OCR
RECOGNISING ACHIEVEMENT

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B264A

GENERAL CERTIFICATE OF SECONDARY EDUCATION
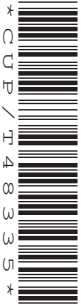
MATHEMATICS B (MEI)

Paper 4 Section A (Higher Tier)

MONDAY 2 JUNE 2008

Afternoon
Time: 1 hour

Candidates answer on the question paper
Additional materials (enclosed):   None

Additional materials (required):
Geometrical instruments
Tracing paper (optional)

Candidate Forename		Candidate Surname	

Centre Number		Candidate Number	

INSTRUCTIONS TO CANDIDATES

- Write your name in capital letters, your Centre Number and Candidate Number in the boxes above.
- Use blue or black ink. Pencil may be used for graphs and diagrams only.
- Read each question carefully and make sure that you know what you have to do before starting your answer.
- Answer **all** the questions.
- Show your working. Marks may be given for a correct method even if the answer is incorrect.
- Do **not** write in the bar codes.
- Write your answer to each question in the space provided.

INFORMATION FOR CANDIDATES

- The number of marks is given in brackets [ ] at the end of each question or part question.
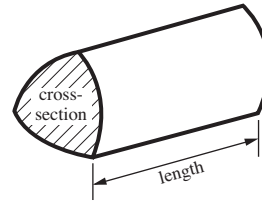- The total number of marks for this Section is **50**.

WARNING
**You are not allowed to use a
calculator in Section A of this paper.**

FOR EXAMINER'S USE	
SECTION A	
SECTION B	
TOTAL	

This document consists of **12** printed pages.

Formulae Sheet : Higher Tier
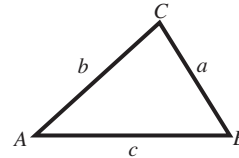
Volume of prism = (area of cross-section) × length

In any triangle *ABC*

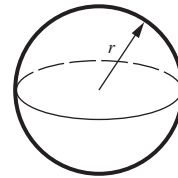**Sine rule** $\dfrac{a}{\sin A} = \dfrac{b}{\sin B} = \dfrac{c}{\sin C}$

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

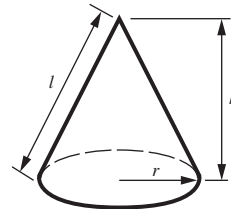**Area of triangle =** $\frac{1}{2} ab \sin C$

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 Glyn is making mortar.

He mixes sand and cement in the ratio 4 : 1.

(a) How much sand does he mix with 5 kg of cement?

(a) .... kg [1]

(b) How much of each does he need to make 45 kg of the mix?

(b) Sand .... kg

Cement.................................. kg [2]

2 The nth term of a sequence is $4n - 5$.

(a) Work out the first three terms of this sequence.

(a) .... [2]

(b) Is 201 a term in this sequence?
Explain how you decided.

.... because ....

.... [2]

3 Alan and Rachel bought a bag of sweets.

Alan ate $\frac{1}{4}$ of them.

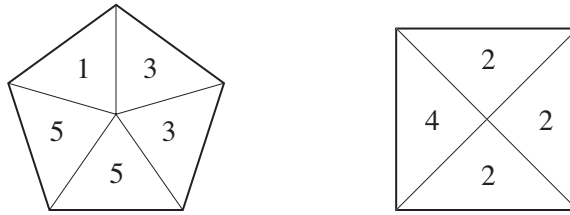Rachel ate $\frac{2}{5}$ of the sweets **that were left**.

(a) What fraction of the original bag of sweets did Rachel eat?

(a) .... [3]

(b) Rachel ate 12 sweets.

How many sweets did Alan and Rachel buy?

(b) .... [2]

4

In a game, Kate spins each of these fair spinners once.
She adds the numbers she gets on the two spinners to find her score.

(a) Explain why Kate's score must be an odd number.

....

.... [1]

(b) To win the game, Kate needs a score of 5.

    (i) What combination of numbers on the spinners would give her a score of 5?

   **(b) (i)** .... [1]

    (ii) Calculate the probability that Kate wins the game.

                              (ii) .... [3]

5 Rushna planted some seeds in her garden.
  After 2 months she measured the heights, in centimetres, of 120 of the plants.
  The cumulative frequency diagram below summarises the distribution of these heights.

  (a) Use the cumulative frequency diagram to estimate the number of these plants which had a height of less than 22 cm.

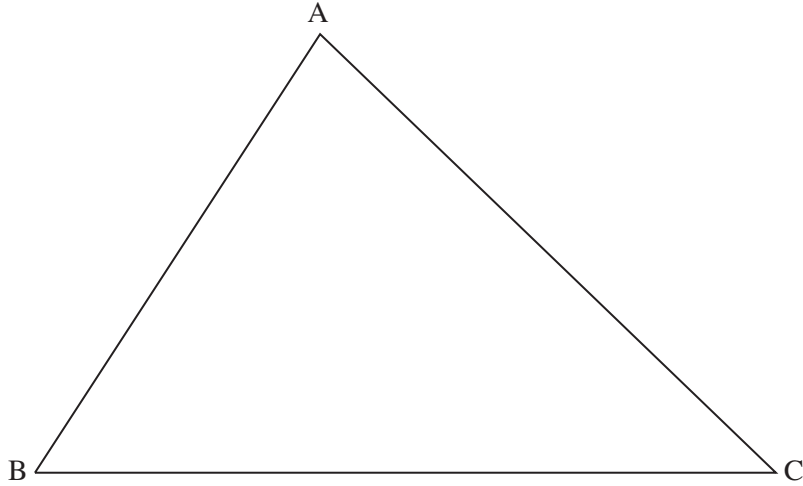 **(a)** .... [1]
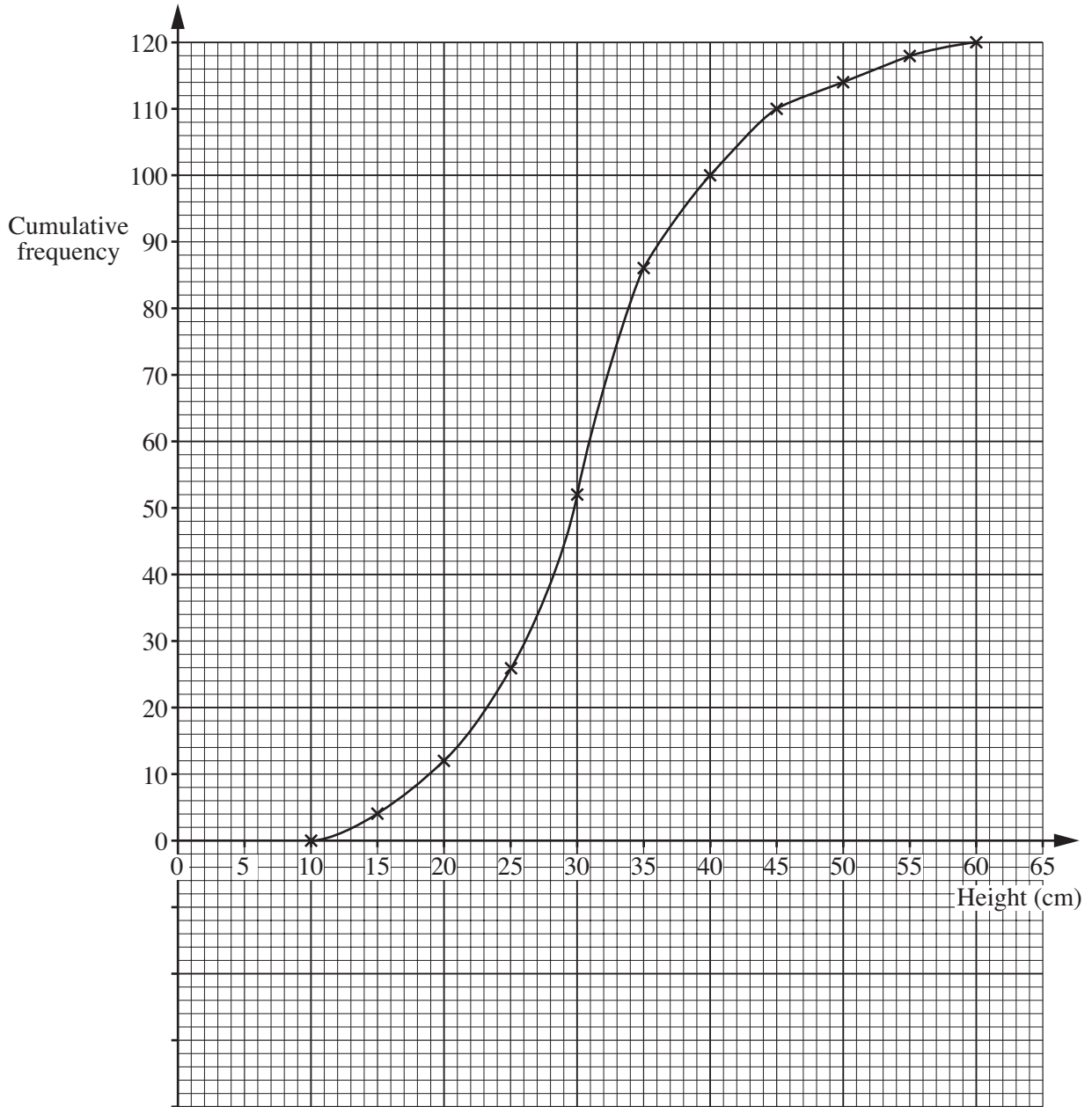
  (b) At the bottom of the grid, draw a box plot to represent the distribution. [4]

6 P is a point, inside the triangle ABC, such that

- P is less than 6 cm from C,
- P is nearer to B than to C.

Shade the region which contains all the possible positions of P.

[3]

7 **(a)** **(i)** In an emergency the distance, x feet, a car travels from when the driver has seen an incident, to when he applies the brakes is proportional to the speed, v mph, of the car.
This is known as the thinking distance.

Write down a formula for x in terms of v and a constant c.

(a) (i) $x =$ .... [1]

(ii) After the brakes have been applied, the distance, y feet, the car takes to stop is proportional to v^2.
This is known as the braking distance.

Write down a formula for y in terms of v and a constant k.

(ii) $y =$ .... [1]

(iii) The total stopping distance, d feet, of the car is equal to the thinking distance plus the braking distance, $(x + y)$.

Use your answers to parts **(a)(i)** and **(ii)** to write down an expression for d in terms of v, c and k.

(iii) $d =$ .... [1]

(b) The table below shows the total stopping distance at speeds of 20mph and 40mph.

v (mph)	d (feet)
20	40
40	120

Using your answer to part **(a) (iii)**,

(i) show that $40 = 20c + 400k$,

....

.... [1]

(ii) write down and simplify a second equation connecting c and k.

(b)(ii) .... [1]

(c) Solve the simultaneous equations in part **(b)** to find the value of c and the value of k.

(c) $c = $ .... $k = $ .... [3]

8 The height of the tide can be modelled by $h = 4 \cos (30t)°$,
where h is the height of the tide in metres,
and t is the time in hours after the time of a high tide.

On the grid below sketch the graph of $h = 4 \cos (30t)°$ for $0 \leq t \leq 24$.
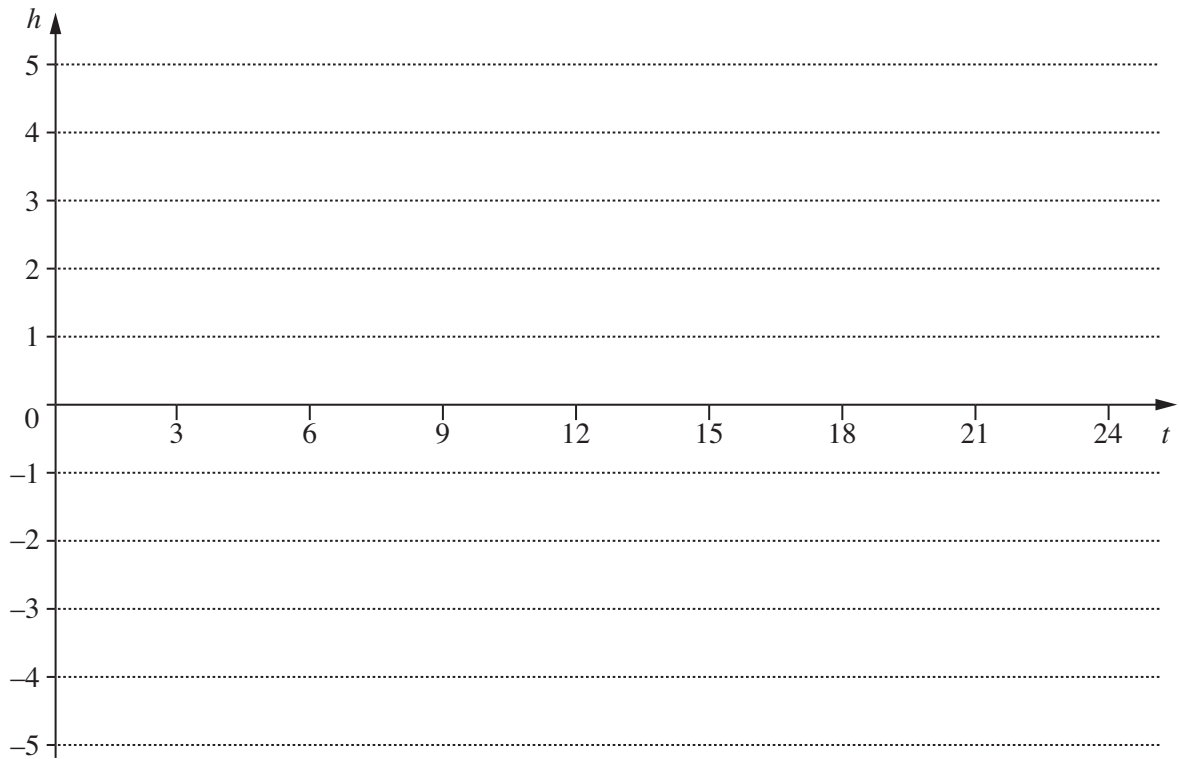
[3]

9 **(a)** Rearrange this equation to make y the subject.

$$5x + 3y = ax - 4y$$

(a) $y =$ .... [3]

(b) Solve this equation algebraically.

$$\frac{2x+1}{3} + \frac{x-5}{2} = \frac{4}{3}$$

(b) .... [4]

(c) Simplify this expression.

$$\frac{x^2 + 8x + 7}{x^2 - 49}$$

(c) .... [3]

TURN OVER FOR QUESTION 10

10
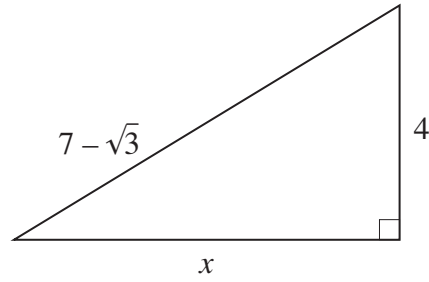
Not to scale

Work out x^2.

Give your answer in the form $a + b\sqrt{3}$ where a and b are integers.

.... [4]