OCR
RECOGNISING ACHIEVEMENT

H

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	

Centre Number						Candidate Number				

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.

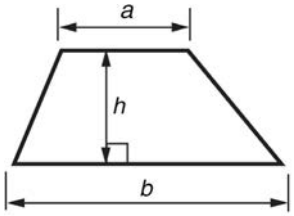
INFORMATION FOR CANDIDATES

- 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.

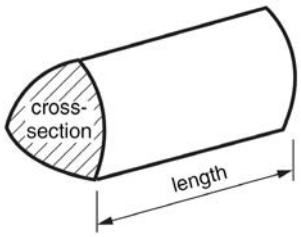
WARNING
You are NOT permitted to use a calculator for this paper.

Formulae Sheet: Higher Tier

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



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

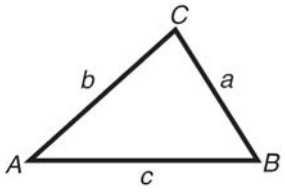


In any triangle *ABC*

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

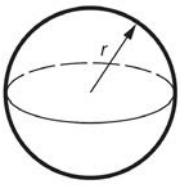
Cosine rule $a^2 = b^2 + c^2 - 2bc\cos A$

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



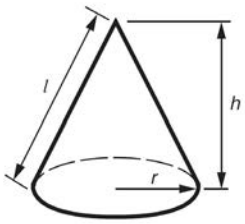
Volume of sphere $= \frac{4}{3}\pi r^3$

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



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

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



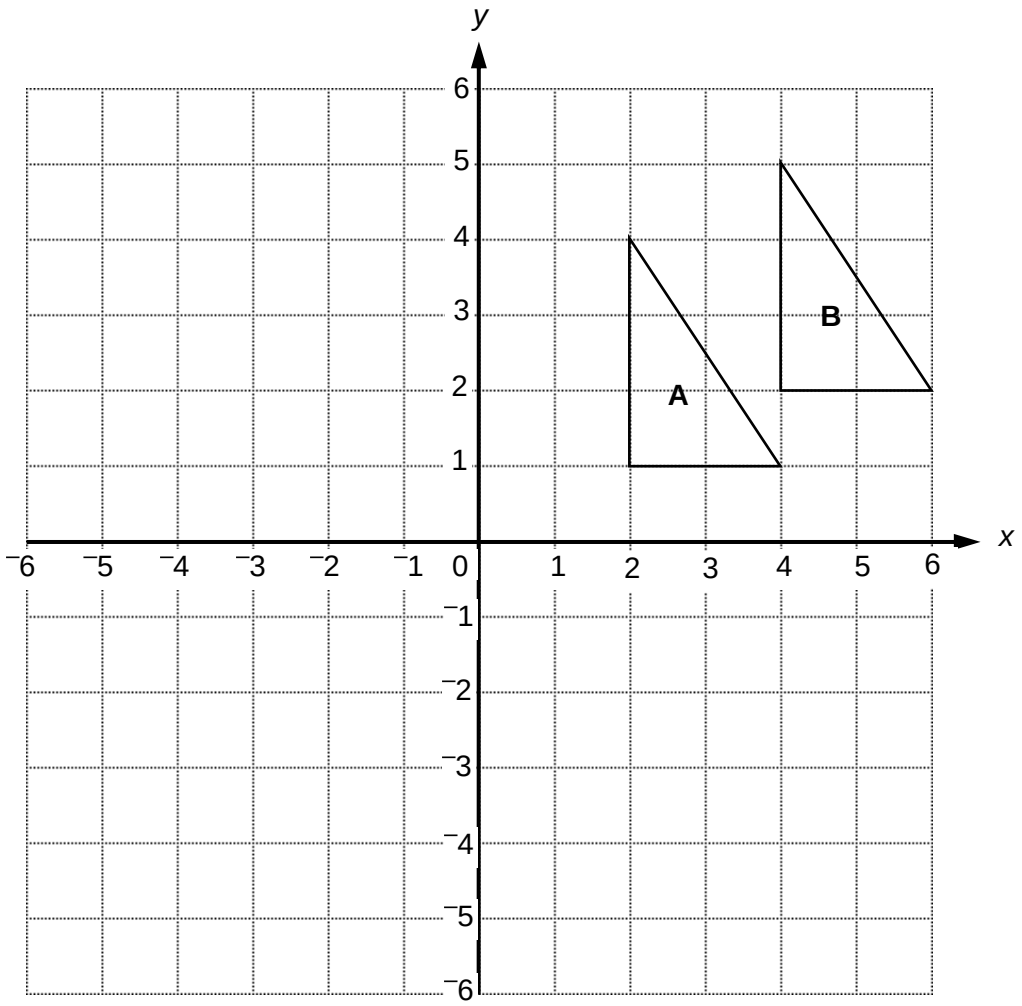
The Quadratic Equation

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



(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**.

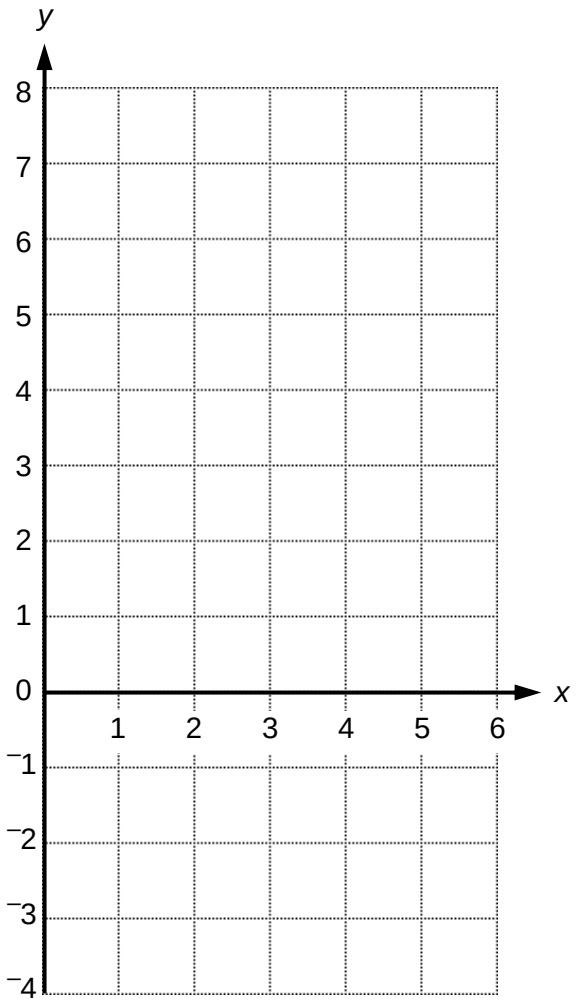
_____ **[2]**

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 litre = $1\frac{3}{4}$ 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) $P = 3h - 5$

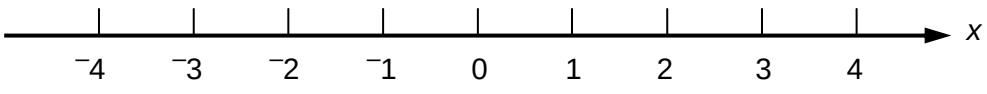
(a)(i) _____ **[2]**

(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.

$$\frac{17{\cdot}5 \times 3{\cdot}8}{0{\cdot}483}$$

(a) _____ **[2]**

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

$(4{\cdot}1 \times 10^{7}) \times (4{\cdot}8 \times 10^{15}) = 1{\cdot}968 \times 10^{22}$

_____ **[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]**

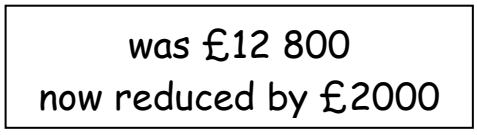
11 A garage displays this sign.

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

Calculate its sale price.

(a) £_____ **[3]**

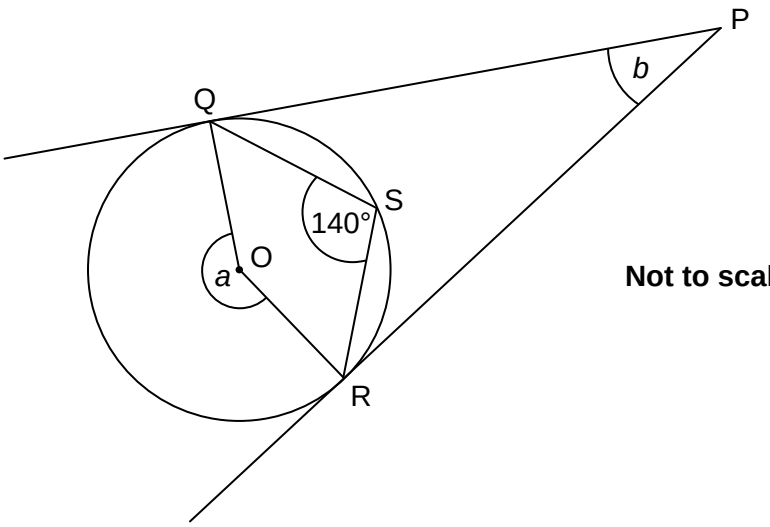
(b) Hidetoshi sees this sign on a different car at the garage.



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°.



Not to scale

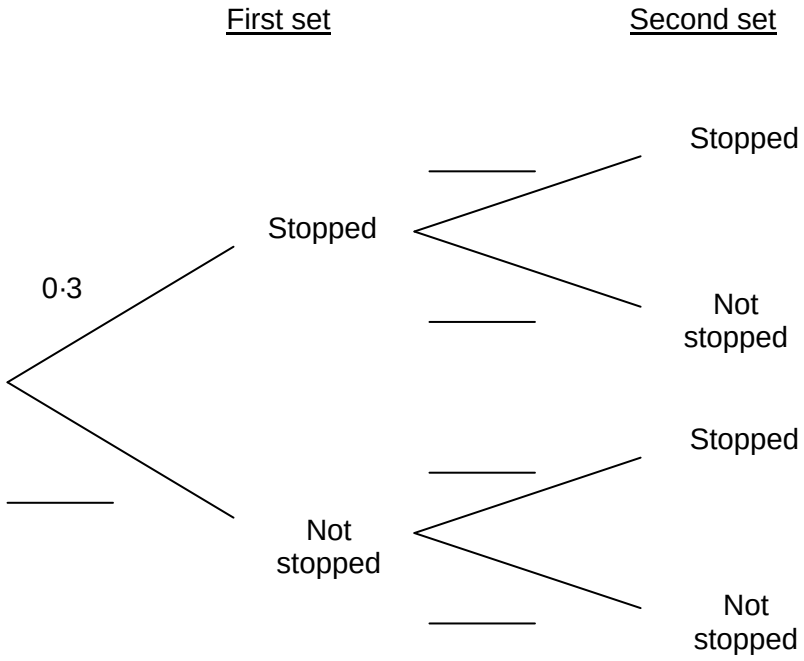
Calculate angles *a* and *b*.

a = _____ °

b = _____ ° **[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.

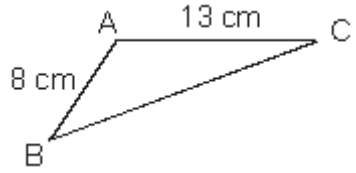


[2]

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

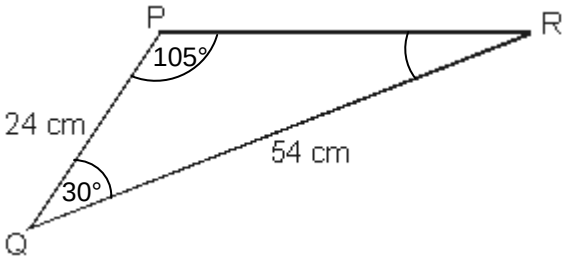
(b) _____ **[2]**

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



Not to scale

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.



Not to scale

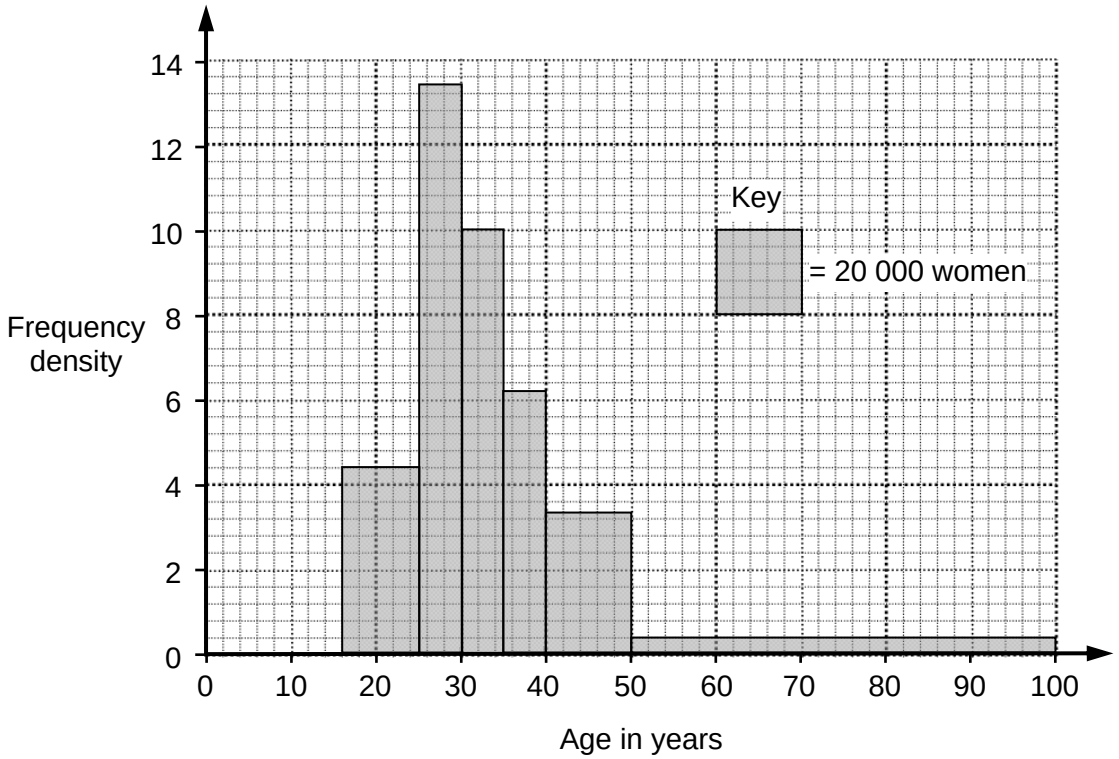
They need to tell the printers the measurements of **all** the sides and angles of both logos.

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.



17

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		False		Not enough information	

Explain your answer.

_____

_____ **[1]**

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

Tick (✓) the correct box.

True		False		Not enough information	

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.

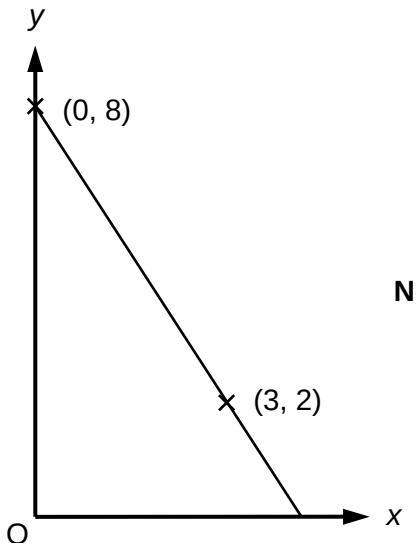
True		False		Not enough information	

Explain your answer.

_____

_____ **[2]**

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

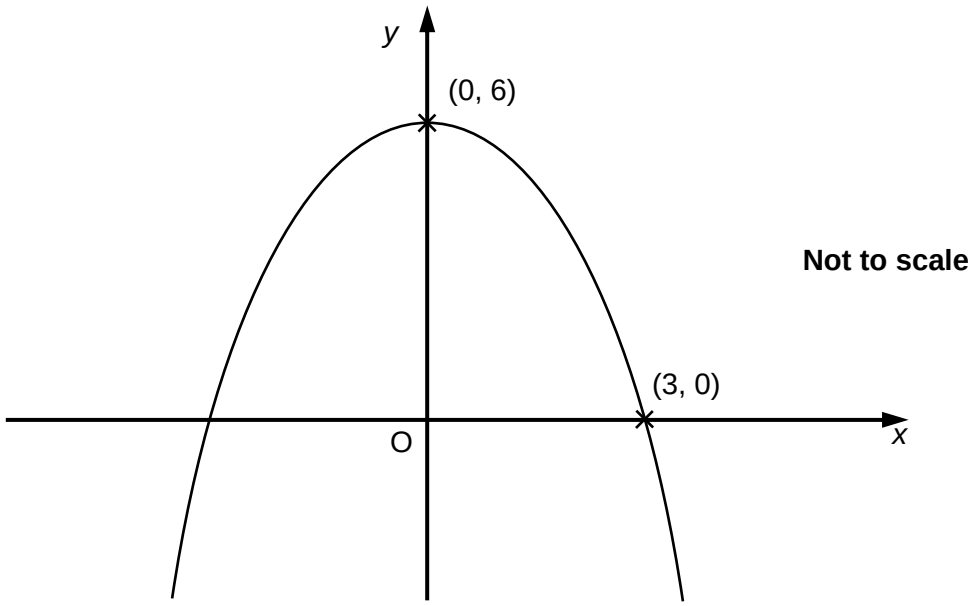


Not to scale

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]**

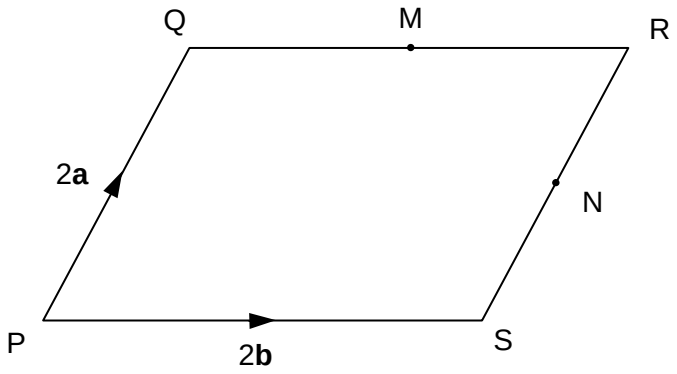
20 The expression $\left(\frac{a^4}{b^2}\right)^{\frac{1}{2}} \times a^5$ can be simplified to $a^x b^y$ where x and y are integers.

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.

$\overrightarrow{PQ} = 2\mathbf{a}$, $\overrightarrow{PS} = 2\mathbf{b}$.



Not to scale

(a) Find, in terms of **a** and **b**,

(i) $\overrightarrow{QS}$,

(a)(i) $\overrightarrow{QS}$ = _____ **[1]**

(ii) $\overrightarrow{MN}$.

(ii) $\overrightarrow{MN}$ = _____ **[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]**

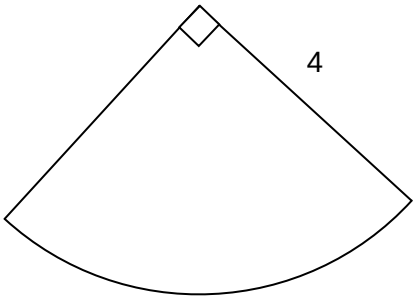
(b) Simplify.

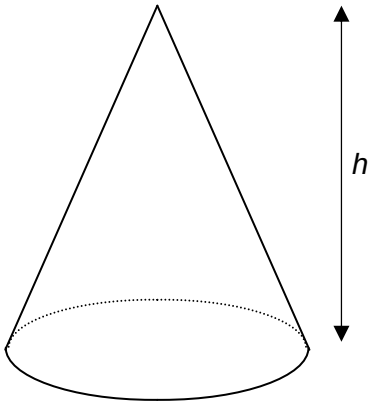
$$\frac{x^2 - 25}{2x + 10}$$

(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]**

Oxford Cambridge and RSA Examinations

General Certificate of Secondary Education

MATHEMATICS B J567/03

Paper 3 (Higher Tier)

Specimen Mark Scheme

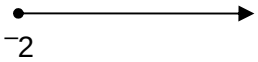
The maximum mark for this Paper is **100**.

This document consists of **8** printed pages.

SP (SLM) T12103

1	**(a)** Correct rotation to triangle with vertices (1, ¯2), (4, ¯2), (1, ¯4)	**3**	**B2** for rotation 90° anticlockwise about origin OR **B1** for rotation 90° clockwise about incorrect centre
	(b) Translation $\begin{bmatrix} 2 \\ 1 \end{bmatrix}$	**1** **1**	 Accept “2 right 1 up”
2	**(a)** 3 and ¯1	**1**	Both correct
	(b) Points correctly plotted Ruled line through (0, 7) and (4, ¯1)	**1** **1**	ft *their* (a) Correct line only
	(c) 3·4 - 3·6	**1**	

3*	Complete correct calculation to find $18\frac{3}{8}$ pints required, and rounds up to 20. Indicates with correct and clear language that as the bottles have the same unit cost it does not matter which combination is chosen, and gives at least one combination for 20 pints.	**6-5**	For the lower mark, there may be one minor slip in the arithmetic at any stage, **or** weaker explanation. Examples of combinations: 6, 6, 6, 2 6, 6, 4, 4 6, 6, 2, 2, 2, 2 6, 4, 4, 4, 2 6, 4, 4, 2, 2, 2 6, 2, 2, 2, 2, 2, 2, 2 4, 4, 2, 2, 2, 2, 2, 2 2, 2, 2, 2, 2, 2, 2, 2, 2, 2 Example of working: $1\frac{1}{2} = \frac{3}{2}$ and $1\frac{3}{4} = \frac{7}{4}$ $\frac{3}{2} \times \frac{7}{4} = \frac{21}{8}$ $\frac{21}{8} \times 7$ (days) $= \frac{147}{8}$ $18\frac{3}{8}$
	Correct method but incomplete or containing a minor error - but if followed without errors, would lead to $\frac{147}{8}$ or $18\frac{3}{8}$. Provides a brief comment saying that it does not matter which combination is chosen but without a clear reason. Gives a combination for *their* answer.	**4-3**	For the lower mark, more than one error is present in the working, **or** comment is missing or has several errors in spelling, punctuation and grammar, **or** no combination for *their* answer.
	Correctly converts both mixed numbers to improper fractions, or correctly multiplies one of the mixed numbers by 7 and attempts to multiply the result by the other fraction. Weak comment concerning the price of the bottles.	**2-1**	For the lower mark, as **2** but with errors in the conversion or in the multiplication, **or** limited comment which may have poor spelling, punctuation and grammar.
	No relevant calculations or comments.	**0**	

4	**(a)(i)** $h = \frac{P+5}{3}$ oe	**2**	**M1** $h = \frac{P-5}{3}$ or $h = \frac{P}{3} - 5$
	(ii) $h = \frac{T}{2} - w$ oe	**2**	**M1** $h = \frac{T-w}{2}$ or $h = \frac{T}{2} + w$ oe
	(b) $x \geq {}^{-}2$ and 	**3**	**M2** $x \geq {}^{-}2$ without correct diagram OR **M1** $6x - 2x \geq {}^{-}8$ or better **B1** ft *their* inequality correctly represented on the number line
5	**(a)** $\frac{20 \times 4}{0{\cdot}5} = 160$	**2**	**M1** Two of the three numbers correctly rounded to 1sf
	(b) Roughly 20×10^{22}	**1**	Condone 16×10^{22}
6	**(a)** 0·55	**1**	
	(b) 0·2	**2**	**M1** for 1 – (0·25 + 0·15 + 0·4)
7	**(a)** She is [extremely] unlikely to get the same result [because of a large number of combinations]	**1**	Accept any correct statement including 'she will **not** get the same results'
	(b) Not very close together, or not close to 0·2, or '2' occurs twice more than '1'	**1**	Accept any correct statement
	Too few trials to be sure, or she needs to do more trials oe	**1**	Accept any correct statement 'More numbered balls' is not enough
8	**(a)** 108°	**2**	**M1** 180° – (360° ÷ 5) Accept any correct method
	(b) 108° does not divide exactly into 360°	**1**	Allow any equivalent correct statement
9	**(a)** All terms will be odd	**1**	Accept any valid statement
	(b) $6n + 1$	**2**	**M1** $6n$ seen

10	**(a)** $2 \times 2 \times 2 \times 5$ or 2^3 (×) 5	**2**	**M1** for attempt at factor tree/ladder or correct factor pair or better seen Or **SC1** for 2, 2, 2, 5 identified but not as product
	(b)(i) 8 cao	**2**	**B1** for $2 \times 2 \times 2$ oe or answer of 2 or 4
	(ii) 120 cao	**2**	**B1** for $2 \times 2 \times 2 \times 3 \times 5$ oe or a multiple of 120 **Or M1** for listing multiples of 24 AND 40 After 0,0 in (b) Award **SC2** in (b)(ii) for reversed answers
11	**(a)** $8640 \times 0{\cdot}15$ (oe) or 1296 8640 – '*their* 1296' 7344	**M1** **M1** **A1**	 **M1** $1 - 0{\cdot}15$ or $0{\cdot}85$ **M1** $8640 \times 0{\cdot}85$
	(b) Yes, as it is [just] over 15 with correct working **Or** No, it is over 15 with correct working	**3**	**M1** Attempt to find 15% of 12800, eg 1280 and attempt to halve **B1** 1920 seen **B1** 2000 > 1920 and conclusion After 0, **SC1** for figs 192 seen Accept any equivalent method.
12	$a = 280°$ $b = 100°$	**1** **2**	 **M1** $\angle PQO = \angle PRO = 90°$ **A1** ft $360° - (90° + 90° + 80°)$, or $360° - (90° + 90°) + (360° - a)$
13	**(a)** Tree diagram complete	**2**	**M1** first or second set correct entries
	(b) 0·42	**2**	**M1** $0{\cdot}7 \times 0{\cdot}6$ or ft *their* tree diagram
14	Finding PR: 8 : 24 oe seen or used $13 \times \frac{24}{8}$ Finding BC: $54 \times \frac{8}{24}$ Showing information: 45° given as missing angle PR = 39 BC = 18 Complete list of required information, or completed labelled sketch, or missing information completed on given diagrams	**B1** **M1** **M1** **B1** **A1** **A1** **B1**	 Dependent on first M1 earned Dependent on second M1 earned

15	**(a)** Not enough information – oldest woman could be anywhere in the 50 to 99/100 interval	**1**	Do not accept "she was 100" oe
	(b) True - about 12 half squares so 120 000 women	**2**	**M1** allow for True with inadequate (but not wrong) justification
	(c) False - for age 50 to 100, women about 20 000, men 29 000	**2**	**M1** for true or false and 16 to 25, women about 40 000, men 21 000 seen
16	$y = {}^{-}2x + 8$	**3**	**M2** ${}^{-}2x$ OR **M1** for $\frac{6}{2}$ or (m) = 2 AND **W1** for +8 in equation
17	Graph translated right (5, 0) marked (${}^{-}1$, 0) marked	**1** **1** **1**	**SC2** for graph translated left and (${}^{-}5$, 0) and (1, 0) shown or **SC1** for graph translated left and either (${}^{-}5$, 0) or (1, 0) shown
18	11 www	**4**	**M3** $5x = 60 - 7 + 2$ OR **M2** $3x + 7 + 2(x - 1) = 4 \times 15$ OR **M1** Multiplication by 4 or 8
19	8	**2**	**M1** $\frac{40}{1000} \times 200$ oe
20	$x = 7$, $y = {}^{-}1$	**3**	**M2** $\frac{a^7}{b}$ OR **M1** *their* $\frac{a^2}{b} \times a^7$ evaluated, or $\frac{a^2}{b}$
21	**(a)(i)** ${}^{-}2\mathbf{a} + 2\mathbf{b}$	**1**	
	(ii) b − a	**1**	
	(b) QS parallel to MN and double the length because QS = 2(**b** – **a)** = 2MN	**2**	**M1** QS parallel to MN and double the length, or for one statement with QS = 2 (**b** – **a**)
22	**(a)** $(x + 5)^2 - 37$	**3**	**M2** $x^2 + 5x + 5x + 25$ OR **M1** $(x + 5)^2$ seen
	(b) $\frac{x - 5}{2}$	**3**	**M1** $(x - 5)(x + 5)$ AND **M1** $2(x + 5)$

23	**(a)** Slant height of cone = 4 Arc length = $4 \times 2\pi \times \frac{1}{4}$ [$= 2\pi$] Radius of cone = 1 (from $\frac{2\pi}{2\pi}$) Use of Pythagoras' theorem $h = \sqrt{15}$	**B1** **M1** **B1** **M1** **A1**	Accept $l = 4$ $h^2 + 1^2 = 4^2$ or better
	(b) Scale factor 2 $2\sqrt{15}$ cao	**M1** **A1**	

Paper Total: 100 marks

Assessment Objectives and Functional Elements Grid

GCSE MATHEMATICS B

J567/03

Mathematics B Paper 3 (Higher Tier)

	Topic	Context	Ref	AO1	AO2	AO3	Functional
1	Transformations		HIG6	5			
2	Draw straight-line graph		HIA4	4			
3	Calculations with mixed numbers	Milk	HBN2			6	6
4	Change subject of formulae; solve inequality		HBA2 HBA3	7			
5	Estimate answer to calculation		HBN5 HSN3	3			
6	Mutually exclusive probability	Counters	HIS1		3		
7	Relative frequency	Lottery machine	HBS1		3		
8	Angle in pentagon; tessellating		HBG3	3			
9	Sequence		HBA1	3			
10	Prime factors, HCF, LCM		HBN6	6			
11	Percentages	Selling cars	HBN4		6		3
12	Geometrical calculation		HSG1	3			
13	Probability with tree diagram	Traffic lights	HSS1		4		2
14	Similar triangles	Company logo	HSG5		7		7
15	Interpreting table and histogram	Marriage statistics	HGS2 HGS3		5		5
16	Find equation of line		HSA7	3			
17	Transforming graph		HGA6	3			
18	Algebraic fraction equation		HSA1	4			
19	Stratified sampling	School	HGS4		2		2
20	Laws of indices		HGN1	3			
21	Vectors	Parallelogram	HGG5	2		2	
22	Completing the square; simplifying		HGA2, HSA2	6			
23	Mensuration of sectors and cones		HGG4			7	
	TOTAL			**55**	**30**	**15**	**25**

Paper Total: 100 marks