

Centre No.						Paper Reference					Surname	Initial(s)		
Candidate No.						1	3	8	0	/	4	H	Signature	

Paper Reference

1380/4H

Edexcel GCSE

Mathematics (Linear) – 1380

Paper 4 (Calculator)

Higher Tier

Friday 14 November 2011 – Morning

Time: 1 hour 45 minutes

Examiner's use only

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Team Leader's use only

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Materials required for examination

Ruler graduated in centimetres and millimetres, protractor, compasses, pen, HB pencil, eraser, calculator. Tracing paper may be used.

Items included with question papers

Nil

Instructions to Candidates

In the boxes above, write your centre number, candidate number, your surname, initials and signature. Check that you have the correct question paper.

Answer ALL the questions. Write your answers in the spaces provided in this question paper.

You must NOT write on the formulae page.

Anything you write on the formulae page will gain NO credit.

If you need more space to complete your answer to any question, use additional answer sheets.

Information for Candidates

The marks for individual questions and the parts of questions are shown in round brackets: e.g. (2).

There are 28 questions in this question paper. The total mark for this paper is 100.

There are 28 pages in this question paper. Any blank pages are indicated.

Calculators may be used.

If your calculator does not have a π button, take the value of π to be 3.142 unless the question instructs otherwise.

Advice to Candidates

Show all stages in any calculations.

Work steadily through the paper. Do not spend too long on one question.

If you cannot answer a question, leave it and attempt the next one.

Return at the end to those you have left out.

Lots more free papers at

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Turn over

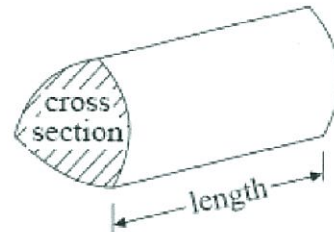
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GCSE Mathematics (Linear) 1380

Formulae: Higher Tier

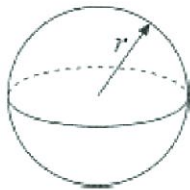
**You must not write on this formulae page.
Anything you write on this formulae page will gain NO credit.**

Volume of prism = area of cross section \times length



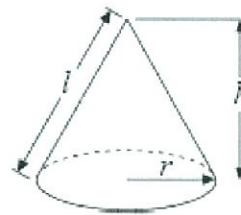
Volume of sphere $\frac{4}{3} \pi r^3$

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

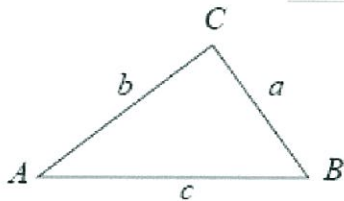


Volume of cone $\frac{1}{3} \pi r^2 h$

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



In any triangle ABC



The Quadratic Equation

The solutions of $ax^2 + bx + c = 0$
where $a \neq 0$, are given by

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

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 = $\frac{1}{2} ab \sin C$

Answer ALL TWENTY FIVE questions.

Write your answers in the spaces provided.

You must write down all stages in your working.

1. (a) Use your calculator to work out

$$\frac{\sqrt{21.5}}{5.8 - 2.36}$$

Write down all the figures on your calculator display.

$$\underline{1.347909665}$$

(2)

- (b) Write down your answer to part (a) correct to 2 decimal places.

$$\underline{1.35}$$

(1)

(Total 3 marks)

-
2. Ishmal invested £3500 for 3 years at 2.5% per annum **simple interest**.

Work out the total amount of interest Ishmal earned.

$$\frac{2.5}{100} \times 3500 \times 3$$
$$= 87.5 \times 3 = \pounds 262.50$$

$$\pounds \underline{262.50}$$

(Total 3 marks)

3. Gary wants to find out how much time teenagers spend listening to music. He uses this question on a questionnaire.

How many hours do you spend listening to music?			
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1 to 5	5 to 10	10 to 20	over 20

- (a) Write down **two** things wrong with this question.

- 1 It does not include the period of time over which the question is to be applied.
- 2 Overlapping class intervals and no option for those who do not spend any time listening to music.

(2)

- (b) Design a better question for Gary's questionnaire to find out how much time teenagers spend listening to music.

How many hours per week on average would you estimate you spend listening to music?

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None	1 to 5	6 to 10	11 to 15	16 to 20	Over 20

(2)

(Total 4 marks)

4. (a) Find the highest common factor (HCF) of 24 and 30

$$30 = 2 \times 3 \times 5$$

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

$$\text{HCF}\{24, 30\} = 2 \times 3 = 6$$

6

(1)

- (b) Find the lowest common multiple (LCM) of 4, 5 and 6

$$4 = 2 \times 2$$

$$5 = 1 \times 5$$

$$6 = 2 \times 3$$

$$\text{LCM}\{4, 5, 6\} = 6 \times 2 \times 5 = 60$$

60

(2)

5. Melissa is 13 years old.
Becky is 12 years old.
Daniel is 10 years old.

Melissa, Becky and Daniel share £28 in the ratio of their ages.
Becky gives a third of her share to her mother.

How much should Becky now have?

$$28 \text{ divided in the ratio } M : B : D = 13 : 12 : 10$$

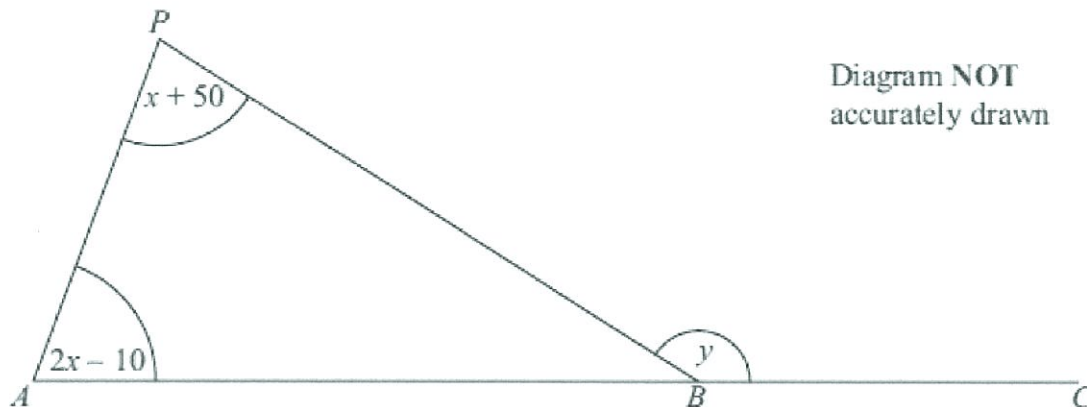
$$\text{Becky's share is given by } \frac{12}{35} \times 28 = £9.60$$

$$\Rightarrow \text{Amount Becky has after giving a third to her mother is given by } \frac{2}{3} \text{ of } 9.6 = £6.40$$

£ 6.40

(Total 4 marks)

6.



All angles are measured in degrees.

ABC is a straight line.

Angle $APB = x + 50$

Angle $PAB = x - 10$

Angle $PBC = y$

(a) Show that $y = 3x + 40$

Give reasons for each stage of your working.

$$y = 180 - [180 - (x + 50 + 2x - 10)] \dots \text{Angles across a straight line add to } 180^\circ \text{ and angles of a triangle add to } 180^\circ \quad (3)$$

$$\Rightarrow y = 180 - 180 + 3x + 40 = 3x + 40$$

(b) Given that $y = 145$

(i) work out the value of x ,

$$145 = 3x + 40$$

$$\Rightarrow x = \frac{145 - 40}{3} = \frac{105}{3} = 35^\circ$$

$$x = 35^\circ$$

(ii) work out the size of the largest angle in triangle ABP .

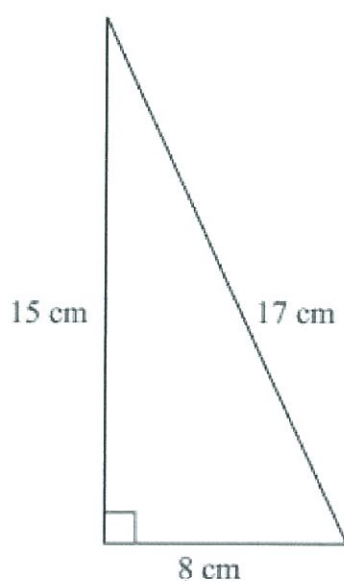
$$x + 50 = 35 + 50 = 85^\circ$$

$$2x - 10 = 2(35) - 10 = 60^\circ$$

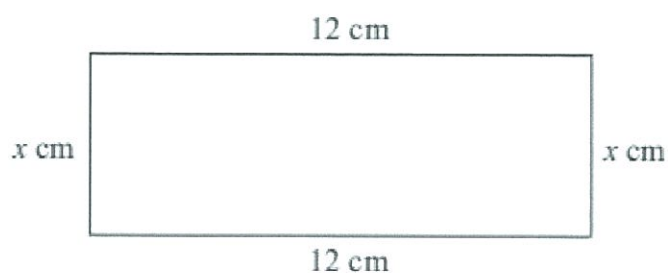
$$85^\circ$$

(Total 7 marks)

7. The diagrams show a right-angled triangle and a rectangle.



Diagrams NOT
accurately drawn



The area of the right-angled triangle is equal to the area of the rectangle.

Find the value of x .

$$12x = \frac{8(15)}{2}$$

$$\Rightarrow 12x = 60$$

$$\Rightarrow x = \frac{60}{12} = 5 \text{ cm}$$

$$x = 5 \text{ cm}$$

(Total 4 marks)

8. The diagram shows a CD.
The CD is a circle of radius 6 cm.

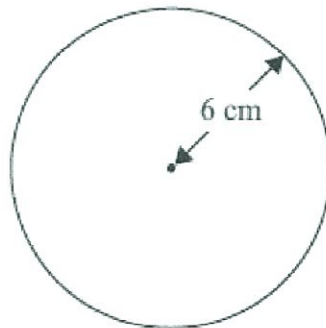


Diagram NOT
accurately drawn

- (a) Work out the circumference of the CD.

N.B: $C = \pi \times d$
and $d = 2r$

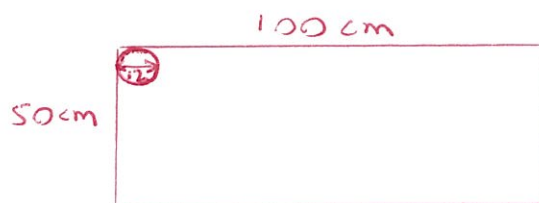
$$\begin{aligned} C &= 2\pi r = 2\pi(6) \\ &= 12\pi \\ &= 37.7 \text{ cm (3 s.f.)} \end{aligned}$$

So $C = \pi(2r)$ or $2\pi r$

..... 37.7 cm (3 s.f.)
(2)

CDs of this size are cut from rectangular sheets of plastic.
Each sheet is 1 metre long and 50 cm wide.

- (b) Work out the greatest number of CDs that can be cut from one rectangular sheet.



No. of CDs which will fit along the width is given by $\frac{50}{12} = 4$ (when rounded down to the nearest integer)

" length is given by $\frac{100}{12} = 8$ (rounded down)

\therefore No. of CDs that can be cut

$$= 4 \times 8 = 32$$

..... 32
(2)

(Total 2 marks)

9. The exchange rate in London is £1 = €1.14
The exchange rate in Paris is €1 = £0.86

Elaine wants to change some pounds into euros.

In which of these cities would Elaine get the most euros?
You must show all of your working.

$$\begin{array}{l} \text{£ } 0.86 \text{ ————— € } 1 \\ \times \frac{1}{0.86} \left(\begin{array}{l} \text{£ } 1 \text{ ————— € } 1.16 \text{ (to 2 d.p.)} \end{array} \right) \times \frac{1}{0.86} \end{array}$$

In Paris, we can express the exchange rate as $\text{£ } 1 = \frac{1}{0.86} = \text{€ } 1.16$ (to 2 d.p.).
 \therefore Elaine would get the most euros in Paris.

(Total 3 marks)

10. The temperature ($T^{\circ}\text{C}$) at noon at a seaside resort was recorded for a period of 60 days. The table shows some of this information.

Temperature ($T^{\circ}\text{C}$)	Number of days	Temperature mid-point, M	$M \times F$
$10 < T \leq 14$	2	12	24
$14 < T \leq 18$	8	16	128
$18 < T \leq 22$	14	20	280
$22 < T \leq 26$	23	24	552
$26 < T \leq 30$	9	28	252
$30 < T \leq 34$	4	32	128

Calculate an estimate for the mean temperature at noon during these 60 days. Give your answer correct to 3 significant figures.

$$\begin{aligned}
 \text{Mean estimate} &= \frac{\sum mf}{\sum f} = \frac{24 + 128 + 280 + 552 + 252 + 128}{60} \\
 &= \frac{1364}{60} \\
 &= 22.7^{\circ} \text{ (3 s.f.)}
 \end{aligned}$$

..... 22.7 $^{\circ}\text{C}$

(Total 4 marks)

11. (a) Simplify $m^3 \times m^6$

$$m^{(3+6)} = m^9$$

$$\frac{m^9}{\dots\dots\dots} \quad (1)$$

- (b) Simplify $\frac{p^8}{p^2}$

$$p^{(8-2)} = p^6$$

$$\frac{p^6}{\dots\dots\dots} \quad (1)$$

- (c) Simplify $(2n^3)^4$

$$2^4 n^{(3 \times 4)} \\ = 16 n^{12}$$

$$\frac{16 n^{12}}{\dots\dots\dots} \quad (2)$$

(Total 4 marks)

-
12. $-2 \leq n < 5$
 n is an integer.

- (a) Write down all the possible values of n .

$$\frac{-2, -1, 0, 1, 2, 3, 4}{\dots\dots\dots} \quad (2)$$

- (b) Solve the inequality $4x + 1 > 11$

$$x > \frac{11-1}{4} \\ \Rightarrow x > \frac{10}{4} \\ x > 2.5$$

$$\frac{x > 2.5}{\dots\dots\dots} \quad (2)$$

(Total 4 marks)

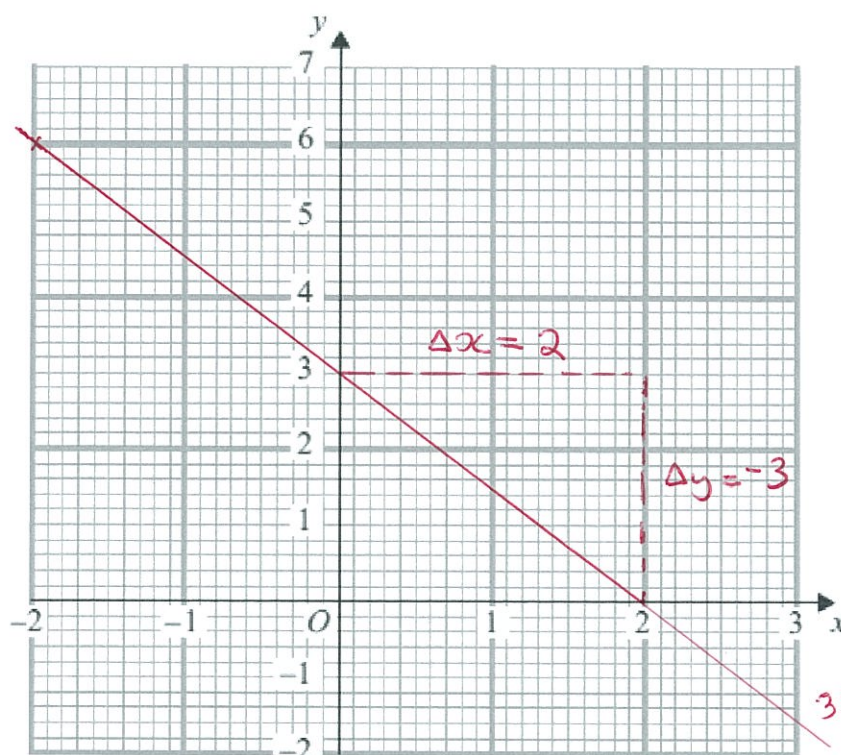
13. (a) Complete the table of values for $3x + 2y = 6$

Re-write in the form $y = mx + c$
i.e. $y = -\frac{3}{2}x + 3$

x	-2	-1	0	1	2	3
y	6	4.5	3	1.5	0	-1.5

(2)

(b) On the grid, draw the graph of $3x + 2y = 6$



$3x + 2y = 6$ or
 $y = -\frac{3}{2}x + 3$

(2)

(c) Find the gradient of the graph of $3x + 2y = 6$

Rearrange $3x + 2y = 6$ in the form $y = mx + c$
so that you can simply read off the gradient as the
coefficient of x , m .

$$\begin{aligned} 3x + 2y &= 6 \\ \Rightarrow 2y &= -3x + 6 \\ \Rightarrow y &= -\frac{3}{2}x + 3 \end{aligned}$$

-1.5

\therefore Gradient $= -\frac{3}{2}$ or -1.5

(Total 6 marks)

(2)

Alternatively, from graph, gradient

$$= \frac{\Delta y}{\Delta x} = \frac{y_2 - y_1}{x_2 - x_1} = \frac{0 - 3}{2 - 0} = -\frac{3}{2} = -1\frac{1}{2} \text{ or } -1.5$$

14. (a) Factorise $6x + 4$

$$\underline{2(3x + 2)}$$

(1)

- (b) Factorise fully $9x^2y - 15xy$

$$\underline{3xy(3x - 5)}$$

(2)

(Total 3 marks)

-
15. A garage sells used cars.
The table shows the number of used cars it sold from July to December.

July	August	September	October	November	December
28	25	34	46	28	40

- (a) Work out the 3-point moving averages for the information in the table.
The first two have been worked out for you.

$$\begin{array}{ccccccc} & & 29 & & 35 & & 36 & 38 \\ & & \dots & & \dots & & \dots & \dots \end{array}$$

(2)

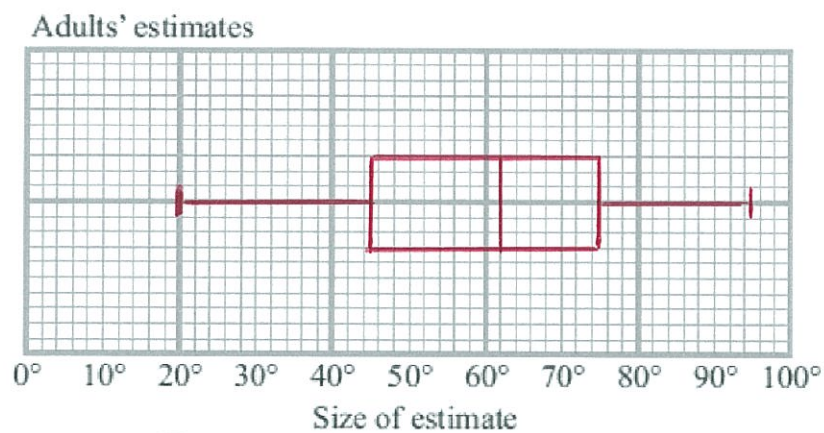
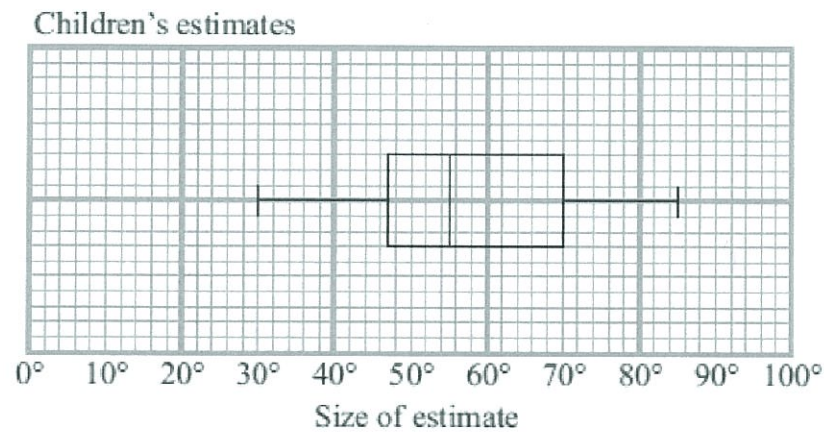
- (b) Comment on the trend shown by the 3-point moving averages.

The 3-point moving averages showed a continued
increase from July to December.

(1)

(Total 3 marks)

16. Barry drew an angle of 60° .
 He asked some children to estimate the size of the angle he had drawn.
 He recorded their estimates.
 The box plot gives some information about these estimates.



- (a) Write down the median of the children's estimates.

55°
 (1)

- (b) Find the interquartile range of the children's estimates.

$$70 - 47 = 23^\circ$$

23°
 (2)

Barry then asked some adults to estimate the size of the angle he had drawn. The table gives some information about the adults' estimates.

	Angle
Lowest estimate	20°
Lower quartile	45°
Median	62°
Upper quartile	75°
Highest estimate	95°

(c) On the grid opposite, draw a box plot to show this information.

(2)

(d) Use the two box plots, to compare the distribution of the children's estimates with the distribution of the adults' estimates.

The median of the adults' estimates was closer to the actual angle 60° than the ^{median of the} children's estimates. However, the range and interquartile range of the adults' estimates were greater indicating these estimates were more widely distributed and less consistent than the children's estimates.

(2)

(Total 7 marks)

17.

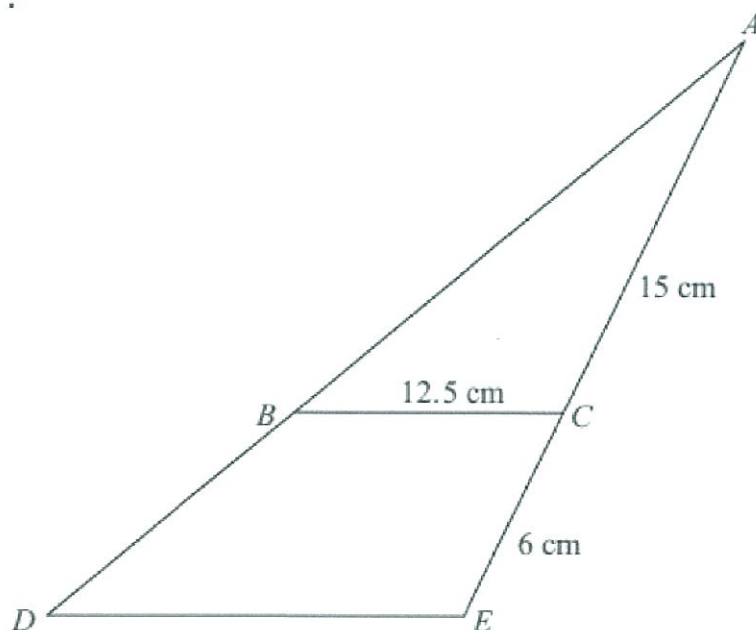


Diagram NOT
accurately drawn

Triangle ABC is similar to triangle ADE .

$AC = 15$ cm.

$CE = 6$ cm.

$BC = 12.5$ cm.

Work out the length of DE .

$$\frac{DE}{BC} = \frac{AE}{AC}$$

$$\Rightarrow \frac{DE}{12.5} = \frac{21}{15}$$

$$\Rightarrow DE = 12.5 \left(\frac{21}{15} \right) = 17.5 \text{ cm}$$

17.5 cm

(Total 3 marks)

18. Change 9 cm^2 to mm^2 .

$$1 \text{ cm} = 10 \text{ mm}$$

$$1 \text{ cm}^2 = (10 \times 10) \text{ mm}^2 = 100 \text{ mm}^2$$

$$9 \times 10^2 = 9 \times 100 = 900 \text{ mm}^2$$

900 mm²

(Total 2 marks)

19. Find the exact solutions of $x + \frac{3}{x} = 7$

Multiply both sides by x :

$$x^2 + 3 = 7x$$

$$\Rightarrow x^2 - 7x + 3 = 0$$

$$x = \frac{-b \pm \sqrt{b^2 - 4ac}}{2a} \quad \text{where } (a, b, c) = (1, -7, 3)$$

$$\Rightarrow x = \frac{7 \pm \sqrt{49 - 4(1)(3)}}{2(1)} = \frac{7 \pm \sqrt{37}}{2}$$

$$\therefore x = \frac{7 + \sqrt{37}}{2} \quad \text{or} \quad x = \frac{7 - \sqrt{37}}{2} \quad x = 6.54 \text{ (3s.f.)}$$

$$\text{or } 0.459 \text{ (3s.f.)} *$$

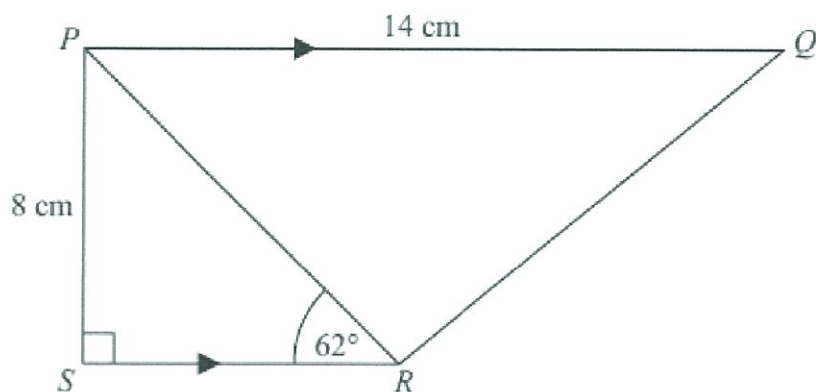
$$x = 6.54 \text{ (3s.f.) or } x = 0.459 \text{ (3s.f.)}$$

(Total 3 marks)

* See working for exact solutions expressed in surd form.

20.

Diagram NOT
accurately drawn



$PQRS$ is a trapezium.

PQ is parallel to SR .

Angle $PSR = 90^\circ$.

Angle $PRS = 62^\circ$.

$PQ = 14$ cm.

$PS = 8$ cm.

(a) Work out the length of PR .

Give your answer correct to 3 significant figures.

$$\sin 62^\circ = \frac{8}{PR}$$

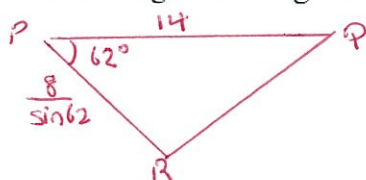
$$\Rightarrow PR = \frac{8}{\sin 62^\circ} = 9.06 \text{ cm (3 s.f.)}$$

9.06
..... cm
(3)

(b) Work out the length of QR .

Give your answer correct to 3 significant figures.

Use cosine rule:



N.B: $\hat{SRP} = \hat{RPQ} = 62^\circ$
Alternate angles are equal

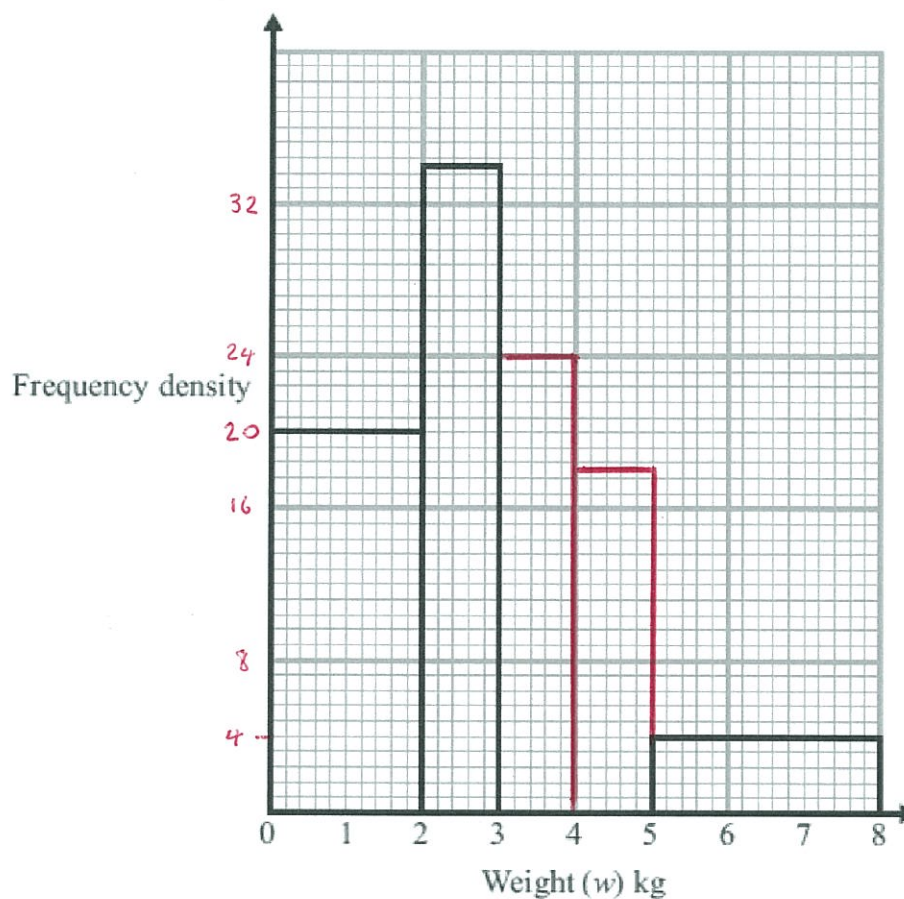
$$QR^2 = \left(\frac{8}{\sin 62}\right)^2 + 14^2 - 2\left(\frac{8}{\sin 62}\right)(14)\cos 62^\circ$$

12.6
..... cm
(4)

$$\Rightarrow QR = 12.6 \text{ cm (3 s.f.)}$$

(Total 7 marks)

21. The table and histogram give some information about the weights of parcels received at a post office during one day.



- (a) Use the histogram to complete the frequency table.

Weight (w) kg	Frequency
$0 < w \leq 2$	40
$2 < w \leq 3$	34
$3 < w \leq 4$	24
$4 < w \leq 5$	18
$5 < w \leq 8$	12

$$\text{Freq. Density} = \frac{\text{Freq.}}{\text{Class width}}$$

20

34

24

18

4

(2)

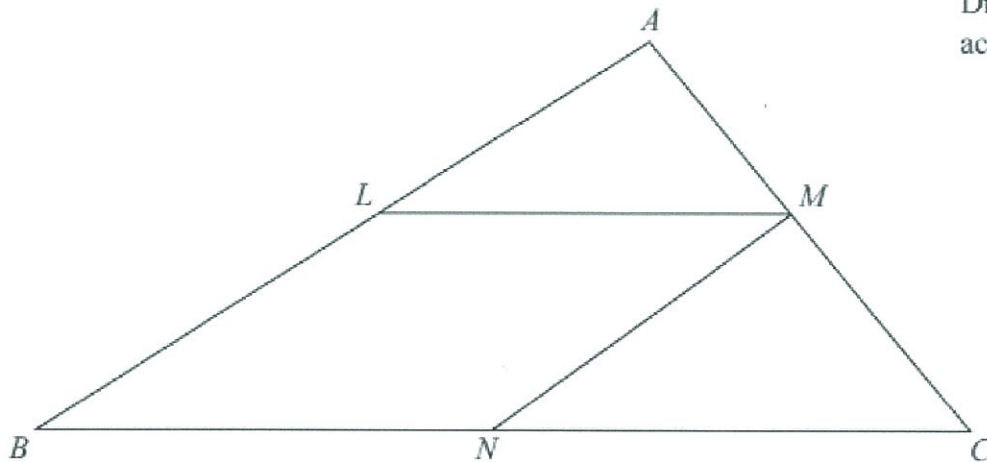
- (b) Use the table to complete the histogram.

(2)

(Total 4 marks)

22.

Diagram NOT
accurately drawn



The diagram shows a triangle ABC .

$LMNB$ is a parallelogram where

L is the midpoint of AB ,
 M is the midpoint of AC ,
and N is the midpoint of BC .

Prove that triangle ALM and triangle MNC are congruent.
You must give reasons for each stage of your proof.

$\hat{A}LM = \hat{L}BN = \hat{M}NC$ — Corresponding angles are equal.

$\hat{A}ML = \hat{M}CN$ — Corresponding angles are equal.

$AM = MC$ — M is the midpoint of AC .

\therefore Since triangles ALM and MNC have at least 2 angles and a side that we've shown must match, triangles ALM and MNC are congruent.

(Total 3 marks)

23. (a) Factorise $x^2 + px + qx + pq$

$$x^2 + (p+q)x + pq$$

$$= (x+p)(x+q)$$

$$\frac{(x+p)(x+q)}{\dots\dots\dots}$$

(2)

- (b) Factorise $m^2 - 4$

$$m^2 - 2^2 = (m+2)(m-2)$$

$$\frac{(m+2)(m-2)}{\dots\dots\dots}$$

(1)

- (c) Write as a single fraction in its simplest form $\frac{2}{x-4} - \frac{1}{x+3}$

$$\frac{2(x+3) - x + 4}{(x-4)(x+3)} = \frac{2x + 6 - x + 4}{(x-4)(x+3)}$$

$$= \frac{x+10}{(x-4)(x+3)}$$

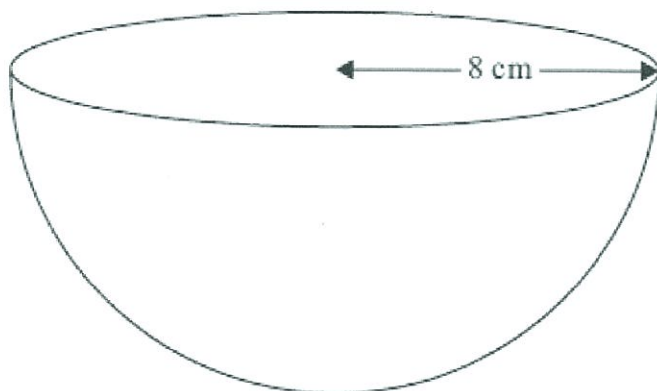
$$\frac{x+10}{(x-4)(x+3)}$$

(3)

(Total 6 marks)

24. The diagram shows a solid hemisphere of radius 8 cm.

Diagram NOT
accurately drawn



Work out the total surface area of the hemisphere.
Give your answer correct to 3 significant figures.

$$\pi r^2 + \frac{4\pi r^2}{2}$$

$$= \pi r^2 + 2\pi r^2$$

$$= 3\pi r^2$$

$$\Rightarrow \text{Total surface area of the hemisphere} = 3\pi(8^2)$$

$$= 3\pi(64) = 192\pi \approx 603 \text{ cm}^2 \text{ (3 s.f.)}$$

..... 603 cm²

(Total 3 marks)

25. Steve measured the length and the width of a rectangle.
He measured the length to be 645 mm correct to the nearest 5 mm.
He measured the width to be 400 mm correct to the nearest 5 mm.

Calculate the lower bound for the area of this rectangle.
Give your answer correct to 3 significant figures.

$$\begin{aligned}\text{Lower bound for area} &= \text{Lower bound for length} \times \\ &\quad \text{Lower bound for width} \\ &= 642.5 \times 397.5 \\ &= 255,393.75 \text{ mm}^2 \\ &= 255,000 \text{ mm}^2 \text{ (3 s.f.)}\end{aligned}$$

255,000 mm²
(Total 3 marks)

TOTAL FOR PAPER = 100 MARKS

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