

Tuesday 10 November 2015 – Morning

GCSE METHODS IN MATHEMATICS

B391/02 Methods in Mathematics 1 (Higher Tier)

Candidates answer on the Question Paper.

OCR supplied materials:
None

Other materials required:

- Geometrical instruments
- Tracing paper (optional)

Duration: 1 hour 15 minutes



Candidate forename		Candidate surname	
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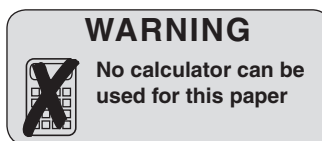
Centre number						Candidate number				
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INSTRUCTIONS TO CANDIDATES

- 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.

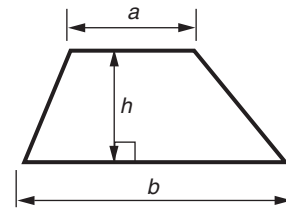
INFORMATION FOR CANDIDATES

- 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 **60**.
- This document consists of **16** pages. Any blank pages are indicated.

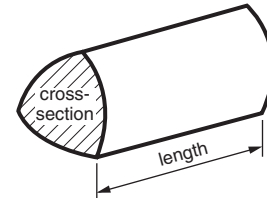


Formula Sheet

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



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

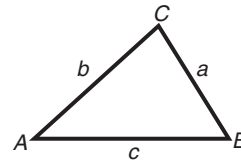


In any triangle ABC

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

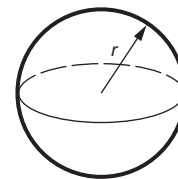
Cosine rule $a^2 = b^2 + c^2 - 2bc \cos A$

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



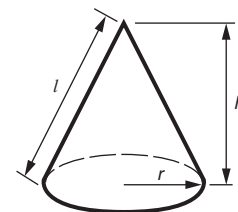
Volume of sphere = $\frac{4}{3}\pi r^3$

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



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

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



The Quadratic Equation

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

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

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Answer **all** the questions.

1 (a) Work out.

(i) 0.2×0.3

(a)(i) [1]

(ii) $\frac{88}{0.11}$

(ii) [1]

(b) Work out.

$$\frac{3}{20} \div \frac{2}{5}$$

Give your answer as a fraction in its lowest terms.

(b) [2]

2 Expressed as the product of its prime factors

$$600 = 2^3 \times 3 \times 5^2.$$

(a) Express 420 as the product of its prime factors.

(a) [2]

(b) Find, leaving your answers expressed as the **product of prime factors**,

(i) the highest common factor (HCF) of 600 and 420,

(b)(i) [1]

(ii) the lowest common multiple (LCM) of 600 and 420,

(ii) [1]

(iii) the smallest value of k when $600k$ is a cube number.

(iii) [1]

- 3 Mario is doing a survey, in his town, about the number of people in cars during the rush hour. From his observations he makes this table of relative frequencies.

Number of people	1	2	3	4	5 or more
Relative frequency	0.4	0.24	0.19	0.1	

- (a) Find the relative frequency of a car having 5 or more people in it.

(a) [2]

- (b) Mario wants to use his results to estimate the probability that a car in his town during the rush hour will have 3 people in it.

Write down two things that Mario must have done, when he did his survey, to make sure that his estimate is a good one.

1

.....

2

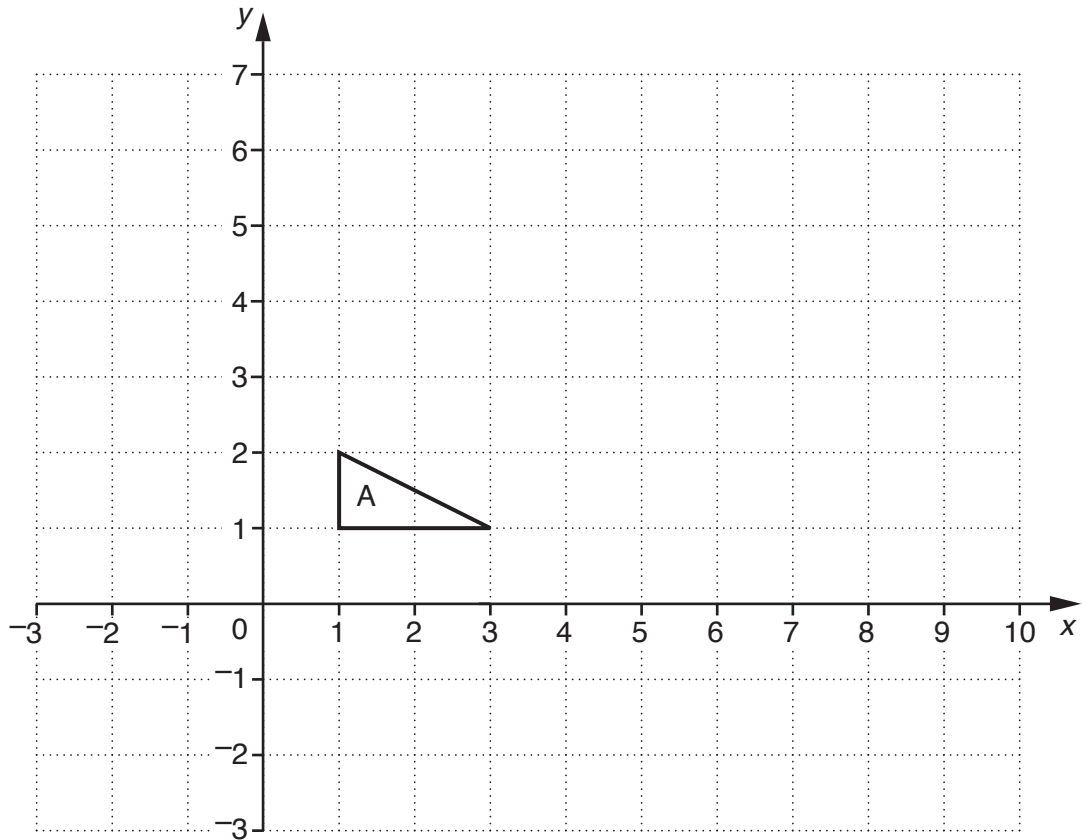
..... [2]

- (c) There were 5000 cars using the roads in Mario's town during the rush hour.

Use Mario's results to estimate the number of these cars that had 1 person in.

(c) [2]

4



- (a) (i) Translate triangle A using the vector $\begin{pmatrix} -3 \\ 2 \end{pmatrix}$.

Label the image B.

[2]

- (ii) Enlarge triangle A with scale factor 3 and centre (0, 0).

Label the image C.

[2]

- (iii) Describe fully the single transformation that maps triangle C onto triangle A.

.....

..... [2]

- (b) A triangle P is reflected to give triangle Q.
Triangle Q is rotated to give triangle R.
Triangle R is enlarged to give triangle S.
Triangle S is translated to give triangle T.

Complete this table.

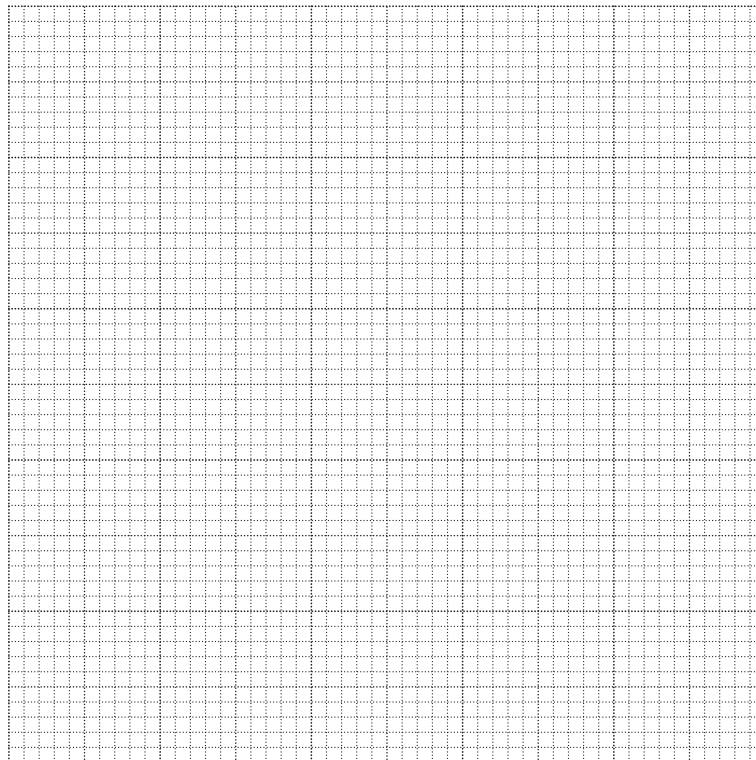
Write Y if the triangles are **always** congruent.

Write N if the triangles are **not always** congruent.

Triangles	Congruent, Y or N?
P and Q	
P and R	
P and S	
R and T	

You may use this grid if required.

[3]



5 (a)* Solve algebraically.

$$7(x + 2) - 2(2x + 3) = 20$$

(a) [4]

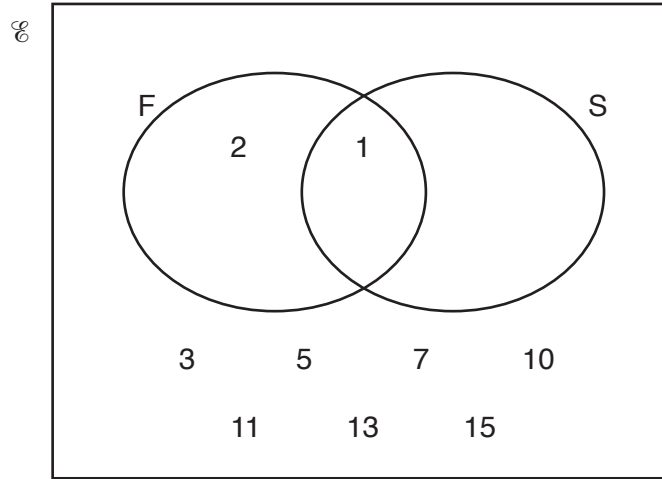
(b) $a(5x^2 + 3x + b) = 20x^2 + cx - 8$

Find the values of a , b and c so that the expansion of the brackets is correct.

(b) $a = \dots\dots\dots, b = \dots\dots\dots, c = \dots\dots\dots$ [3]

- 6 (a) $\mathcal{E} = \{\text{positive integers less than 17}\}$
 $F = \{\text{factors of 16}\}$
 $S = \{\text{square numbers}\}$

(i) Complete this Venn diagram to show the sets \mathcal{E} , F and S .



[3]

(ii) List the members of $F \cap S$.

(a)(ii) [1]

(b) In a group of students

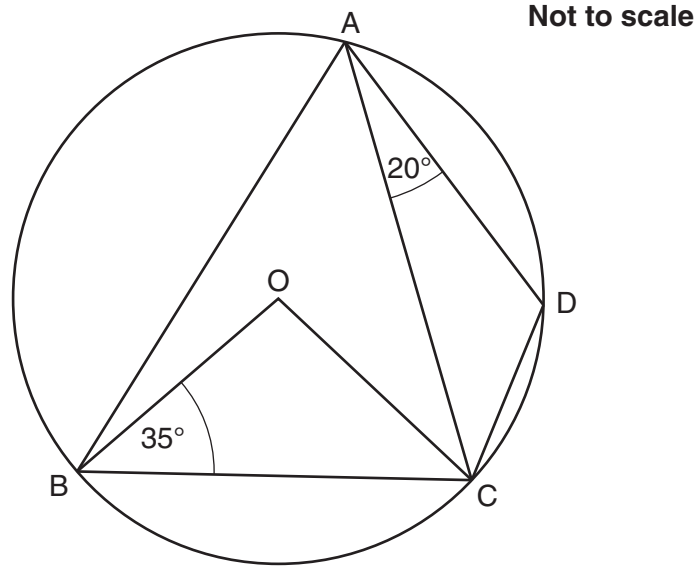
- 35 study Geography
- 25 study History
- 9 study neither Geography nor History.

Find the highest and lowest possible number of students in the group.

(b) highest

lowest [2]

- 7 A, B, C and D are points on a circle, centre O.
 Angle $OBC = 35^\circ$ and angle $DAC = 20^\circ$.



(a) Calculate the size of these angles.

(i) $\angle BOC$

(a)(i) $^\circ$ [1]

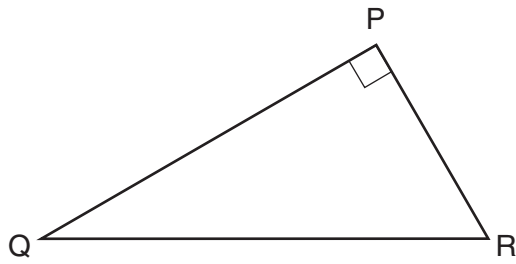
(ii) $\angle BAC$

(ii) $^\circ$ [1]

(iii) $\angle OCD$

(iii) $^\circ$ [2]

(b) PQR is a triangle with angle $QPR = 90^\circ$.



Explain why the circle that passes through P, Q and R has its centre at the midpoint of QR.

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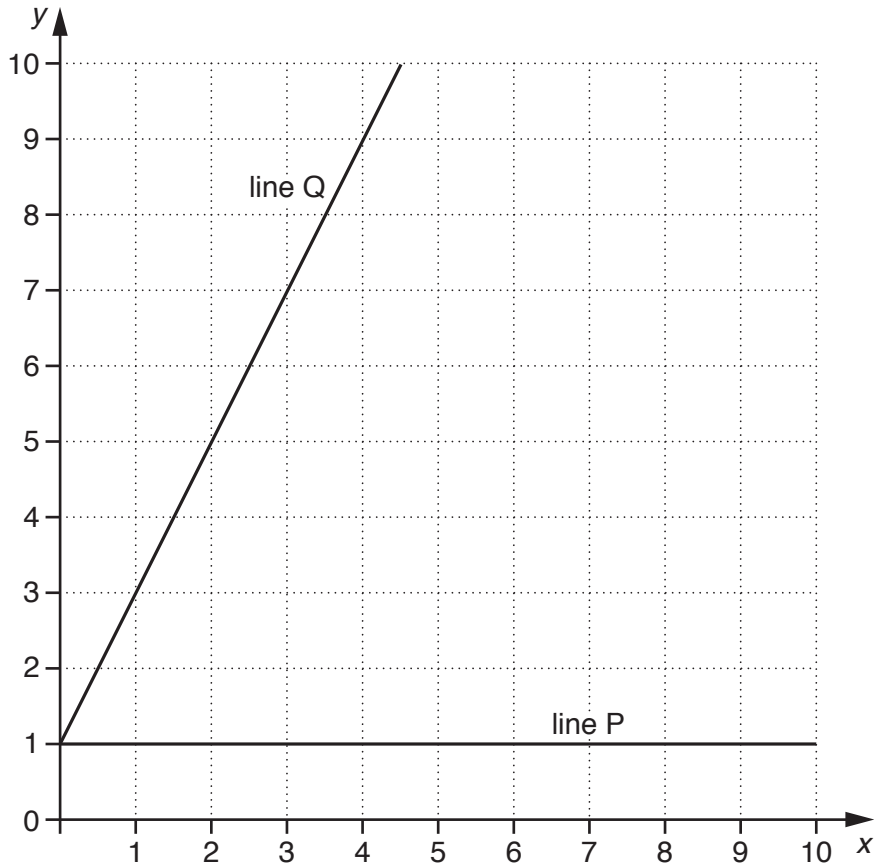
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..... [2]

- 8 The graph shows the line P and the line Q drawn on a one-centimetre grid. The equation of line Q is $y = 2x + 1$.



(a) Write down the equation of line P.

(a) [1]

(b) Line R goes through the point (6, 1). The area of the triangle enclosed by line P, line Q and line R is 12cm^2 .

Draw line R.

[2]

(c) Write down the equation of line R.

(c) [1]

(d) Line S is parallel to line Q.

It goes through the points (6, 5) and $(a, a + 4)$.

Find the value of a .

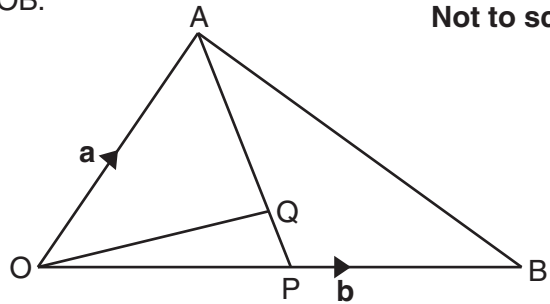
(d) $a = \dots\dots\dots$ [3]

9 Rationalise the denominator and simplify this fraction.

$$\frac{14}{\sqrt{7}}$$

..... [2]

10 In the diagram P is the midpoint of OB.
 Q divides AP in the ratio 4:1.
 $\vec{OA} = \mathbf{a}$ and $\vec{OB} = \mathbf{b}$.



Find these vectors, as simply as possible, in terms of \mathbf{a} and \mathbf{b} .

(a) \vec{AP}

(a) [1]

(b) \vec{OQ}

(b) [2]

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