OXFORD CAMBRIDGE AND RSA EXAMINATIONS
GCSE

J567/03

MATHEMATICS B

Paper 3 (Higher Tier)

TUESDAY 11 JUNE 2013: Morning
DURATION: 1 hour 45 minutes
plus your additional time allowance

MODIFIED ENLARGED

Candidate forename		Candidate surname	

Centre number					Candidate number				

Candidates answer on the Question Paper.

OCR SUPPLIED MATERIALS:

None

OTHER MATERIALS REQUIRED:

Geometrical instruments
Tracing paper (optional)

WARNING
NO CALCULATOR CAN BE USED 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. HB pencil may be used for graphs and diagrams only.

- Answer <u>ALL</u> 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).
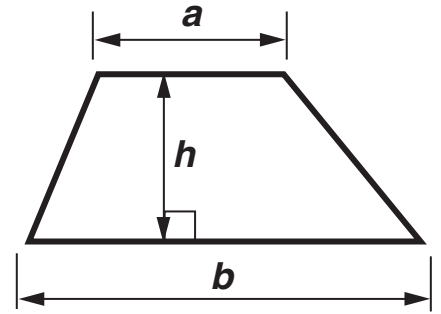

INFORMATION FOR CANDIDATES

- 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 <u>100</u>.

- Any blank pages are indicated.

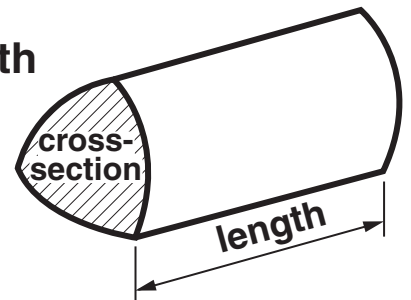**BLANK PAGE**

FORMULAE SHEET: HIGHER TIER

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

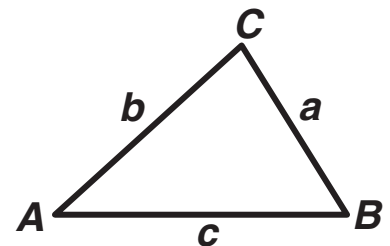**Volume of prism = (area of cross-section) × length**

In any triangle *ABC*

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

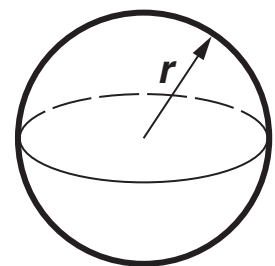**Cosine rule** $\; a^2 = b^2 + c^2 - 2bc \cos A$
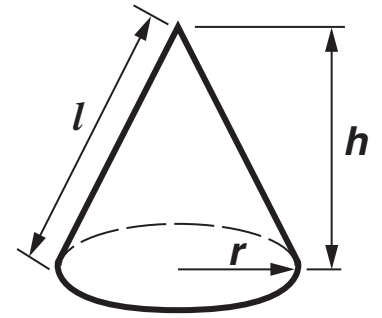
Area of triangle $= \frac{1}{2} ab \sin C$

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**

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

1 The table below shows the number of games won and the number of goals scored by 12 teams in one season in a football league.

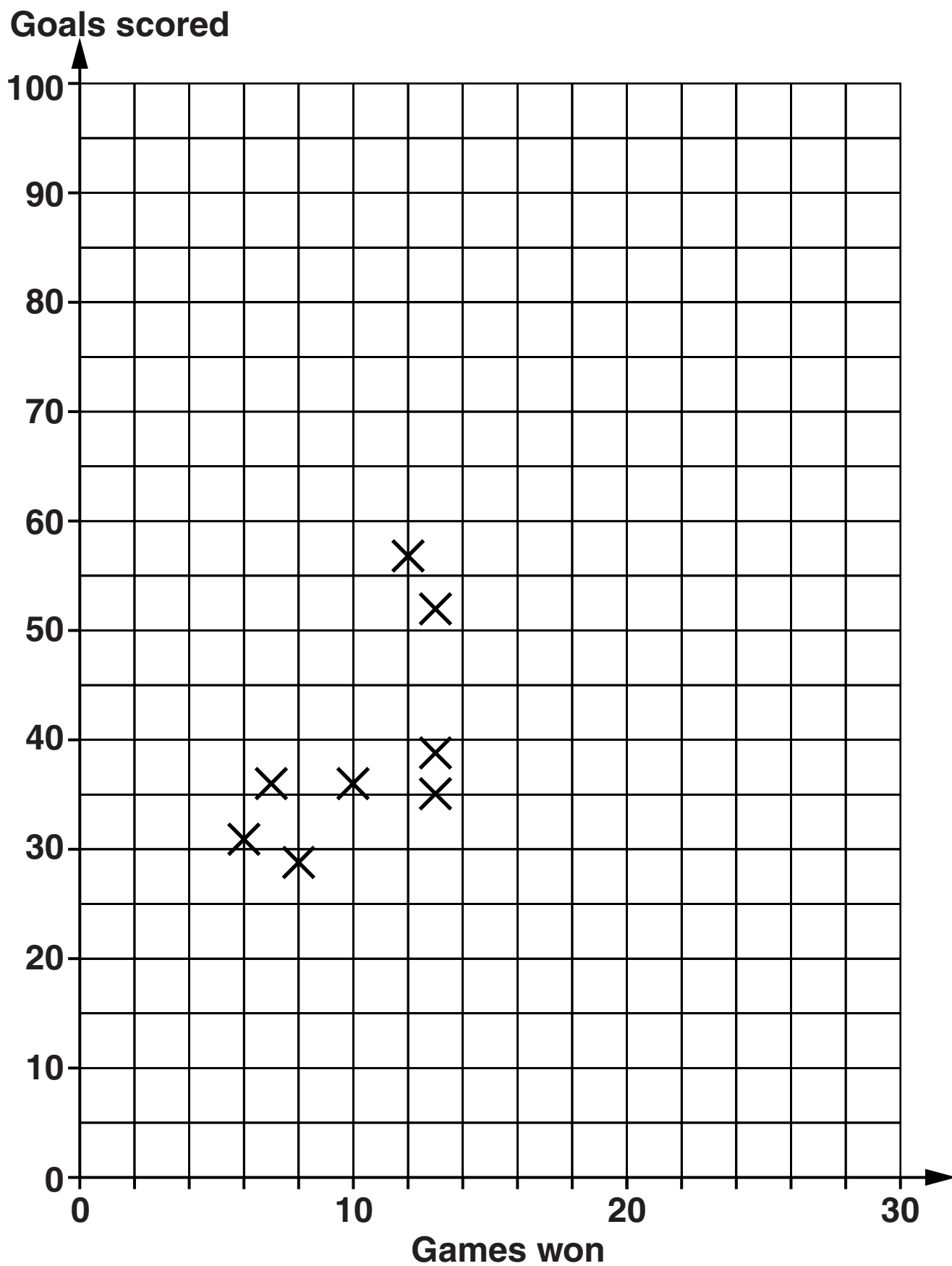| Games won	Goals scored
6	31
7	36
8	29
10	36
12	57
13	35
13	39
13	52
15	58
17	55
25	75
26	82

The information for the first eight teams is plotted on the scatter graph opposite.

(a) Complete the scatter graph opposite. [2]

(b) (i) Draw a line of best fit. [1]

(ii) Use your line of best fit to estimate the number of goals scored by a team that won 20 games in the season.

(b)(ii)_____ [1]

6

Goals scored

100
90
80
70
60
50
40
30
20
10
0

0   10   20   30

Games won

7

2 **(a)** Work out the value of $x^2 - 3x$ when

    (i) $x = 5$,

                                     (a)(i) _____ [1]

    (ii) $x = {}^-4$.

                                       (ii) _____ [2]

(b) Multiply out.

    $y(y + 5)$

                                        (b) _____ [1]

(c) **Factorise fully.**

$$4p^2 - 8p$$

(c) _____ [2]

3 **The scale diagram shows the positions of two towns, A and B.**

SCALE: 1 cm represents 2 km

A.

•B

A new business park is to be built near to these towns.

The business park will be:

- closer to town A than town B
- no more than 14 km from town B.

Construct and shade the region where the business park could be built.
Leave in all your construction lines. [4]

4 (a) On weekdays it costs £6.50 per hour to hire a tennis court at Meadway Tennis Club.
On Saturdays the cost is 30% more.

How much does it cost to hire a court for 2 hours on a Saturday?

(a) £ _____ [3]

(b) At a junior coaching session the ratio of boys to girls is 3 : 5.
There are 40 children at the coaching session.

Work out the number of boys and the number of girls at the coaching session.

(b) _____ boys _____ girls [2]

(c) Rosie is doing a survey of the members of Meadway Tennis Club.

(i) Rosie wants to find out how often the members visit the club in a month.

Write a suitable question she could ask with response boxes. **[2]**

(ii) Rosie does her survey one Friday morning at the tennis club.

Explain why this will not give a random sample of the members.

_____

_____ **[1]**

(iii) Describe how Rosie could select a random sample of the members.

_____

_____ **[1]**

5   Catalin works in an office.
    One week he divides his time between these tasks:

- $\frac{1}{4}$ of his time in meetings

- $\frac{5}{8}$ of his time writing reports

- the rest of his time doing the accounts.

He spends a total of 6 hours doing the accounts.

Find the total number of hours he works in the week.

_____ hours [4]

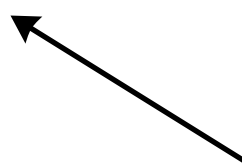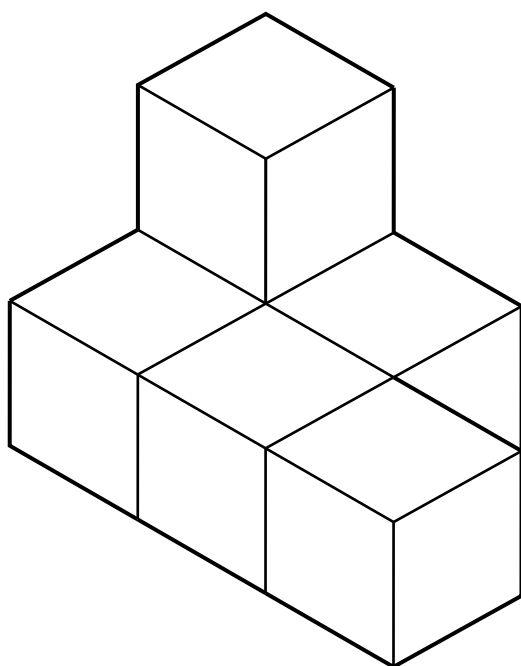**6** **(a)** Draw the graph of $2y + 3x = 9$ on the grid below.

[3]

(b) The line L is a reflection of the line $2y + 3x = 9$ in the y-axis.
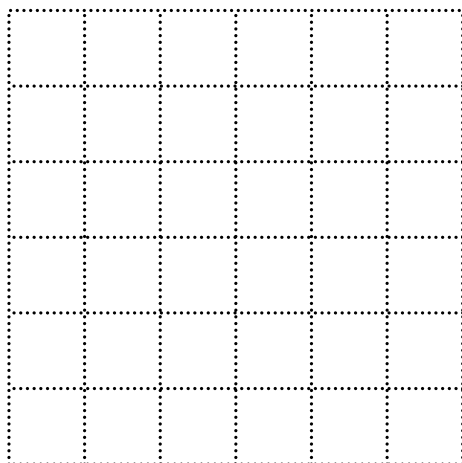
Find the gradient of the line L.

(b) _____ [3]
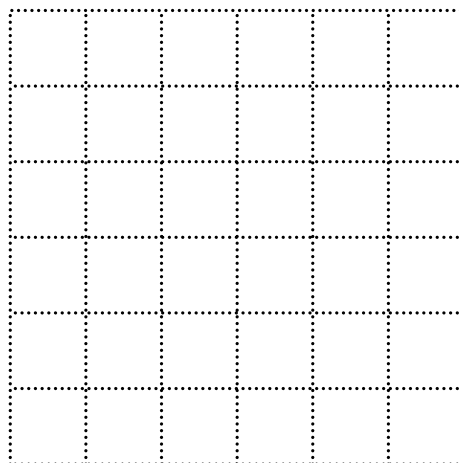
7 The solid below is made from six cubes.

Front view

(a) On the grids below, draw the plan view and the front view of the solid.

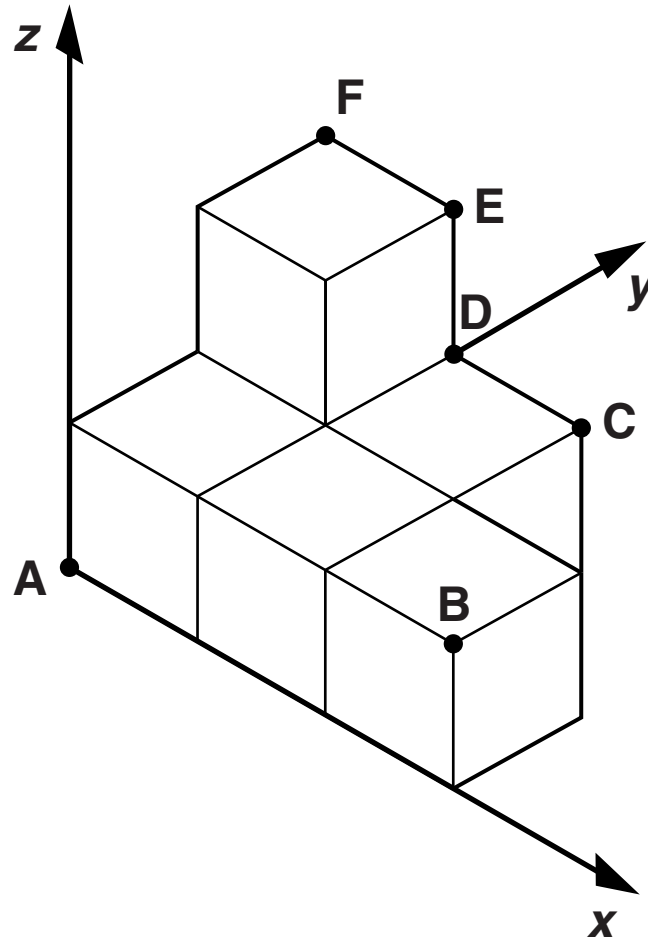**Plan view**

Front view

[2]

(b) The volume of the solid is 6 cubic centimetres.

Write this volume in cubic millimetres.

(b)_____ mm^3 [1]

(c) The solid is placed on a set of axes as shown.

The coordinates of point A are (0, 0, 0).
The coordinates of point B are (3, 0, 1).

(i) Which point has coordinates (1, 2, 1)?

(c)(i) _____ [1]

(ii) Write down the coordinates of point F.

(ii)(_____, _____, _____) [1]

(iii) The solid is moved so that the new coordinates of point A are (0, 1, 1) and the new coordinates of point B are (3, 1, 2).

Find the new coordinates of point F.

(iii)(_____, _____, _____) [1]

8 **(a)** Solve.

$$4(3x + 5) = 28$$

(a) $x =$ _____ [3]

(b) Write down all the integers that satisfy this inequality.

$$\text{-}3 \leqslant x < 2$$

_____ [2]

(c) Solve this inequality.

$$2x - 7 < 9$$

(c) _____ [2]

(d) Rearrange the formula $A = 2\pi r^2$ to make r the subject.

(d) _____ [2]

9   (a) Work out.

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

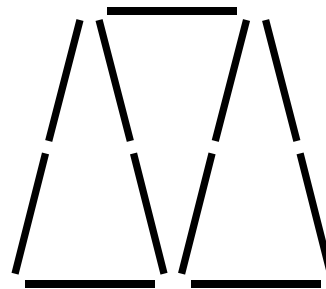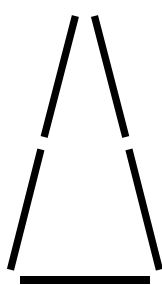Give your answer as a mixed number in its lowest terms.

(a) _____ [3]

(b) Express $\frac{1}{6}$ as a decimal.

(b) _____ [1]

(c) Express 0.5̇8̇ as a fraction.

(c) _____ [2]

10 Here are the first three matchstick patterns in a sequence.

Find an expression, in terms of *n*, for the number of matchsticks in pattern *n*.
Show clearly how you get your answer.

_____ [4]

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11 The table below shows the areas of some countries.

Country	Area (square kilometres)
Brazil	
China	9.33×10^6
India	2.97×10^6
Mongolia	1.55×10^6
Tunisia	1.55×10^5
Turkey	7.70×10^5

(a) The area of Brazil is 8 459 417 square kilometres.

Complete the table to show the area of Brazil.
Give the area in standard form, correct to three
significant figures.   [1]

(b) Complete the following sentences.

The area of _____ is about twice
the area of Turkey.

The area of China is about three times the area of
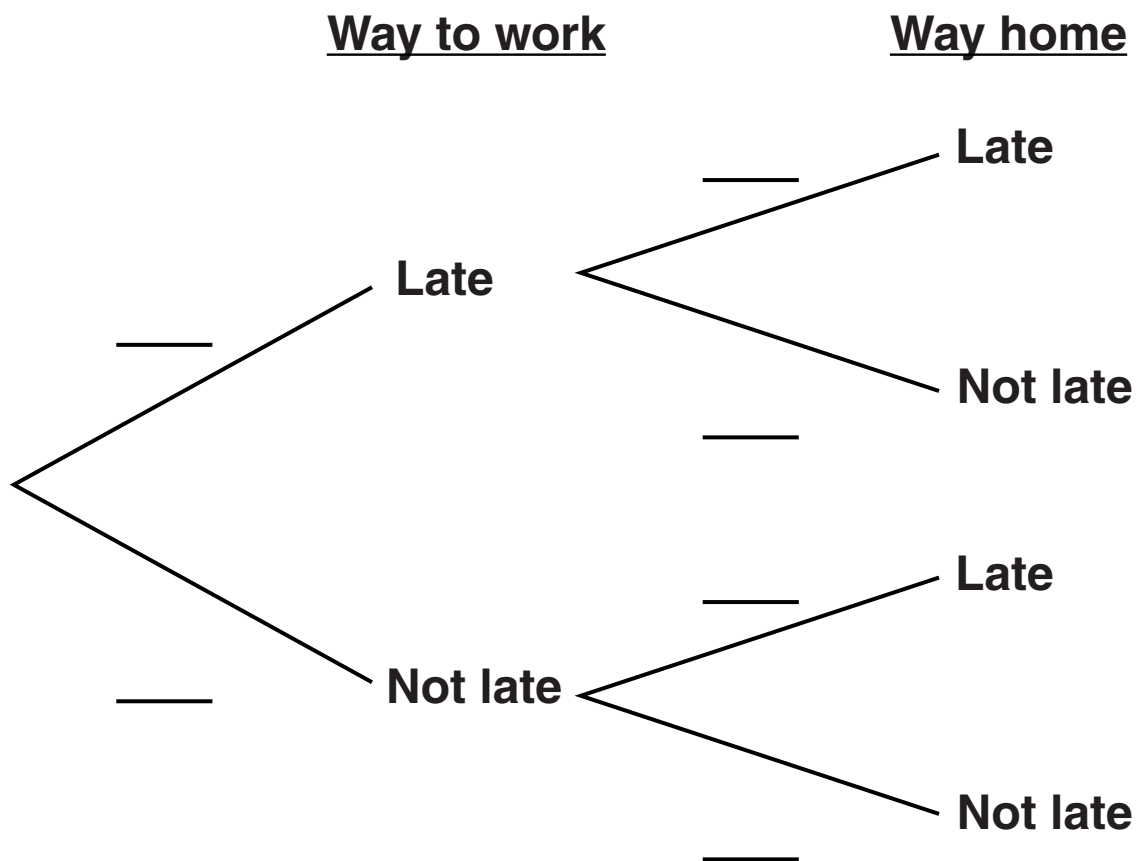
_____.   [2]

(c) The population of India in 2011 was approximately 1.19×10^9.

Estimate the population density of India in people per square kilometre.

(c) _____ people/km^2 [2]

12 Carlos travels to work and back home each day by bus.

The probability that the bus is late on the way to work is 0.2.

The probability that the bus is late on the way home is 0.4.

These events are independent.

(a) Complete the following tree diagram to represent this information by filling in the 6 missing numbers.
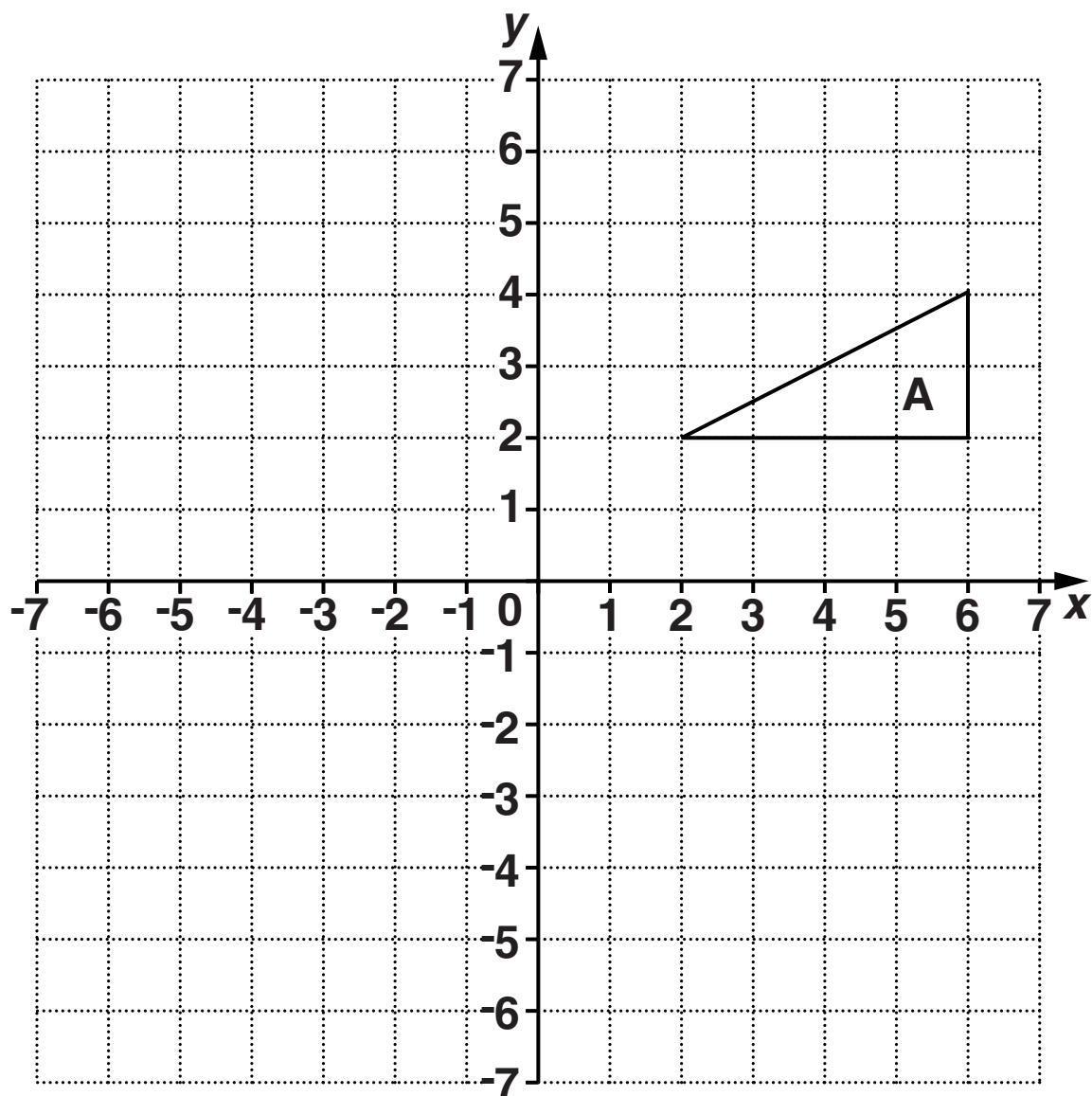
Way to work   Way home

```
                              ____ —— Late
                    Late
        ____       /    \
       /                  ____ —— Not late
      <
       \
        ____       Not late   ____ —— Late
                              \
                               ____ —— Not late
```

[2]

(b) Calculate the probability that on one particular day only one of the buses that Carlos travels on is late.

(b) _____ [3]

13 **Triangle A is drawn on the grid below.**

(a) **Enlarge triangle A with scale factor $\frac{1}{2}$ and centre of enlargement (-4, 6).**
Label the image B. [3]

(b) Describe fully the SINGLE transformation that is equivalent to

a reflection in $y = {}^-1$ followed by a reflection in the *y*-axis.
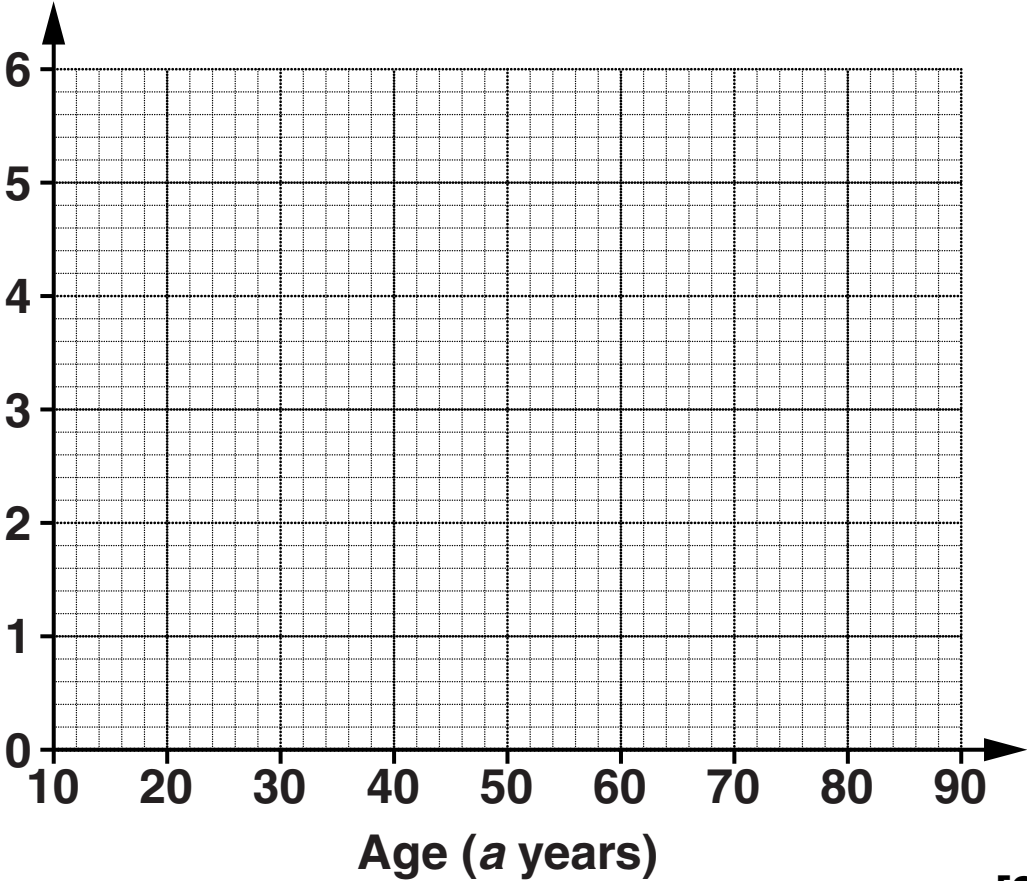
You may use the grid to help you.

_____

_____ **[3]**

14 This table summarises the ages of the members of the audience at a cinema one Saturday afternoon.

Age (a years)	Frequency
$15 \leqslant a < 20$	25
$20 \leqslant a < 30$	32
$30 \leqslant a < 40$	16
$40 \leqslant a < 60$	15
$60 \leqslant a < 90$	12

(a) Draw a histogram to represent this distribution on the grid below.

Saturday afternoon

Frequency density
(people per year)

Age (a years)

[3]

(b) The histogram below represents the distribution of the ages of the members of the audience at the cinema on Saturday evening.

Saturday evening

Make two comparisons between the distributions for the afternoon and the evening.

1 _____

_____

2 _____

_____ [2]

15 **A, B, C and D are points on a circle.**
The lines AC and BD intersect at X.
Angle ABD = 48° and angle CXD = 110°.
AXD is an isosceles triangle. This is shown on the
following diagram.

NOT TO SCALE

(a) **Show that angle CDX = 22°.**
Give a reason for each step of your working.

_____

_____

_____ **[2]**

(b) Prove that triangles ABD and DCA are congruent.

_____

_____

_____

_____ **[3]**

16 Write $x^2 + 10x + 9$ in the form $(x + a)^2 + b$.

_____ **[3]**

17 The cost, £*C*, of building a circular pond is proportional to the square of its diameter, *d* metres. A pond with diameter 2 metres costs £52.

Find the formula for *C* in terms of *d*.

_____ [3]

18 (a) Write $\dfrac{\sqrt{2}}{\sqrt{18}}$ in its simplest form.

(a) _____ [2]

(b) Simplify.

$$\frac{4x^2 - 9}{2x^2 - 3x}$$

(b) _____ [3]

19* A sphere and a cylinder have equal volumes.
   The sphere has radius 3r.
   The cylinder has radius 2r and height h.

   Find h in terms of r.

_____ **[5]**

END OF QUESTION PAPER

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