

OXFORD CAMBRIDGE AND RSA EXAMINATIONS
GCSE

B392/02

METHODS IN MATHEMATICS

Methods in Mathematics 2

(Higher Tier)

THURSDAY 11 JUNE 2015: Afternoon

DURATION: 2 hours

plus your additional time allowance

MODIFIED ENLARGED

Candidate forename		Candidate surname	
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Centre number						Candidate number				
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Candidates answer on the Question Paper.

OCR SUPPLIED MATERIALS:

None

OTHER MATERIALS REQUIRED:

Scientific or graphical calculator

Geometrical instruments

Tracing paper (optional)

<p>YOU ARE PERMITTED TO USE A CALCULATOR FOR THIS PAPER</p>
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READ INSTRUCTIONS OVERLEAF

INSTRUCTIONS TO CANDIDATES

Write your name, centre number and candidate number in the boxes on the first page. Please write clearly and in capital letters.

Use black ink. HB pencil may be used for graphs and diagrams only.

Answer ALL the questions.

Read each question carefully. Make sure you know what you have to do before starting your answer.

Your answers should be supported with appropriate working. Marks may be given for a correct method even if the answer is incorrect.

Write your answer to each question in the space provided. Additional paper may be used if necessary but you must clearly show your candidate number, centre number and question number(s).

INFORMATION FOR CANDIDATES

The number of marks is given in brackets [] at the end of each question or part question.

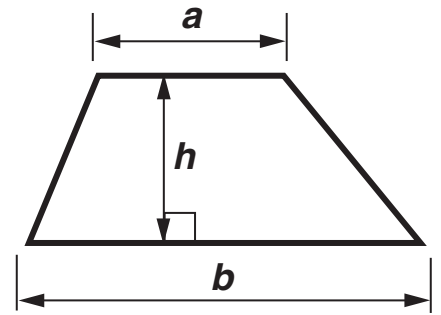
Quality of written communication will be assessed in questions marked with an asterisk (*).

The total number of marks for this paper is 90.

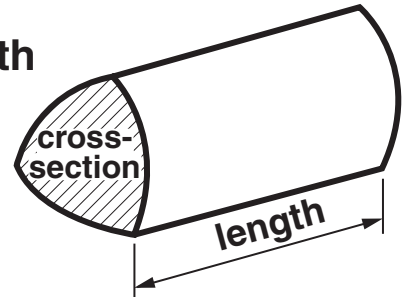
Any blank pages are indicated.

FORMULAE SHEET: HIGHER TIER

Area of trapezium = $\frac{1}{2}(a + b)h$



Volume of prism = (area of cross-section) \times length

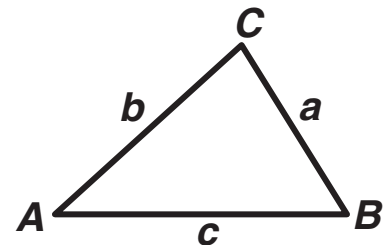


In any triangle ABC

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

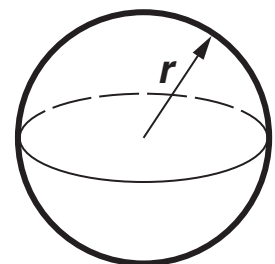
Cosine rule $a^2 = b^2 + c^2 - 2bc \cos A$

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



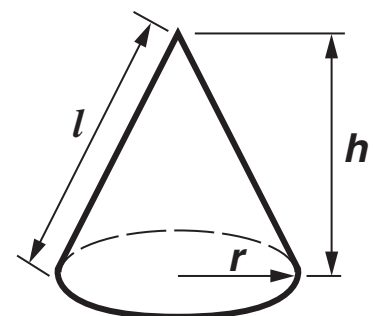
Volume of sphere = $\frac{4}{3}\pi r^3$

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



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

Curved surface area of cone = πrl



The Quadratic Equation

The solutions of $ax^2 + bx + c = 0$,
where $a \neq 0$, are given by

$$x = \frac{-b \pm \sqrt{b^2 - 4ac}}{2a}$$

Answer ALL the questions.

1 (a) Use your calculator to work out the following.

(i) $4.1 \times \sqrt{8^3}$

(a)(i) _____ [2]

**(ii)
$$\frac{(1.6 \times 10^2) \times (9.7 \times 10^8)}{1.25}$$**

(ii) _____ [2]

**(b) Andrea is working without a calculator.
She does $1215 \div 6$ and gets the answer 22.5.**

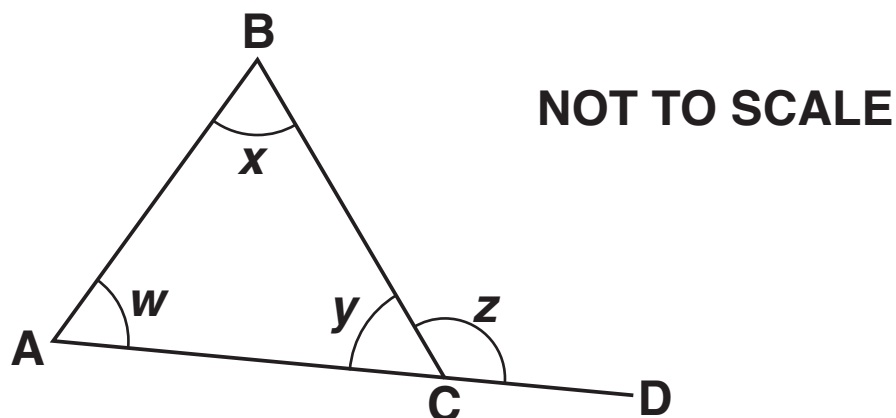
**Show the working for one way that Andrea could
check her answer without using a calculator.**

_____ **[1]**

(c) Write 1.3̄ as a fraction.

(c) _____ [2]

- 2 (a) In the diagram below, triangle ABC has side AC continued to D.



There are errors in the proof opposite.

Tick the box to show which line contains the **FIRST** error.

☐

The first line

☐

The second line

☐

The third line

☐

The fourth line

[1]

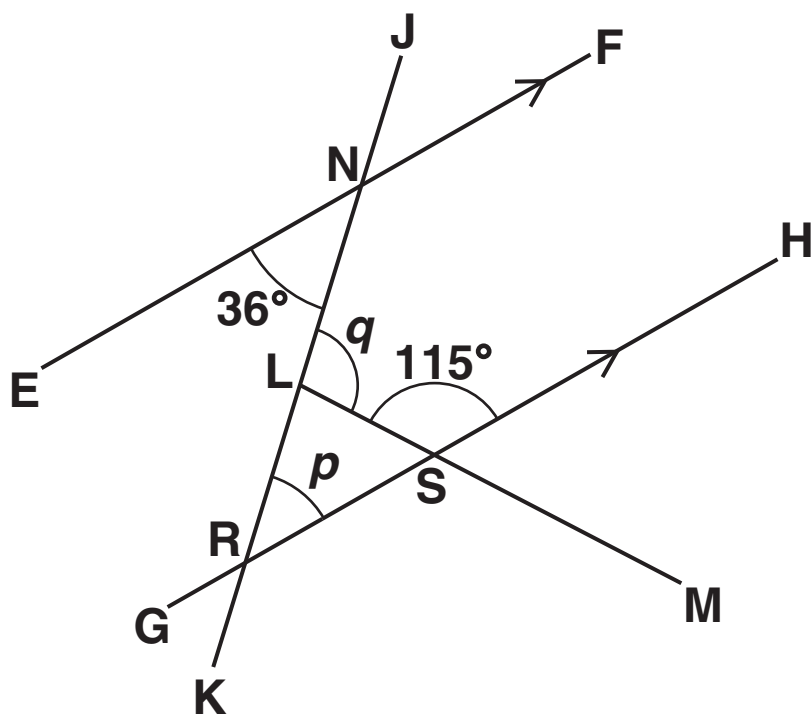
$w + x + y = 180^\circ$ (angle sum of a triangle is 180°)

$w + y + z = 180^\circ$ (angles on a straight line add up to 180°)

So $w + x = z$

Exterior angle of a triangle is equal to the sum of the opposite interior angles.

(b)* The diagram below consists of four straight lines.
EF and GH are parallel.



NOT TO SCALE

Calculate angles p and q , giving a geometrical reason for each step in your working.

[4]

3 (a) Divide £54 in the ratio 2 : 7.

(a) £ _____, £ _____ [3]

(b) (i) Calculate $\frac{3}{4} \times 7$. Give your answer as a mixed number.

(b)(i) _____ [2]

(ii) What exact number does $\frac{3}{4} \times 7$ need to be multiplied by to give $\frac{3}{4}$?

(ii) _____ [1]

(c) Bernard's wage is 10% more than Carlotta's wage.

Work out the ratio of Bernard's wage to Carlotta's wage. Write the ratio in its simplest form using whole numbers.

(c) _____ [2]

4 The first five terms of a sequence are shown below.

3, 5, 7, 9, 11

(a) Write an expression for the n th term of the sequence.

(a) _____ [2]

(b)*3 and 7 are both terms in the sequence.

The product of 3 and 7 is $3 \times 7 = 21$. 21 is also a term in the sequence.

Show that the product of ANY two terms in the sequence will also be a term in the sequence.

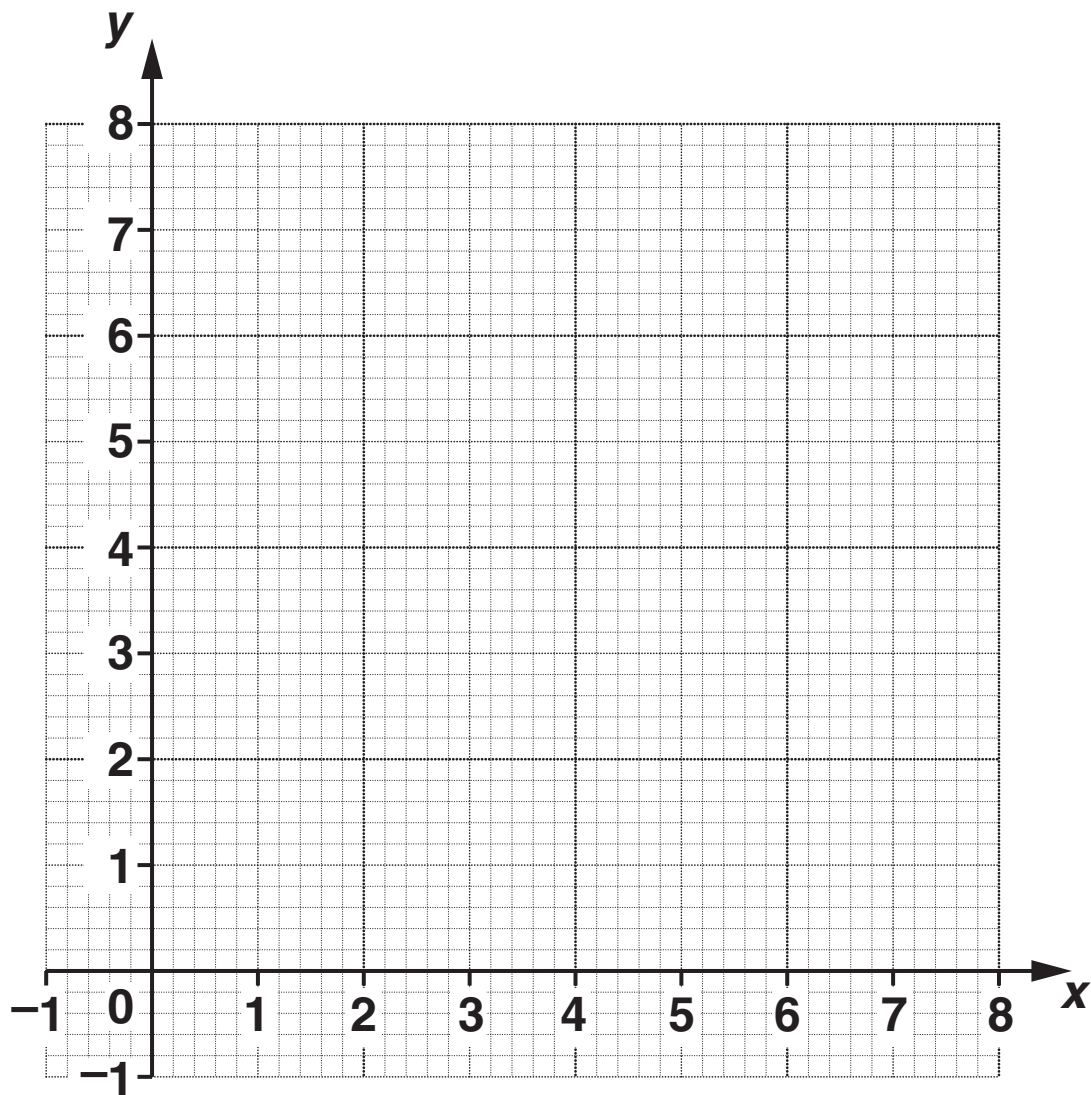
[2]

5 Two positive numbers, x and y , add up to make 8.

(a) Write an equation to show this relationship between x and y .

(a) _____ [1]

(b) On the grid below, draw a graph which shows all possible pairs of values of x and y .



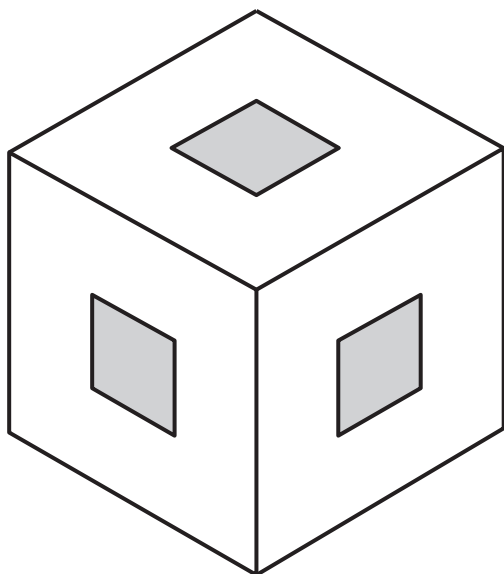
[2]

(c) It is also known that y is three times x .

By drawing a suitable additional line on the grid, find the values of x and y .

(c) x _____, y _____ [4]

- 6 The diagram below shows a cube of side 6 cm. Square holes, of side 2 cm, have been drilled through the cube, between the middles of pairs of opposite sides.



Find the volume of the shape that is left.

_____ cm^3 [4]

7 (a) Solve.

$$4(x - 6) = x$$

(a) _____ [3]

(b) It is given that $R = \frac{P}{A^2}$.

(i) Calculate the value of R when $P = 36$ and $A = 4$.

(b)(i) _____ [2]

(ii) Make A the subject of the formula.

(ii) _____ [2]

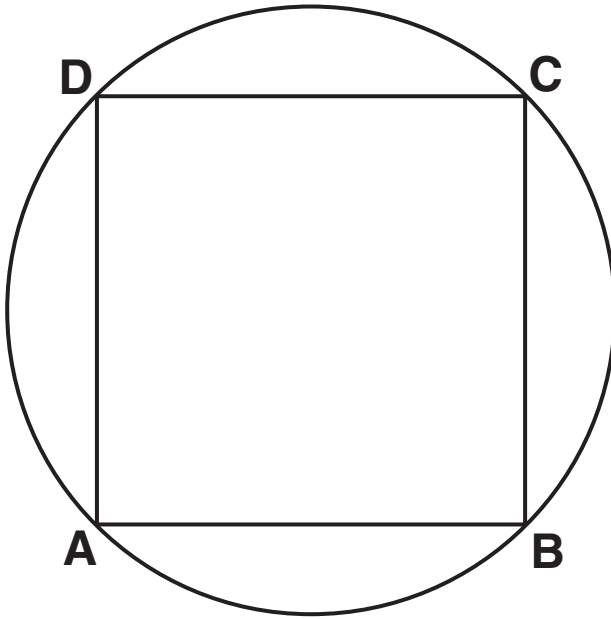
(iii) Write down a possible pair of values of P and A so that $R = 3.4 \times 10^8$.

(iii) P _____ A _____ [2]

8 ABCD is a square.

A circle passes through all the points A, B, C and D.

The centre of the circle is at the centre of the square.

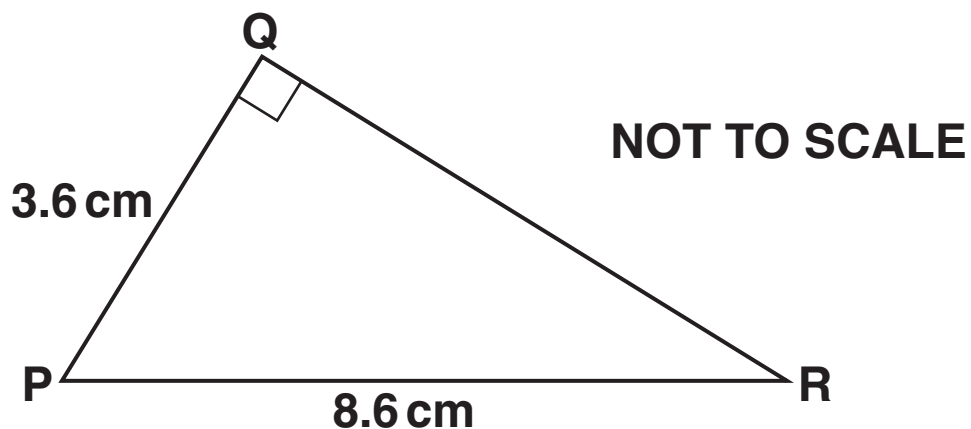


The area of square ABCD is 36 cm^2 .

Work out the radius of the circle.

_____ cm [4]

- 9 Triangle PQR is right-angled at Q.
PQ = 3.6 cm. PR = 8.6 cm.



- (a) Calculate the size of angle P.

(a) _____° [3]

(b) Calculate the area of triangle PQR.

(b) _____ cm^2 [2]

10 (a) Solve.

$$2x^2 + 5x - 3 = 0$$

(a) _____ [4]

(b) Write $\frac{1}{x-2} - \frac{1}{x+2}$ as a single fraction.

Give your answer in its simplest form.

(b) _____ [2]

- (c) (i) An identity in x is given below. Find the values of u and v .

$$x^2 + 4x + 8 = (x + u)^2 + v$$

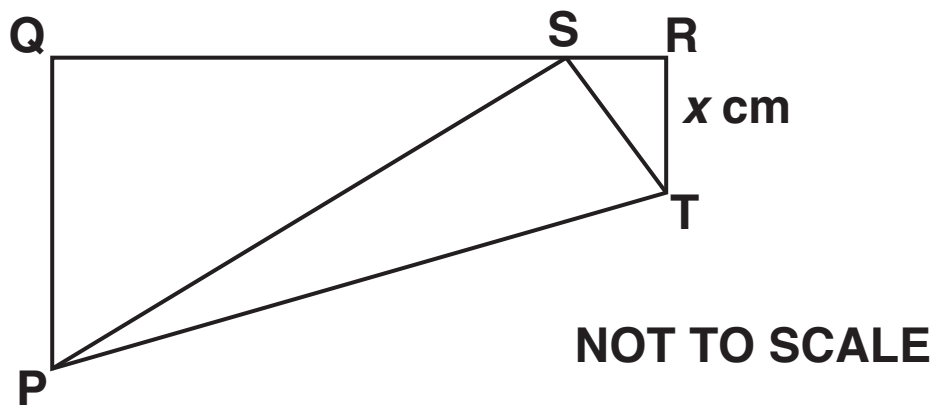
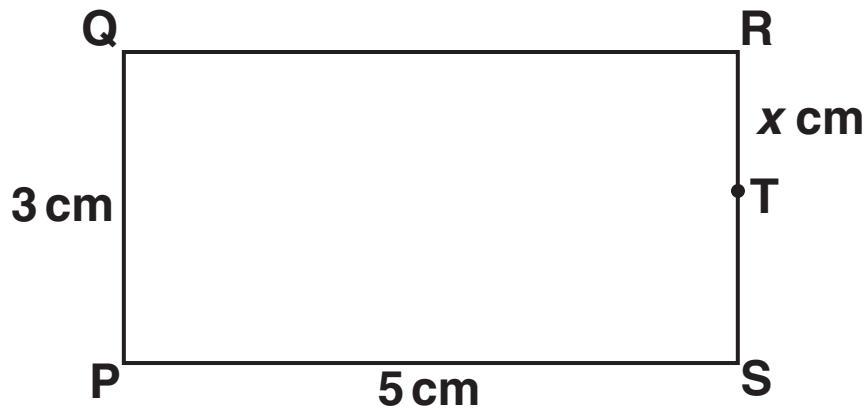
(c)(i) $u =$ _____, $v =$ _____ [3]

- (ii) Carlos thinks that $x^2 + 4x + 8$ is always bigger than 8.

Find a value of x which makes $x^2 + 4x + 8$ smaller than 8.

(ii) _____ [1]

11 PQRS is a rectangle. $PQ = 3\text{ cm}$; $QR = 5\text{ cm}$.



T is a point on RS with $RT = x\text{ cm}$.
The rectangle is folded along PT. S then lies on RQ.

Show that $x^2 - 6x + 9 = x^2 + 1$ and hence find the value of x .

_____ [6]

12 y is inversely proportional to the square root of x .
When $x = 4$, $y = 8$.

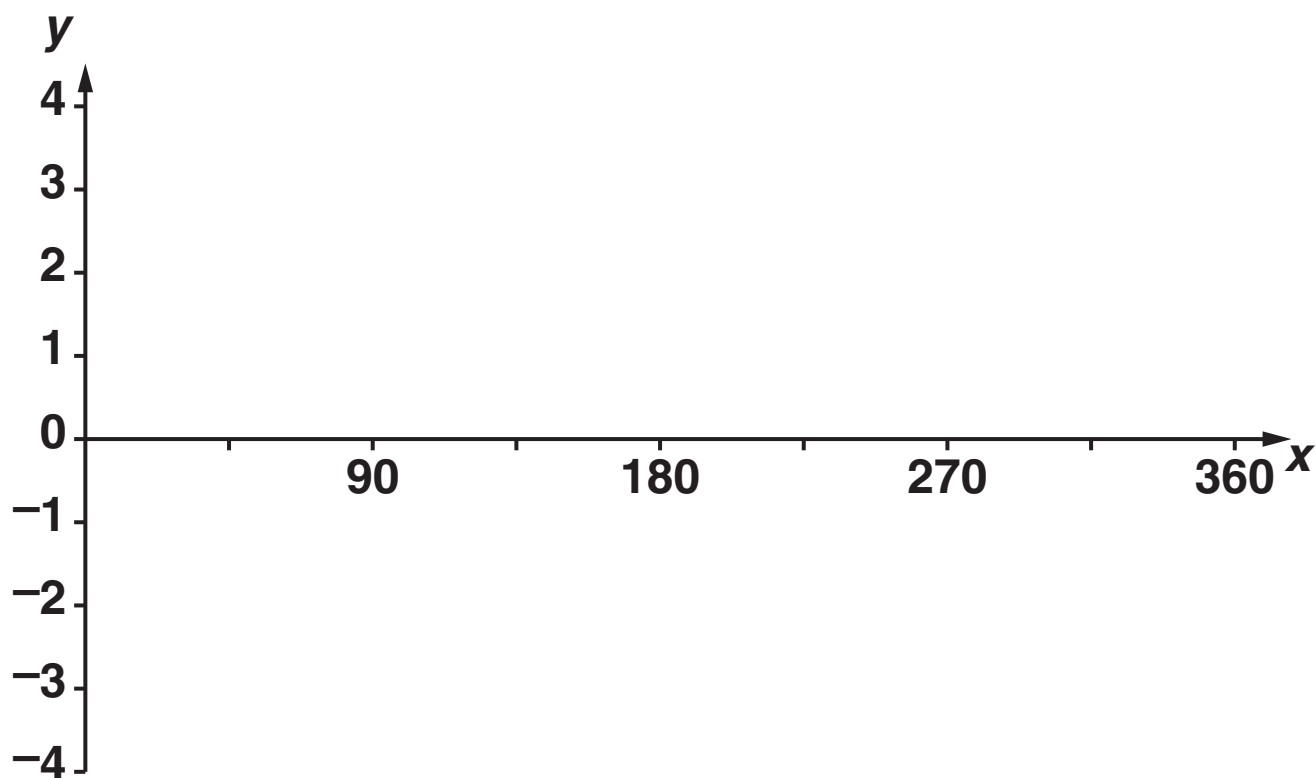
(a) Find y when $x = 25$.

(a) _____ **[3]**

(b) Find x when $y = 2$.

(b) _____ [2]

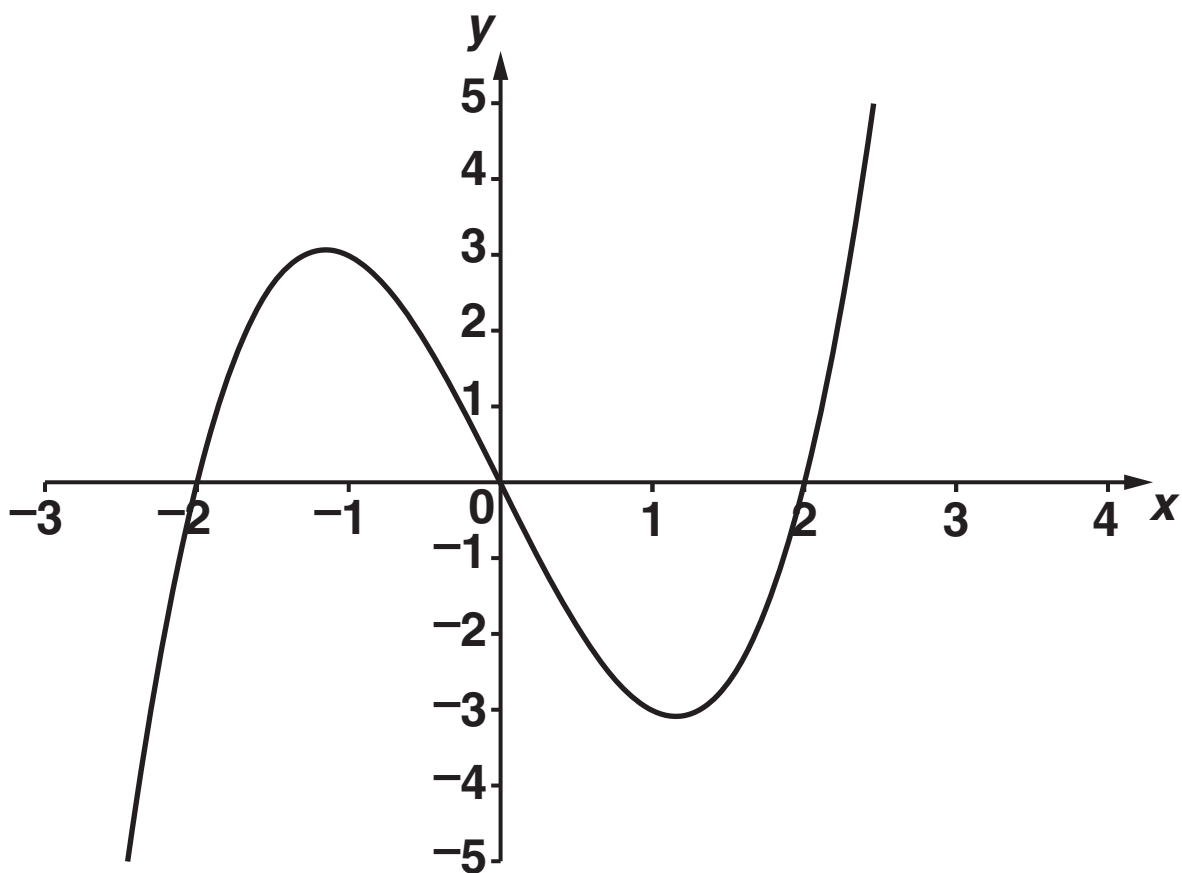
- 13 (a) Use the axes below to sketch the graph of $y = 3 \cos x$.



[3]

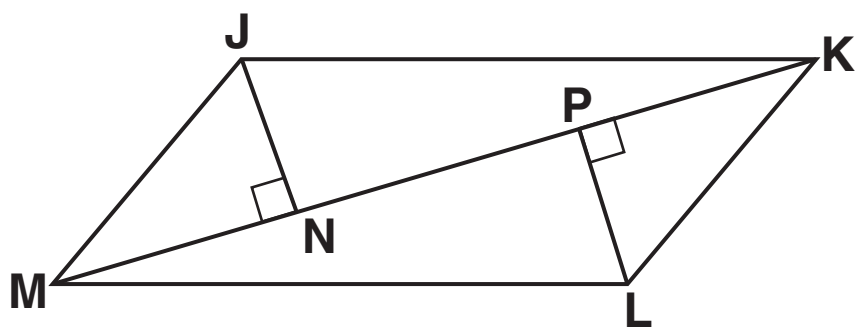
(b) The graph of $y = x^3 - 4x$ is shown below.

On the same axes, sketch the graph of $y = x^3 - 4x + 1$.



[2]

- 14 (a) JKLM is a parallelogram. MK is a diagonal of the parallelogram.
N and P are points on MK such that angle JNM = angle LPK = 90° .



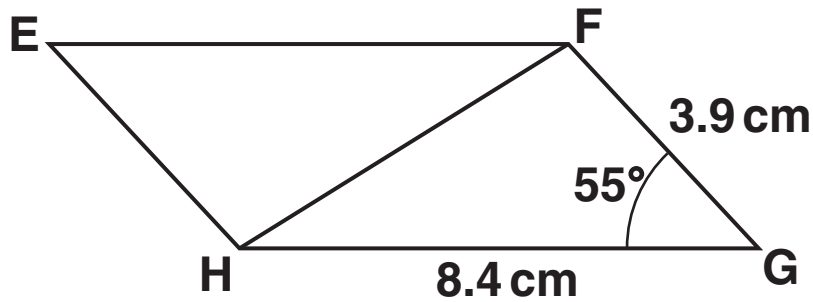
NOT TO SCALE

Prove that triangles JNM and LPK are congruent.

[3]

- (b) EFGH is a parallelogram. $HG = 8.4\text{ cm}$, $FG = 3.9\text{ cm}$ and angle $FGH = 55^\circ$.

NOT TO SCALE

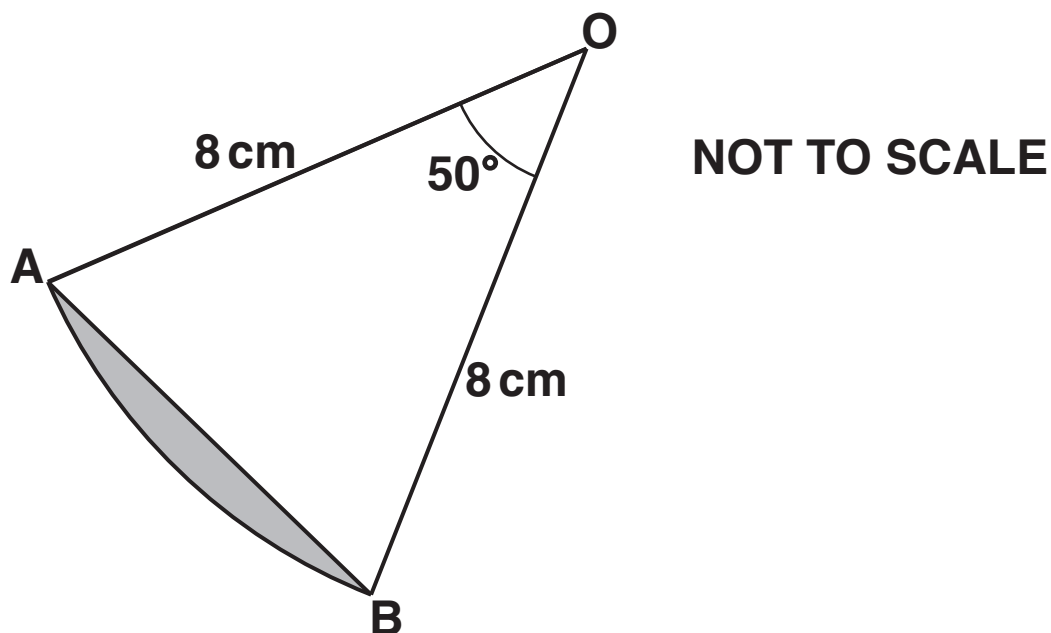


Calculate the length of the diagonal FH.

(b) _____ cm [3]

- 15 O is the centre of a circle with radius 8 cm.
A and B are points on the circle.
Angle AOB is 50° .

Calculate the PERIMETER of the shaded segment.



_____ cm [5]

END OF QUESTION PAPER

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