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Thursday 19 June 2014 – Morning

GCSE METHODS IN MATHEMATICS

B392/02   Methods in Mathematics 2 (Higher Tier)
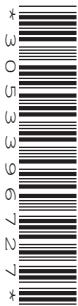
Duration: 2 hours

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.
* Your quality of written communication is assessed in questions marked with an asterisk (*).
* The total number of marks for this paper is **90**.
* This document consists of **16** pages. Any blank pages are indicated.

You are permitted to use a calculator for this paper

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Turn over
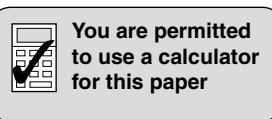
Formulae Sheet: Higher Tier

Area of trapezium $= \frac{1}{2}(a + b)h$
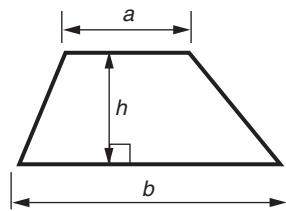
Volume of prism = (area of cross-section) × length
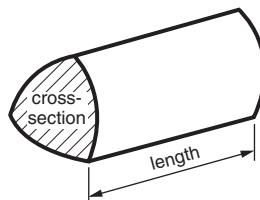
In any triangle _ABC_

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

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

Area of triangle $= \frac{1}{2}ab \sin C$
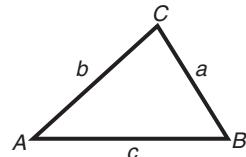
Volume of sphere $= \frac{4}{3}\pi r^3$

Surface area of sphere $= 4\pi r^2$
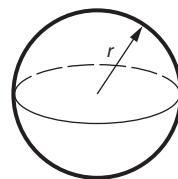
Volume of cone $= \frac{1}{3}\pi r^2 h$

Curved surface area of cone $= \pi rl$
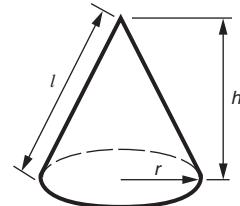
The Quadratic Equation

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)** Divide £360 in the ratio 5 : 7.

(a) £_____ , £_____ [3]

(b) Bill and Ken divide some money between them in the ratio 2 : 3.
Ken gets £27.

How much does Bill get?

(b) £ _____ [2]

(c) Write down the value of *x*, given that $8x = 1$.

(c) _____ [1]

(d) Work out the following, giving your answer as a mixed number in its simplest form.

$$35 \times \frac{3}{14}$$

(d) _____ [2]

Turn over

2 **(a)** Convert $0.\dot{1}$ to a fraction.

(a) _____ **[2]**

(b) $\dfrac{3}{20}$ of the sweets in a packet are red.

What percentage is this?

(b) _____ % **[1]**

(c) A dress normally costs £42.95.
It is reduced by 20% in a sale.

What is the sale price?

(c) £ _____ **[2]**

(d) The number of members in a club goes up by 16%.
The number of members is now 261.

How many members were in the club before the 16% increase?

(d) _____ **[3]**

3 This question is about a regular polygon with 15 sides.

(a) Calculate the size of each exterior angle.

(a) _____ ° **[2]**

(b) Calculate the size of each interior angle.

**(b)** _____ ° **[1]**

4 Solve.

(a) $10 - 3x = 16$

(a) _____ **[2]**

(b) $\frac{1}{3}(x + 2) = 7$

(b) _____ **[2]**

Turn over

5 AB is a side of a square.
A is the point with coordinates (4,3). B is the point with coordinates (10,6).

Not to scale
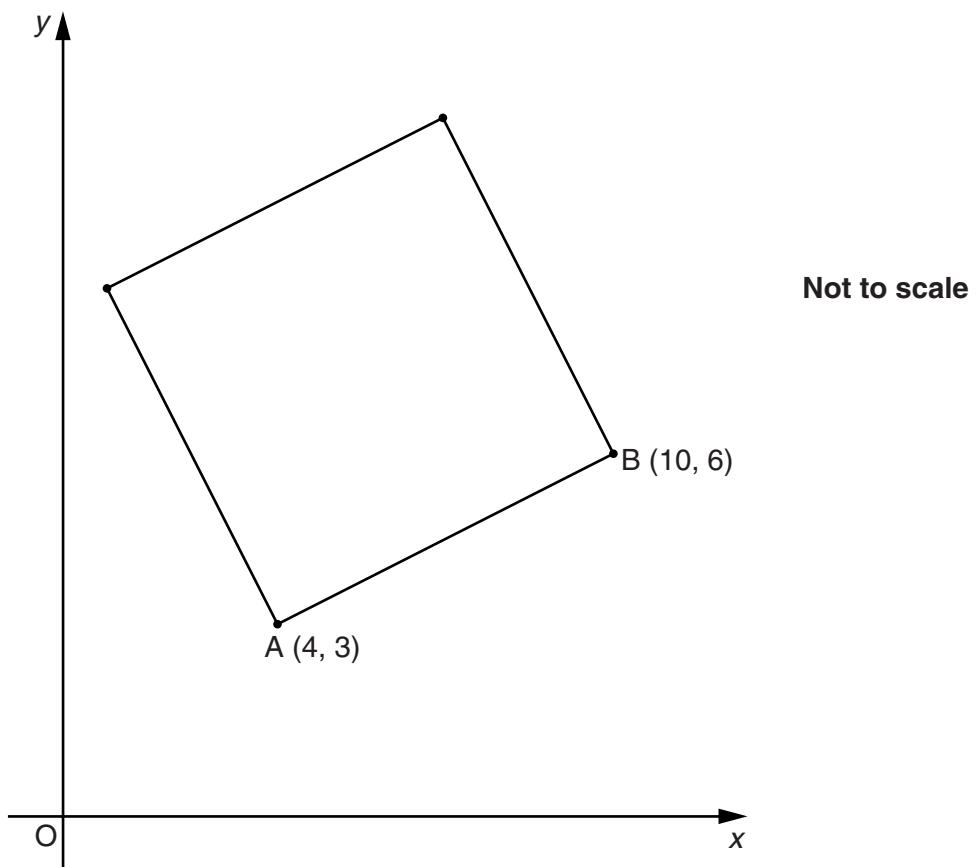
Calculate the area of the square.

_____ square units **[4]**

6 The diagrams show a sequence of patterns using squares.
The first four patterns are shown.
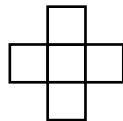
Pattern 1   Pattern 2   Pattern 3   Pattern 4
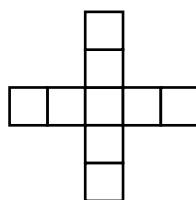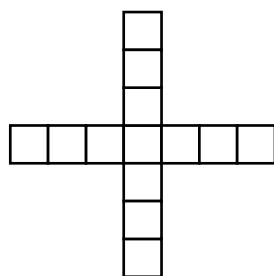
(a) How many squares are needed to make the 5th pattern?

(a) _____ **[2]**

(b) Find an expression for the number of squares in the nth pattern.

(b) _____ **[2]**

(c)* Explain why there cannot be a pattern in this sequence with an even number of squares.

_____

_____

_____

_____ **[2]**

Turn over

7 The shape below is made of two semicircles and a straight line.
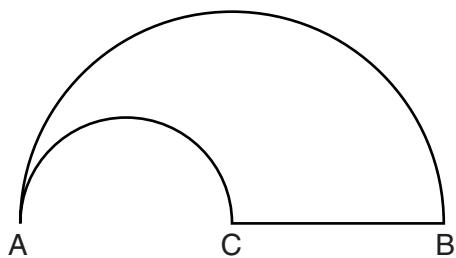
AB = 10 cm. C is the midpoint of AB.

Calculate the perimeter of the shape.

_____ cm **[5]**

8 *p* and *q* are two numbers.
Each of *p* and *q* is **bigger** than 1000.
$pq = 3.2 \times 10^8$.

Find a possible pair of values for *p* and *q*.

p = _____

q = _____

[2]

9 **(a)** Complete the table for $y = x(x - 2)$.

x	$^-2$	$^-1$	0	1	2	3
y	8					3

[2]

(b) Draw the graph of $y = x(x - 2)$.
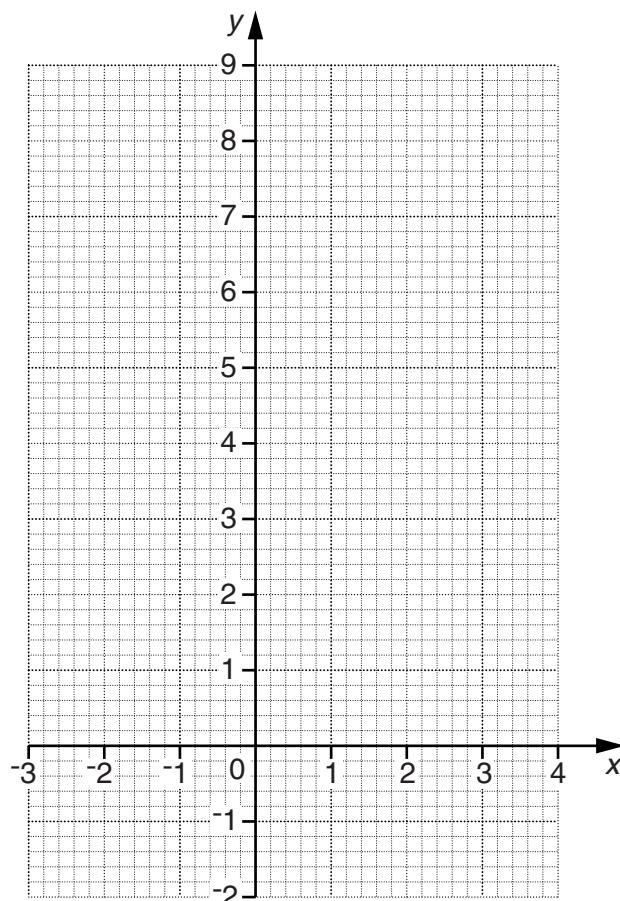
[2]

(c) Use your graph to solve the equation $x(x - 2) = 1$.
Give your answers correct to 1 decimal place.

(c) _____ [2]

Turn over

10 A is the point (3, 1); B is the point (0, ‾2).

(a) Find the coordinates of the midpoint of AB.

(a) (_____ , _____) **[2]**

(b) (i) Draw accurately the locus of points which are equidistant from points A and B.
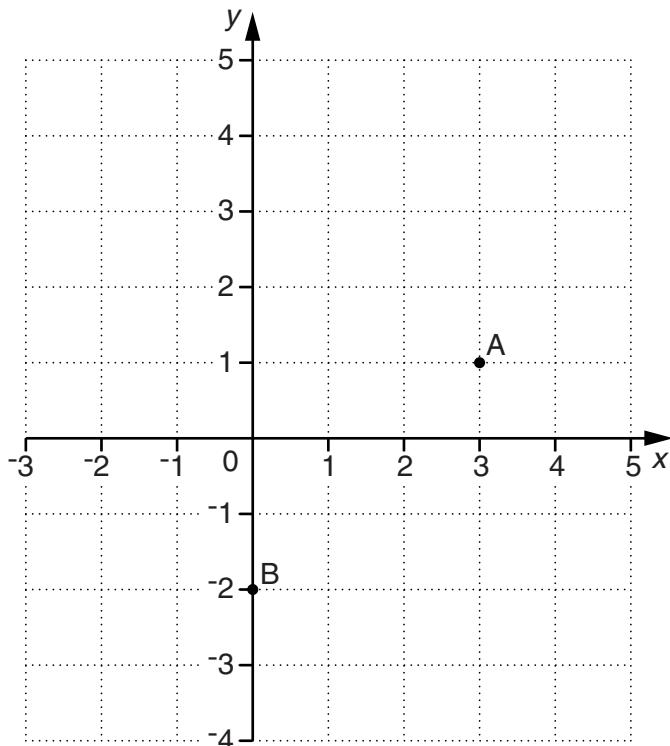
[2]

(ii) Find the equation of the locus in part **(b)(i)**.

(ii) _____ **[2]**

11 (a) Expand the brackets and simplify.

$$(2x + 3)(2x + 1)$$

(a) _____ **[3]**

(b) Factorise.

$$9x^2 - 4$$

(b) _____ **[2]**

(c) A rectangle is x cm long. Its width is 4 cm shorter than its length.
The area of the rectangle is 15 cm^2.
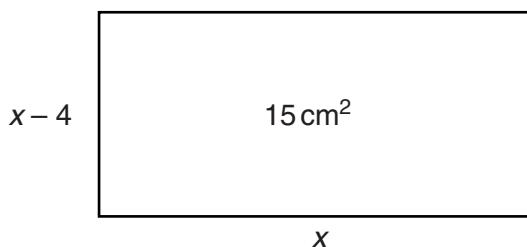
Work out the value of x. Give your answer correct to 2 decimal places.

(c) _____ **[5]**

Turn over

12 This question is about the following formula.

$$T = 2\pi \sqrt{\dfrac{L}{g}}$$

(a) Calculate the value of T when $L = 5.9$ and $g = 9.8$. Give your answer correct to 1 decimal place.

(a) _____ **[2]**

(b) Rearrange the formula to make L the subject.

(b) _____ **[3]**

**13** **(a)** A cuboid is 2 cm wide, 3 cm high and 6 cm long.
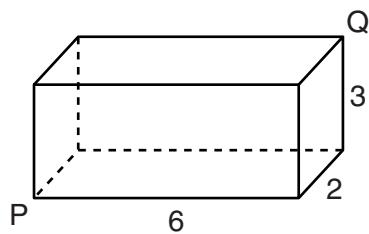
Calculate the length of the diagonal PQ.

(a) _____ cm **[3]**

**(b)** Triangle ABC is right-angled at C such that tan B = 2.

Fill in possible lengths on **two** of the sides of the triangle.

Not to Scale
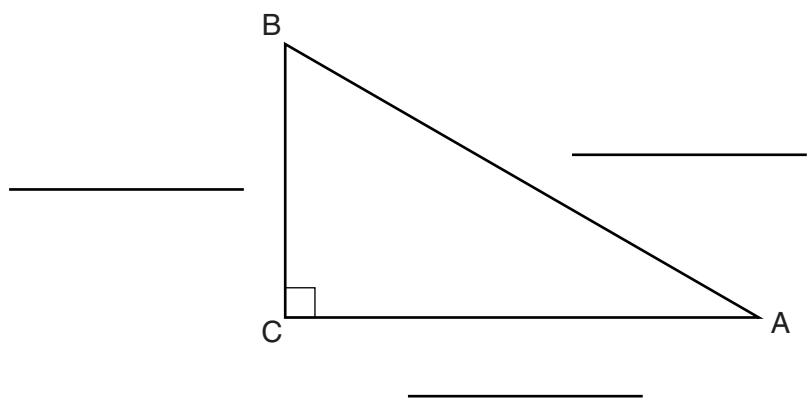
[2]

14* The diagram below shows two regular hexagons. O is the centre of each hexagon.
The larger hexagon is an enlargement of the smaller hexagon, scale factor 2, centre O.
The midpoints of corresponding sides of these two hexagons are joined.
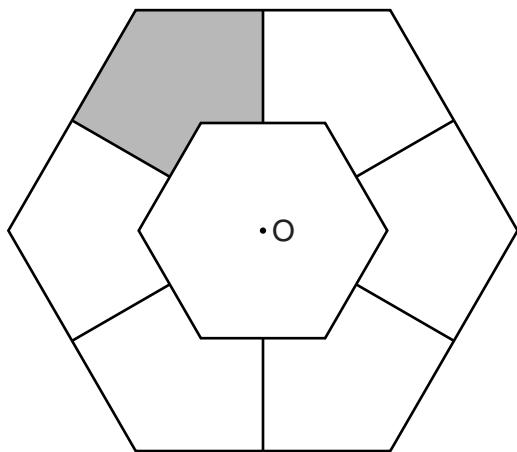
What fraction of the larger hexagon is shaded?

_____

_____

_____

_____

_____

_____

_____

_____

_____ **[5]**

15 *p* is inversely proportional to *v*.
   When *v* = 4, *p* = 2.

   (a) Find *p* when *v* = 2.5.

   (a) _____ **[3]**

   (b) Find *v* when *p* = 0.5.

   (b) _____ **[2]**

Turn over

16 A box is in the shape of a triangular prism.
The cross-section of the prism is an equilateral triangle.
The box is exactly the right size to contain a sphere of
radius 5 cm.
The sphere touches the five faces of the box.

The diagram below shows a cross-section through the
centre of the sphere.
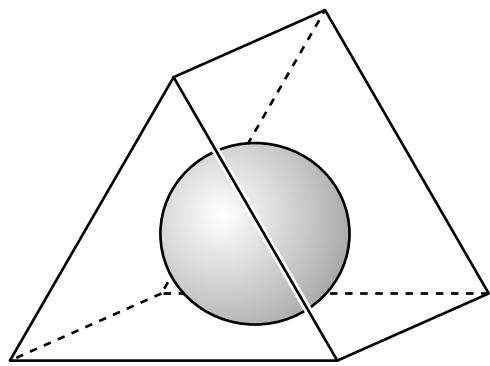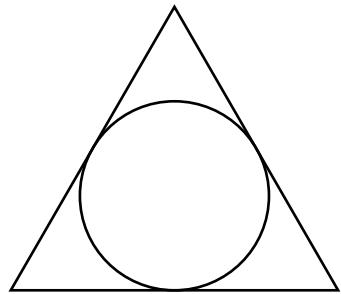
(a) Show that the length of a side of the equilateral triangle is 17.3 cm, correct to 1 decimal place.

[4]

(b) Calculate the volume of the box.

(b) _____ cm³ **[4]**

END OF QUESTION PAPER