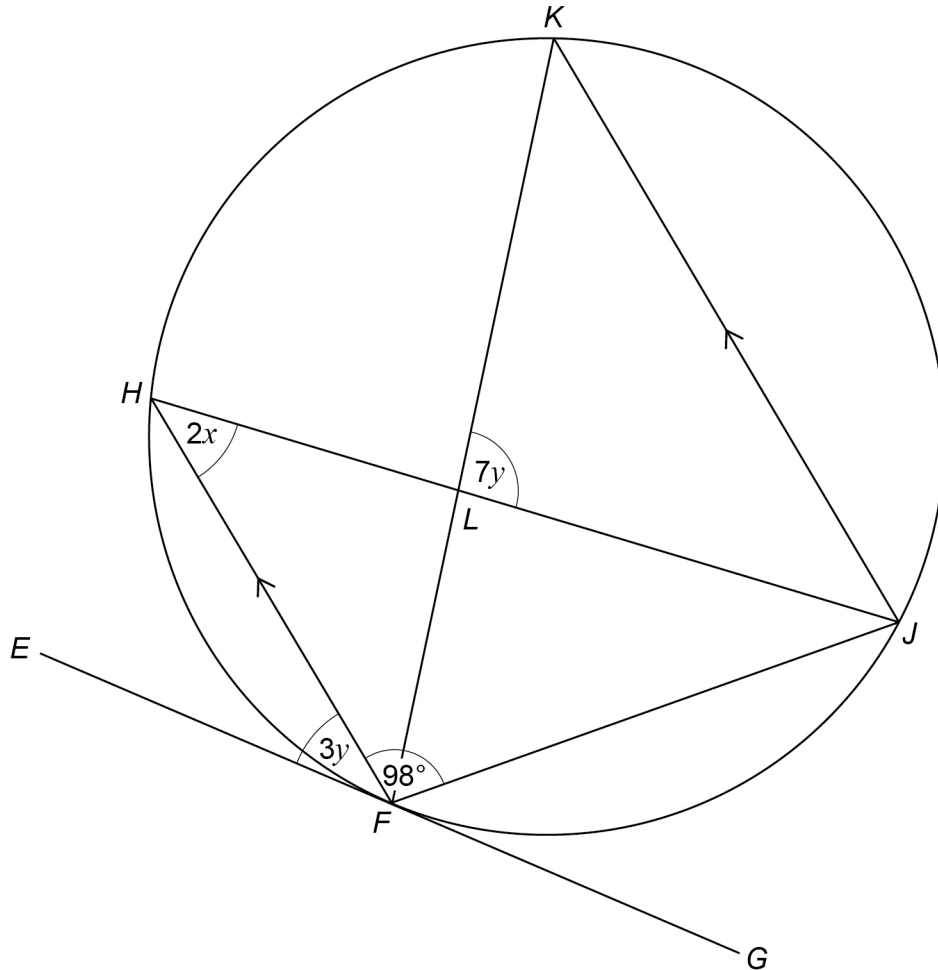
23

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

box

23 (a) Angle $FHJ = 2x$

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

[2 marks]

Angle FKJ _____

Angle HJK _____



23 (b) Work out the values of x and y .
You **must** show your working.
Do **not** use trial and improvement.

[4 marks]

Answer $x = \underline{\hspace{3cm}}$ $y = \underline{\hspace{3cm}}$

END OF QUESTIONS

box



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2 8



2 1 6 G 8 3 6 5 / 1

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