

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

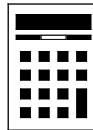
Paper 2 Calculator

Time allowed: 1 hour 45 minutes

Materials

For this paper you must have:

- a calculator
- mathematical instruments
- the Formulae Sheet (enclosed).



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.
- The use of a calculator is expected but calculators with a facility for symbolic algebra must **not** be used.

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	
TOTAL	



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

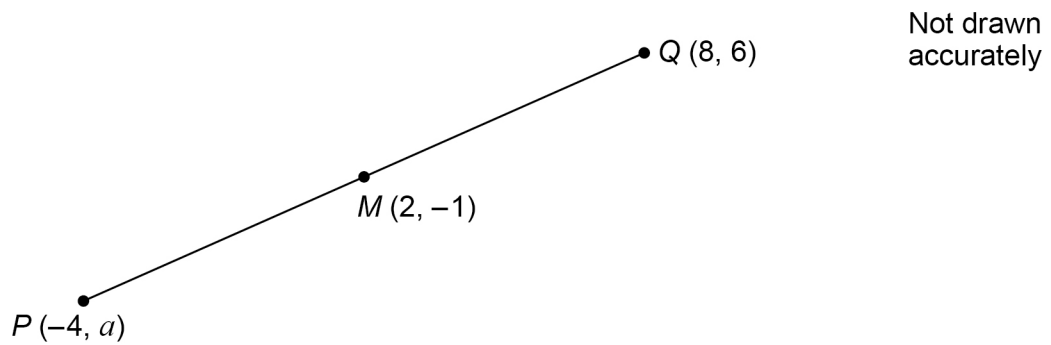
Do not write
outside the
box

1 Factorise fully $12w + 18w^2$

[2 marks]

Answer _____

2 M is the midpoint of PQ .



Work out the value of a .

[2 marks]

Answer _____



3 (a) Work out $3 \begin{pmatrix} 4 & 2 \\ 1 & 0 \end{pmatrix} \begin{pmatrix} 2 & 0 \\ -1 & 5 \end{pmatrix}$

Give your answer as a single matrix.

[3 marks]

Answer _____

3 (b) $\begin{pmatrix} 7 & a^2 \\ b & -5 \end{pmatrix} \begin{pmatrix} 2 \\ a \end{pmatrix} = \begin{pmatrix} 78 \\ 12 \end{pmatrix}$

Work out the values of a and b .

[3 marks]

$a =$ _____ $b =$ _____

10

Turn over ►



- 4 Line A has equation $y + 4x = 6$
Line B is parallel to line A and passes through the point (2, 1)
The point $(d, 2d)$ lies on line B.
Work out the value of d .

[4 marks]

Answer _____

- 5 Work out all the **negative** integer values of x for which $3x^2 < 48$

[3 marks]

Answer _____



6 Prove algebraically that when n is an integer

$$\frac{(2n+1)^2 - (2n-1)^2}{4} \text{ is always even.}$$

[3 marks]

7 How many integers between 200 000 and 400 000 can be formed using only the digits

1 2 3 5 8 9

with no repetition of any digit?

[2 marks]

Answer _____



8 A curve has equation $y = x^3 - 5x^2$
At two points on the curve, the rate of change of y with respect to x is 4

8 (a) Work out an equation, in terms of x , to represent this information.
Give your answer in the form $ax^2 + bx + c = 0$ where a , b and c are integers.

[2 marks]

Answer _____

8 (b) Hence, work out the two possible values of x .
Give your answers to 3 significant figures.

[2 marks]

Answer _____



9 The first three terms of a linear sequence are

$$30 \quad 30 + 4k \quad 30 + 8k$$

where k is a constant.

9 (a) Work out an expression, in terms of k , for the 4th term.
Give your answer in its simplest form.

[1 mark]

Answer _____

9 (b) The 100th term of the sequence is 525

Work out the value of k .

[3 marks]

Answer _____

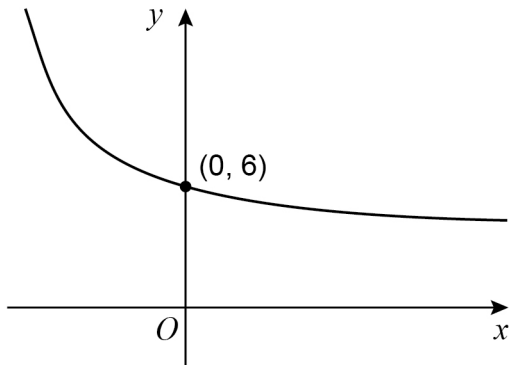


10 Here are four sketch graphs.

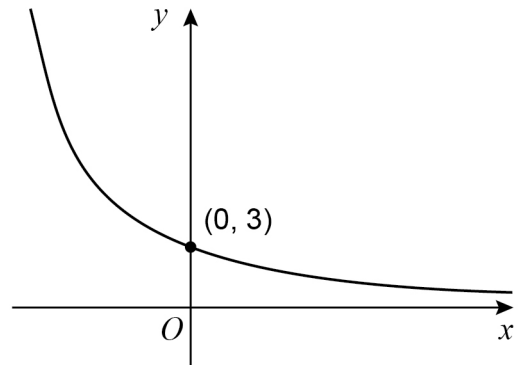
Circle the letter of the sketch graph that represents $y = 3 \times 2^x$

[1 mark]

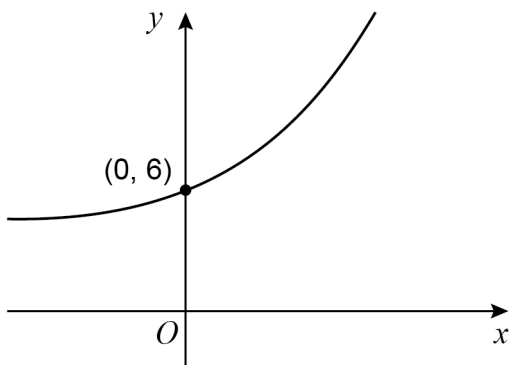
A



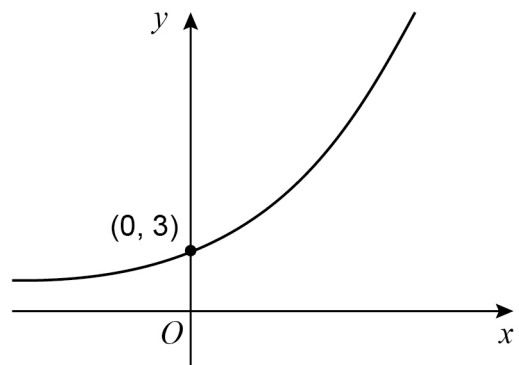
B



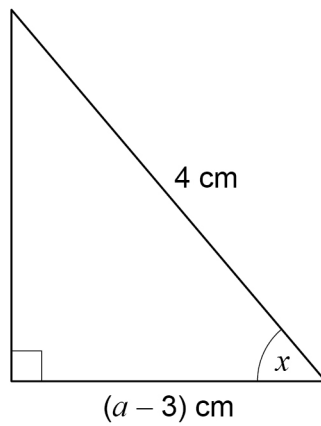
C



D



- 11 Here is a right-angled triangle.



Not drawn
accurately

You are given that $a > 5$

Use trigonometry to work out the range of values of x .

[2 marks]

Answer _____

Turn over for the next question



12

Work out the gradient of the curve $y = \frac{12x^3 - 8x + 3}{4x^2}$

at the point where $x = -1$

You **must** show your working.

[5 marks]

Answer _____



13

$A(-2, 5)$ and $B(4, 13)$ are points on a circle.

AB is a diameter.

Work out the equation of the circle.

Give your answer in the form $(x - a)^2 + (y - b)^2 = c$ where a , b and c are integers.

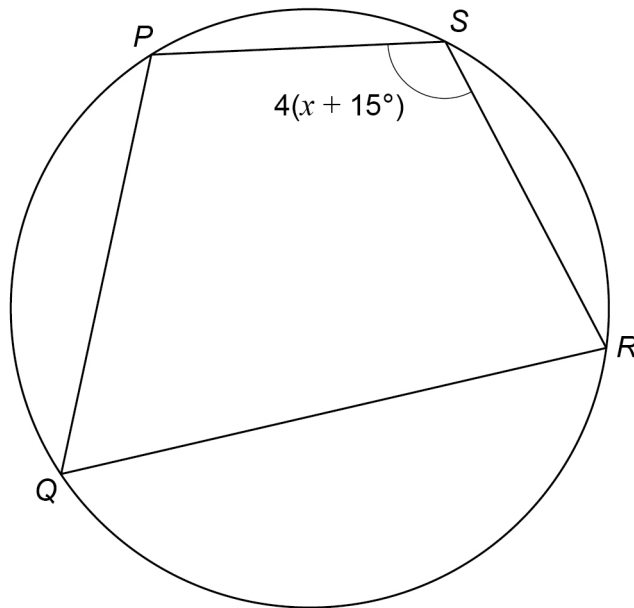
[3 marks]

Answer _____

Turn over for the next question



- 14 $PQRS$ is a cyclic quadrilateral.



Not drawn
accurately

Angle $PSR = 4(x + 15^\circ)$

Angle PQR is 40° smaller than angle PSR .

Work out the value of x .

[3 marks]

Answer _____ degrees



15 Simplify fully $\left(\frac{x}{2} + \frac{3x}{5}\right) \div \sqrt{\frac{x^6}{4}}$ [5 marks]

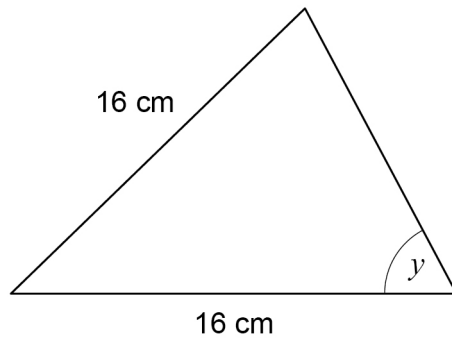
Answer _____

Turn over for the next question



16

Here is an isosceles triangle.
All the angles are acute.



Not drawn
accurately

The area of the triangle is 120 cm^2

Work out the size of angle y .

[4 marks]

Answer _____ degrees



17 Solve the simultaneous equations

$$a + 3b - 2c = 4$$

$$4a - 3b + 5c = -5$$

$$2a + b + 3c = 9$$

Do **not** use trial and improvement.

You **must** show your working.

[5 marks]

$$a = \underline{\hspace{2cm}} \quad b = \underline{\hspace{2cm}} \quad c = \underline{\hspace{2cm}}$$

Turn over ►



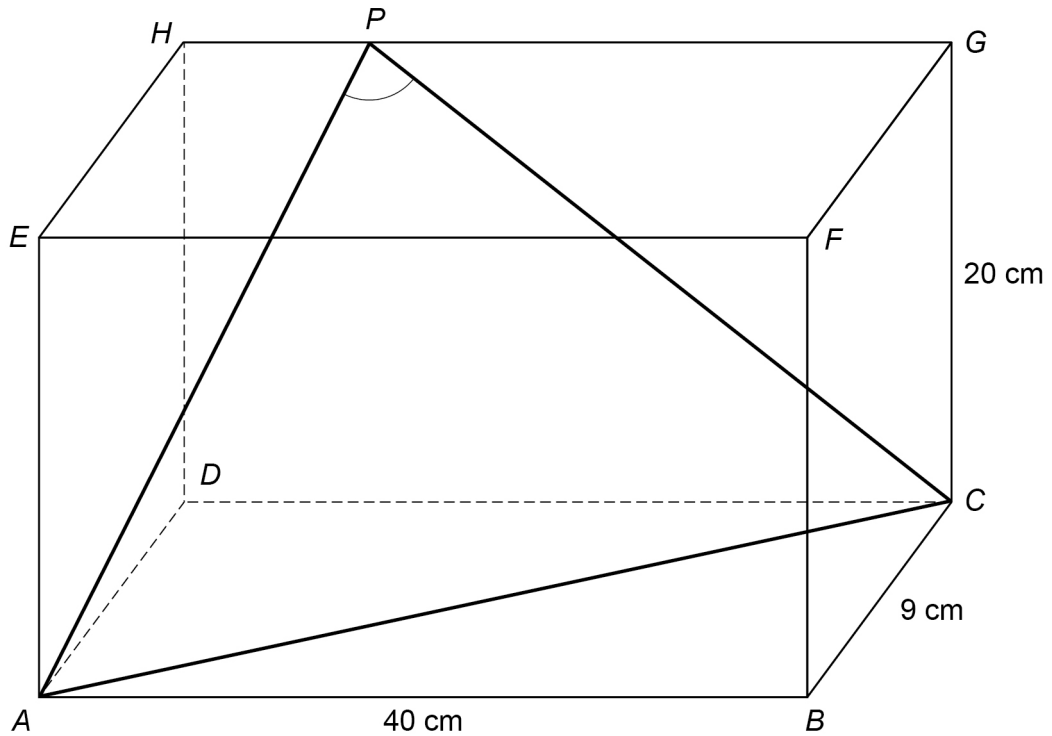
18

 $ABCDEFGH$ is a cuboid.

$$AB = 40 \text{ cm} \quad BC = 9 \text{ cm} \quad CG = 20 \text{ cm}$$

$$P \text{ is a point on } HG \text{ such that } HP : PG = 3 : 7$$

$$AP = 25 \text{ cm}$$

Work out the size of angle APC .**[5 marks]**



Answer _____ degrees

- 19 Expand and simplify fully $(3x + 4)(2x - 3)(5x - 2)$ [3 marks]

Answer _____



21

Work out the values of x between 0° and 360° for which

$$2 \tan^2 x = 3$$

Give your answers to 1 decimal place.

You **must** show your working.**[4 marks]**

Answer _____

Turn over for the next question

22 Using powers of 2 or otherwise, work out the non-zero value of x for which

$$(16^x)^x = \frac{1}{2^{3x}}$$

You **must** show your working.

[4 marks]

Answer _____

END OF QUESTIONS



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outside the
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ANSWER IN THE SPACES PROVIDED**



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