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 – 23	
24 – 25	
TOTAL	

AQA Level 2 Certificate in Further Mathematics

Further Mathematics 8360/2
Level 2

Practice Paper Set 4

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.

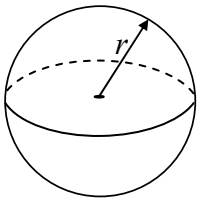
Information

- 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

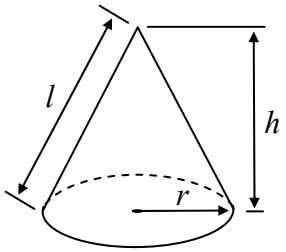
Volume of sphere = $\frac{4}{3}\pi r^3$

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



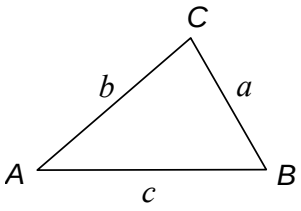
Volume of cone = $\frac{1}{3}\pi r^2 h$

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 c is a positive odd integer.

d is a negative even integer.

Tick boxes to show what each of the following expressions are.

The first one has been done for you.

	positive	**negative**	**even**	**odd**
$5d$	☐	✓	✓	☐
$c - d$	☐	☐	☐	☐
d^3	☐	☐	☐	☐
$(c + d)^2$	☐	☐	☐	☐

.....

.....

.....

(3 marks)

3

2 Here is a formula.

$$P = \sqrt{QR - 1}$$

2 (a) Rearrange the formula to make Q the subject.

……

……

……

……

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

2 (b) Work out the value of Q when $P = 12$ and $R = 5$

……

……

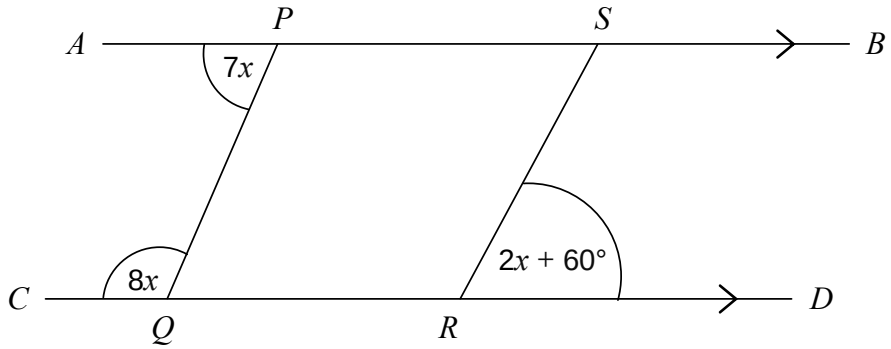
……

……

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

3 AB is parallel to CD.

Not drawn accurately



Is PQ parallel to SR?
You **must** show your working.

……

……

……

……

……

……

……

(4 marks)

Turn over for the next question

9

4 Circle A has equation $x^2 + y^2 = 16$

Circle B has equation $(x + 6)^2 + (y - 8)^2 = 25$

4 (a) Work out the distance between the centres of the circles.

……

……

……

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

4 (b) Circle the correct statement.

The circles overlap The circles touch The circles do not overlap

Give a reason for your answer, which may include a diagram.

(2 marks)

5 (a) Write $\dfrac{n^6}{(n^2)^5}$ as a single power of n.

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

5 (b) Expand and simplify fully $c^{\frac{3}{2}}(c^{\frac{1}{2}} + c^{-\frac{3}{2}})$

.....

.....

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

5 (c) Solve $d^{\frac{1}{4}} = \dfrac{1}{2}$

.....

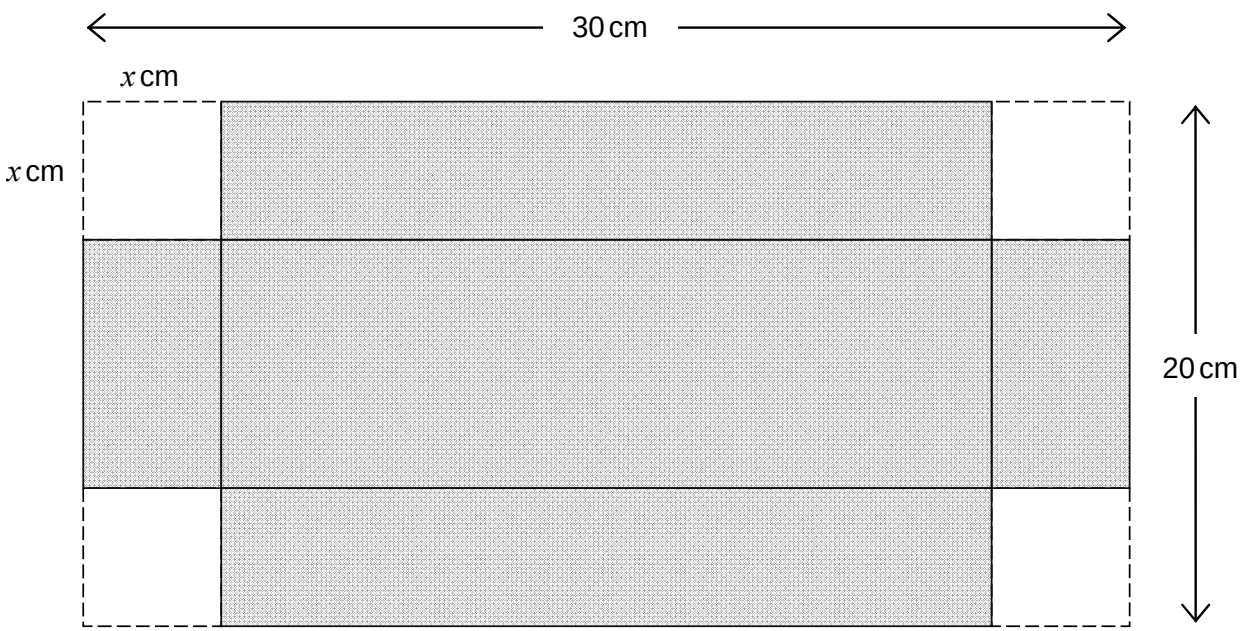
.....

$d =$ ..... *(2 marks)*

11

6 A net for an open cuboid is made by removing squares of edge x cm from the corners of a 30 cm by 20 cm rectangle.

Not drawn accurately



6 (a) Work out an expression for the area of the net.

Give your answer in its simplest form.

……

……

……

Answer …… *(2 marks)*

Do not write outside the box

6 (b) Work out an expression for the volume of the cuboid.

Give your answer in the form $ax + bx^2 + cx^3$ where a, b and c are constants.

……

……

……

……

……

……

……

……

……

……

Answer …… *(4 marks)*

Turn over for the next question

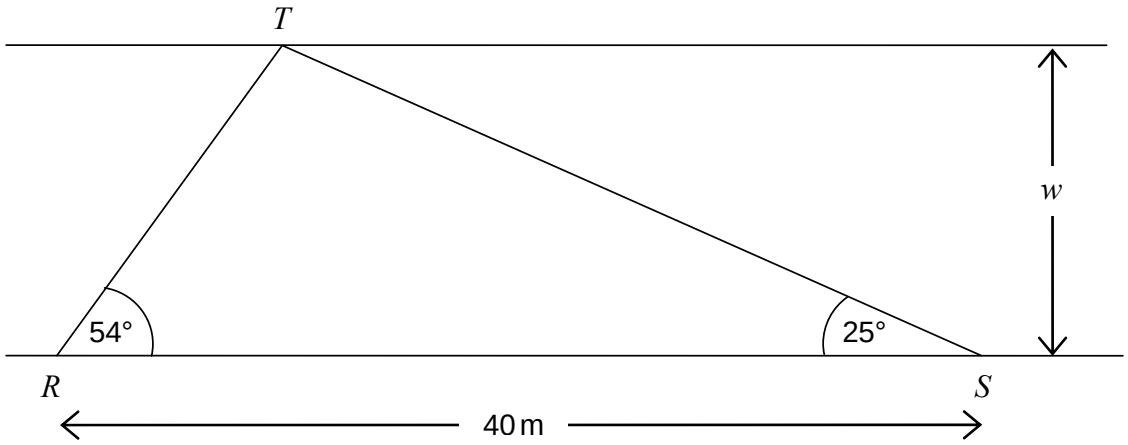
6

7 The sides of a canal are straight and parallel.

R and S are two points on one side of the canal.

T is a point on the other side.

Not drawn accurately



7 (a) Show that ST = 32.97 m to 4 significant figures.

(3 marks)

7 (b) Hence, work out the width of the canal, marked w on the diagram.

……

……

……

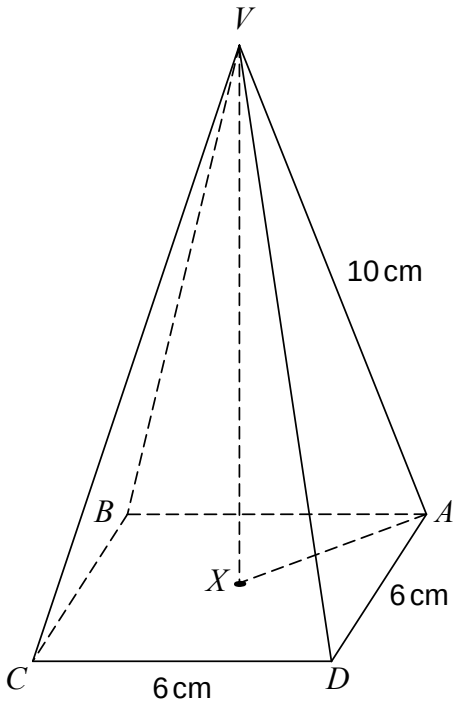
……

w = ... m *(3 marks)*

8 A pyramid has a square base $ABCD$ of sides 6 cm.

Vertex, V, is directly above the centre of the base, X.

VA = 10 cm

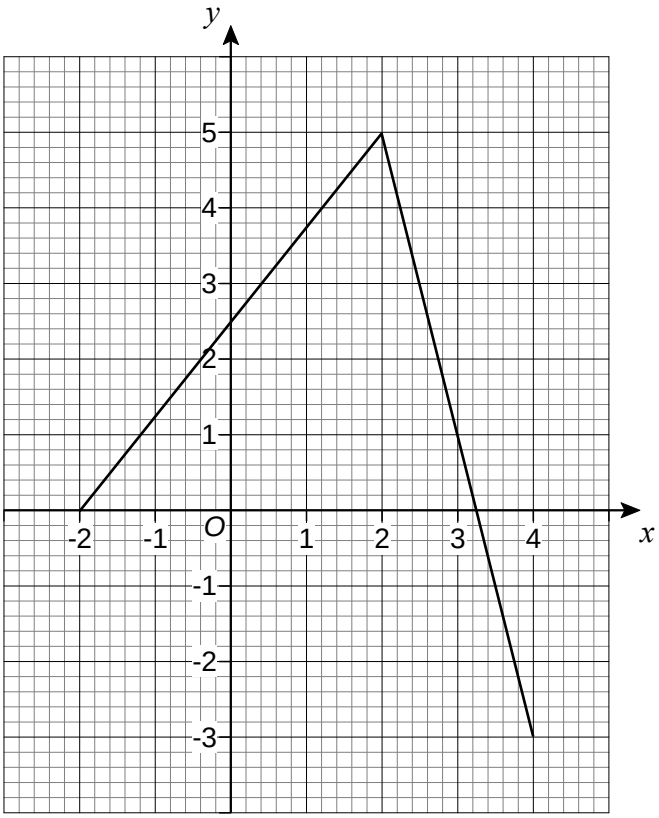


Work out the height, VX, of the pyramid.

Answer …..... cm *(4 marks)*

10

9 The graph of $y = g(x)$ is shown for the full domain of $g(x)$.



9 (a) State the domain of $g(x)$.

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

9 (b) State the range of $g(x)$.

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

9 (c) Use the graph to solve $g(x) = 1$

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

9 (d) Work out the gradient of the graph for $2 \leqslant x \leqslant 4$

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

Do not write outside the box

10 $\mathbf{M} = \begin{pmatrix} -2 & 0 \\ 0 & -2 \end{pmatrix}$

M represents a single transformation.

Describe the transformation fully.

……

……

……

(3 marks)

11 (a) $f(n) = n^2 + n$

Show that $f(n + 1) - f(n) = 2n + 2$

……

……

……

……

……

(2 marks)

11 (b) The nth term of a sequence is $n^2 + n$

Two consecutive terms in the sequence have a difference of 32.

Work out the two terms.

……

……

……

……

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

17

12 (a) Solve $\sqrt{35 + 4x^2} = 6$

.....

.....

.....

.....

.....

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

12 (b) Solve $\frac{3}{8x} = \frac{x^2}{9}$

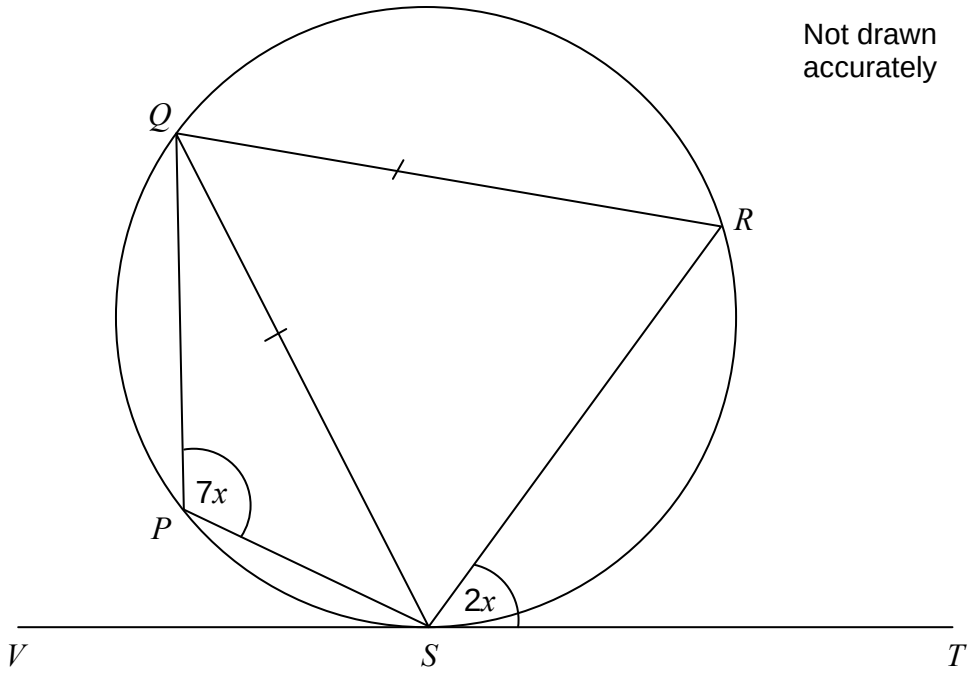
Answer ..... *(3 marks)*

Do not write outside the box

13 $PQRS$ is a cyclic quadrilateral.

$QS = QR$

VST is a tangent to the circle.



Work out the value of x.

You **must** show your working.

.....

.....

.....

.....

.....

.....

.....

.....

.....

.....

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

10

14 Solve $2 \sin \theta = -1.36$ for $0° \leqslant \theta \leqslant 360°$

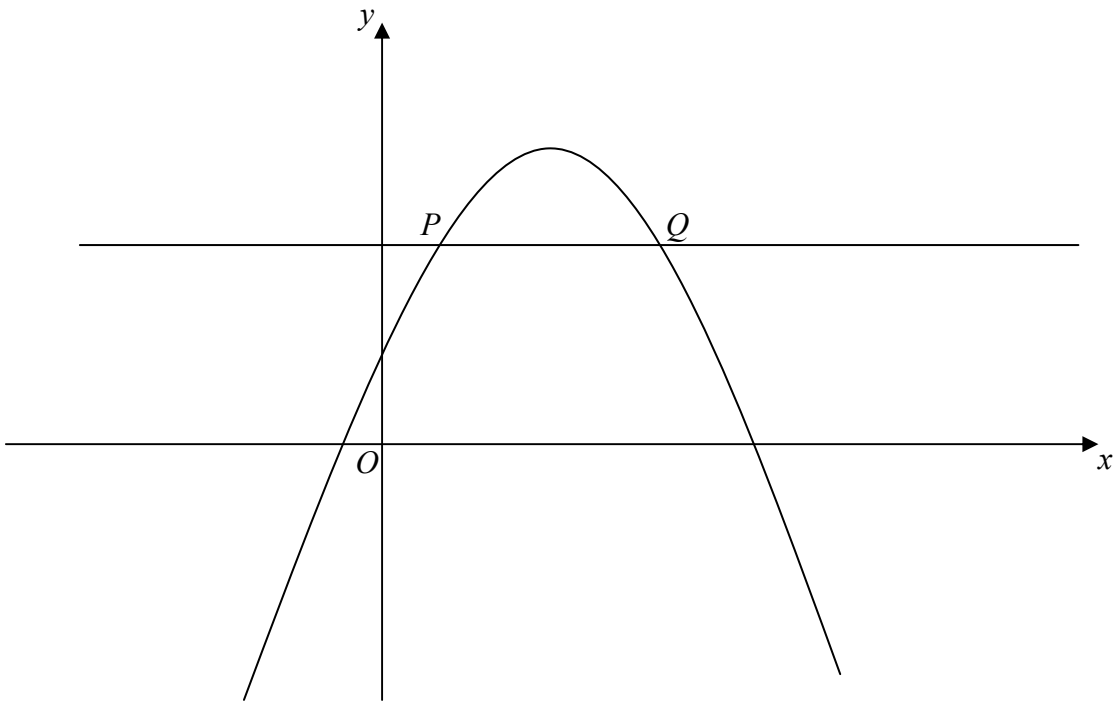
……

……

……

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

15 The graphs of $y = 2 + 8x - 2x^2$ and $y = 5$ intersect at P and Q as shown in the sketch.



Work out the length PQ.

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

8

16 $\mathbf{P} = \begin{pmatrix} \sin x & \cos x \\ -\cos x & \sin x \end{pmatrix}$ $\mathbf{Q} = \begin{pmatrix} \sin x & -\cos x \\ \cos x & \sin x \end{pmatrix}$

Work out **PQ**

Give your answer in its simplest form.

(*3 marks)*

Do not write outside the box

17 The first four terms of a quadratic sequence are

$a + 5b$ $\quad 2a + 8b$ $\quad 3a + 12b$ $\quad 4a + 17b$

The nth term of the sequence is $n^2 - 2n + 6$

Work out the values of a and b.

.....

.....

.....

.....

.....

.....

.....

.....

.....

.....

.....

.....

$a =$ .....

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

8

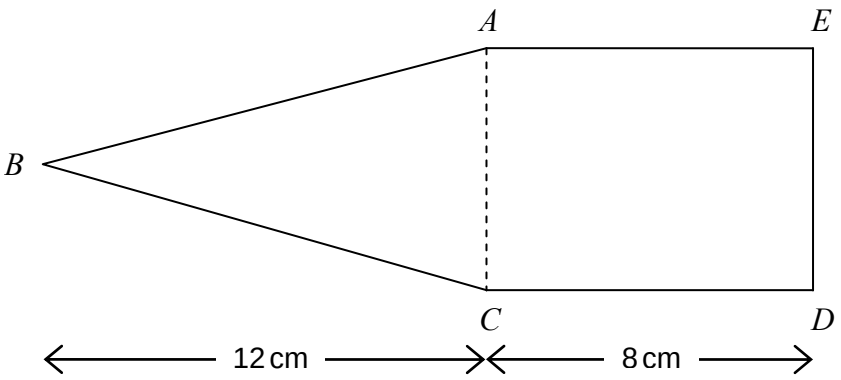
Do not write outside the box

18 Simplify fully $\dfrac{24m - 9m^2}{64 - 9m^2}$

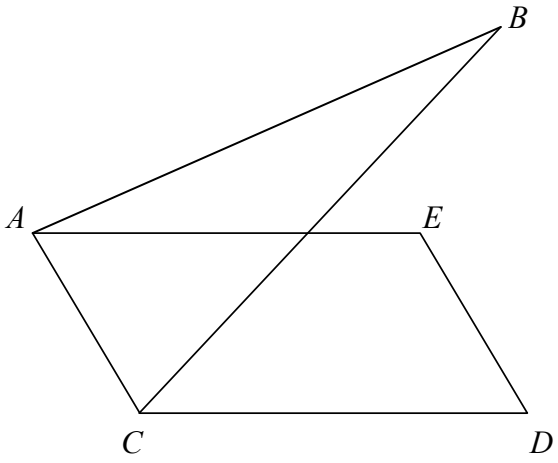
Answer ..... *(3 marks)*

19 $ABCDE$ is a piece of card in the shape of a rectangle and an isosceles triangle.

Not drawn accurately



$ABCDE$ is folded along AC so that B is vertically above the midpoint of DE.



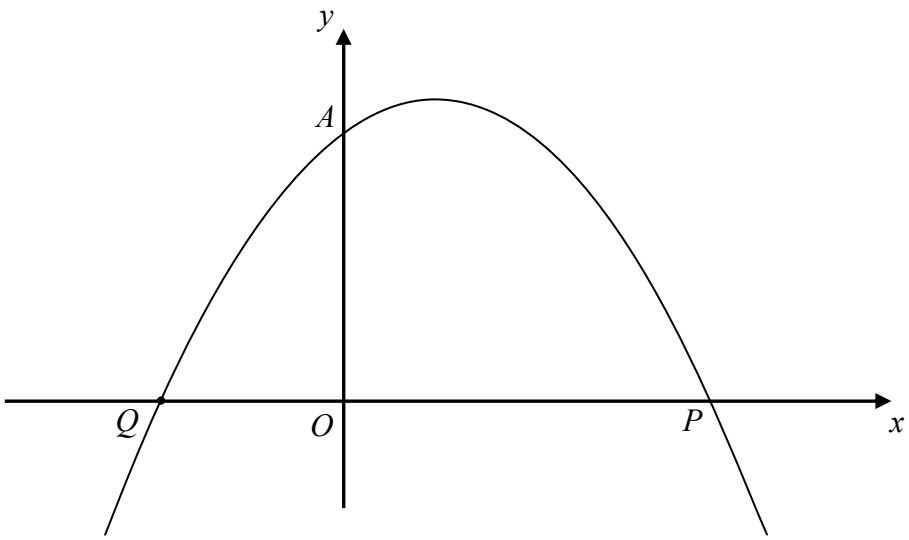
Work out the angle between the planes ABC and $ACDE$.

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

6

20 A sketch of the curve $y = (x + 1)(2 - x)$ is shown.

A (0, 2), P (2, 0) and Q are points on the curve.



20 (a) Write down the coordinates of point Q.

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

20 (b) Show that the normal to the curve at A intersects the curve again at P.

.....

.....

.....

.....

.....

.....

.....

.....

.....

.....

.....

.....

.....

(6 marks)

Do not write outside the box

21 Factorise fully $3a^4b - 2a^3b^2 - 5a^2b^3$

.....

.....

.....

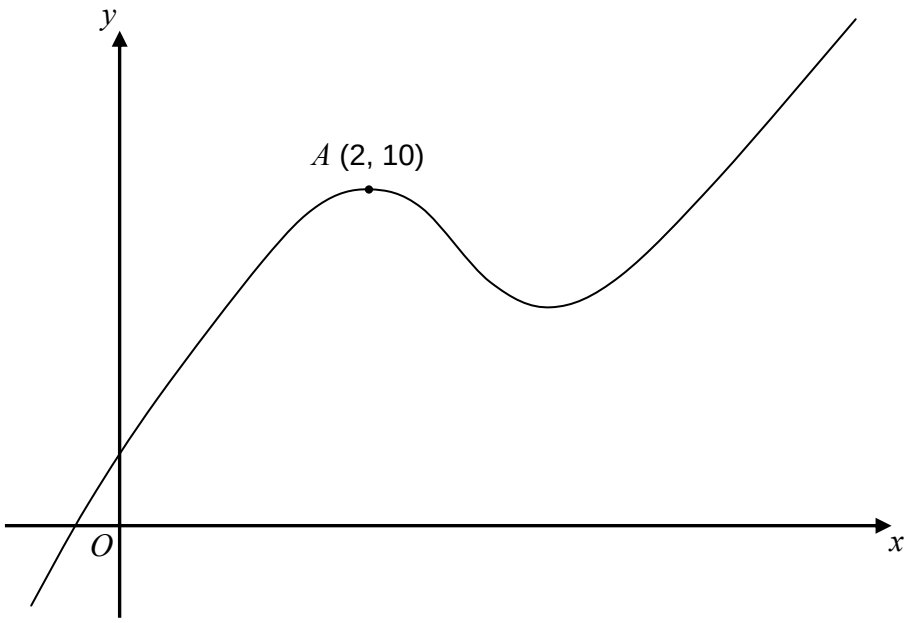
.....

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

Turn over for the next question

9

22 A sketch of $y = f(x)$, where $f(x)$ is a cubic function, is shown.



There is a maximum point at A (2,10).

22 (a) Write down the equation of the tangent to the curve at A.

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

22 (b) Write down the equation of the normal to the curve at A.

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

22 (c) Circle the word that describes the cubic function when $x < 2$

positive negative increasing decreasing

(1 mark)

Do not write outside the box

22 (d) The equation of the curve is $y = px^3 - 3x^2 + 8x + r$ where p and r are constants.

Use the fact that there is a maximum point at (2, 10) to work out the values p and r.

……

……

……

……

……

……

……

……

……

……

……

……

p = ...

r = ... *(5 marks)*

END OF QUESTIONS

8

There are no questions printed on this page

DO NOT WRITE ON THIS PAGE
ANSWER IN THE SPACES PROVIDED