A

AQA

Surname

Other Names

Centre Number

Candidate Number

Candidate Signature

I declare this is my own work.

Level 2 Certificate

FURTHER MATHEMATICS

Paper 2 Calculator

8365/2

Time allowed: 1 hour 45 minutes

At the top of the page, write your surname and other names, your centre number, your candidate number and add your signature.
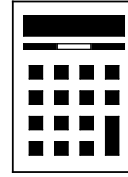
[Turn over]

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.**

- **Answer ALL questions.**

- **You must answer the questions in the spaces provided. Do not write 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.**

DO NOT TURN OVER UNTIL TOLD TO DO SO
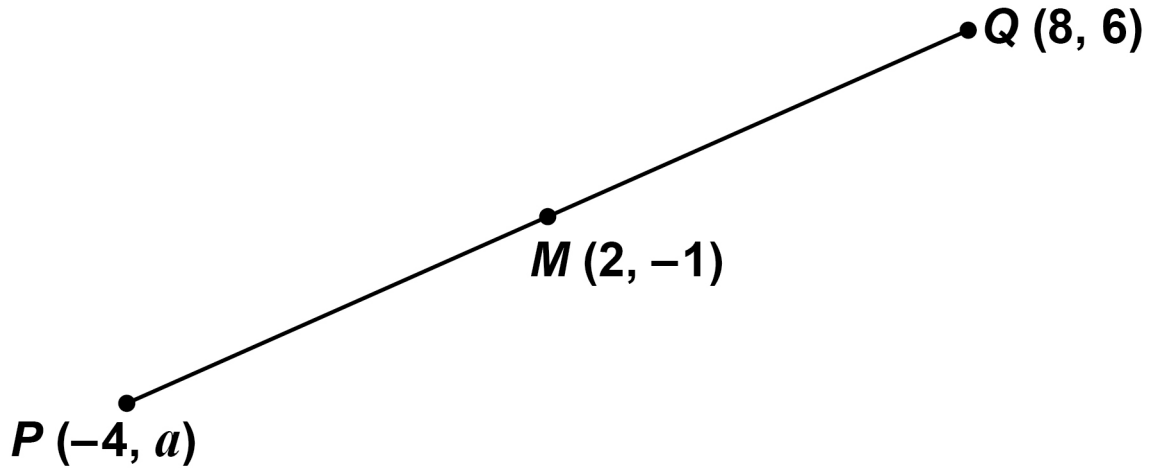
Answer ALL questions in the spaces provided.

1 **Factorise fully** $12w + 18w^2$ **[2 marks]**

_____

_____

_____

Answer _____

2 *M* is the midpoint of *PQ*.

The diagram is not drawn accurately.

P (−4, a)

Work out the value of a. **[2 marks]**

_____

_____

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_____

_____

Answer _____

[Turn over]

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

0 7

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]**

_____

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Answer _____

5   **Work out all the NEGATIVE integer values of x for which $3x^2 < 48$ [3 marks]**

Answer _____

[Turn over]

6   **Prove algebraically that when n is an integer**

$$\frac{(2n+1)^2 - (2n-1)^2}{4}$$ **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]

_____

_____

_____

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_____

Answer _____

[Turn over]

12

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]

_____

_____

_____

_____

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_____

Answer _____

[Turn over]

9   **The first three terms of a linear sequence are**

      30   **30 + 4k**   **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**

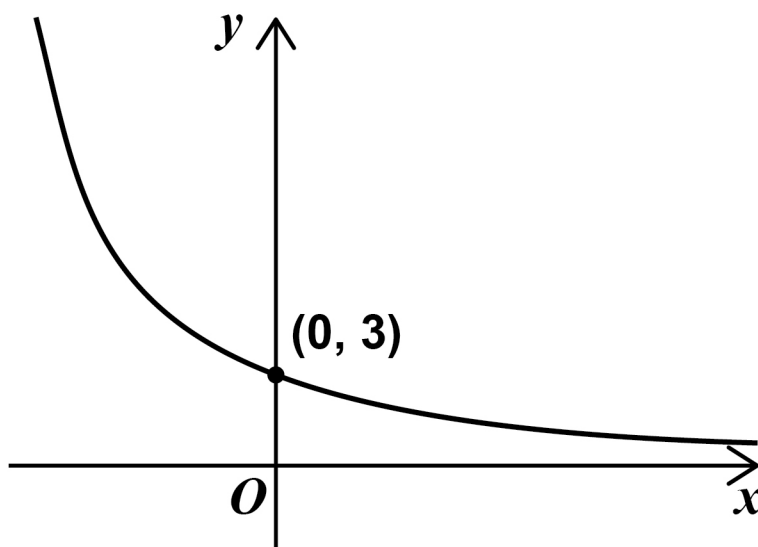**Work out the value of k. [3 marks]**

Answer _____

[Turn over]

8
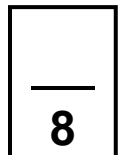
10   There are four sketch graphs below and on the opposite page.

Circle the letter of the sketch graph that represents $y = 3 \times 2^x$ [1 mark]
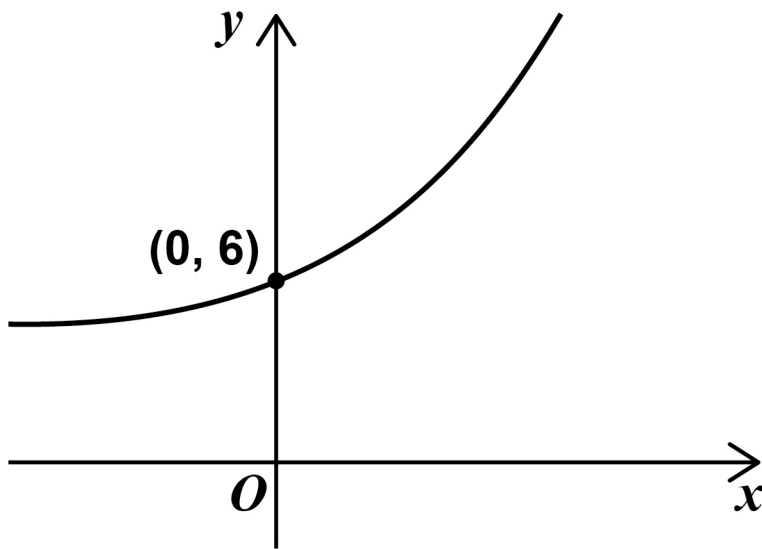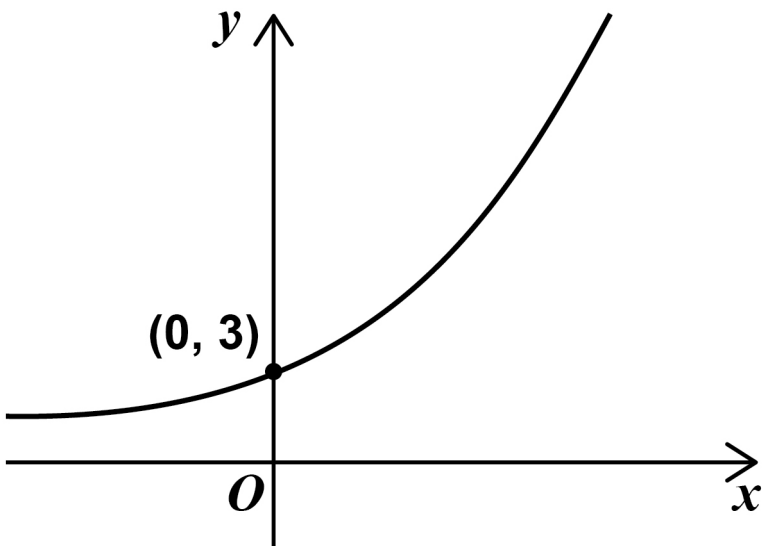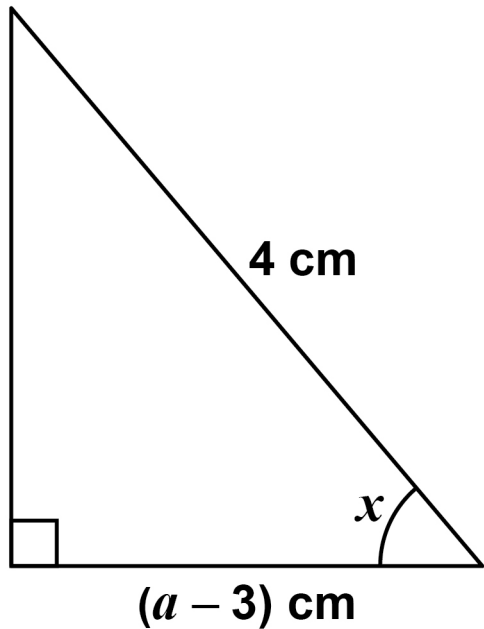
A

(0, 6)

B

(0, 3)

C

D
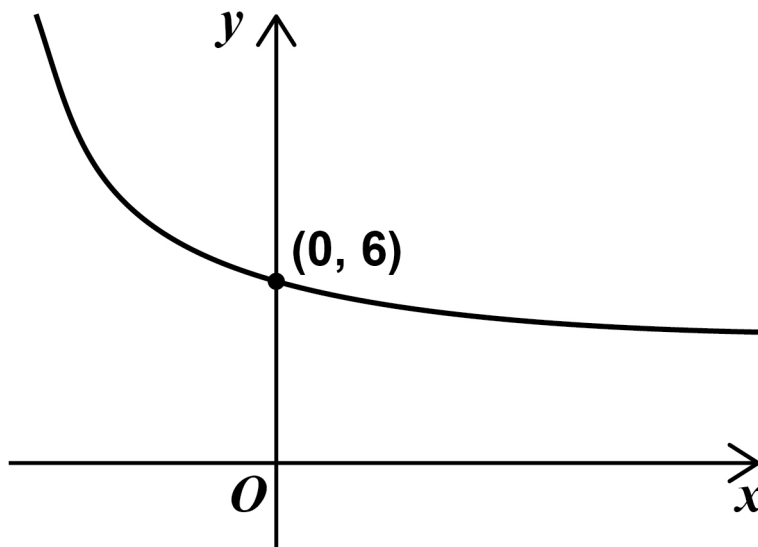
11   **Here is a right-angled triangle.**

The diagram is not drawn accurately.

4 cm

x

$(a - 3)$ cm

You are given that $a > 5$

Use trigonometry to work out the range of values of x. [2 marks]

_____

_____

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_____

Answer _____

[Turn over]

3

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

at the point where $x = -1$

You MUST show your working. **[5 marks]**

_____

_____

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_____

Answer _____

[Turn over]

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]**

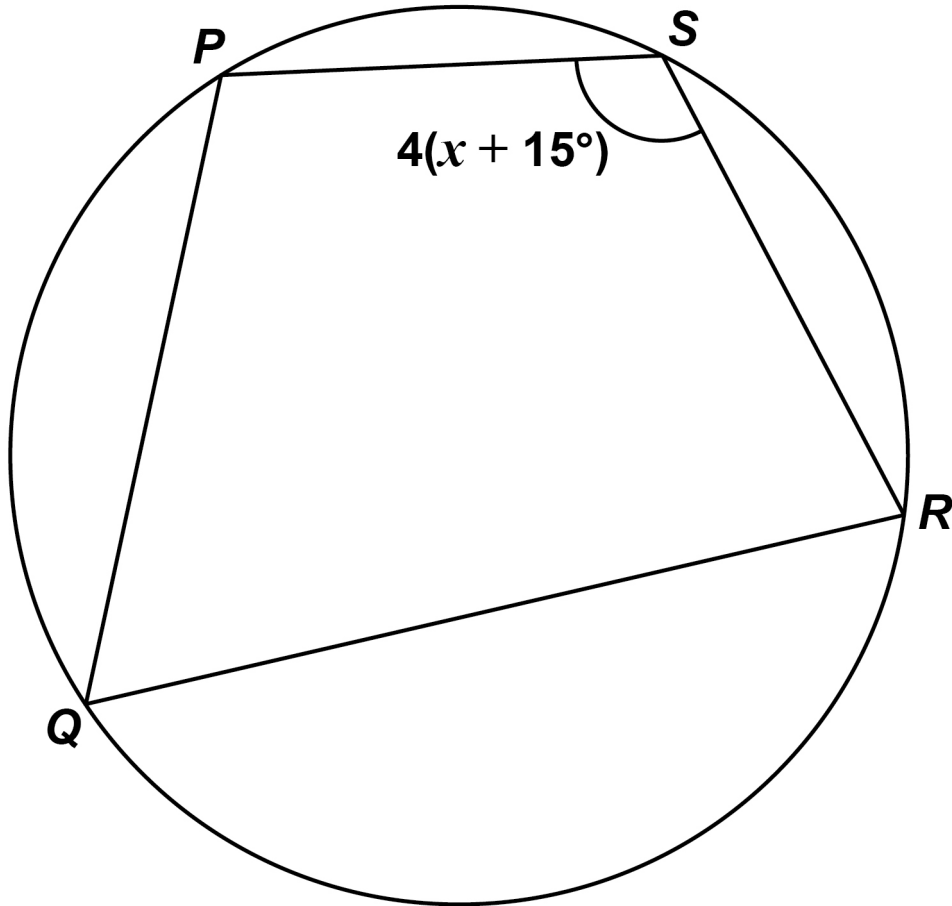_____

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Answer _____

$$\frac{\quad}{8}$$

14   *PQRS* is a cyclic quadrilateral.

The diagram is not drawn accurately.

Angle *PSR* = 4(*x* + 15°)

Angle *PQR* is 40° smaller than angle *PSR*.

Work out the value of *x*. [3 marks]

_____

_____

_____

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_____

_____

_____

_____

Answer _____ **degrees**

[Turn over]

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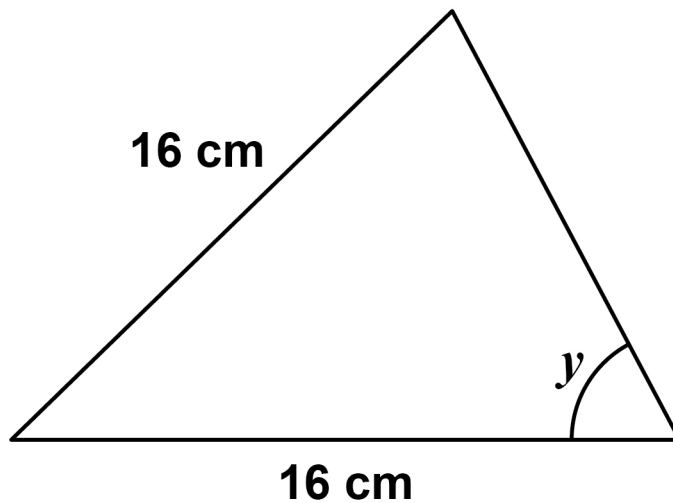
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Answer _____

8

16   Here is an isosceles triangle.

All the angles are acute.

The diagram is not drawn accurately.

16 cm

16 cm

y

The area of the triangle is 120 cm^2

Work out the size of angle y. [4 marks]

_____

_____

_____

_____

_____

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_____

_____

_____

Answer _____ **degrees**

[Turn over]

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]

9

_a_ = _____ _b_ = _____ _c_ = _____

9

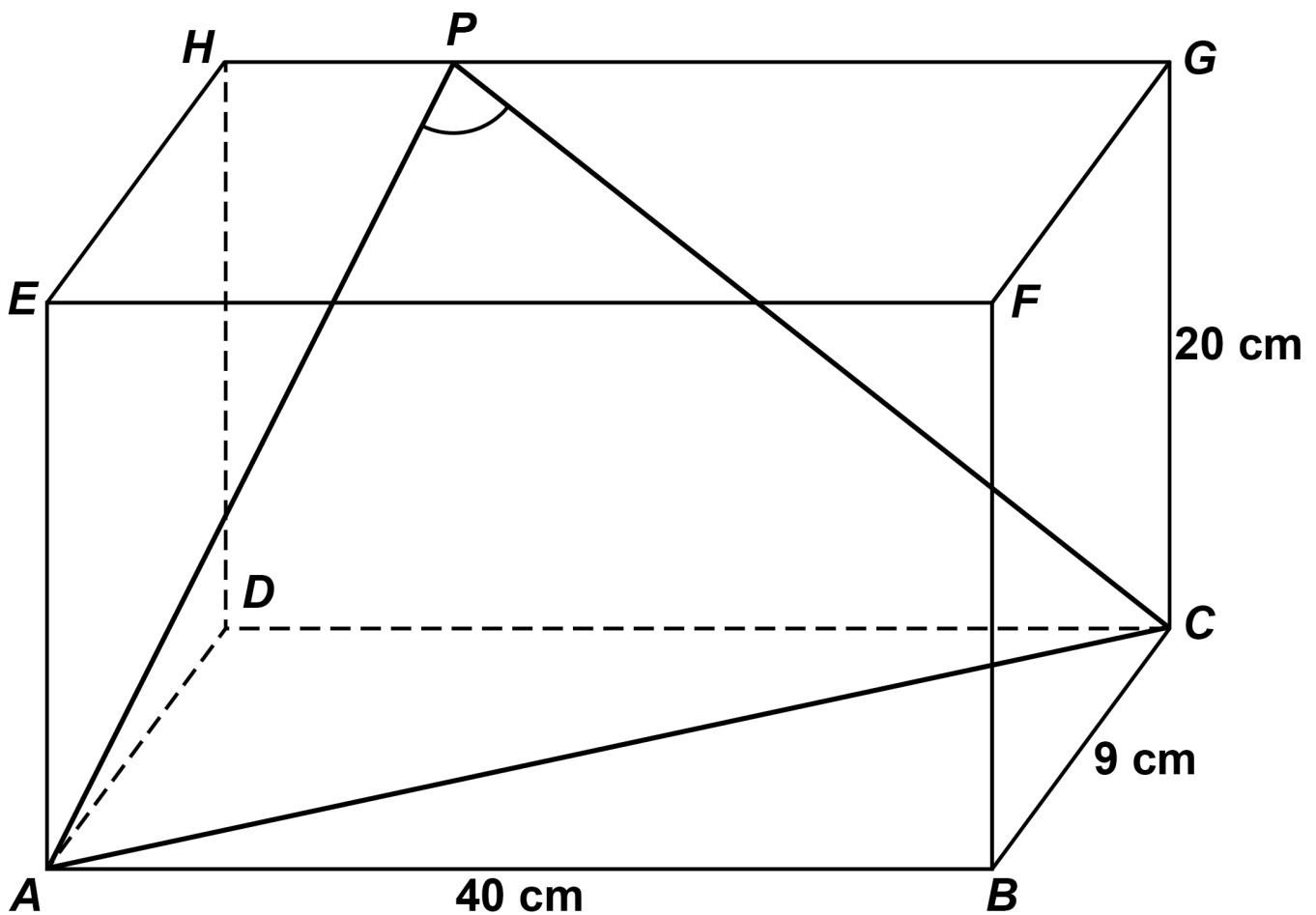18   *ABCDEFGH* is a cuboid.

AB = 40 cm   *BC* = 9 cm   *CG* = 20 cm

P is a point on *HG* such that   *HP* : *PG* = 3 : 7

AP = 25 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 _____

[Turn over]

8
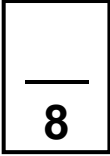
20 $f(x) = 2x^3 + 11x^2 + 12x - 9$

20 (a)   Use the factor theorem to show that $(2x - 1)$ is a factor of f(x). [2 marks]

_____

_____

_____

_____

_____

_____

20 (b)   Show that $f(x) = 0$ has EXACTLY TWO solutions. [4 marks]

_____

_____

_____

_____

_____

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 _____

10

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

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

You MUST show your working. [4 marks]

Answer _____

END OF QUESTIONS

$$\overline{\quad 4 \quad}$$

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

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Write the question numbers in the left-hand margin.

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