

Monday 11 June 2012 – Afternoon

GCSE APPLICATIONS OF MATHEMATICS

A381/02 Applications of Mathematics 1 (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: 1 hour 15 minutes



Candidate forename		Candidate surname	
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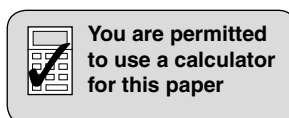
Centre number						Candidate number				
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INSTRUCTIONS TO CANDIDATES

- 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

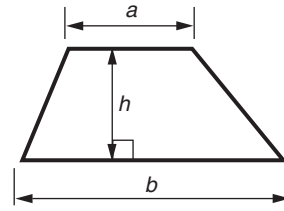
- The number of marks is given in brackets [] at the end of each question or part question.
- Your Quality of Written Communication is assessed in questions marked with an asterisk (*).
- The total number of marks for this paper is **60**.
- This document consists of **12** pages. Any blank pages are indicated.



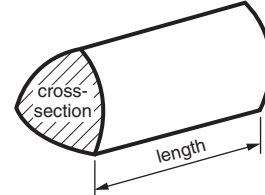
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Formulae Sheet: Higher Tier

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



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

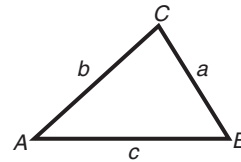


In any triangle ABC

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

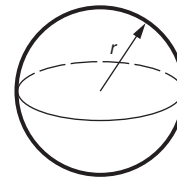
Cosine rule $a^2 = b^2 + c^2 - 2bc \cos A$

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



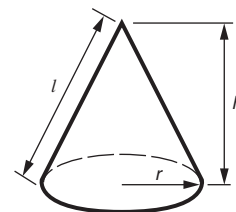
Volume of sphere = $\frac{4}{3}\pi r^3$

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



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

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



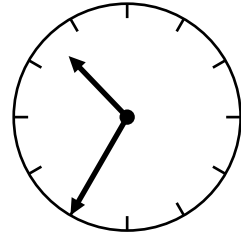
The Quadratic Equation

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

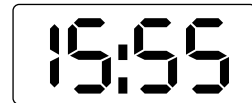
$$x = \frac{-b \pm \sqrt{b^2 - 4ac}}{2a}$$

PLEASE DO NOT WRITE ON THIS PAGE

- 1 Robert sets his watch to the same time as his hall clock.
He leaves home after lunch to visit his mother.
As he is leaving the house he sees this **reflection** of his hall clock.



Robert drives 136 miles to his mother's house without stopping.
When he arrives his watch shows this time.



- (a) What time was it when he left home?

(a) _____ pm [1]

- (b) How long did the journey take?

(b) _____ hours _____ minutes [1]

- (c) Calculate his average speed for the journey.

(c) _____ mph [3]

- 2 These are the ingredients for making four portions of raspberry fool.

<p>Raspberry Fool Makes 4 portions</p> <p>240 g raspberries 50 g sugar 150 ml cream 150 ml yoghurt</p>
--



- (a) Teresa makes 6 portions of raspberry fool.

Complete this list of ingredients she will use.

..... g raspberries

..... g sugar

..... ml cream

..... ml yoghurt

[2]

- (b) John also makes raspberry fool.
He uses 600 g of raspberries.

- (i) How many portions does he make?

(b)(i) _____ [2]

- (ii) He opens a new 1 kg bag of sugar.

How much sugar is left in the bag after he has made the raspberry fool?

(ii) _____ g [2]

- 3 One solution of the equation $9x^2 + 21x + 11 = 0$ is given by this calculation.

$$x = \frac{-21 - \sqrt{21^2 - 396}}{2 \times 9}$$

Work out this solution.

Give your answer correct to two decimal places.

_____ [2]

- 4 A chip shop displays this sign.

CHICKEN NUGGETS	
SMALL PORTION	6 for £2.20
LARGE PORTION	10 for £3.75

- (a) What is the cost per nugget in a large portion?

(a) _____ [1]

- (b) Which portion, large or small, gives better value for money?
Show how you decide.

(b) _____ [2]

- 5 Amir, Behnaz, Carol and Dafydd each had a bag of sweets. Each bag contained the same number of sweets. By the next day

Amir had eaten $\frac{2}{3}$ of his sweets,

Behnaz had eaten $\frac{3}{5}$ of her sweets,

Carol had eaten $\frac{5}{6}$ of her sweets,

Dafydd had eaten $\frac{7}{10}$ of his sweets.

- (a) Write these four fractions in order of size, starting with the smallest.

.....
smallest

[3]

- (b) Each bag contained 30 sweets.

Who has the least number of sweets left?
 How many sweets do they have left?

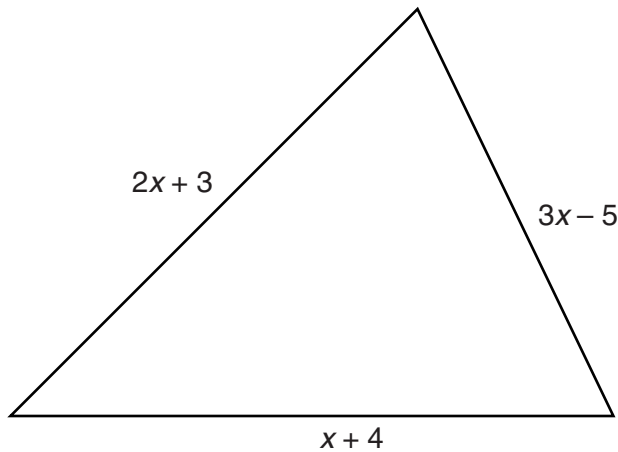
(b) _____ has _____ sweets left [2]

- (c) Elwyn also had a bag of 30 sweets. Eighteen were red and the rest were yellow.

What fraction of the sweets were yellow?
 Write your answer in its lowest terms.

(c) _____ [1]

- 6 The diagram shows a sketch of a triangle.
Expressions for the lengths of the sides are given.



Not to scale

- (a) Write an expression for the perimeter of the triangle.
Give your expression in its simplest form.

(a) _____ [2]

- (b) (i) Show that when $x = 8$, the triangle is isosceles.

_____ [2]

- (ii)* Show that there is only one other value of x that makes the triangle isosceles.
Find this value.

_____ [4]

- 7 In a restaurant, there are tables for four people and tables for two people. There are 20 tables altogether. The maximum number of people that can be seated in the restaurant is 58.

Let x represent the number of tables for 4 people.

Let y represent the number of tables for 2 people.

Form two equations in x and y .

Solve the equations to find the number of tables for 4 people and the number of tables for 2 people.

Number of tables for 4 people _____

Number of tables for 2 people _____ [4]

- 8 Eddie is working out this puzzle.

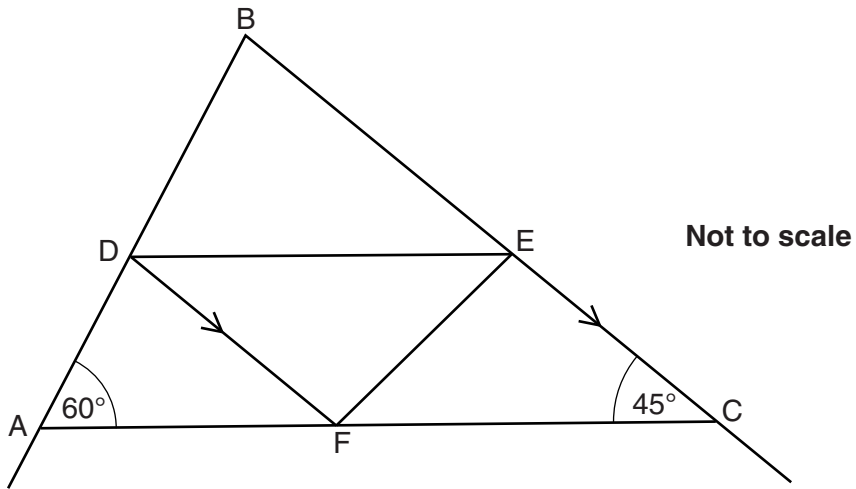
A number has exactly eight factors.
Two of the factors are 27 and 45.

What is the number?

Work out the answer to Eddie's puzzle.

_____ [3]

9 This is a sketch of a roof truss.



AB and BC are rafters.
 AC and DE are horizontal timbers.
 DF and EF are supports with DF parallel to BC.
 Angle BAC = 60° and angle ECF = 45° .

(a) Complete this statement.

Angle AFD = 45° because _____
 _____ [1]

(b) Show that triangle ADF is similar to triangle DBE.
 Give reasons for each step of your working.

 _____ [2]

(c) Triangles ADF and DBE are congruent.

What does this tell you about the position of D?
 _____ [1]

10

- 10 In a TV magazine, $\frac{2}{3}$ of the pages are used for TV listings,
 $\frac{5}{6}$ of the remaining pages are used for previews,
The other 6 pages are used for adverts.

How many pages are in the magazine?

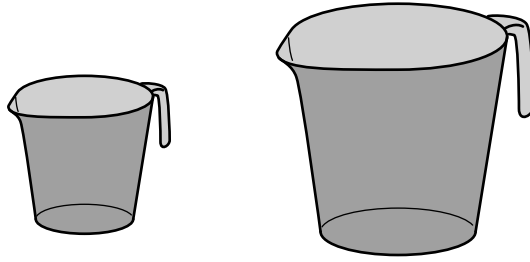
_____ [4]

- 11 The rate of VAT was increased in January 2010 from $17\frac{1}{2}\%$ to 20%.
Before the increase, a hairdryer was priced at £24.99 including VAT.

What was the increase in price of the hairdryer after the increase in VAT?

_____ [4]

- 12** A measuring jug has a diameter of 6 cm and a capacity of 400 ml.
A mathematically similar measuring jug has a height of 19.3 cm and a capacity of 1 litre.
1 litre = 1000 ml



- (a)** Show that the diameter of the larger jug, correct to 1 decimal place, is 8.1 cm.

[3]

- (b)** Calculate the height of the smaller jug.

(b) _____ cm **[2]**

- 13** The kinetic energy, E joules, of an object is proportional to the square of the speed, v metres per second.

When the object is moving at 5 metres per second it has 400 joules of kinetic energy.

- (a) Find a formula for E in terms of v .

(a) _____ [3]

- (b) The speed of the object is reduced by 50%.

Calculate the percentage decrease in the value of the kinetic energy.

(b) _____ % [3]

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