OCR
Oxford Cambridge and RSA

H

Thursday 11 June 2015 – Afternoon

GCSE METHODS IN MATHEMATICS

B392/02 Methods in Mathematics 2 (Higher Tier)

Candidates answer on the Question Paper.

OCR supplied materials:
None

Other materials required:
- Scientific or graphical calculator
- Geometrical instruments
- Tracing paper (optional)

Duration: 2 hours

Candidate forename		Candidate surname	

Centre number						Candidate number				

INSTRUCTIONS TO CANDIDATES

- Write your name, centre number and candidate number in the boxes above. 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).
- Do **not** write in the bar codes.

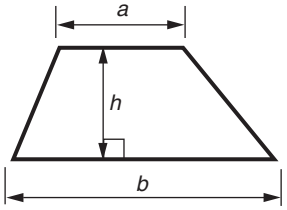
INFORMATION FOR CANDIDATES

- 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**.
- This document consists of **20** pages. Any blank pages are indicated.

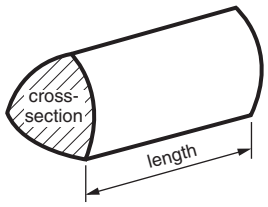
You are permitted to use a calculator for this paper

Formulae Sheet: Higher Tier

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



Volume of prism = (area of cross-section) × length

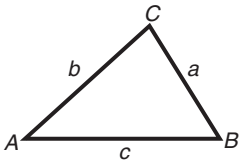


In any triangle *ABC*

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

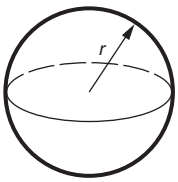
Cosine rule $a^2 = b^2 + c^2 - 2bc\cos A$

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



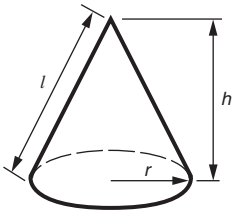
Volume of sphere $= \frac{4}{3}\pi r^3$

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



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

Curved surface area of cone $= \pi rl$



The Quadratic Equation

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

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

PLEASE DO NOT WRITE ON THIS PAGE

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) $\dfrac{(1.6 \times 10^2) \times (9.7 \times 10^8)}{1.25}$

(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.

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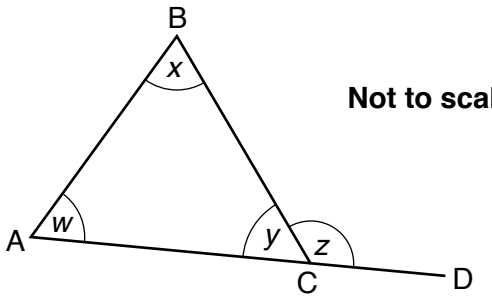
..... **[1]**

(c) Write $1.\dot{3}$ as a fraction.

(c) ..... **[2]**

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



There are errors in the following proof.

$w + x + y = 180°$ (angle sum of a triangle is 180°) $w + y + z = 180°$ (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.

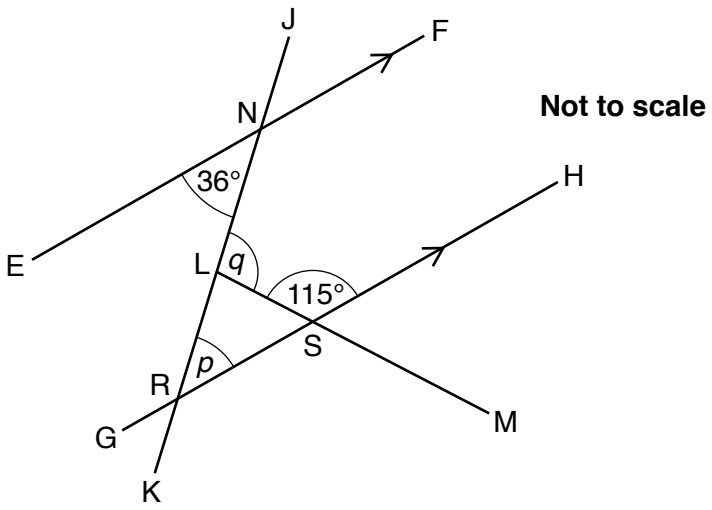
Tick the box to show which line contains the **first** error.

☐ The first line ☐ The second line

☐ The third line ☐ The fourth line

[1]

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



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

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..... **[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.

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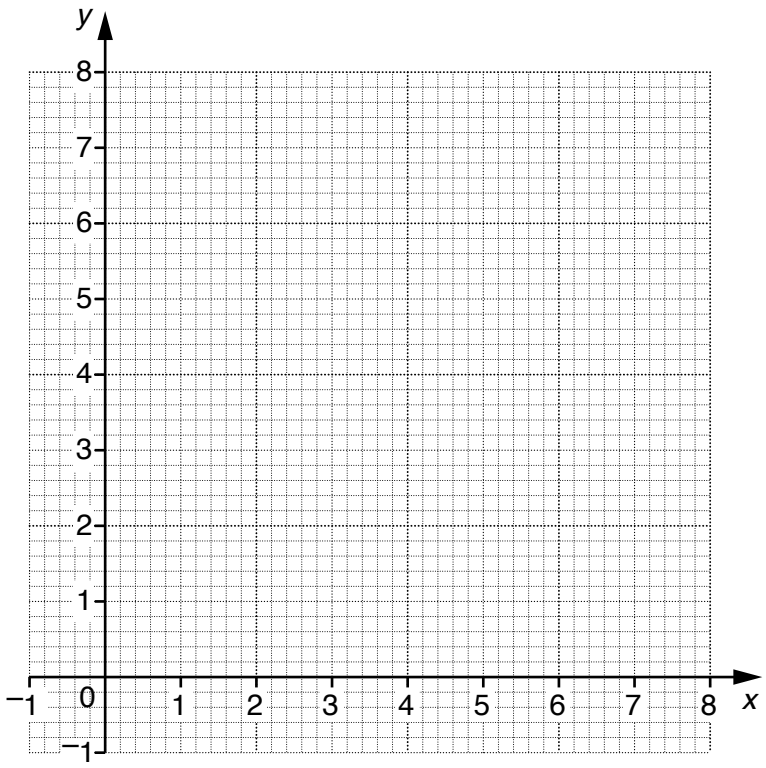
..... **[2]**

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.



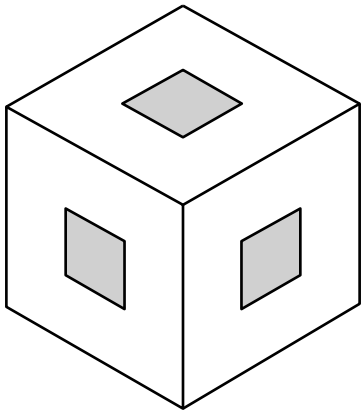
[2]

(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 $R = \dfrac{P}{A^2}$.

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

(b)(i) ..... **[2]**

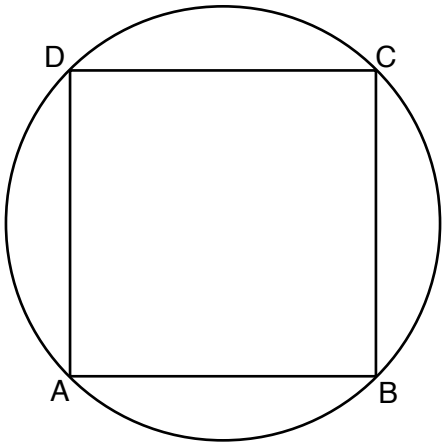
(ii) Make A the subject of the formula.

(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.

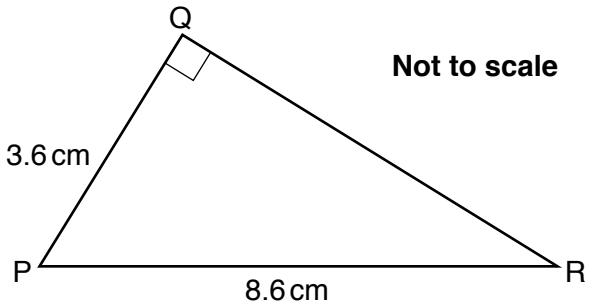


The area of square ABCD is 36 cm^2.

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.

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

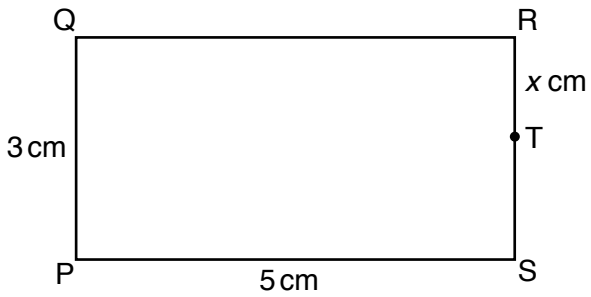
(c)(i) u = ..., v = ... **[3]**

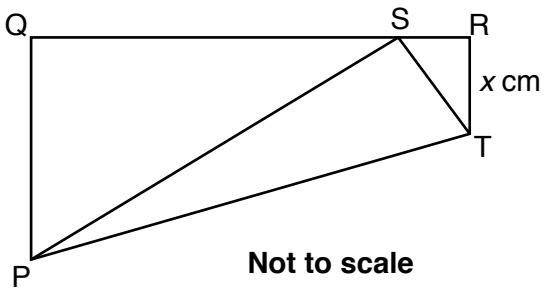
(ii) Carlos thinks that $x^2 + 4x + 8$ is always bigger than 8.

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

(ii) ..... **[1]**

11 PQRS is a rectangle. PQ = 3 cm; QR = 5 cm.





T is a point on RS with RT = x 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 $x = 4$, $y = 8$.

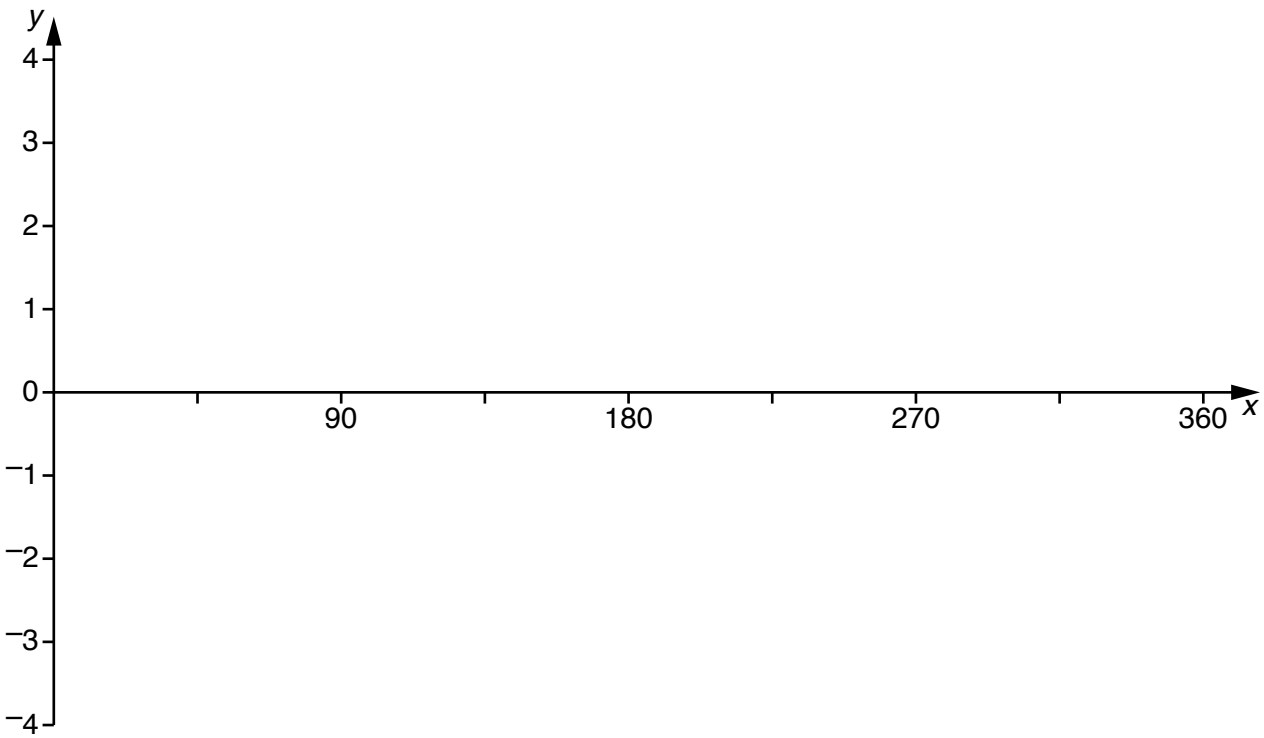
(a) Find y when $x = 25$.

(a) ..... **[3]**

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

(b) ..... **[2]**

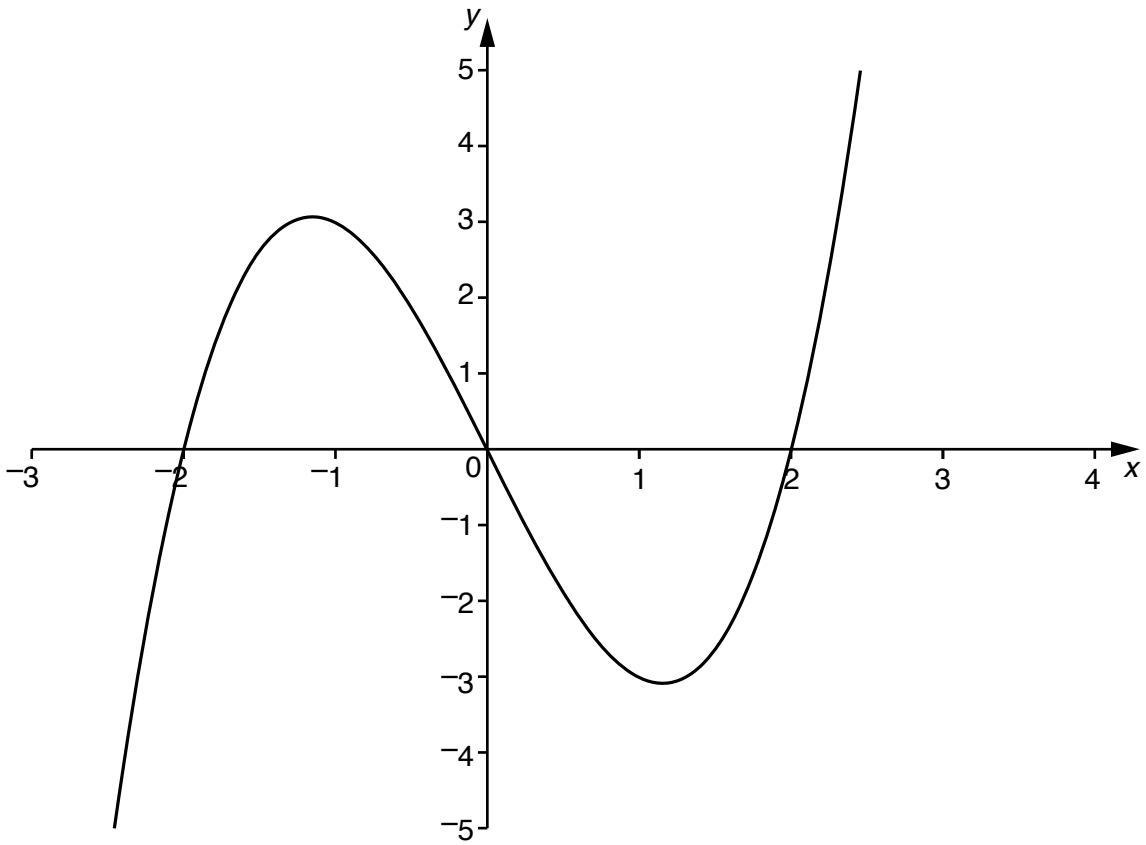
13 **(a)** Use the axes below to sketch the graph of $y = 3\cos x$.



[3]

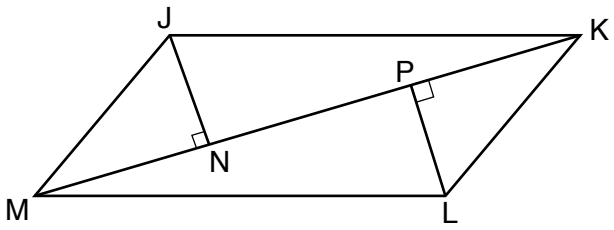
(b) The graph of $y = x^3 - 4x$ is shown below.

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.

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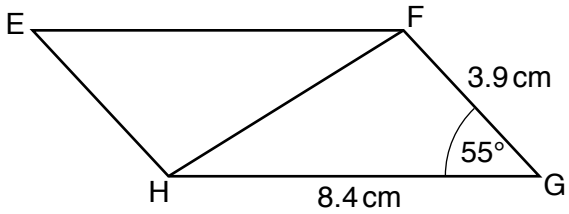
..... **[3]**

(b) EFGH is a parallelogram. HG = 8.4 cm, FG = 3.9 cm and angle FGH = 55°.



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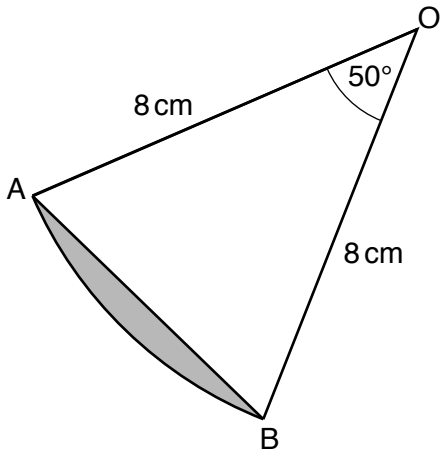
Calculate the length of the diagonal FH.

(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.



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..... cm **[5]**

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