

**GENERAL CERTIFICATE OF SECONDARY EDUCATION
MATHEMATICS B**

J567/03

Paper 3 (Higher Tier)

Candidates answer on the Question Paper

OCR Supplied Materials:
None

Other Materials Required:

- Geometrical instruments
- Tracing paper (optional)

SPECIMEN

Duration: 1 hour 45 minutes



Candidate Forename		Candidate Surname	
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Centre Number							Candidate Number				
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INSTRUCTIONS TO CANDIDATES

- Write your name clearly in capital letters, your Centre Number and Candidate Number in the boxes above.
- Use 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.
- Your answers should be supported with appropriate working. Marks may be given for a correct method even if the answer is incorrect.
- Answer **all** the questions.
- 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.
- Your Quality of Written Communication is assessed in questions marked with an asterisk (*).
- The total number of marks for this paper is **100**.
- This document consists of **24** pages. Any blank pages are indicated.



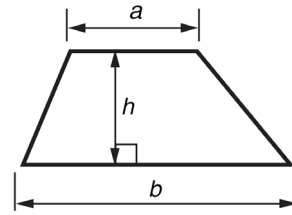
WARNING

You are **NOT** permitted to use a calculator for this paper.

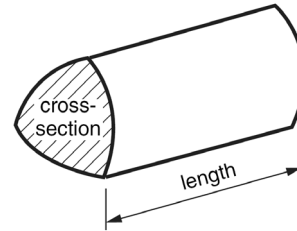


Formulae Sheet: Higher Tier

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



Volume of prism $= (\text{area of cross-section}) \times \text{length}$

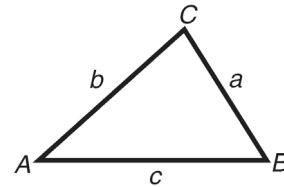


In any triangle ABC

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

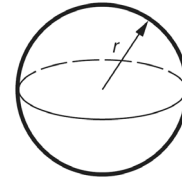
Cosine rule $a^2 = b^2 + c^2 - 2bc \cos A$

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



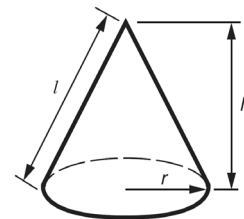
Volume of sphere $= \frac{4}{3}\pi r^3$

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



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

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

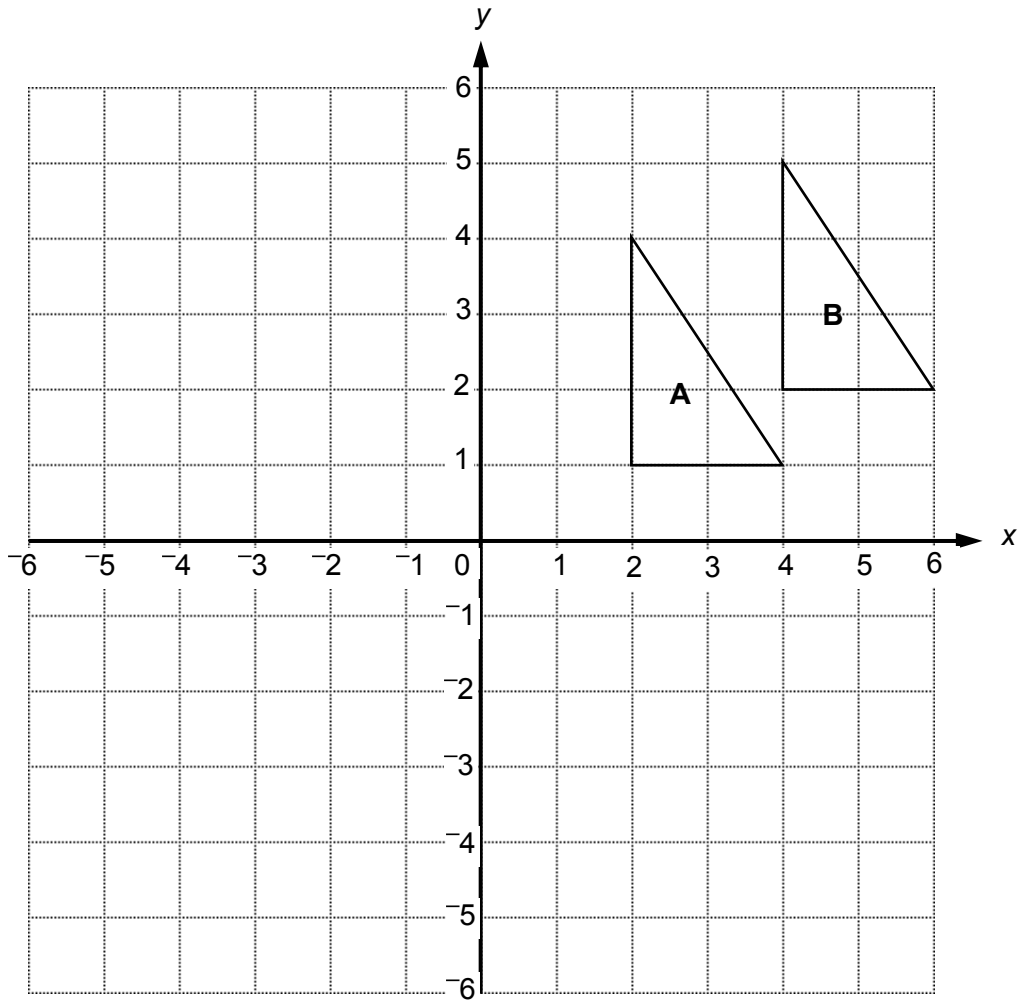


The Quadratic Equation

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



- (a) Rotate triangle **A** by 90° clockwise about the origin.
Label the image **C**.

[3]

- (b) Describe fully the **single** transformation that maps triangle **A** onto triangle **B**.

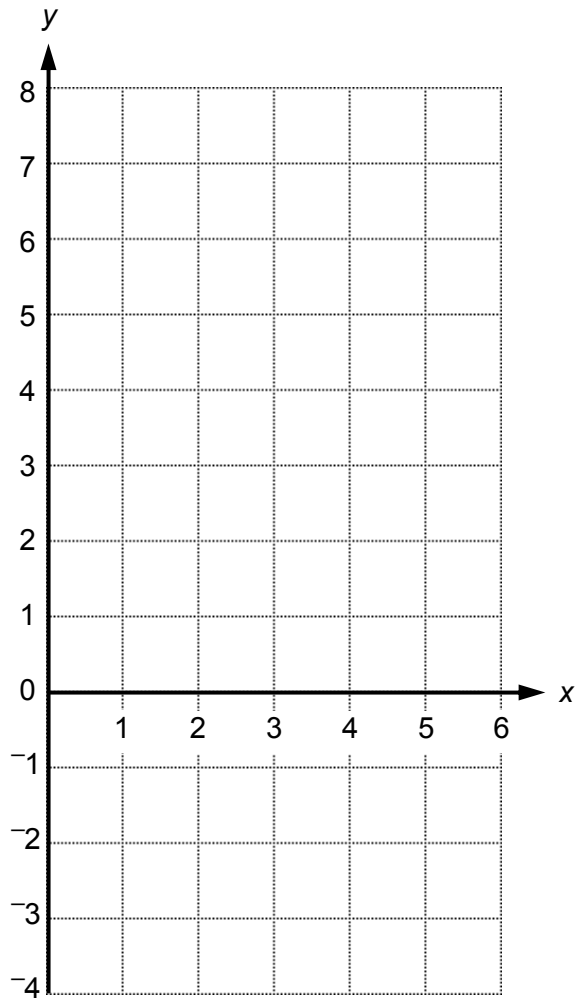
[2]

2 (a) Complete this table for $y = 7 - 2x$.

x	0	2	4
y	7		

[1]

(b) Draw the graph of $y = 7 - 2x$.



[2]

(c) Use your graph to find the value of x when $y = 0$.

(c) $x =$ _____ [1]

3 *

$$1 \text{ litre} = 1\frac{3}{4} \text{ pints}$$



2 pints
£0.70



4 pints
£1.40



6 pints
£2.10

Sunidra estimates that she needs $1\frac{1}{2}$ litres of milk each day.

Milk is sold in 2, 4 and 6 pint bottles, as shown above.

Sunidra wants to buy enough milk to last for a week.

Advise Sunidra which bottles of milk she should buy for the whole week.

[6]

4 (a) Rearrange each of these formulae to make h the subject.

(i) $P = 3h - 5$

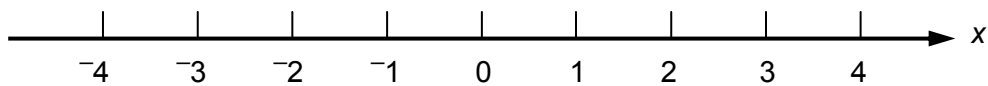
(a)(i) _____ [2]

(ii) $T = 2(h + w)$

(ii) _____ [2]

(b) Solve this inequality and represent your solution on the number line.

$$6x \geq 2x - 8$$



[3]

5 (a) Estimate the answer to this calculation.

$$\frac{17.5 \times 3.8}{0.483}$$

(a) _____ [2]

(b) Explain how you can tell that the following answer must be wrong.

$$(4.1 \times 10^7) \times (4.8 \times 10^{15}) = 1.968 \times 10^{22}$$

_____ [1]

- 6 A bag contains only red, green, blue and yellow counters. A counter is taken from the bag at random. Some probabilities for this are shown in the table.

Colour	Red	Green	Blue	Yellow
Probability	0.25	0.15		0.4

- (a) Find the probability that the counter is green or yellow.

(a) _____ [1]

- (b) Find the probability of taking a blue counter.

(b) _____ [2]

- 7 Abbie is making a lottery machine for her school. It contains five balls, numbered from 1 to 5. It has to work so that each ball has an equal probability of being selected. She tests the machine by using it 50 times. Here are her results.

Number	Relative Frequency
1	0.12
2	0.28
3	0.20
4	0.24
5	0.16

- (a) If Abbie repeated this test, would she get the same results? Explain your answer.

[1]

- (b) Make two comments about the results of Abbie's test.

1 _____

2 _____

[2]

8 (a) Calculate the interior angle of a regular pentagon.

(a) _____° [2]

(b) Use your answer to part (a) to explain why regular pentagons do not tessellate.

_____ [1]

9 Here are the first four terms of a sequence.

7 13 19 25

(a) Explain why 286 cannot be in this sequence.

_____ [1]

(b) Write an expression for the n th term of this sequence.

(b) _____ [2]

10 As a product of prime factors,

$$24 = 2 \times 2 \times 2 \times 3.$$

(a) Write 40 as a product of prime factors.

(a) _____ [2]

(b) (i) Work out the highest common factor (HCF) of 24 and 40.

(b)(i) _____ [2]

(ii) Work out the lowest common multiple (LCM) of 24 and 40.

(ii) _____ [2]

11 A garage displays this sign.

<p style="text-align: center;"><u>Sale</u> 15% off all car prices</p>

(a) The original price of one car is £8640.

Calculate its sale price.

(a) £ _____ [3]

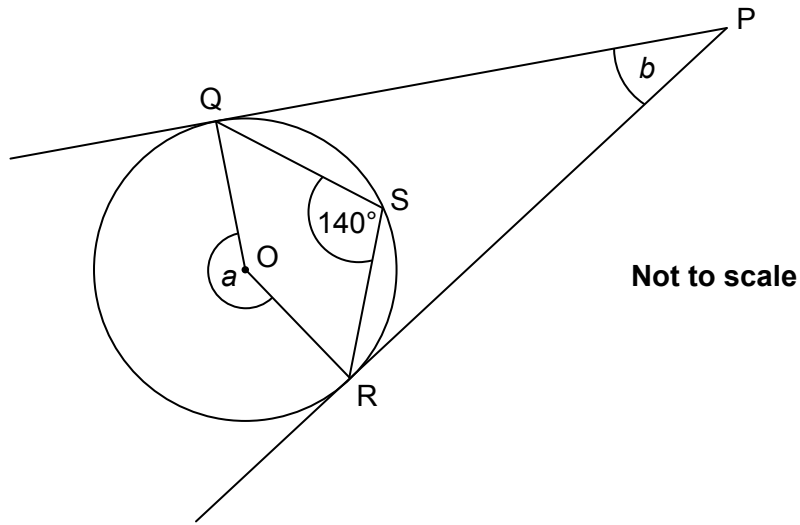
(b) Hidetoshi sees this sign on a different car at the garage.

<p style="text-align: center;">was £12 800 now reduced by £2000</p>

Does the offer on this car match the 15% sale at the garage?

[3]

- 12 In this diagram, O is the centre of the circle.
 PQ and PR are tangents.
 S is a point on the circumference of the circle.
 Angle QSR = 140° .



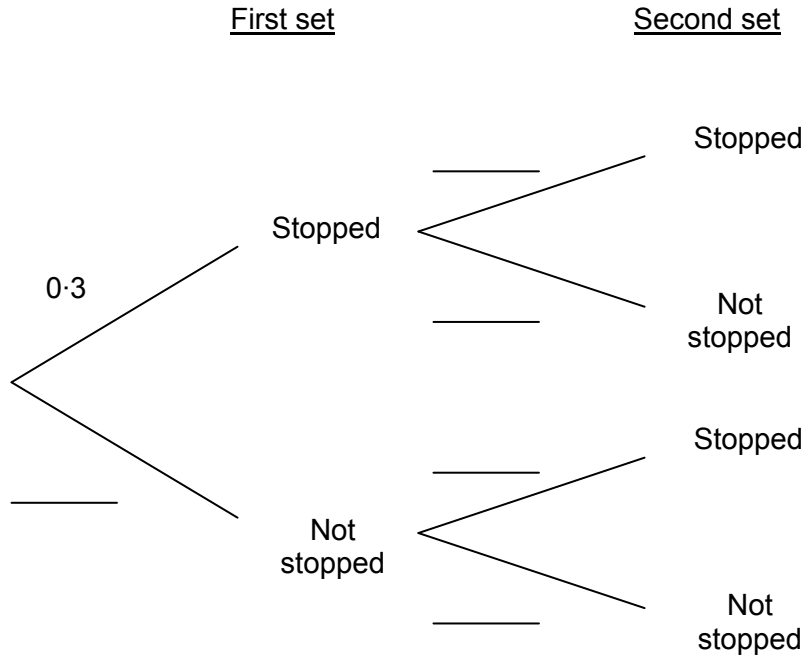
Calculate angles a and b .

$$a = \underline{\hspace{4cm}}^\circ$$

$$b = \underline{\hspace{4cm}}^\circ \text{ [3]}$$

- 13 There are two sets of traffic lights on Dwayne’s journey home. The probability that he is stopped at the first set of lights is 0.3. The probability that he is stopped at the second set of lights is 0.4. These probabilities are independent.

(a) Complete the tree diagram to represent this information.

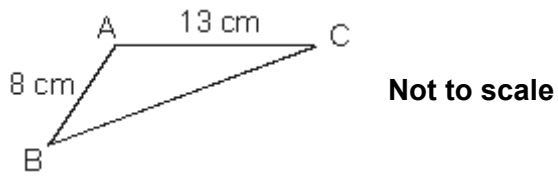


[2]

- (b) What is the probability that Dwayne is **not** stopped at either set of lights?

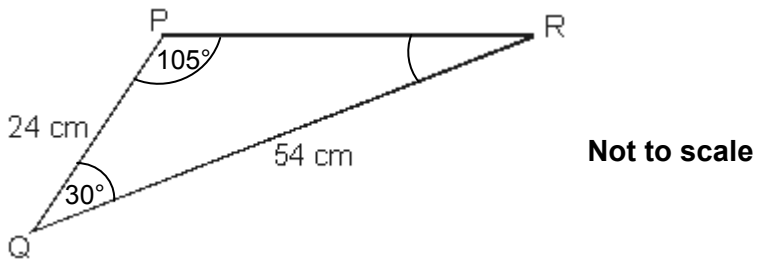
(b) _____ [2]

14 Triangle ABC is the logo for *Linsdell's Laundry*.



Linsdell's Laundry wants to print copies of this logo, as well as an enlarged version to go on the side of their van.

The enlarged version is triangle PQR below.



They need to tell the printers the measurements of **all** the sides and angles of both logos.

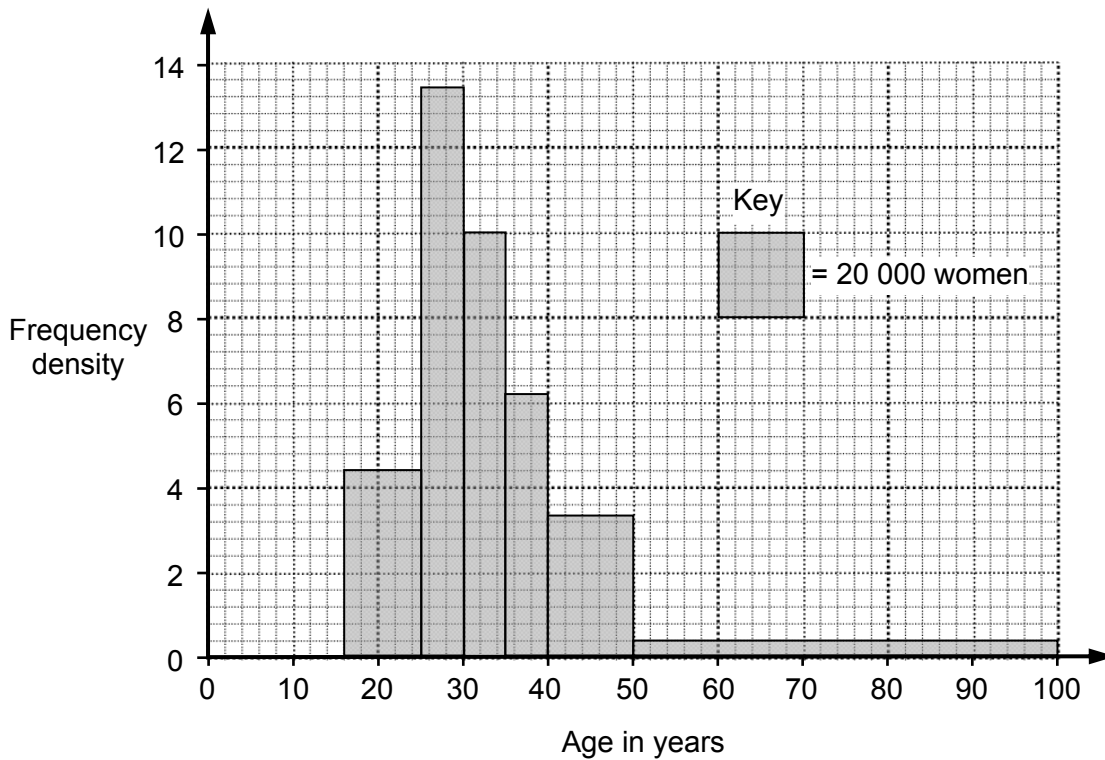
Show clearly what information *Linsdell's Laundry* should give to the printers.

[7]

- 15 In 2006 there were approximately 240 000 marriages in England and Wales.
This table shows the age distribution for the **men** who married in 2006 in England and Wales.

Age (n years)	Frequency (thousands)
$16 \leq n < 25$	21
$25 \leq n < 30$	57
$30 \leq n < 35$	56
$35 \leq n < 40$	37
$40 \leq n < 50$	40
$50 \leq n < 100$	29

This histogram shows the age distribution for the **women** who married in 2006.



Use the table and the histogram to decide whether these statements are true, or false, or whether there is not enough information to decide.

(a) The oldest woman was 99 when she married.

Tick (✓) the correct box.

True	<input type="checkbox"/>
------	--------------------------

False	<input type="checkbox"/>
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Not enough information	<input type="checkbox"/>
------------------------	--------------------------

Explain your answer.

[1]

(b) About half the women were aged between 25 and 35 when they married.

Tick (✓) the correct box.

True	<input type="checkbox"/>
------	--------------------------

False	<input type="checkbox"/>
-------	--------------------------

Not enough information	<input type="checkbox"/>
------------------------	--------------------------

Explain your answer.

[2]

(c) When they married, there were

- more women than men aged under 25, and
- more women than men aged 50 and over.

Tick (✓) the correct box.

True	<input type="checkbox"/>
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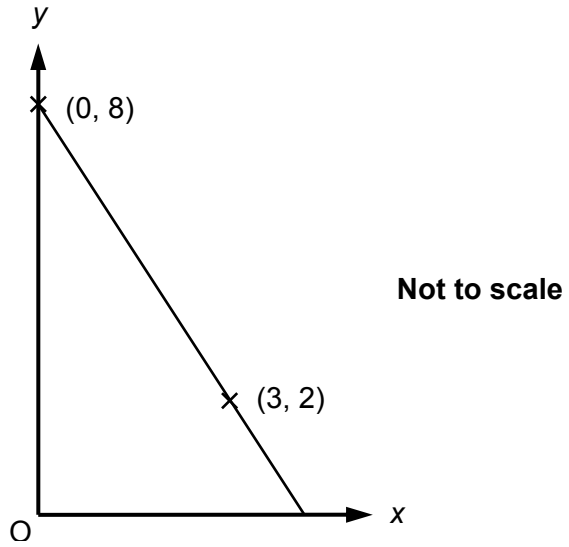
False	<input type="checkbox"/>
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Not enough information	<input type="checkbox"/>
------------------------	--------------------------

Explain your answer.

[2]

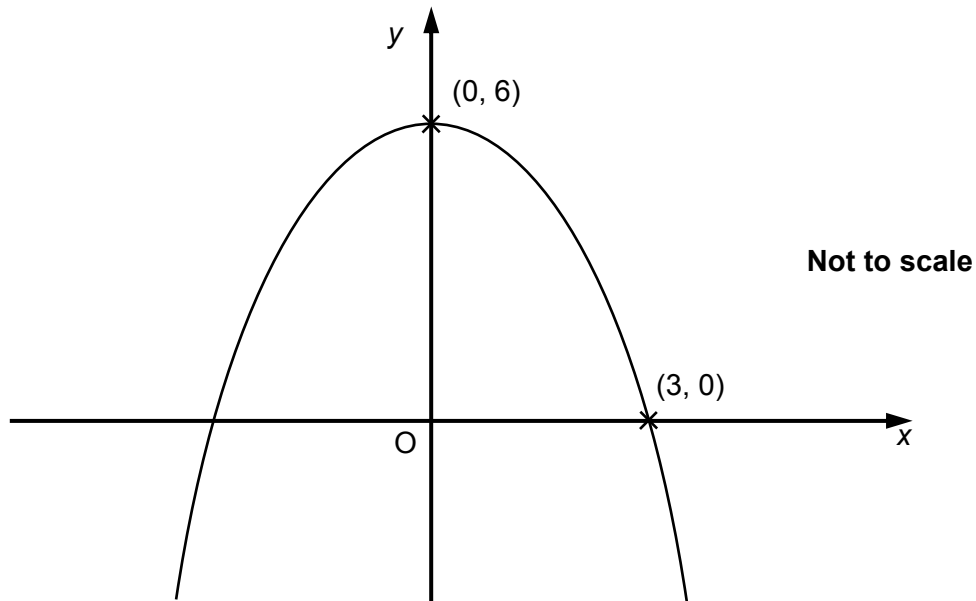
16 A line goes through the points $(0, 8)$ and $(3, 2)$.



Find the equation of this line.

_____ [3]

17 This is a sketch of the function $y = f(x)$, which is symmetrical about the y -axis.



Using the same axes, sketch the graph of the function $y = f(x - 2)$, showing the coordinates of the points where the new graph crosses the x -axis.

[3]

18 Solve.

$$\frac{3x+7}{4} + \frac{x-1}{2} = 15$$

[4]

- 19** Bishopfield School has students from Year 7 to Year 13.
Nada is conducting a survey about leisure activities at the school.
She decides to interview a representative stratified sample of 40 students.

In Year 7 to Year 9 there are 450 students in total.
In Year 10 and Year 11 there are 350 students in total.
In Year 12 and Year 13 there are 200 students in total.

How many students should Nada interview from Year 12 and Year 13?

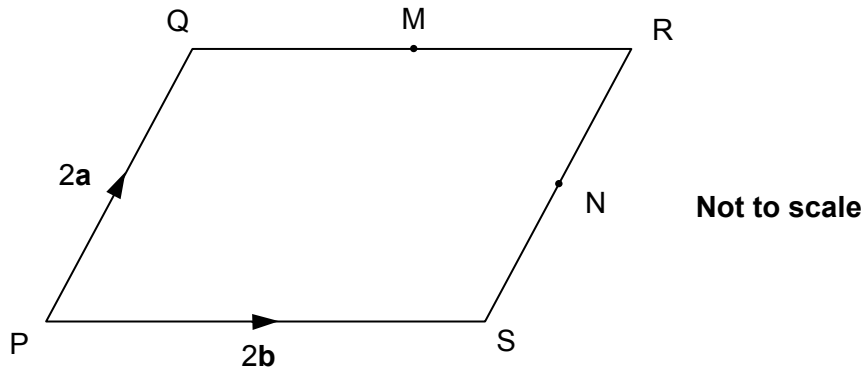
[2]

20 The expression $\left(\frac{a^4}{b^2}\right)^{\frac{1}{2}} \times a^5$ can be simplified to $a^x b^y$ where x and y are integers.

Find the values of x and y .

$x =$ _____ $y =$ _____ [3]

- 21 PQRS is a parallelogram.
 M is the midpoint of QR and N is the midpoint of RS.
 $\vec{PQ} = 2\mathbf{a}$, $\vec{PS} = 2\mathbf{b}$.



(a) Find, in terms of \mathbf{a} and \mathbf{b} ,

(i) \vec{QS} ,

(a)(i) $\vec{QS} = \underline{\hspace{2cm}}$ [1]

(ii) \vec{MN} .

(ii) $\vec{MN} = \underline{\hspace{2cm}}$ [1]

(b) What is the relationship between the line segments QS and MN?
 Use vectors to justify your answer.

[2]

22 (a) Write $x^2 + 10x - 12$ in the form $(x + a)^2 + b$.

(a) _____ [3]

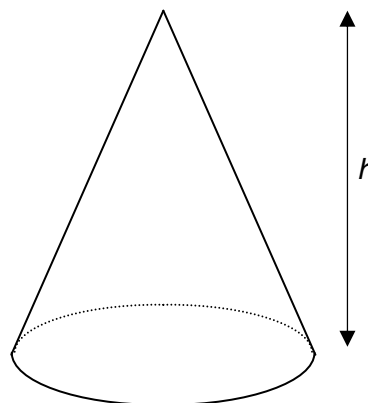
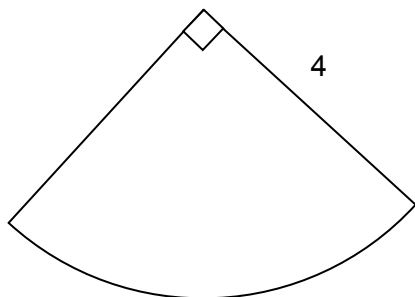
(b) Simplify.

$$\frac{x^2 - 25}{2x + 10}$$

(b) _____ [3]

TURN OVER FOR QUESTION 23

- 23 The sector below is the net for the curved surface of the cone.
All lengths are in centimetres.



- (a) Calculate h , the height of the cone.
Give your answer in exact form.

(a) _____ cm [5]

- (b) A mathematically similar sector has radius 8 cm.

Find the height of the cone that can be made from this sector.

(b) _____ cm [2]

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