Centre Number						Candidate Number				
Surname										
Other Names										
Candidate Signature										

For Examiner's Use	
Examiner's Initials	
Pages	Mark
3	
4 - 5	
6 - 7	
8 - 9	
10 - 11	
12 - 13	
14 - 15	
16 - 17	
18 - 19	
20 - 21	
22	
TOTAL	

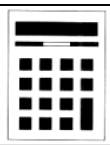
Level 2 Certificate in Further Mathematics

Further Mathematics 8360/2
Level 2

Practice Paper Set 2

Paper 2

Calculator

For this paper you must have:	
• a calculator • mathematical instruments.	

Time allowed
2 hours

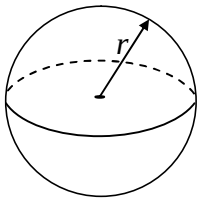
Instructions
- Use black ink or black ball-point pen. Draw diagrams in pencil.
- Fill in the boxes at the top of this page.
- Answer **all** questions.
- You must answer the questions in the space provided. Do not write outside the box around each page or on blank pages.
- Do all rough work in this book. Cross through any work that 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 105.
- You may ask for more answer paper, graph paper and tracing paper. These must be tagged securely to this answer booklet.
- The use of a calculator is expected but calculators with a facility for symbolic algebra must **not** be used.

Formulae Sheet

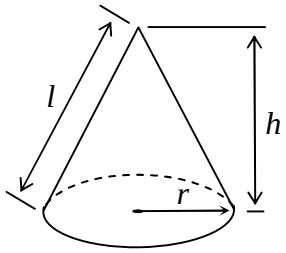
Volume of sphere = $\frac{4}{3}\pi r^3$

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



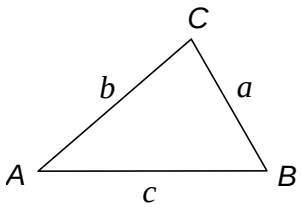
Volume of cone = $\frac{1}{3}\pi r^2 h$

Curved surface area of cone = $\pi r l$



In any triangle *ABC*

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



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

Cosine rule $a^2 = b^2 + c^2 - 2bc\cos A$

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

The Quadratic Equation

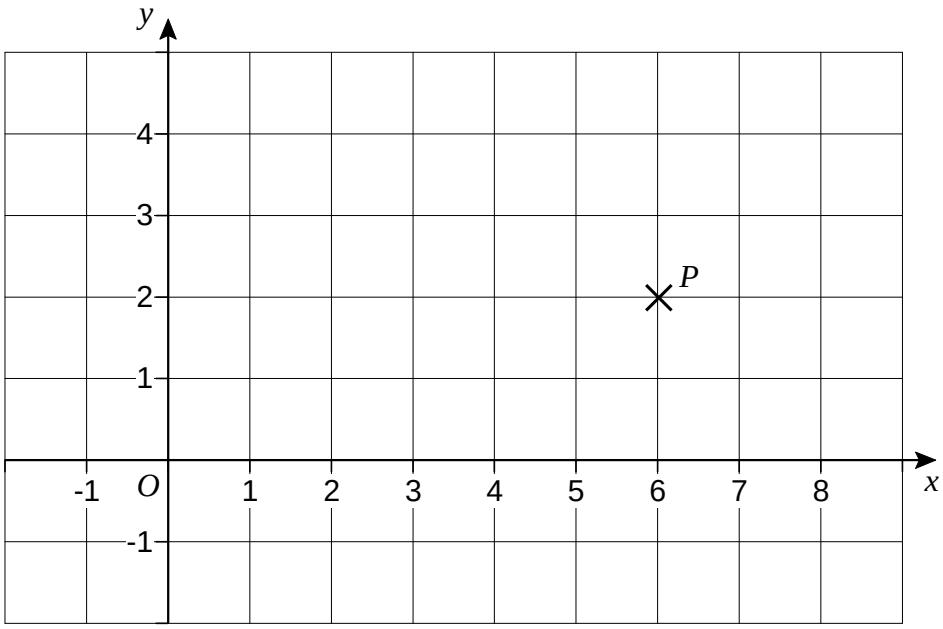
The solutions of $ax^2 + bx + c = 0$, where $a \neq 0$, are given by $x = \frac{-b \pm \sqrt{(b^2 - 4ac)}}{2a}$

Trigonometric Identities

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

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

1 Point P is marked on the grid.



1 (a) Work out the equation of the line that passes through O and P.

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Answer ..... *(2 marks)*

1 (b) Work out the distance OP.

Give your answer to 2 significant figures.

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Answer ..... *(4 marks)*

Turn over for the next question

6

2 Write as single powers of m.

2 (a) $(m^2)^5$

Answer ..... *(1 mark)*

2 (b) $m^{12} \div m^{-4}$

Answer ..... *(1 mark)*

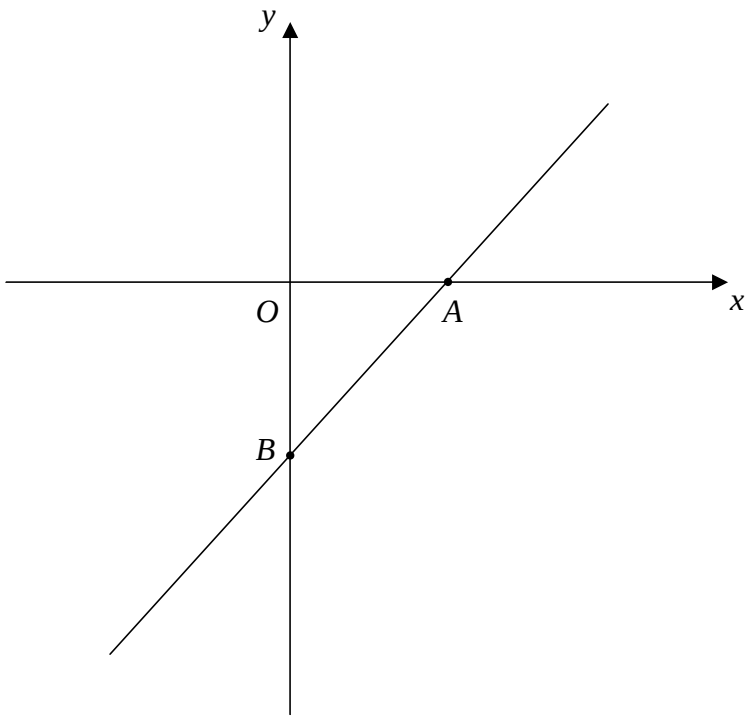
2 (c) $m^{\frac{1}{2}} \times m^{\frac{3}{2}}$

Answer ..... *(1 mark)*

2 (d) $\sqrt{\frac{1}{m^6}}$

Answer ..... *(2 marks)*

3 The line $5x - 2y = 20$ crosses the axes at the points A and B, as shown.



Work out the area of triangle OAB.

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Answer ..... *(4 marks)*

4 Solve $\frac{x-4}{3} + \frac{x}{5} = 2$

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Answer x = ... *(4 marks)*

13

5 The function f(x) is defined as

$$f(x) = x^2 - 4 \qquad 0 \leqslant x < 3$$
$$= 14 - 3x \qquad 3 \leqslant x \leqslant 5$$

5 (a) Work out the value of f(1).

……

Answer ..... *(1 mark)*

5 (b) Work out the value of f(4).

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Answer ..... *(1 mark)*

5 (c) Solve f(x) = 0

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Answer ..... *(3 marks)*

5 (d) Work out the range of f(x).

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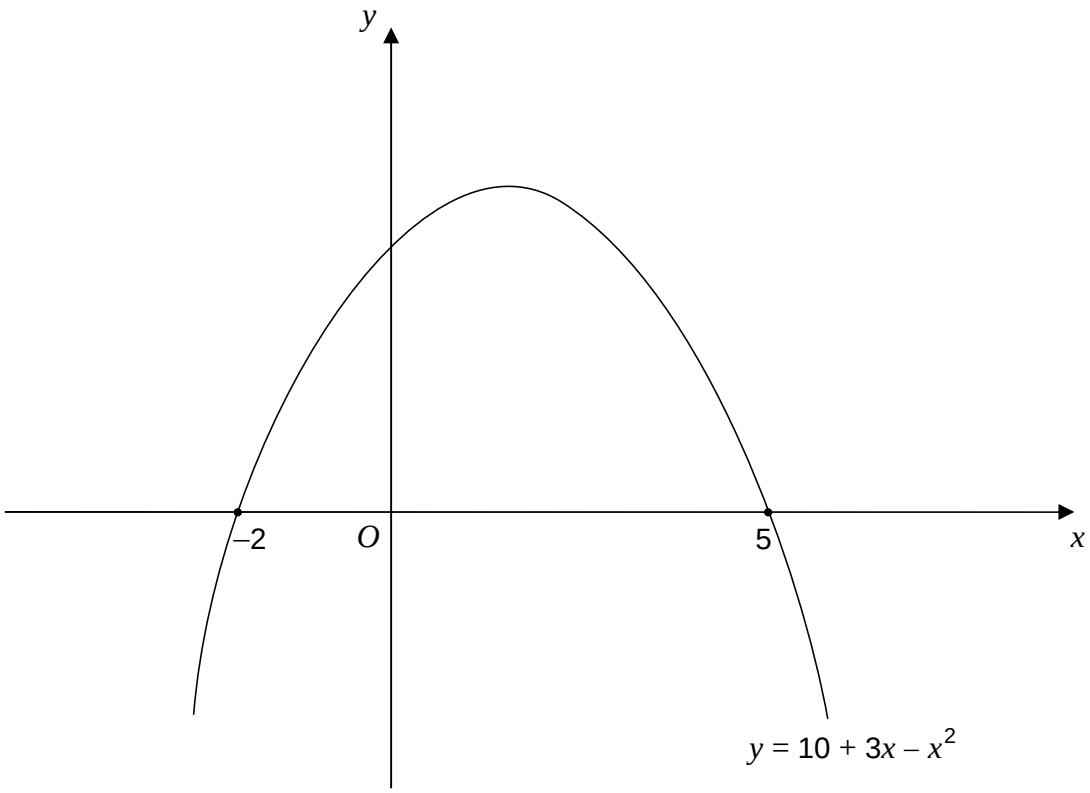
Answer ..... *(3 marks)*

6 Here is a sketch of $y = 10 + 3x - x^2$



6 (a) Write down the two solutions of $10 + 3x - x^2 = 0$

Answer $x =$ ..... and $x =$ ..... *(1 mark)*

6 (b) Write down the equation of the line of symmetry of $y = 10 + 3x - x^2$

Answer ..... *(1 mark)*

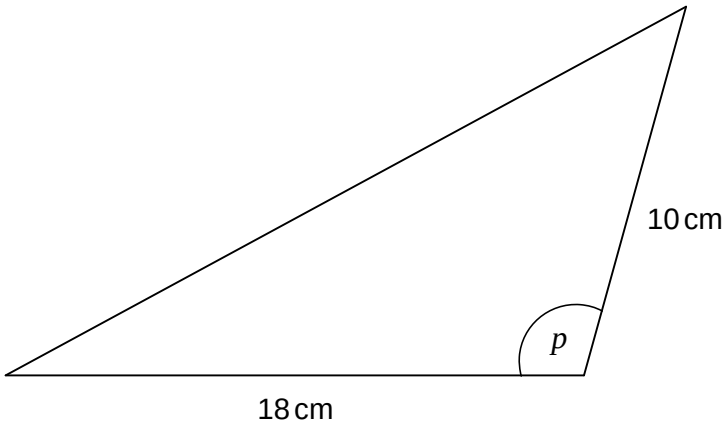
6 (c) Write down the solution of $10 + 3x - x^2 \geqslant 0$

Answer ..... *(2 marks)*

Turn over for the next question

12

7 The area of this triangle is $27\,cm^2$.



Not drawn accurately

Work out the size of obtuse angle p.

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Answer ..... degrees *(3 marks)*

Do not write outside the box

8 *PQR* is a straight line.

P is (–5, 11) and *R* is (16, –3).

PQ : *QR* = 3 : 4

Work out the coordinates of *Q*.

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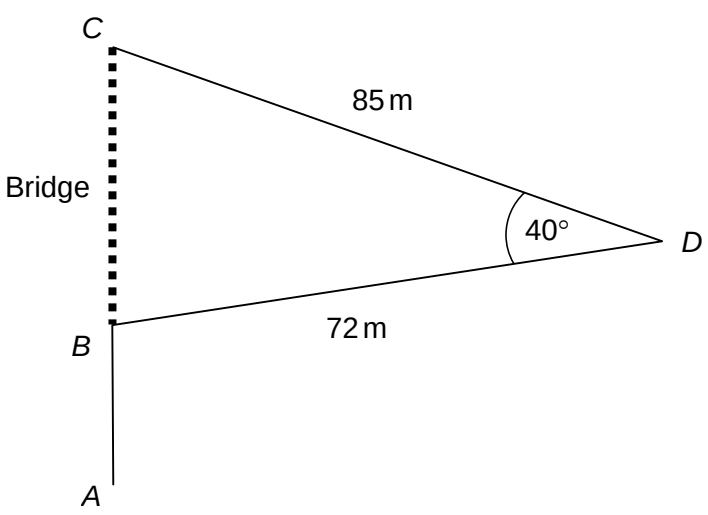
Answer (....., ...) *(4 marks)*

7

9 Sue is walking due North from *A* to *C*.

The bridge between *B* and *C* is closed.
She has to walk along paths *BD* and *DC* instead.



Not drawn accurately

Work out how much further Sue has to walk.

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Answer ..... m *(4 marks)*

10 Simplify fully $\dfrac{9x^3 - 16x}{6x + 8}$

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Answer ..... *(4 marks)*

Do not write outside the box

11 The nth term of sequence X is $an + b$

The nth term of sequence Y is $bn + a$

11 (a) Show that the sequences have the same first term.

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(1 mark)

11 (b) The 2nd term of sequence X is equal to the 3rd term of sequence Y.

Show that $a = 2b$

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(2 marks)

11 (c) Prove that

$$\frac{n\text{th term of sequence } X}{n\text{th term of sequence } Y} = \frac{2n + 1}{n + 2}$$

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(3 marks)

Turn over for the next question

14

Do not write outside the box

12 A curve has equation $y = x^3 - 9x^2 + 24x - 16$

12 (a) Show that the curve passes through the point (1, 0).

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(1 mark)

12 (b) State the coordinates of the point where the curve intersects the y-axis.

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Answer (....., ...) *(1 mark)*

12 (c) Work out $\frac{dy}{dx}$.

Answer ……..... *(2 marks)*

Do not write outside the box

12 (d) Work out the coordinates of the **two** stationary points on the curve.

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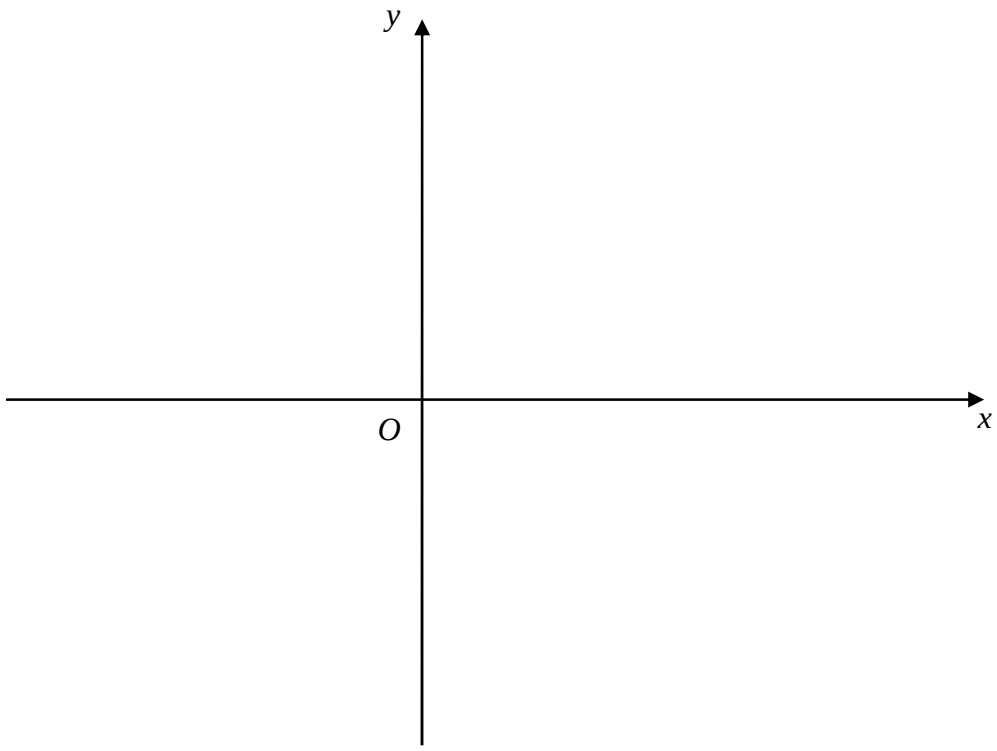
Answer (....., ...) and (....., ...) *(4 marks)*

12 (e) You are given that the curve has one maximum point and one minimum point.

Sketch the curve.

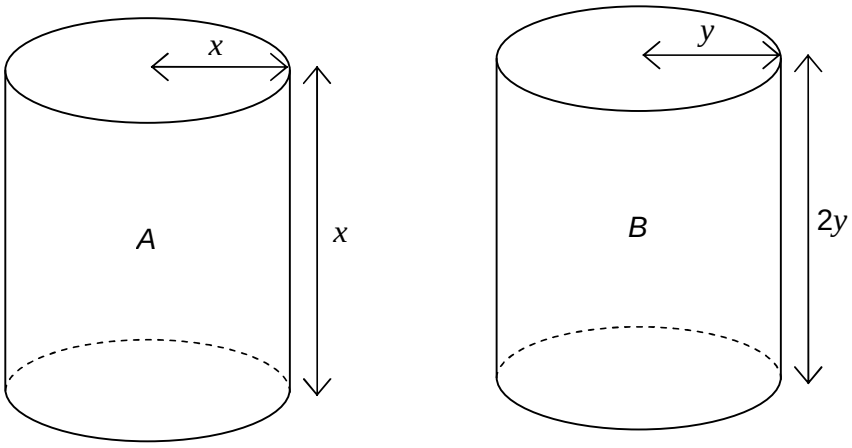


(2 marks)

10

13 Cylinder *A* has radius x cm and height x cm.
Cylinder *B* has radius y cm and height $2y$ cm.

Not drawn accurately



You are given that

total surface area of cylinder *A* = **total** surface area of cylinder *B*

13 (a) Show that $x^2 = \frac{3}{2}y^2$

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(4 marks)

13 (b) Which cylinder has the greater height?
You **must** show your working.

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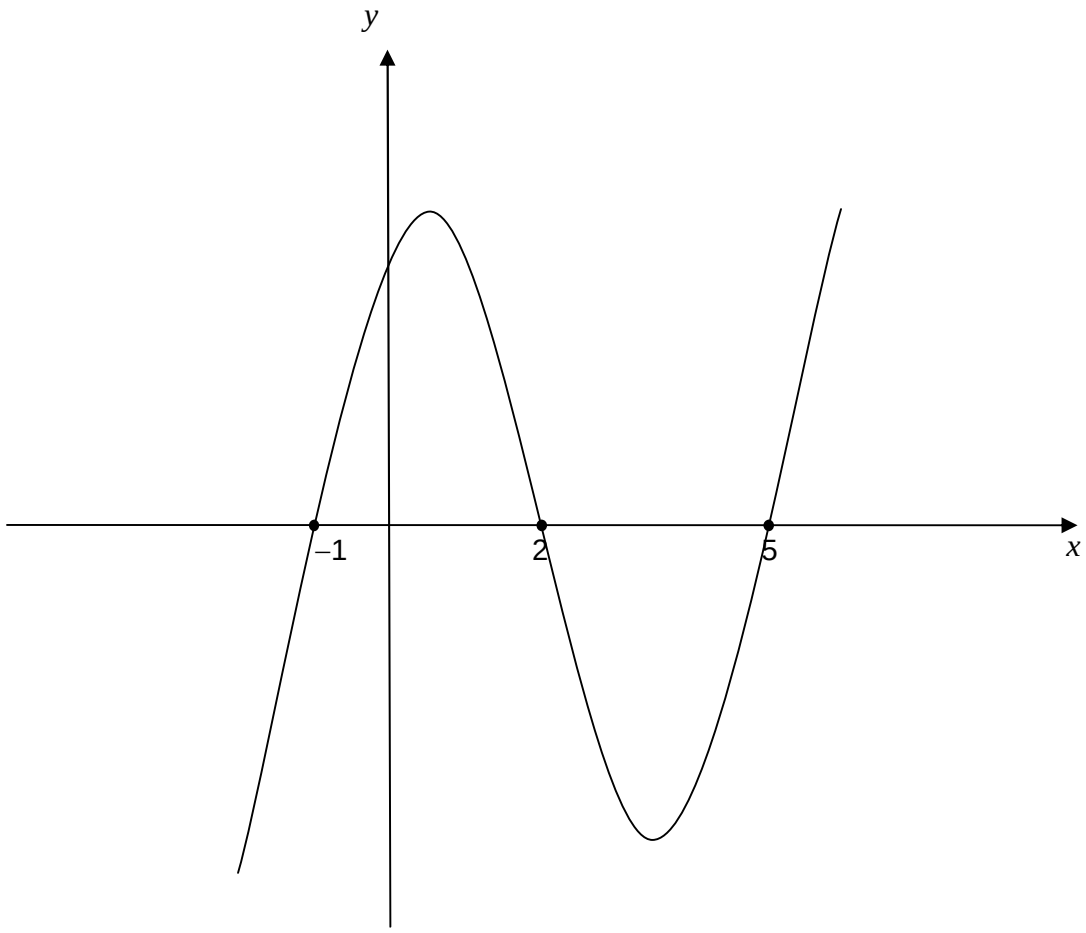
Answer Cylinder ..... *(2 marks)*

Do not write outside the box

14 Here is a sketch of $y = x^3 + bx^2 + cx + d$ where b, c and d are constants.



Work out the values of b, c and d.

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Answer b = ...

c = ...

d = ... *(4 marks)*

10

15 (a) Work out the values of a and b such that

$$x^2 - 6x + 5 \equiv (x + a)^2 + b$$

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Answer a = ...

b = ... *(2 marks)*

15 (b) Rearrange the equation $m = 12 - (p - 1)^2$ to make p the subject.

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Answer ..... *(4 marks)*

Do not write outside the box

16 Matrix $\mathbf{P} = \begin{pmatrix} 2 & 3 \\ a & b \end{pmatrix}$ Matrix $\mathbf{Q} = \begin{pmatrix} 1 & 1 \\ 0 & 1 \end{pmatrix}$

You are given that $\mathbf{PQ} = \mathbf{QP}$

Work out the values of a and b.

Answer $a =$ .....

$b =$ ..... *(5 marks)*

Turn over for the next question

11

17 The population of Japan, J, is 1.30×10^8

The population of Brazil, B, is 1.95×10^8

17 (a) You are given that $J : B = x : x + 5$

Work out the value of x.

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Answer $x =$ ..... *(3 marks)*

17 (b) The population of Pakistan is P.

You are given that $J : P = x : x + 4$

Work out the population of Pakistan.

Give your answer in standard form.

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Answer ..... *(2 marks)*

Do not write outside the box

18 (a) Expand and simplify $(2s + 1)(s - 1)$

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Answer ..... *(2 marks)*

18 (b) Hence, or otherwise, solve $2\sin^2\theta - \sin\theta - 1 = 0$ for $0° \leqslant \theta \leqslant 360°$

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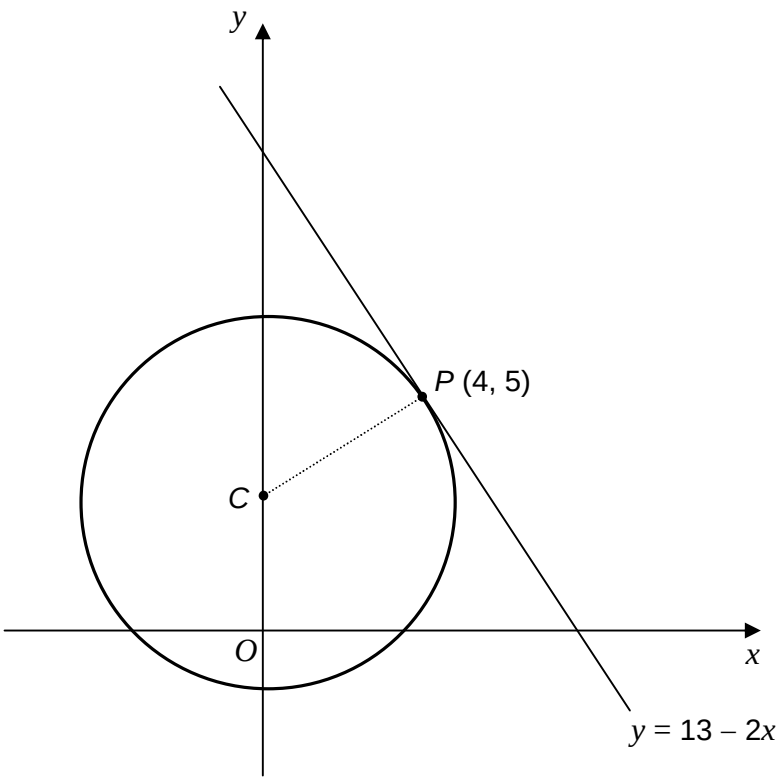
Answer ..... *(3 marks)*

Turn over for the next question

10

19 The sketch shows point P on a circle, centre C.

The equation of the tangent at P is $y = 13 - 2x$



19 (a) Work out the gradient of PC.

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Answer ..... *(1 mark)*

Do not write outside the box

19 (b) Work out the equation of the circle.

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Answer ..... *(5 marks)*

Turn over for the next question

6

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20 Factorise fully $x^3 + 4x^2 - 25x - 28$

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Answer ..... *(6 marks)*

6

END OF QUESTIONS

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