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Thursday 19 January 2012 – Afternoon

GCSE METHODS IN MATHEMATICS

B391/02 Methods in Mathematics 1 (Higher Tier)

B31694011 2

Candidates answer on the Question Paper.

OCR supplied materials:
None

Other materials required:
- Geometrical instruments
- Tracing paper (optional)

Duration: 1 hour 15 minutes

B391 02

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

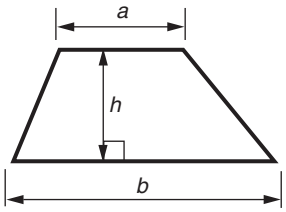
WARNING

No calculator can be used for this paper

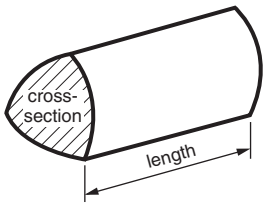
This paper has been pre modified for carrier language

Formulae Sheet: Foundation Tier

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



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

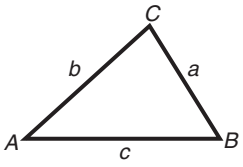


In any triangle *ABC*

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

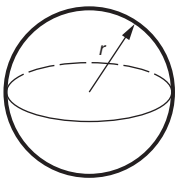
Cosine rule $a^2 = b^2 + c^2 - 2bc\cos A$

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



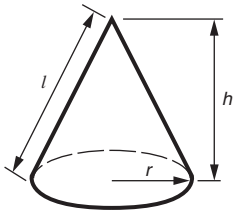
Volume of sphere $= \frac{4}{3}\pi r^3$

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

1 Work out.

(a) $29.4 \div 1.4$

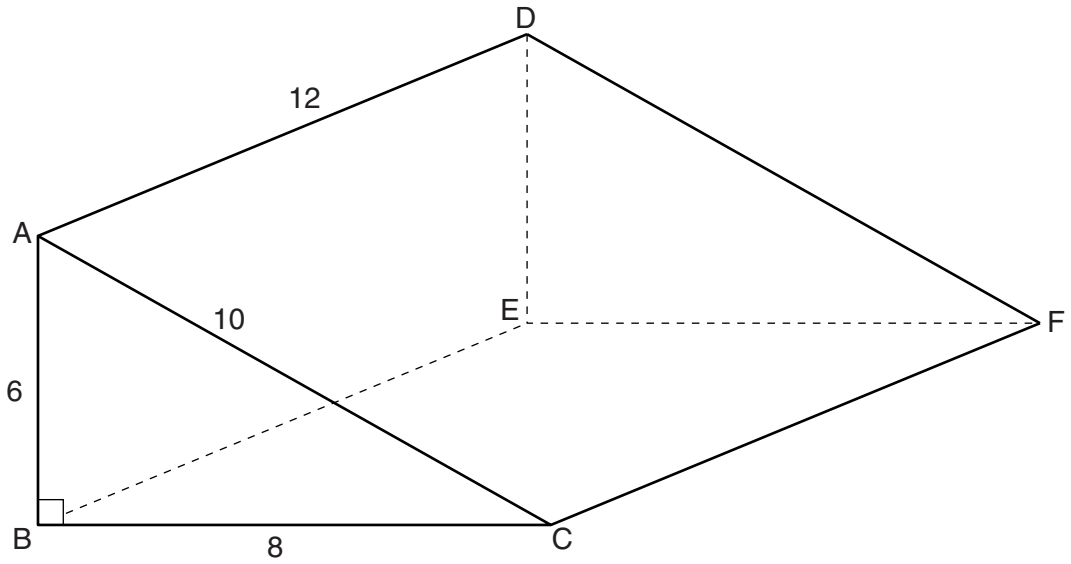
(a) _____ **[2]**

(b) $y = 4a - 5x^2$

Find the value of y when $a = 3$ and $x = {}^{-}2$,

(b) _____ **[2]**

2 The diagram shows a triangular prism of length 12 cm.



AB = 6 cm, AC = 10 cm and BC = 8 cm.
Angle ABC = 90°.

(a) How many planes of symmetry does the prism have?

(a) _____ **[1]**

(b) The prism is made out of card.

(i) Calculate the total surface area of the prism.

(b)(i) _____ cm^2 **[4]**

(ii) Each square centimetre of card weighs 0.02 grams.

Calculate the weight of the prism.

(ii) _____ grams **[2]**

3 Emma is conducting a survey on what the students in her college normally do for lunch.
She selects a random sample of 200 students.
These are her results.

	Cafeteria	Packed lunch	Go home	Buy at local shop
Frequency	80	60	24	36

(a) Complete the table of relative frequencies below.
Give your answers as decimals.

	Cafeteria	Packed lunch	Go home	Buy at local shop
Relative Frequency				

[2]

(b) Emma says that the relative frequencies in **part (a)** are good estimates of probability.

Is she correct? Give a reason for your answer.

_____ because _____

_____ **[1]**

(c) The college has 3200 students.

Estimate the number of students in the college who normally have lunch at the cafeteria.

(c) _____ **[2]**

4 Work these out.
Give your answers as mixed numbers in their lowest terms.

(a) $8 \times \frac{3}{10}$

(a) _____ **[2]**

(b) $\frac{2}{3} + \frac{5}{6} - \frac{1}{4}$

(b) _____ **[4]**

5 In triangle ABC

- angle B is twice as big as angle A
- angle C is 40° less than angle A

Find the three angles of the triangle.

angle A = _____ ° angle B = _____ ° angle C = _____ ° **[3]**

6 **(a)** Simplify.

(i) $5p^4 \times 3p^3$

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

(ii) $8x - 4 + 3(2x + 5)$

(ii) _____ **[3]**

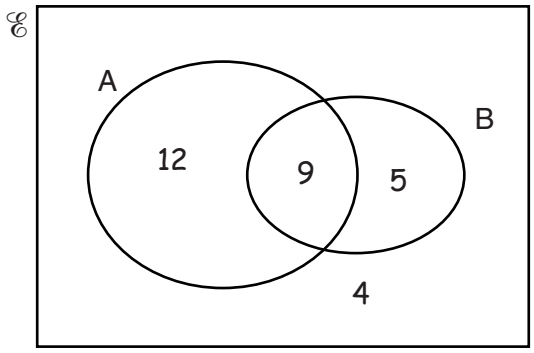
(b) Solve.

$5x + 3 = 4 - 2x$

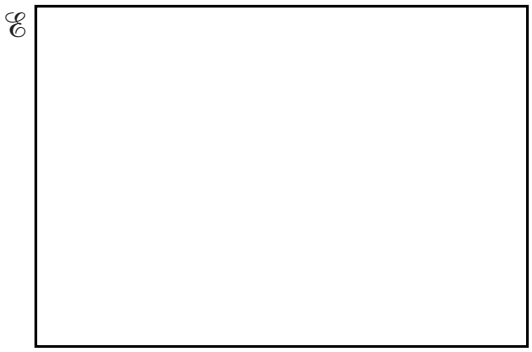
(b) _____ **[3]**

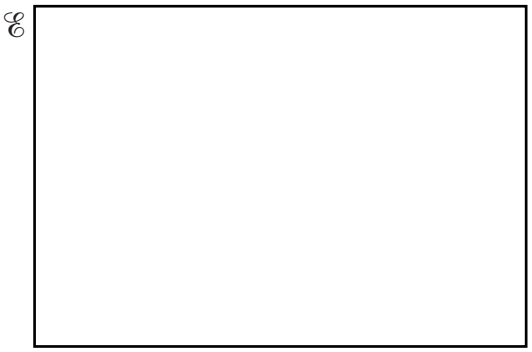
7 The sets A and B and the universal set $\mathscr{E}$ are such that $n(\mathscr{E}) = 30$, $n(A) = 21$ and $n(B) = 14$.

This Venn diagram shows the sets when $n(A \cap B) = 9$



Find the smallest and greatest values of $n(A \cap B)$.
You can use diagrams to help you.



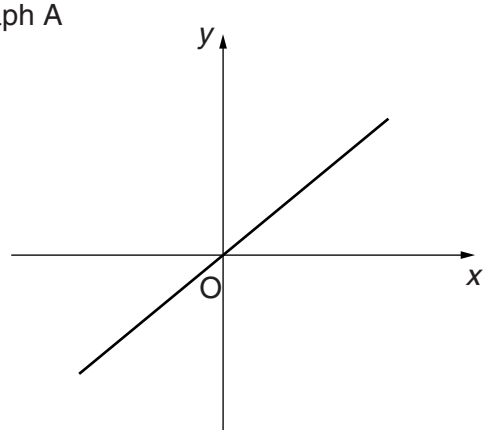


smallest _____

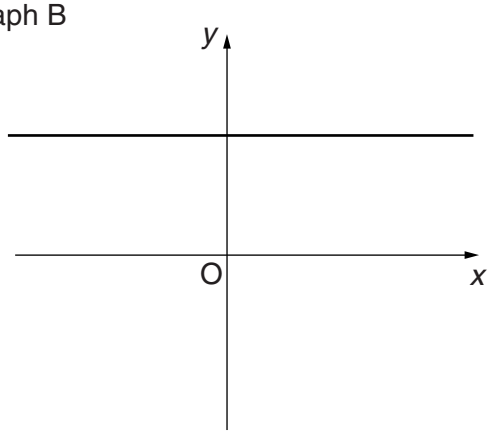
greatest _____ **[3]**

8 Here are some sketch graphs.

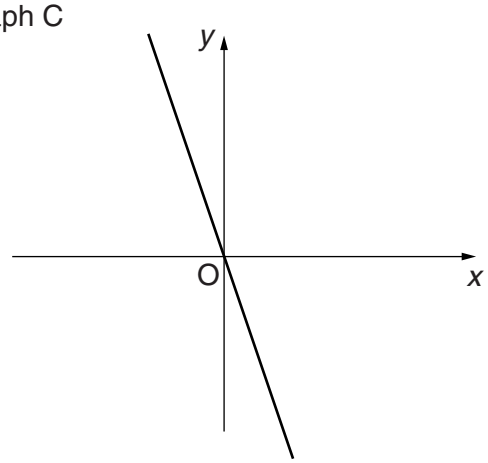
Graph A



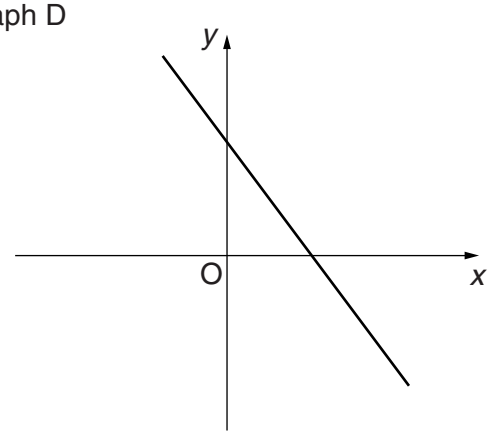
Graph B



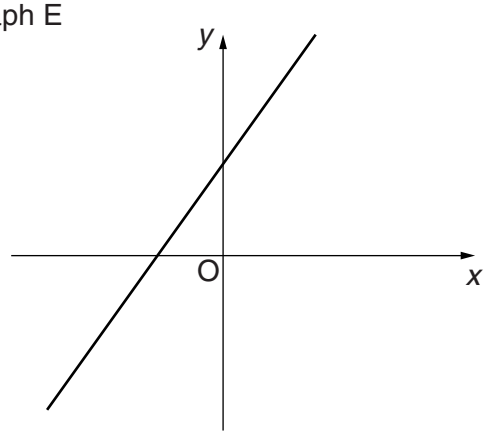
Graph C



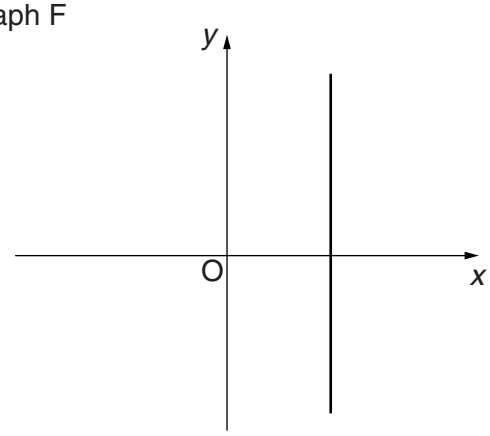
Graph D



Graph E



Graph F



Complete the following.

The equation $y = 2x + 3$ can be represented by sketch graph _____ .

The equation $x = 4$ can be represented by sketch graph _____ .

The equation $y = {}^{-}3x$ can be represented by sketch graph _____ .

The equation $3x + 2y = 6$ can be represented by sketch graph _____ . **[4]**

9 **(a)** Which of these fractions are equivalent to recurring decimals?
Put an R under the ones which recur.

$\frac{5}{6}$ $\frac{3}{5}$ $\frac{8}{15}$ $\frac{5}{7}$ $\frac{3}{40}$

_____ _____ _____ _____ _____ **[2]**

(b) Explain how you decided which were recurring decimals.

_____

_____

_____ **[2]**

10 Write these in order, smallest first.

(a) 0.63 $\quad \frac{2}{3} \quad$ 0.6 $\quad \frac{13}{20}$

_____ , _____ , _____ , _____ **[2]**

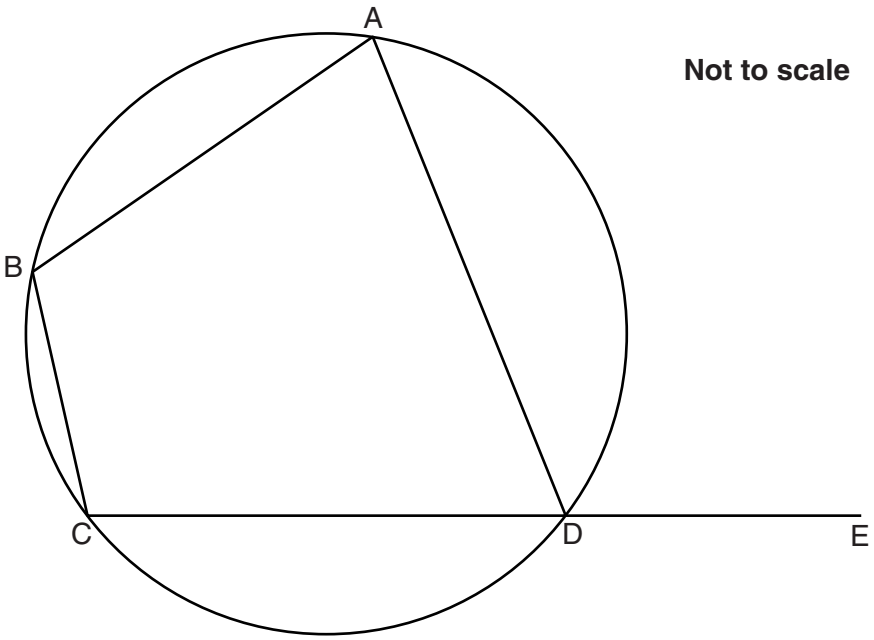
smallest

(b) $\frac{5}{\sqrt{5}} \quad 2\sqrt{5} \quad (\sqrt{5})^3 \quad \frac{\sqrt{5}}{2}$

_____ , _____ , _____ , _____ **[3]**

smallest

11* The points A, B, C and D lie on a circle.
CDE is a straight line.



Not to scale

Prove that angle ABC = angle ADE.
Give a reason for each of your statements.

_____

_____

_____

_____

_____

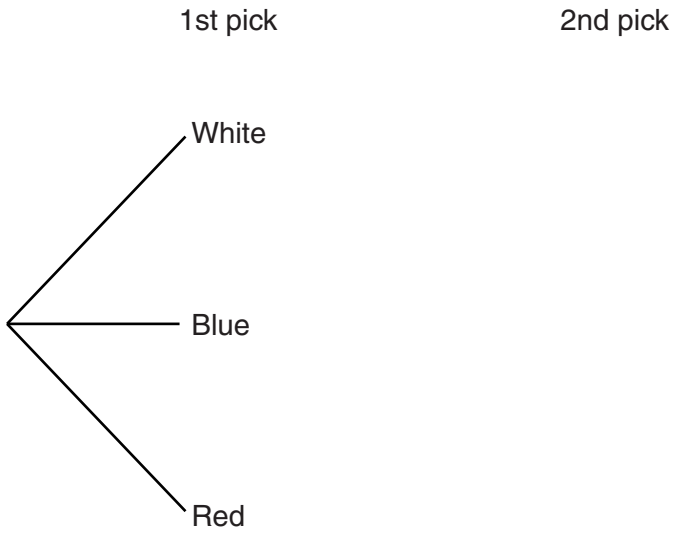
_____

_____

_____ **[3]**

12 In a game there are 7 white beads, 2 blue beads and 1 red bead in a bag.
Natasha picks a bead at random from the bag.
If it is white she loses and the game ends.
If it is blue she picks another bead.
If she picks the red bead at any time she wins a prize.
Beads are not replaced and she is not allowed to pick a third bead.

(a) Complete the probability tree diagram to show **all** the possible outcomes.

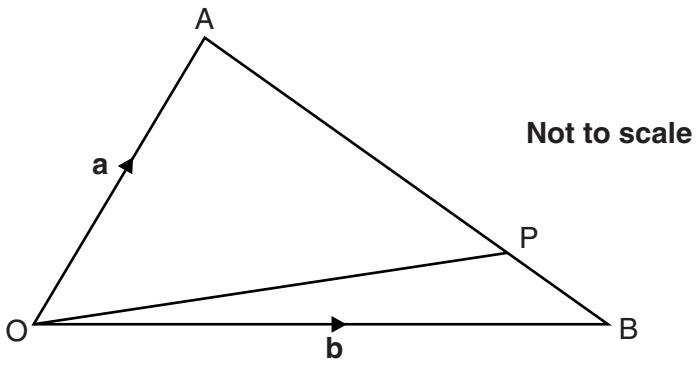


[2]

(b) What is the probability that Natasha wins a prize?

(b) _____ **[3]**

13 In the diagram $\overrightarrow{OA}$ = **a** and $\overrightarrow{OB}$ = **b**.
P is on AB such that AP : PB = 4 : 1.



Not to scale

Find $\overrightarrow{OP}$ in terms of **a** and **b**.
Give your answer in its simplest form.

_____ **[3]**

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