Candidate forename		Candidate surname	

Centre number					Candidate number				

OXFORD CAMBRIDGE AND RSA EXAMINATIONS
GENERAL CERTIFICATE OF SECONDARY EDUCATION

B294A

MATHEMATICS B (MEI)

Paper 4 Section A (Higher Tier)

FRIDAY 14 JANUARY 2011: Morning
DURATION: 1 hour

SUITABLE FOR VISUALLY IMPAIRED CANDIDATES

Candidates answer on the question paper.

OCR SUPPLIED MATERIALS:

None

OTHER MATERIALS REQUIRED:

Geometrical instruments
Tracing paper (optional)
Do not use a calculator for this paper

READ INSTRUCTIONS OVERLEAF

INSTRUCTIONS TO CANDIDATES

- Write your name, centre number and candidate number in the boxes on the first page. 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.

- Show your 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.

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 <u>50</u>.

FORMULAE SHEET: HIGHER TIER
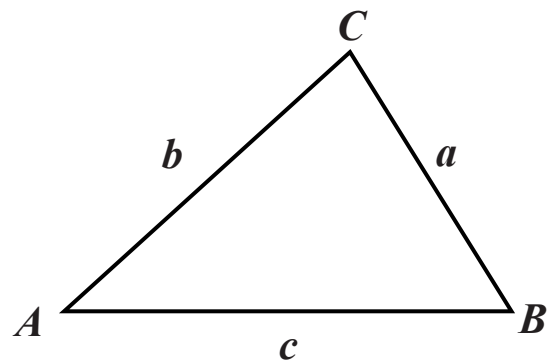
Area of trapezium $= \frac{1}{2}(a + b)h$
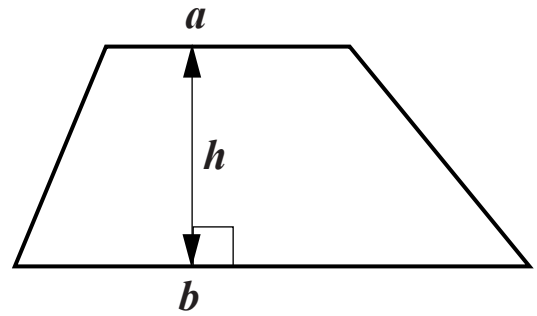
Volume of prism =
(area of cross-section) × length

In any triangle *ABC*

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

Cosine rule $a^2 = b^2 + c^2 - 2bc \cos A$
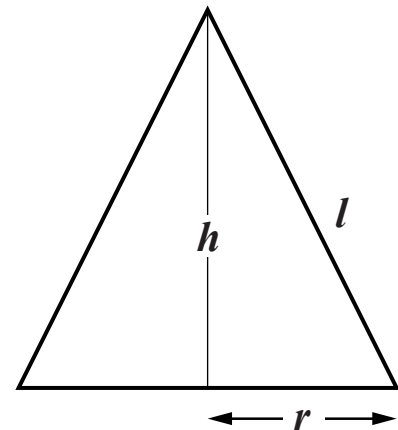
Area of triangle $= \frac{1}{2} ab \, \sin C$

Volume of sphere $= \frac{4}{3}\pi r^3$
Surface area of sphere $= 4\pi r^2$
Where *r* is the radius.

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

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

1 **Anil does the calculation below on his calculator.**

$$\frac{0 \cdot 432 \times 689 \cdot 86}{28 \cdot 4}$$

He writes down the numbers shown on his calculator display as
10 493 645, but forgets to put in the decimal point.
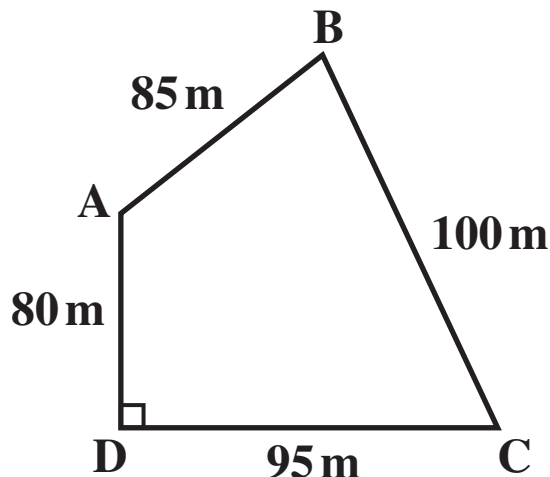
(a) Use estimation to decide where the decimal point should go.
You must show your working. [3 marks]

_____

(b) **Write the correct answer, accurate to 3 significant figures. [1 mark]**

_____

2   IN THIS QUESTION LEAVE IN ALL THE
     CONSTRUCTION ARCS YOU USE.

The diagram below shows the sketch of a field.
It is not to scale.

(a) On the page opposite, make an accurate scale drawing
    of the field.
    Use a scale of 1 cm to represent 10 m.
    The line DC has been drawn for you. [3 marks]

(b) A mobile phone mast is to be erected in the field.
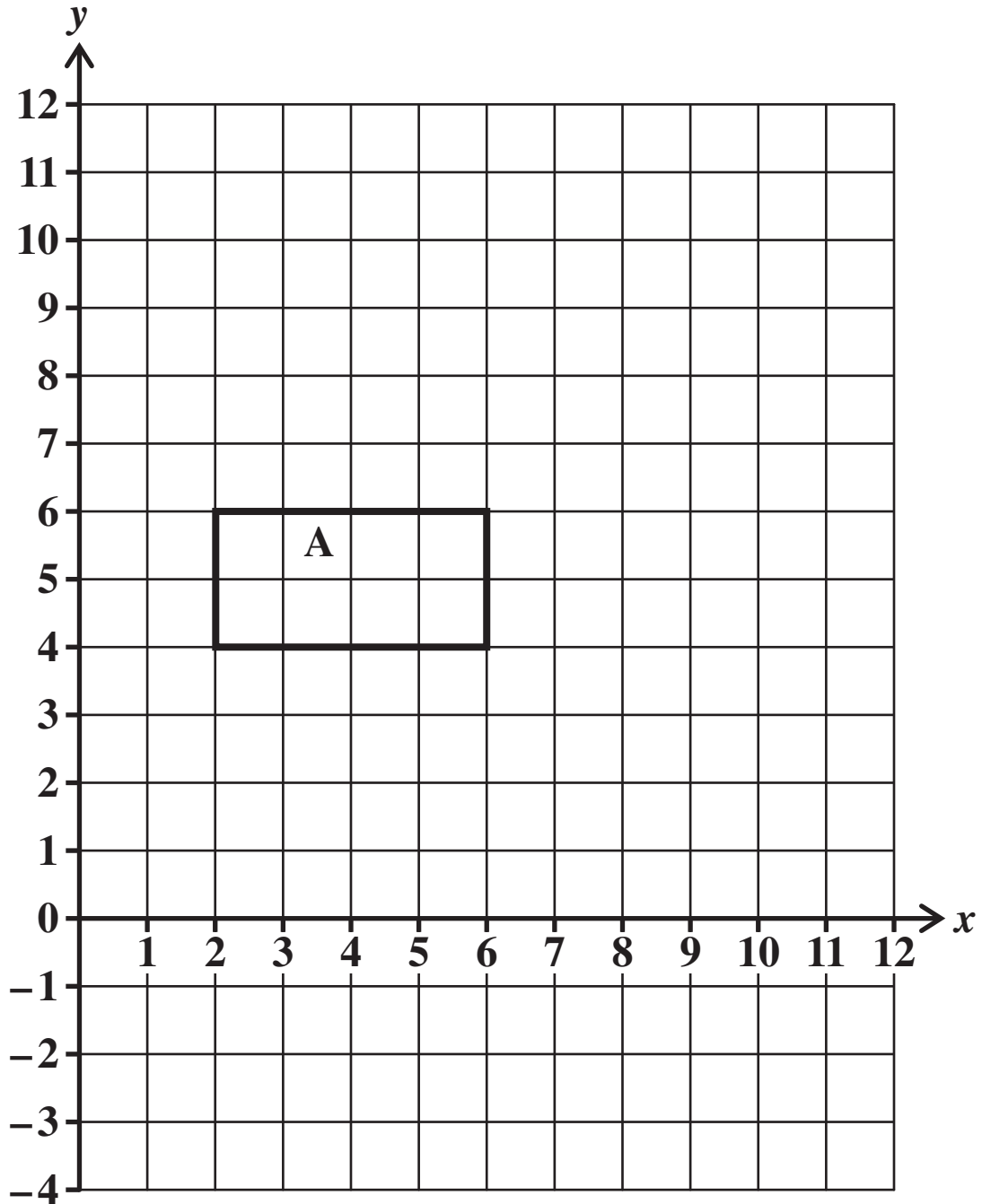   The mast must be
        • the same distance from B as it is from D
        • at least 65 m from A.

    On your drawing, use ruler and compasses only to
    construct all the possible positions for the mast.
    Show your answer clearly. [4 marks]

D •————————————————————————• C

3 A rectangle is drawn on the grid below.

(a) Enlarge rectangle A by scale factor $\frac{1}{2}$ with centre (0, 0).
[2 marks]

(b) Translate rectangle A by the vector $\begin{pmatrix} 2 \\ -7 \end{pmatrix}$.
[2 marks]

4 **Write each of the following as a single power of 5**

(a) $\dfrac{5^4 \times 5^7}{5^3}$

[2 marks]

_____

(b) $\dfrac{1}{5}$

[1 mark]

_____

(c) the square root of five cubed

[1 mark]

_____

5 At Barney's Diner a three-course meal costs £2 more than a two-course meal.
A group of 8 people go to the Diner.
Three of them have two-course meals and the rest have three-course meals.

The total cost is £126
Let £x be the cost of a two-course meal.

Write down an equation in x and solve it to find the cost of a two-course meal. [5 marks]

£ _____

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Question 6 begins on page 12.

6 The letters of the words COUNTDOWN are written on nine cards.

| C | O | U | N | T | D | O | W | N |

Carol chooses two of these cards at random and places them side by side.
She notes whether each is a vowel or a consonant.

(a) Complete the probability tree diagram below for Carol's choices. [2 marks]

1st Card   **2nd Card**

$\frac{3}{9}$ vowel

vowel

consonant

consonant

vowel
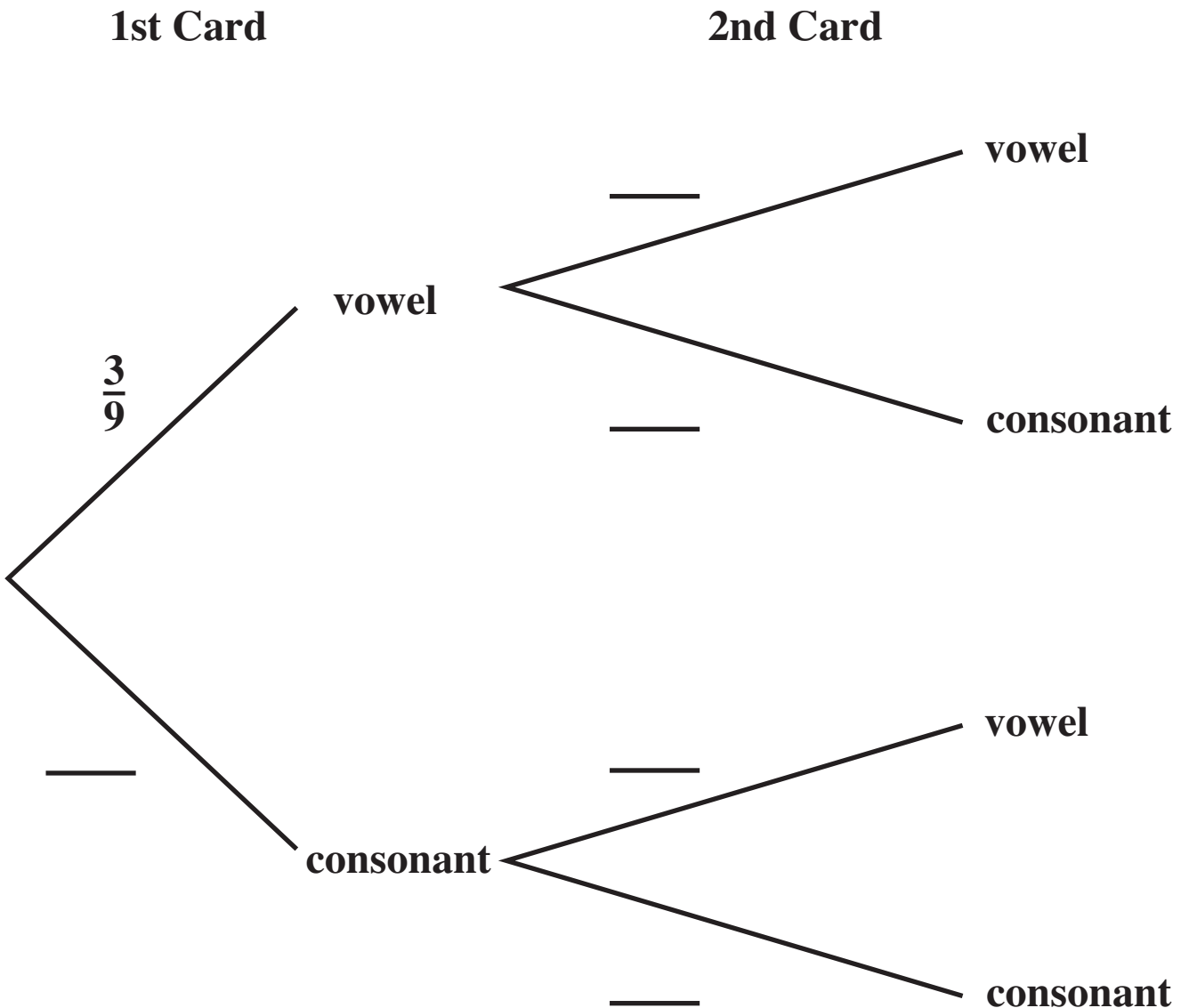
consonant

(b) Calculate the probability that at least one of her cards is a consonant. [3 marks]

_____

7 Mr Gill drives regularly from Manchester to London.
He records the time t hours it takes on 80 of these journeys.
His results are summarised in the table below.

Time (t hours)	Number of journeys
$2.75 < t \leq 3$	10
$3 < t \leq 3.25$	15
$3.25 < t \leq 3.5$	20
$3.5 < t \leq 3.75$	15
$3.75 < t \leq 4$	14
$4 < t \leq 4.25$	6

(a) Complete the table of cumulative frequencies below.
[1 mark]

Time (t hours)	Cumulative frequency
$t \leq 3$	10
$t \leq 3.25$	
$t \leq 3.5$	
$t \leq 3.75$	
$t \leq 4$	
$t \leq 4.25$	80

(b) On the grid opposite draw a cumulative frequency diagram to show these data. [2 marks]

Cumulative frequency
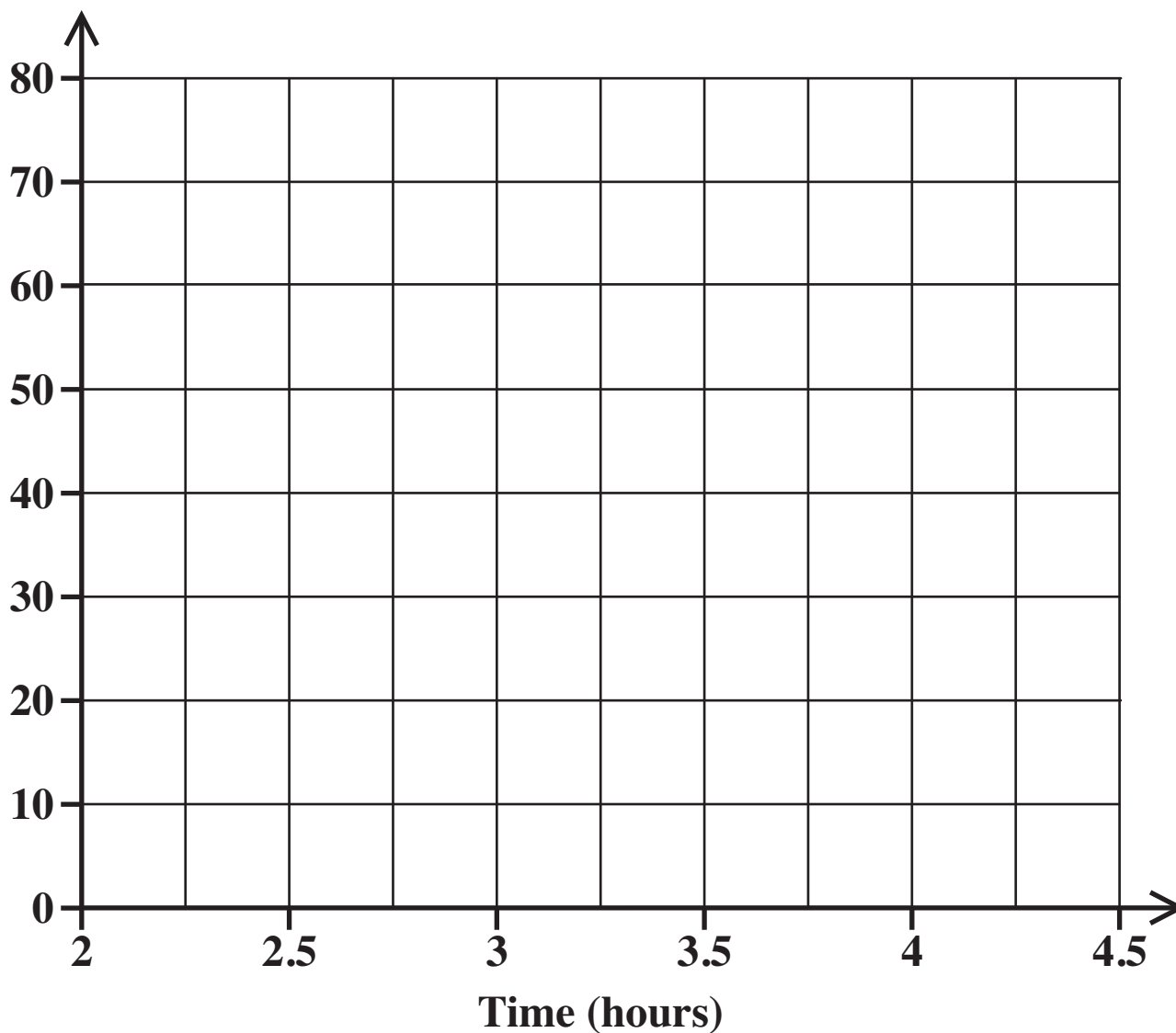
(c) (i) Find the median time. [1 mark]

_____ hours

(ii) Find the interquartile range of the times. [2 marks]

_____ hours

(d) Mr Badley also travels from Manchester to London. He travels by train.
The median time for his journeys is **3.7** hours and the interquartile range is **0.4** hours.

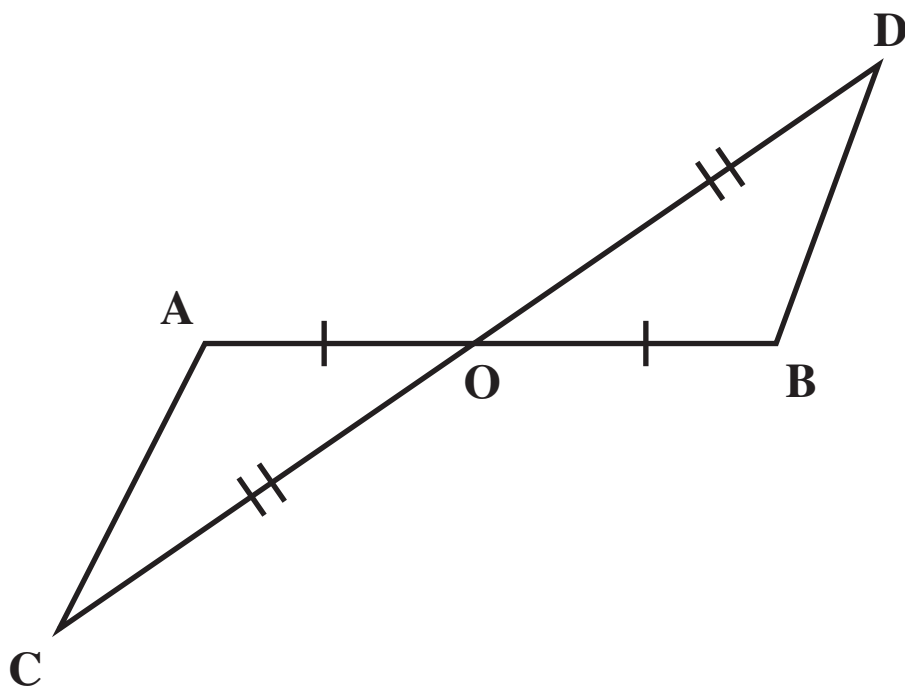Make two comparisons between Mr Gill's journeys and Mr Badley's journeys. **[2 marks]**

1 _____

_____

2 _____

_____

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8 **Look at the diagram below.**

The lines AB and CD bisect each other at O

(a) Prove that triangles AOC and BOD are congruent.
[3 marks]

_____

_____

_____

_____

_____

_____

_____

(b) Prove that CA is parallel to BD. [2 marks]

_____

_____

_____

9 The sketch below shows the graph of $y = f(x)$
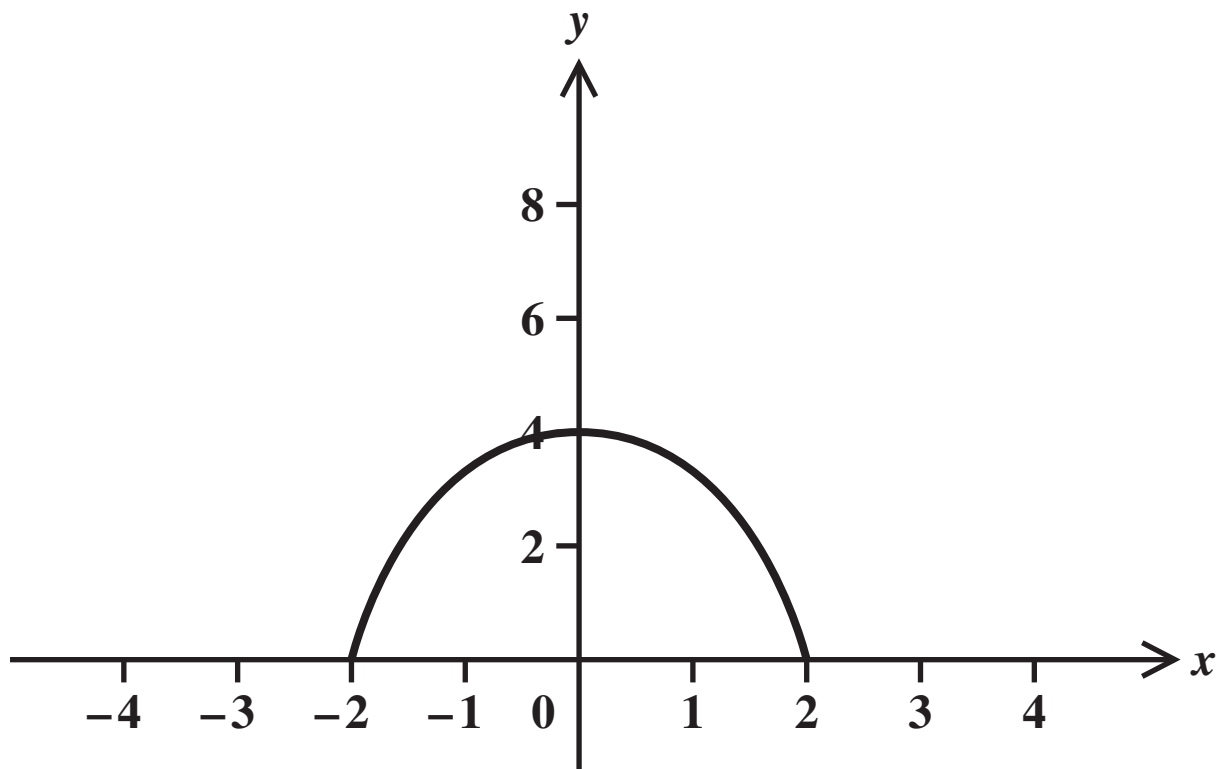
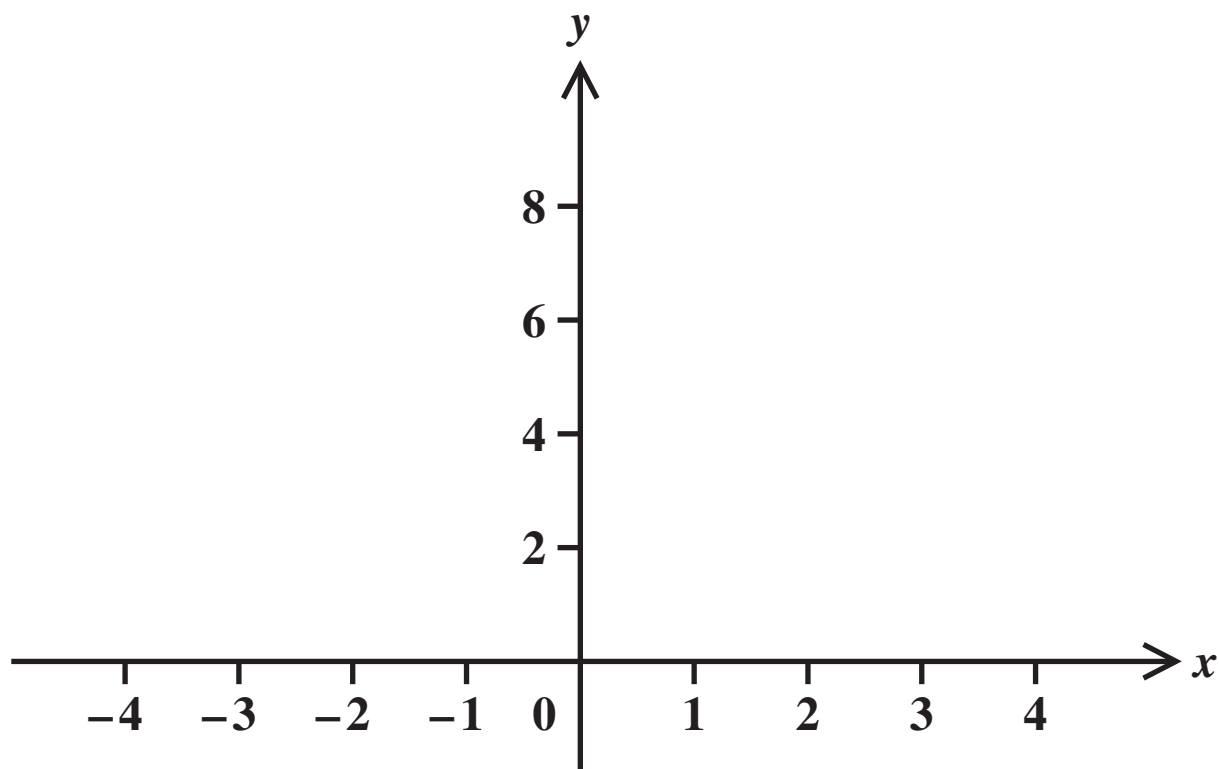On the given axes, sketch the graphs of the three functions below. Show clearly where the graphs cut the x and y axes.

(a) $y = 2f(x)$
[1 mark]

20
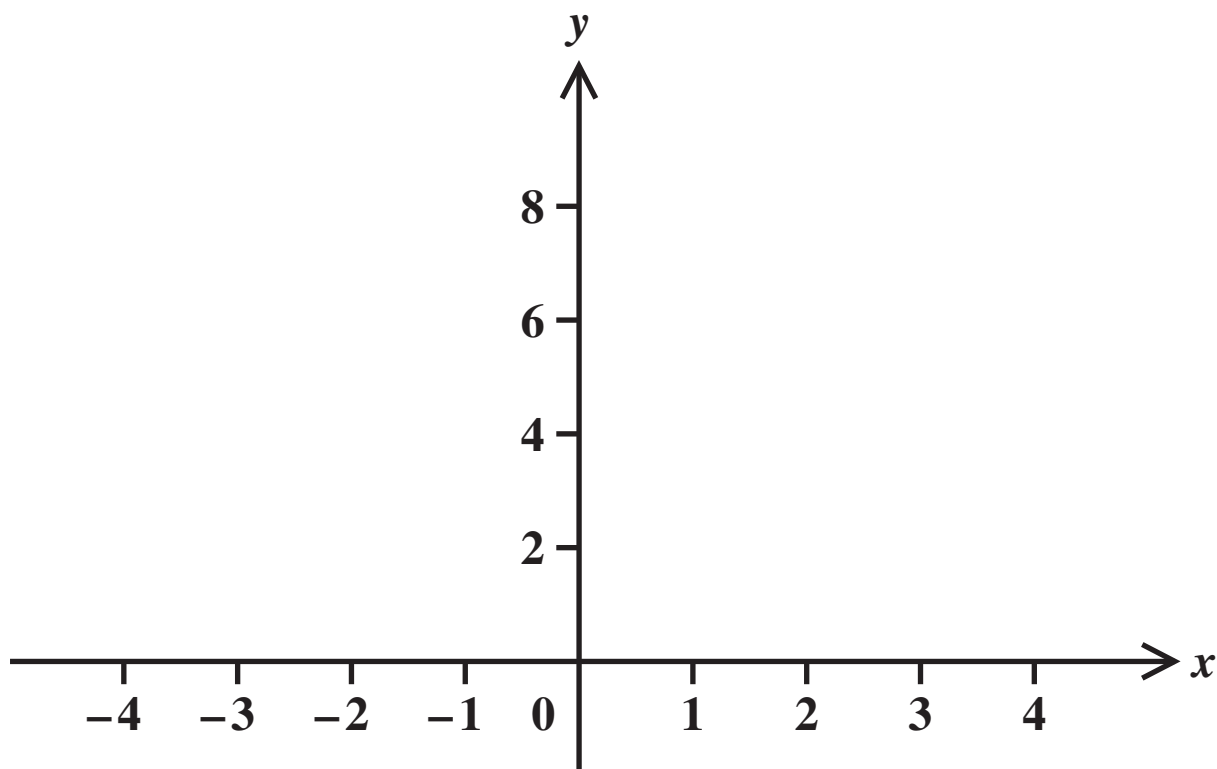
(b) *y* = f(2*x*)
    [1 mark]
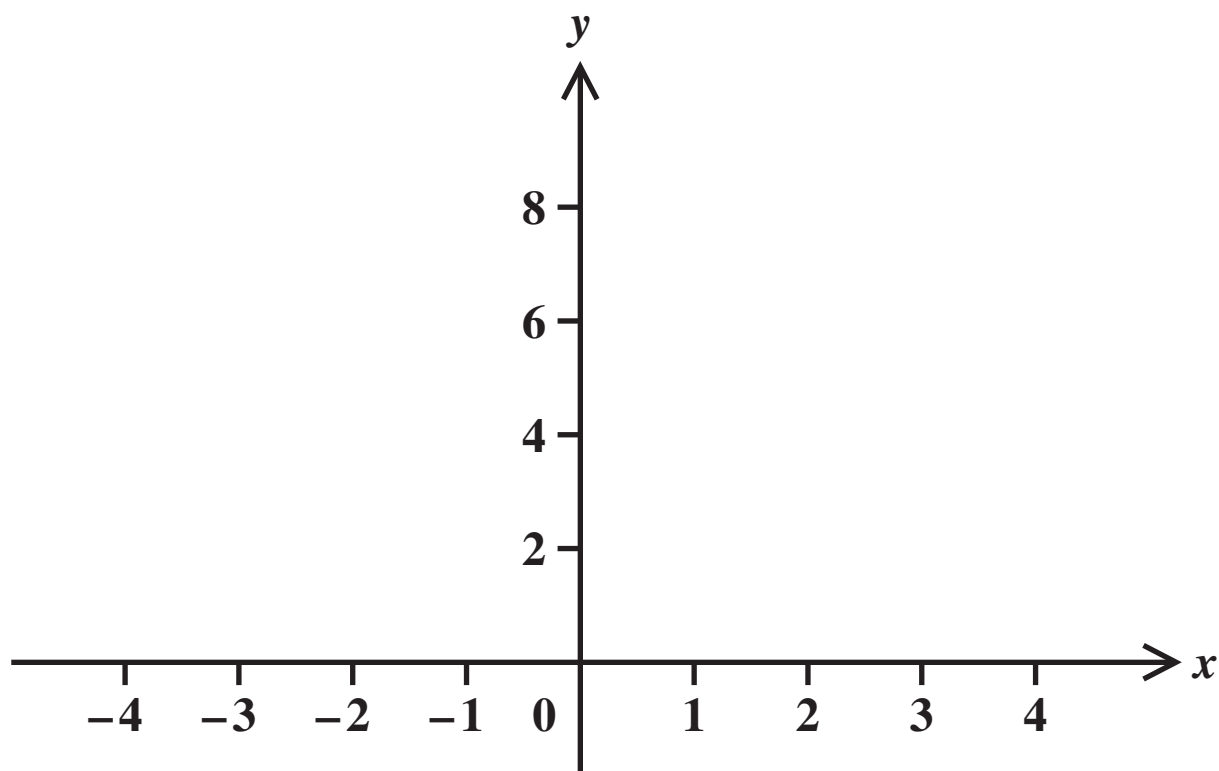
(c) *y* = f(*x* + 2)
    [1 mark]

10 (a) Simplify
$$(5 + \sqrt{2})(5 - \sqrt{2})$$
[2 marks]

_____

(b) Expand
$(3 + 4\sqrt{3})(2 + \sqrt{3})$

Write your answer in the form
$a + b\sqrt{3}$ **where** a **and** b **are integers. [3 marks]**

_____

END OF QUESTIONS

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