



H

GENERAL CERTIFICATE OF SECONDARY EDUCATION

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)

**Tuesday 11 January 2011
Morning**

Duration: 1 hour 15 minutes



Candidate forename		Candidate surname	
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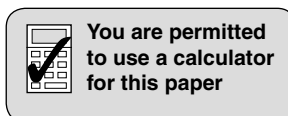
Centre number						Candidate number				
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INSTRUCTIONS TO CANDIDATES

- Write your name, centre number and candidate number in the boxes above. Please write clearly and in capital letters.
- Use black ink. Pencil may be used for graphs and diagrams only.
- 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).
- Answer **all** the questions.
- Do **not** write in the bar codes.

INFORMATION FOR CANDIDATES

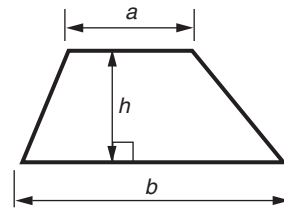
- The number of marks is given in brackets [] at the end of each question or part question.
- Your Quality of Written Communication is assessed in questions marked with an asterisk (*).
- The total number of marks for this paper is **60**.
- This document consists of **12** pages. Any blank pages are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



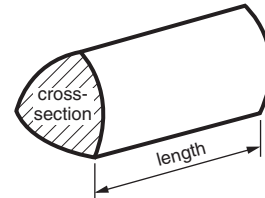
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Formulae Sheet: Higher Tier

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



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

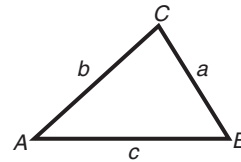


In any triangle ABC

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

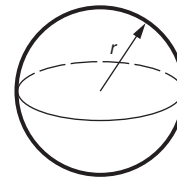
Cosine rule $a^2 = b^2 + c^2 - 2bc \cos A$

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



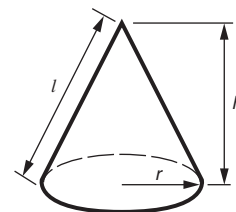
Volume of sphere = $\frac{4}{3}\pi r^3$

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 These are the ingredients for making sixteen cakes.

240 g	flour
120 g	sugar
120 g	margarine
2	eggs
30 ml	milk
Makes 16 cakes	

- (a) Sandra makes 24 cakes.

How much flour does she use?

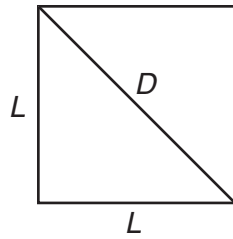
(a) _____ g [2]

- (b) Elfed makes 12 cakes.
He opens a $\frac{1}{2}$ kg bag of sugar.

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

(b) _____ g [3]

- 2 (a) A square has a side of length L .



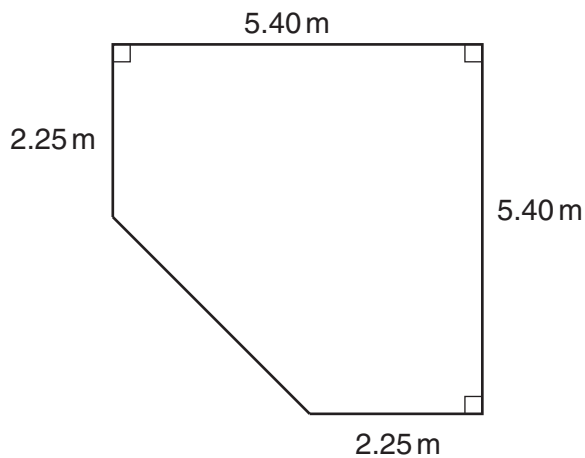
Frank uses this formula to calculate the length, D , of the diagonal of the square.

$$D = \sqrt{2L^2}$$

Calculate the length of the diagonal of a square with a side of length 3.15 m.
Give your answer correct to 2 decimal places.

(a) _____ m [2]

- (b) Frank is planning a patio.
This is a sketch of the area to be paved.



Not to scale

Edging stones will be placed around the edge of the patio.

Calculate the perimeter of the patio.

(b) _____ m [2]

3 Here is a puzzle.

A school hires 2 minibuses and 3 coaches for a trip.

Each minibus seats x passengers.

Each coach seats $(3x - 5)$ passengers.

All the seats are occupied.

(a) Write down and simplify an expression, in terms of x , for the total number of passengers.

(a) _____ [3]

(b) A total of 150 passengers go on the trip.

(i) Form an equation in x and solve it.

(b)(i) _____ [3]

(ii) How many passengers are in each coach?

(ii) _____ [1]

4 Work out.

$$5\frac{3}{5} - 1\frac{3}{4}$$

Give your answer as a mixed number.

_____ [3]

- 5 Kim's hot and cold taps both drip.
Kim's hot tap drips every 12 seconds.
Her cold tap drips every 10 seconds.
She sees them both drip together.

How many seconds will it be before they next drip together?

_____ [2]

6 (a) Solve.

$$3(2x - 3) = 2x + 4$$

(a) _____ [3]

(b) At a school fayre Sima paid £1.55 for two teas and three cakes.
Dipak bought three teas and four cakes and paid £2.15.

Work out the cost of one tea and the cost of one cake.

(b) _____ [4]

- 7 (a) In January 2010 a website had a total of 20 664 visitors.
This was an increase of 12% compared with December 2009.

Work out the number of visitors in December 2009.

(a) _____ [2]

- (b) In January 2010 another website had a total of 27 500 visitors.
In February 2010 the number of visitors increased by 16% of the January figure.
In March 2010 the number of visitors increased by 16% of the February figure.
In April 2010 the number of visitors increased by 16% of the March figure.

How many visitors did this website receive in April 2010?

(b) _____ [3]

8 Evaluate.

(a) 6^0

(a) _____ [1]

(b) $49^{-\frac{1}{2}}$

(b) _____ [2]

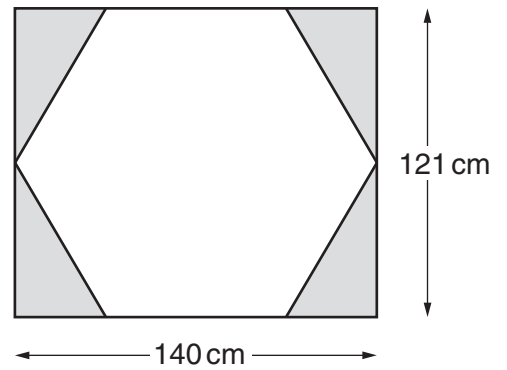
(c) $\frac{5^7 \times 5}{5^6}$

(c) _____ [2]

9 Pino is making a table.
The top of the table is a regular hexagon of side length 70 cm.
It is cut from a rectangular piece of wood as shown.

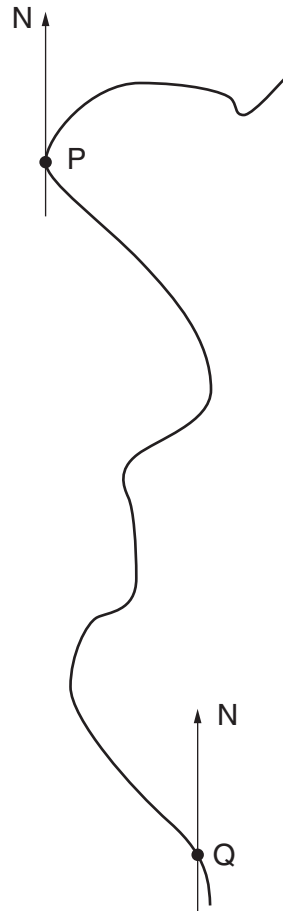
Calculate the area of the top of the table.

Not to scale



_____ cm² [4]

- 10 This scale drawing shows two ports, P and Q.
The scale is 1 cm represents 4 km.



- (a) The bearing of a lighthouse from P is 255° .
The bearing of the lighthouse from Q is 305° .

Construct and mark the position of the lighthouse.
Label it L.

[3]

- (b) A ship sails from Q to the lighthouse at a speed of 25 km/h.

Work out the time, to the nearest minute, for the ship to reach the lighthouse.

(b) _____ hours _____ minutes [4]

TURN OVER FOR QUESTION 11

- 11 A manufacturer makes novelty balloons in two sizes.
Each balloon is a cube.
The volume of the larger balloon is twice that of the smaller balloon.

Calculate the surface area of the larger balloon as a percentage of the surface area of the smaller balloon.

_____ % [4]

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