

SOLUTIONS

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

Paper Reference(s)

1380/4H

Edexcel GCSE

Mathematics (Linear) – 1380

Paper 4 (Calculator)

Higher Tier

Monday 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 25 questions in this question paper. The total mark for this paper is 100.

There are 24 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.

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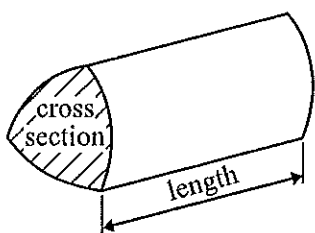
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GCSE Mathematics (Linear) 1380

Formulae: Higher Tier

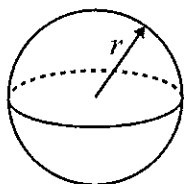
You must not write on this formulae page.
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Volume of a prism = area of cross section \times length



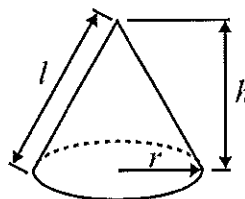
Volume of sphere = $\frac{4}{3}\pi r^3$

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

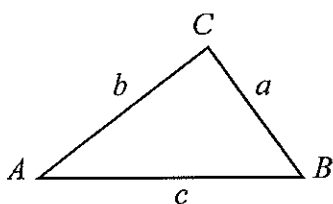


Volume of cone = $\frac{1}{3}\pi r^2 h$

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.

$$\frac{4.636809248}{3.44}$$

$$1.347909665$$

(2)

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

$$1.35$$

(1)

(Total 3 marks)

Q1

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

Work out the total amount of interest Ishmal earned.

$$2.5\% \text{ of } 3500 = 0.025 \times 3500$$

$$= \pounds 87.50$$

$$\pounds 87.50 \times 3 \text{ years} = \pounds 262.50$$

£

(Total 3 marks)

Q2



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?			
<input type="text"/>	<input type="text"/>	<input type="text"/>	<input type="text"/>
1 to 5	5 to 10	10 to 20	over 20

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

1. Overlapping boxes.

2. No time frame in the question

(2)

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

How many hours do you spend listening to music each week?

<input type="text"/>	<input type="text"/>	<input type="text"/>	<input type="text"/>
0 - 1	2 - 3	4 - 5	6 + .

(2)

(Total 4 marks)

Q3



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

24

```

      / \
     /   \
    (2)  12
         / \
        /   \
       (3)  4
            / \
           /   \
          (2) (2)
            
```

30

```

      / \
     /   \
    (2)  15
         / \
        /   \
       (3) (5)
            
```

$24 = (2) \times 2 \times 2 \times (3)$

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

HCF = $2 \times 3 = 6$

.....6.....
(1)

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

<u>4</u>		<u>5</u>		<u>6</u>
4	44	5	(60)	6
8	48	10	65	12
12	52	15	70	18
16	56	20	75	24
20	(60)	25	80	30
24		30	⋮	36
28		35	⋮	42
32		40	⋮	48
36		45		(54)
40		50		(60)
		55		

.....60.....
(2)

(Total 3 marks)

Q4

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

$13 : 12 : 10 = 35 \text{ shares}$

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?

$\frac{28}{35} = 0.8$

$0.8 \times 12 = \pounds 9.60$

$\pounds 9.60 \times \frac{1}{3} = \pounds 3.20$

9.60
 $- 3.20$

 $\pounds 6.40$

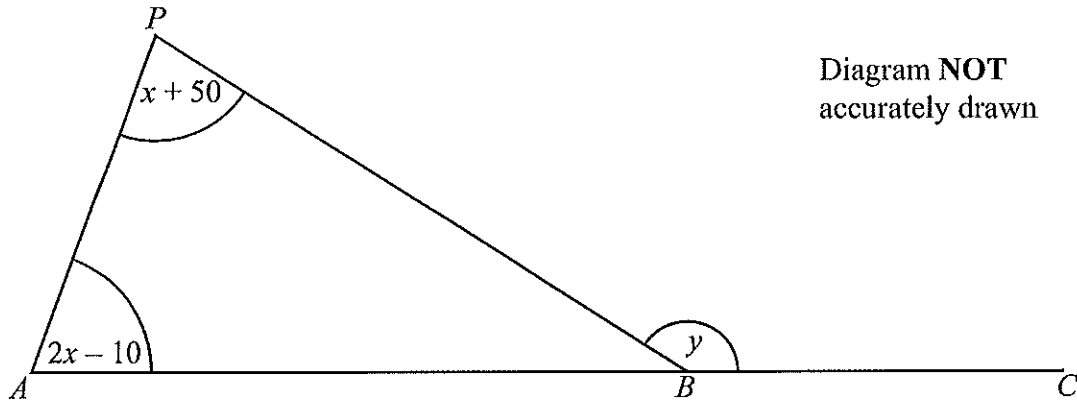
£6.40.....

(Total 4 marks)

Q5



6.



All angles are measured in degrees.

ABC is a straight line.

Angle $APB = x + 50$

Angle $PAB = 2x - 10$

Angle $PBC = y$

- (a) Show that $y = 3x + 40$
Give reasons for each stage of your working.

$$y = x + 50 + 2x - 10$$

$$y = 3x + 40$$

(3)

- (b) Given that $y = 145$,

- (i) work out the value of x ,

$$145 = 3x + 40$$

$$3x = 105$$

$$x = \frac{105}{3} = 35$$

$$x = \underline{35}$$

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

$$x + 50 = 35 + 50 = 85^\circ \leftarrow \text{largest}$$

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

$$180 - 85 - 60 = 40^\circ$$

$$\underline{85}^\circ$$

(4)

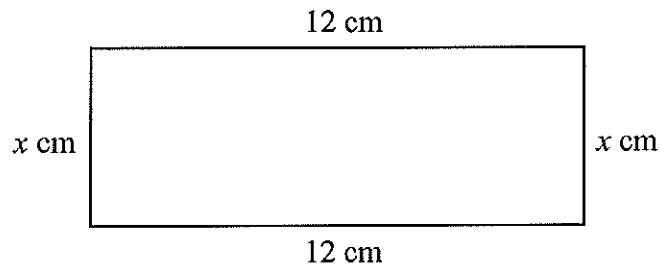
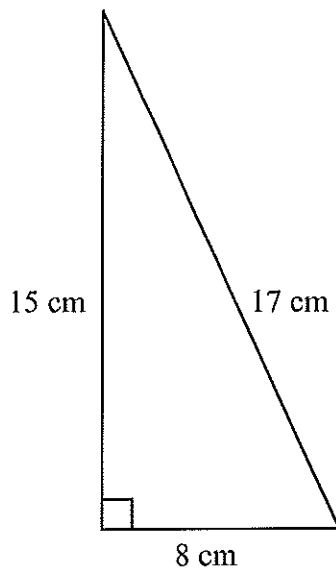
(Total 7 marks)

Q6



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 .

$$\text{Area of Triangle} = \frac{8 \times 15}{2} = 60 \text{ cm}^2$$

$$x \times 12 = 60$$

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

$$x = 5 \dots\dots\dots$$

(Total 4 marks)

Q7



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

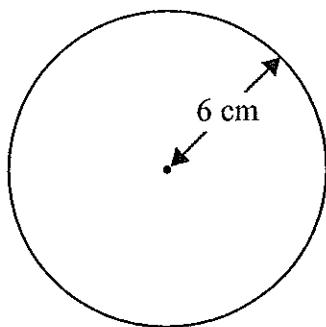


Diagram NOT
accurately drawn

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

$$\text{Circumference} = \pi d$$

$$\pi \times 12 = 37.69911184$$

$$\dots 37.7 \dots \text{ cm}$$

(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.

$$\text{CDs to fit along the length} = \frac{100}{12} = 8.3$$

$$\therefore 8 \text{ full CDs}$$

$$\text{CDs to fit along the width} = \frac{50}{12} = 4.16$$

$$\therefore 4 \text{ full CDs}$$

$$\text{Total CDs} = 8 \times 4 = 36$$

$$\dots 36 \dots$$

(2)

(Total 4 marks)

Q8



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.

$$\text{London} \rightarrow \frac{1}{1.14} \rightarrow \cancel{\text{£}}0.877 \rightarrow \text{€}1$$

It would cost more to get the same amount of Euros in London than in Paris.

∴ she would get more Euros in Paris than London for the same amount of Pounds.

..... Paris

(Total 3 marks)

09



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	midpoint	mp \times freq
$10 < T \leq 14$	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
	60		1364

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

$$\frac{\sum \text{mp} \times \text{freq}}{\sum \text{freq}} = \frac{1364}{60} = 22.7\dot{3} = 22.7 \text{ (1dp)}$$

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

(Total 4 marks)

Q10



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

$$\underline{m^9} \quad (1)$$

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

$$\underline{p^6} \quad (1)$$

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

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

(Total 4 marks)

Q11

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

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

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

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

$$4x > 10$$

$$x > \frac{10}{4}$$

$$x > 2.5$$

$$\underline{x > 2.5} \quad (2)$$

(Total 4 marks)

Q12

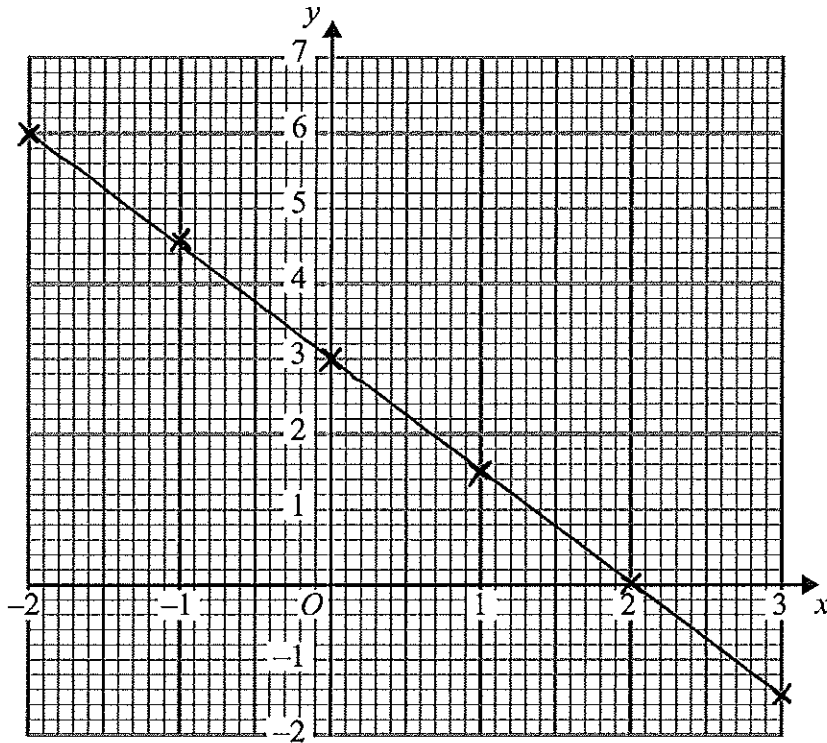


13. (a) Complete the table of values for $3x + 2y = 6$

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 $3x + 2y = 6$



(2)

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

$$\text{gradient} = \frac{\text{diff in } y}{\text{diff in } x} = \frac{3-0}{0-2} = \frac{3}{-2} = -1.5$$

Two points on the line $\rightarrow (0, 3) (2, 0)$

$$\dots\dots\dots -1.5 \dots\dots\dots$$

(2)

(Total 6 marks)

Q13



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

$$2(3x + 2)$$

$$\underline{2(3x + 2)} \quad (1)$$

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

$$3xy(3x - 5)$$

$$\underline{3xy(3x - 5)} \quad (2)$$

(Total 3 marks)

Q14

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.

$$\frac{34 + 46 + 28}{3} = 36$$

$$\frac{46 + 28 + 40}{3} = 38$$

29	35	36	38
.....

(2)

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

They increase as the year progresses.

(1)

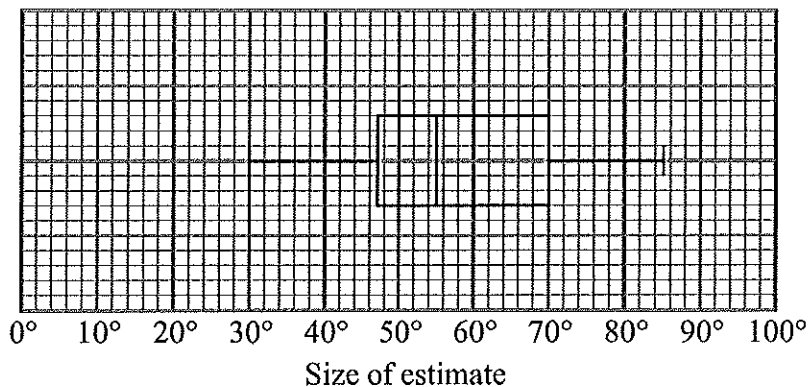
(Total 3 marks)

Q15

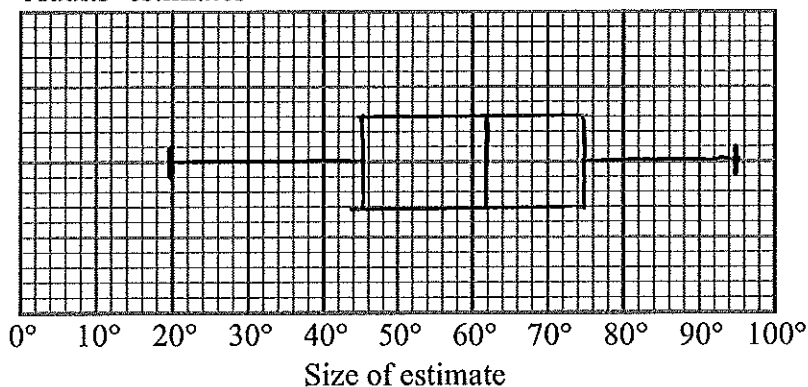


16. Barry drew an angle of 60° .
 He asked some children to estimate the size of the angle he had drawn.
 He recorded their estimates.
 The box plot gives some information about these estimates.

Children's estimates



Adults' estimates



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

55^o
 (1)

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

$$70 - 47 = 23$$

23^o
 (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.

- Adults have a greater interquartile range than the children
- The adults greatest value is higher than the childrens highest value

(2)

Q16

(Total 7 marks)



17.

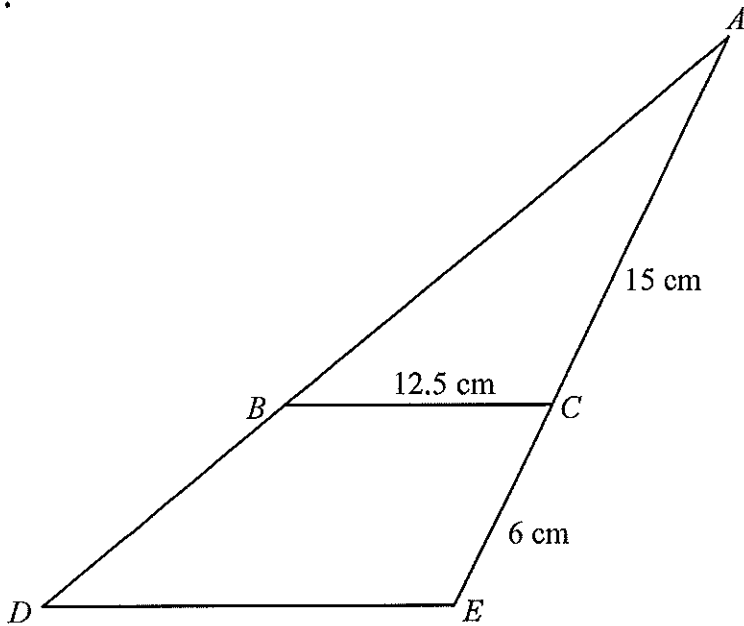


Diagram NOT accurately drawn

Triangle ABC is similar to triangle ADE .
 $AC = 15$ cm.
 $CE = 6$ cm.
 $BC = 12.5$ cm.

Work out the length of DE .

$$\frac{15+6}{15} = \frac{21}{15}$$

$$\frac{21}{15} \times 12.5 = 17.5$$

.....17.5..... cm

(Total 3 marks)

Q17

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

$$9 \times 100 = 900$$

.....900..... mm^2

(Total 2 marks)

Q18



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

Multiply everything by x

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

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

$$a = 1$$

$$b = -7$$

$$c = 3$$

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

$$x = \frac{-(-7) \pm \sqrt{(-7)^2 - 4 \times 3}}{2}$$

$$x = \frac{7 \pm \sqrt{49 - 12}}{2}$$

$$x = \frac{7 + \sqrt{37}}{2} \quad \text{OR} \quad \frac{7 - \sqrt{37}}{2}$$

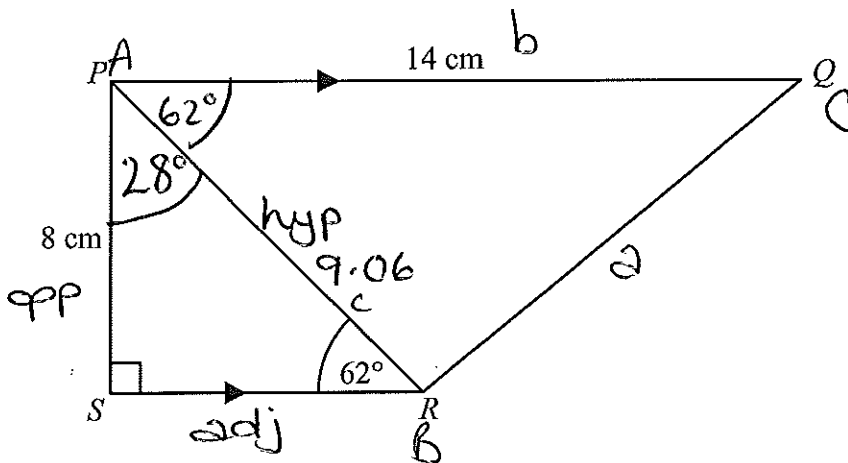
.....
(Total 3 marks)

Q19



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.

$$S = \frac{O}{H} \quad C = \frac{A}{H} \quad T = \frac{O}{A}$$

$$\sin 62 = \frac{8}{PR} \quad PR = \frac{8}{\sin 62} = 9.06$$

..... 9.06 cm
 (3)

- (b) Work out the length of QR .
 Give your answer correct to 3 significant figures.

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

$$QR^2 = 14^2 + 9.06^2 - (2 \times 14 \times 9.06 \times \cos 62)$$

$$= 158.988054$$

$$QR = \sqrt{158.988054}$$

$$= 12.6 \text{ cm (3 sf)}$$

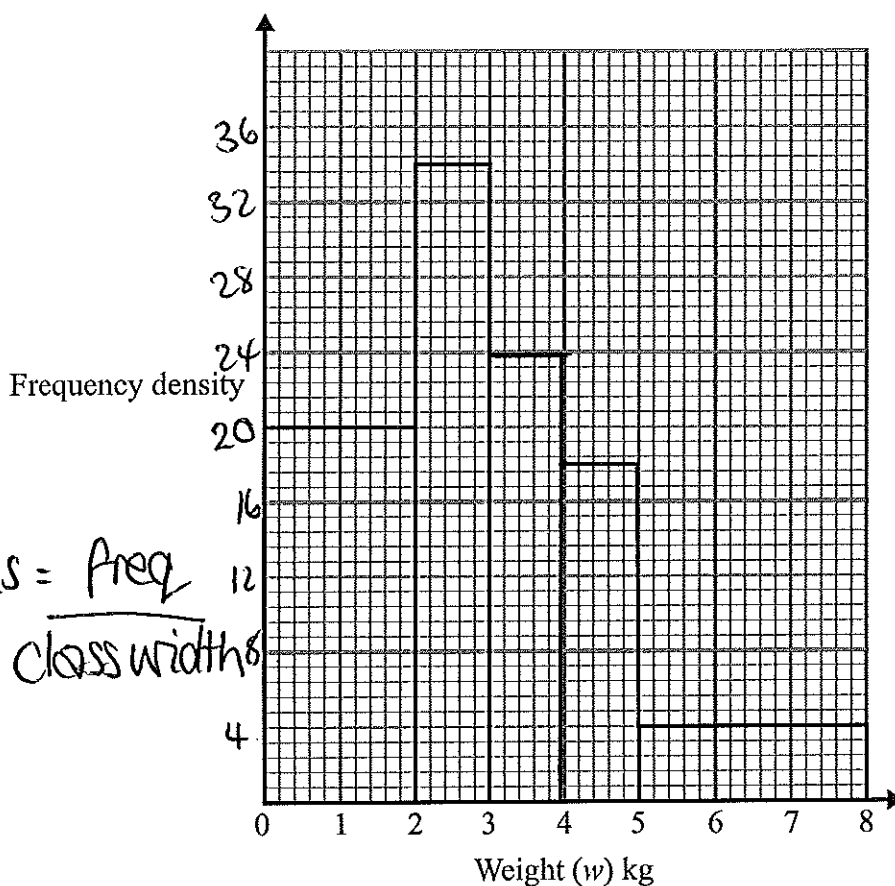
..... 12.6 cm
 (4)

(Total 7 marks)

Q20



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



$$\text{freq dens} = \frac{\text{freq}}{\text{class widths}}$$

(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

freq dens .
20 .
34
24
18
4 .

(2)

(b) Use the table to complete the histogram.

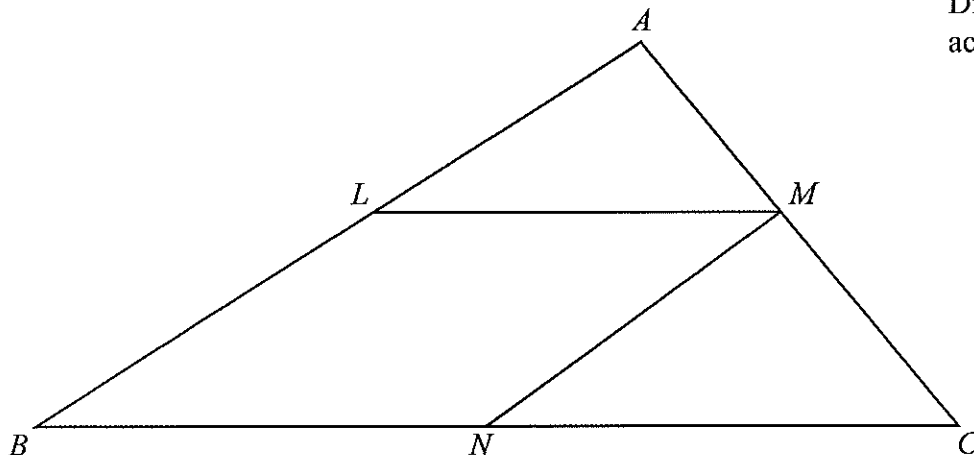
(2)

(Total 4 marks)

Q21



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.

$AM = MC$ as M is the midpoint of AC .
 $AL = LB$ as L is the midpoint of AB .
 $LB = MN$ as they are the opposite sides of
 a parallelogram.

Therefore $AL = MN$.

$BN = NC$ as N is the midpoint of BC .
 $BN = LM$ as they are opposite sides of
 a parallelogram.

Therefore $LM = NC$

and triangles ALM and MNC are
 congruent.

(Total 3 marks)

Q22



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

$$\frac{(x+p)(x+q)}{(2)}$$

(b) Factorise $m^2 - 4$

$$\frac{(m-2)(m+2)}{(1)}$$

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

$$\frac{2(x+3)}{(x-4)(x+3)} - \frac{1(x-4)}{(x-4)(x+3)}$$

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

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

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

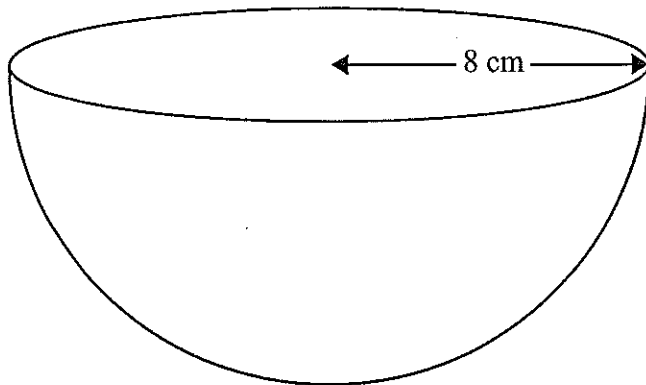
(Total 6 marks)

Q23



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.

$$\text{SA of sphere} = 4\pi r^2$$

$$\text{SA of hemisphere therefore is } \frac{4\pi r^2}{2}$$

$$\frac{4 \times \pi \times 8^2}{2} = 402.1238597$$

$$\text{Area of Circle} = \pi r^2$$

$$= \pi \times 8^2$$

$$= 201.0619298$$

$$\dots 603 \dots \text{ cm}^2$$

(Total 3 marks)

Q24

$$\begin{array}{r} 402.1238597 \\ + 201.0619298 \\ \hline 603.1857895 \end{array}$$



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.

645mm to nearest 5mm lower bound
 is 642.5mm.

400mm to nearest 5mm lower bound
 is 397.5mm

Lower bound
 for area = 642.5×397.5
 $= 255393.75$
 $= 255000 (3sf)$

..... mm²

(Total 3 marks)

Q25

TOTAL FOR PAPER: 100 MARKS

END

