

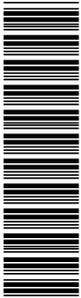
## GCSE (9–1) Mathematics

### J560/06 Paper 6 (Higher Tier)

#### Practice Paper

## Date – Morning/Afternoon

Time allowed: 1 hour 30 minutes



**You may use:**

- A scientific or graphical calculator
- Geometrical instruments
- Tracing paper



First name	Just Maths				
Last name	Solutions				
Centre number					
Candidate number					

### INSTRUCTIONS

- Use black ink. You may use an HB pencil for graphs and diagrams.
- Complete the boxes above with your name, centre number and candidate number.
- Answer **all** the questions.
- Read each question carefully before you start your answer.
- Where appropriate, your answers should be supported with 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 required but you must clearly show your candidate number, centre number and question number(s).
- Do **not** write in the bar codes.

### INFORMATION

- The total mark for this paper is **100**.
- The marks for each question are shown in brackets [ ].
- Use the  $\pi$  button on your calculator or take  $\pi$  to be 3.142 unless the question says otherwise.
- This document consists of **16** pages.

Answer **all** the questions

- 1 A bakery bakes small, medium and large pies.  
The ratio small : medium : large is 3 : 5 : 2.

(a) What fraction of the pies are large?

(a)  $\frac{2}{10} = \frac{1}{5}$  ..... [1]

(b) One day 460 medium pies are baked.

Work out how many small pies are baked.

$$\begin{array}{ccc} S & M & L \\ 3 & 5 & 2 \\ \hline & 460 & \div 5 = 92 \\ 3 \times 92 & & \end{array}$$

(b) ..... 276 ..... [2]

- 2 A triangle has sides of length 23.8 cm, 31.2 cm and 39.6 cm.

Is this a right-angled triangle?  
Show how you decide.

$$23.8^2 + 31.2^2 = 1539.88$$

$$\sqrt{1539.88} = 39.24130... \neq 39.6 \text{ cm}$$

it is not right angled

.....  
..... [4]

3 (a) Solve.

$$4x - 7 = 8 - 2x$$

$$\begin{aligned} 6x &= 15 \\ x &= \frac{15}{6} = \frac{5}{2} \end{aligned}$$

(a)  $x = \dots\dots\dots 2.5 \dots\dots\dots$  [3]

(b) Solve this inequality.

$$5x + 9 > 13$$

$$\begin{aligned} 5x &> 4 \\ x &> \frac{4}{5} \end{aligned}$$

(b)  $\dots\dots\dots x > \frac{4}{5} \dots\dots\dots$  [2]

(c) Rearrange this formula to make  $x$  the subject.

$$y = \sqrt{4x - 3}$$

$$y^2 = 4x - 3$$

$$y^2 + 3 = 4x$$

$$x = \frac{y^2 + 3}{4}$$

(c)  $\dots\dots\dots x = \frac{y^2 + 3}{4} \dots\dots\dots$  [3]



- (b) State one assumption you have made.  
Explain how this has affected your answer to part (a).

I have assumed he doesn't stop for a break during the journey. If he does it will take longer.

[2]

- 5 When water freezes into ice its volume increases by 9%.

What volume of water freezes to make  $1962 \text{ cm}^3$  of ice?

$$\begin{aligned} \text{---} \times 1.09 &= 1962 \\ 1962 \div 1.09 &= 1800 \end{aligned}$$

1800 .....  $\text{cm}^3$  [3]

- 6 The table shows data for the UK about its population and the total amount of money spent on healthcare in 2002, 2007 and 2012.

Year	Population	Total spent on healthcare (£)	£ per person
2002	$5.94 \times 10^7$	$8.14 \times 10^{10}$	£1370.37
2007	$6.13 \times 10^7$	$1.20 \times 10^{11}$	£1957.59
2012	$6.37 \times 10^7$	$1.45 \times 10^{11}$	£2276.30

- (a) How much more was spent on healthcare in 2007 than in 2002?  
Give your answer in millions of pounds.

$$1.2 \times 10^{11} - 8.14 \times 10^{10}$$

$$3.86 \times 10^{10}$$

$$38600,000,000$$

┌──────────┐  
million

(a) £ ...38,600..... million [3]

- (b) Marcia says

The amount spent on healthcare **per person** in the UK doubled in 10 years.

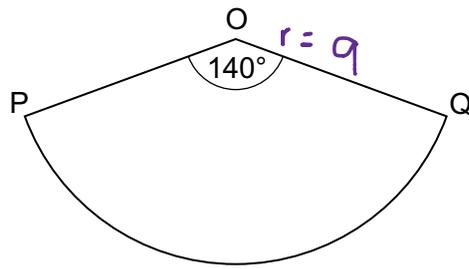
Use the information in the table to comment on whether Marcia is correct.

	£ per person	
2002	£1370.37	$\times 2 = 2740.74$
2007	£1957.59	
2012	£2276.30	$2740.74 > 2276.30$

Marcia is incorrect

[4]

- 7 OPQ is a sector of a circle, centre O and radius 9 cm.



Not to scale

$$D = 18 \text{ cm}$$

$$C = \pi D$$

$$A = \pi r^2$$

Find the perimeter of the sector.  
Give your answer in terms of  $\pi$ .

$$\frac{140}{360} \times \pi \times 18 = 7\pi$$

$$\text{Perimeter} = 7\pi + 18$$

$$\dots\dots\dots 7\pi + 18 \dots\dots\dots \text{ cm [3]}$$

- 8 (a) Write down the reciprocal of 8.

$$(a) \dots\dots\dots \frac{1}{8} \dots\dots\dots [1]$$

(b) Work out the value of  $k$ .

$$4^5 \times 2^{-4} = 2^k$$

$$2^{10} \times 2^{-4} = 2^6$$

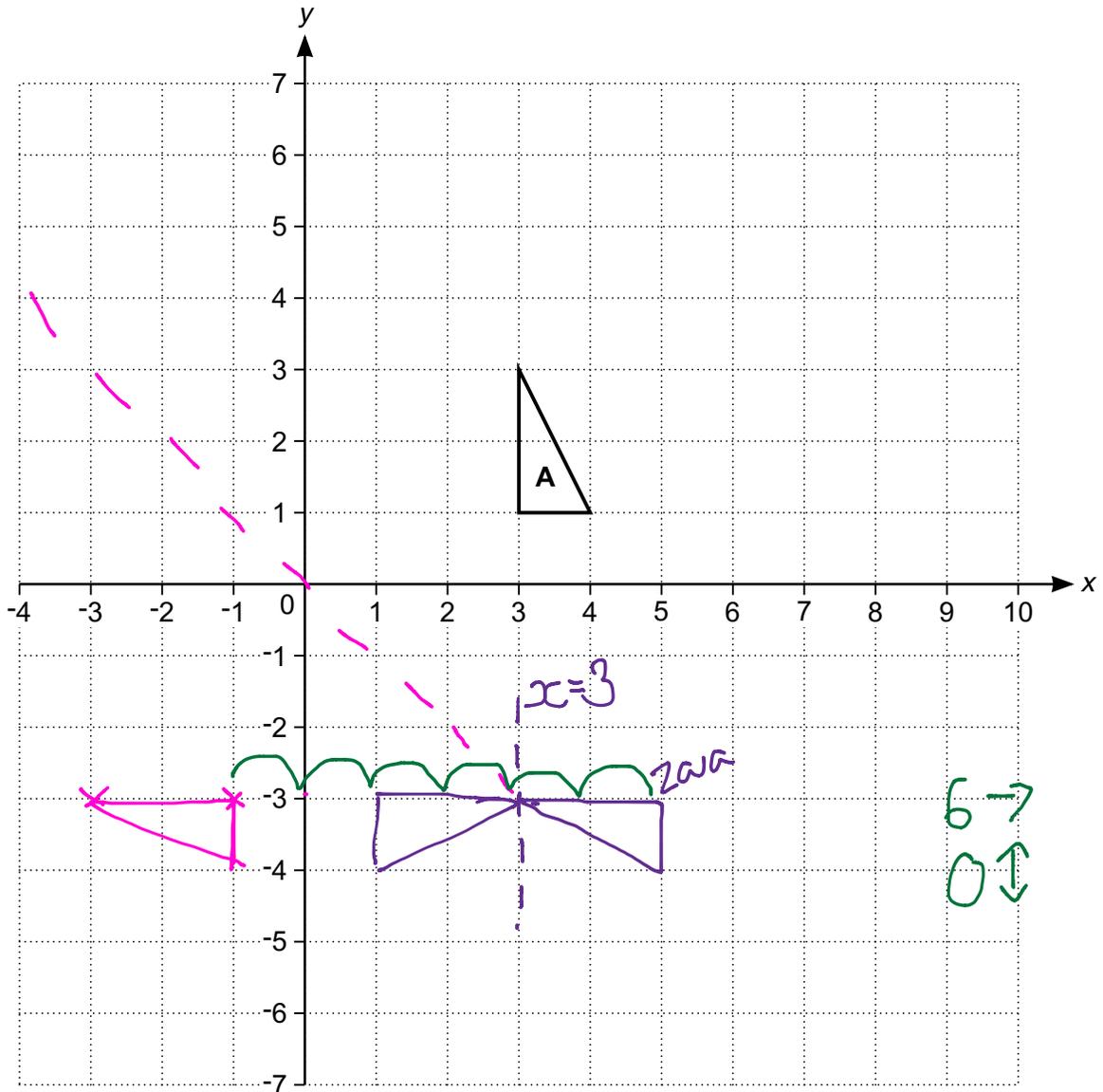
$$4^5 = 4 \times 4 \times 4 \times 4 \times 4$$

$$= 2 \times 2$$

$$= 2^{10}$$

$$(b) \dots\dots\dots 6 \dots\dots\dots [3]$$

9 Triangle **A** is drawn on the coordinate grid.



Zara and Sam each transform triangle **A** onto triangle **B**.

- Zara uses a rotation of  $90^\circ$  clockwise about the origin **followed by** a reflection in  $x = 3$ .
- Sam uses a reflection in  $y = -x$  **followed by** a transformation **T**.

(a) Draw and label triangle **B**.

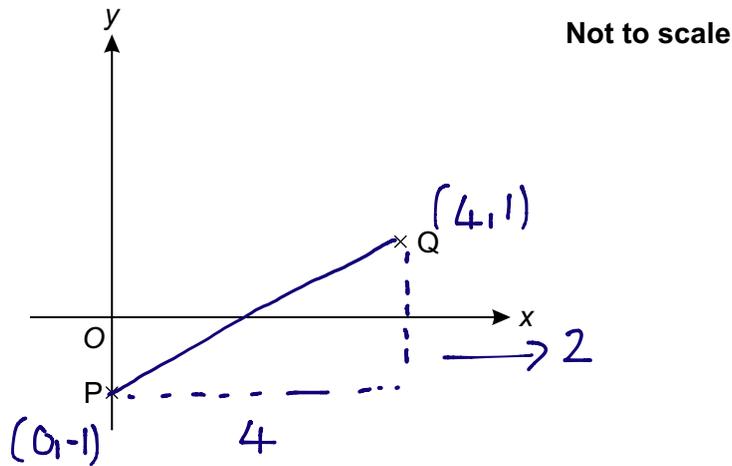
[3]

(b) Describe fully transformation **T**.

Translation using vector  $\begin{pmatrix} 6 \\ 0 \end{pmatrix}$

[3]

- 10 P has coordinates (0, -1) and Q has coordinates (4, 1).



$$\text{gradient} = \frac{2}{4} = \frac{1}{2}$$

- (a) Find the equation of line PQ.

$$y = \frac{1}{2}x - 1$$

(a)  $y = \frac{1}{2}x - 1$  ..... [3]

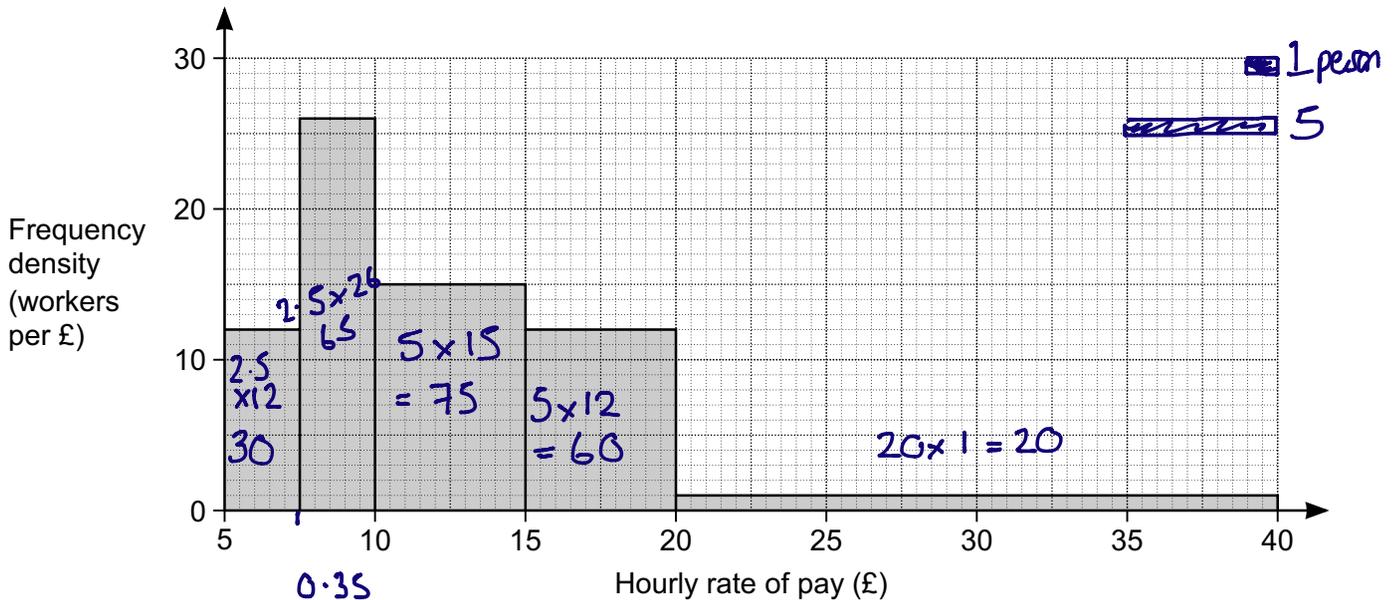
- (b) P and Q are two vertices of rectangle PQRS.

Find the equation of line QR.

$$\begin{aligned} \text{line QR } y &= -2x + c \\ x=4 \quad 1 &= -2 \times 4 + c \\ y=1 \quad 1+8 &= c = 9 \end{aligned}$$

(b)  $y = -2x + 9$  ..... [3]

- 11 Omar surveyed a group of workers to find their hourly rate of pay. His results are summarised in the histogram.



- (a) Show that Omar surveyed 250 workers. [3]

$$\begin{array}{l|l}
 5-7.5 = 2.5 \times 12 & 30 \\
 7.5-10 = 2.5 \times 26 & 65 \\
 10-15 = 5 \times 15 & 75 \\
 15-20 = 5 \times 12 & 60 \\
 20-40 = 20 \times 1 & 20
 \end{array}
 \quad
 \begin{array}{l}
 30+65+75+60+20 \\
 = \underline{\underline{250}}
 \end{array}$$

- (b) The UK living wage is £7.85 per hour. A newspaper states that one fifth of workers earn less than the living wage.

- (i) Does Omar's survey support the statement in the newspaper? Show how you decide.

$$\frac{1}{5} \text{ of } 250 = 50$$

$$\begin{array}{l}
 \text{£}7.85 \quad 2.5 \times 12 + 0.35 \times 26 \\
 30 + 9.1 \\
 = 39.1
 \end{array}$$

$39.1 < 50$  so his survey does not support the statement

[4]

- (ii) Explain why your calculations in part (b)(i) may not give the exact number of workers earning less than the living wage.

We don't know the exact values within each interval

[1]

- (c) Omar used this table to record the ages of the people in his survey.

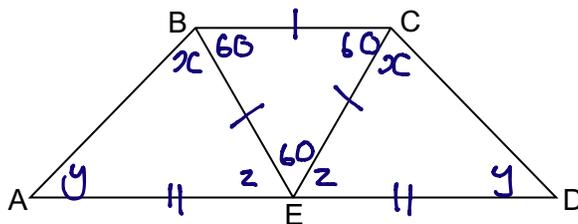
Age ( $a$ years)	$18 \leq a \leq 20$	$20 \leq a \leq 30$	$30 \leq a \leq 40$	$40 \leq a \leq 50$	$50 \leq a \leq 70$
	$18 < a < 20$	$< 30$	$< 40$	$< 50$	$< 70$

Comment on one problem with his table.

The intervals overlap

[1]

- 12 The diagram shows trapezium ABCD.  
E is the midpoint of AD.  
BCE is an equilateral triangle.



Not to scale

Prove that triangle ABE is congruent to triangle DCE.

$BE = EC$  (equilateral triangle)

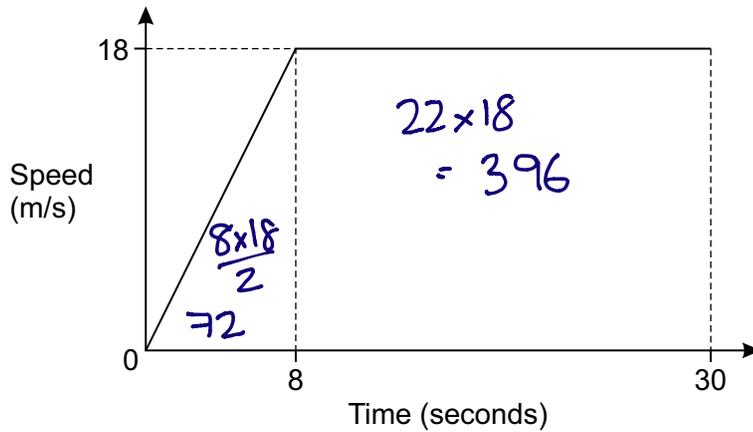
$AE = ED$  (midpoint of AD)

$\hat{B}EA = \hat{C}ED$

Therefore ABC is congruent to DCE (SAS)

[4]

13 (a) The graph shows the speed of a car during the first 30 seconds of its journey.



(i) State the acceleration of the car after 20 seconds.

(a)(i) ..... 0 .....  $\text{m/s}^2$  [1]

(ii) Find the total distance travelled by the car in the 30 seconds.

$$72 + 396$$

(ii) ..... 468 ..... m [3]

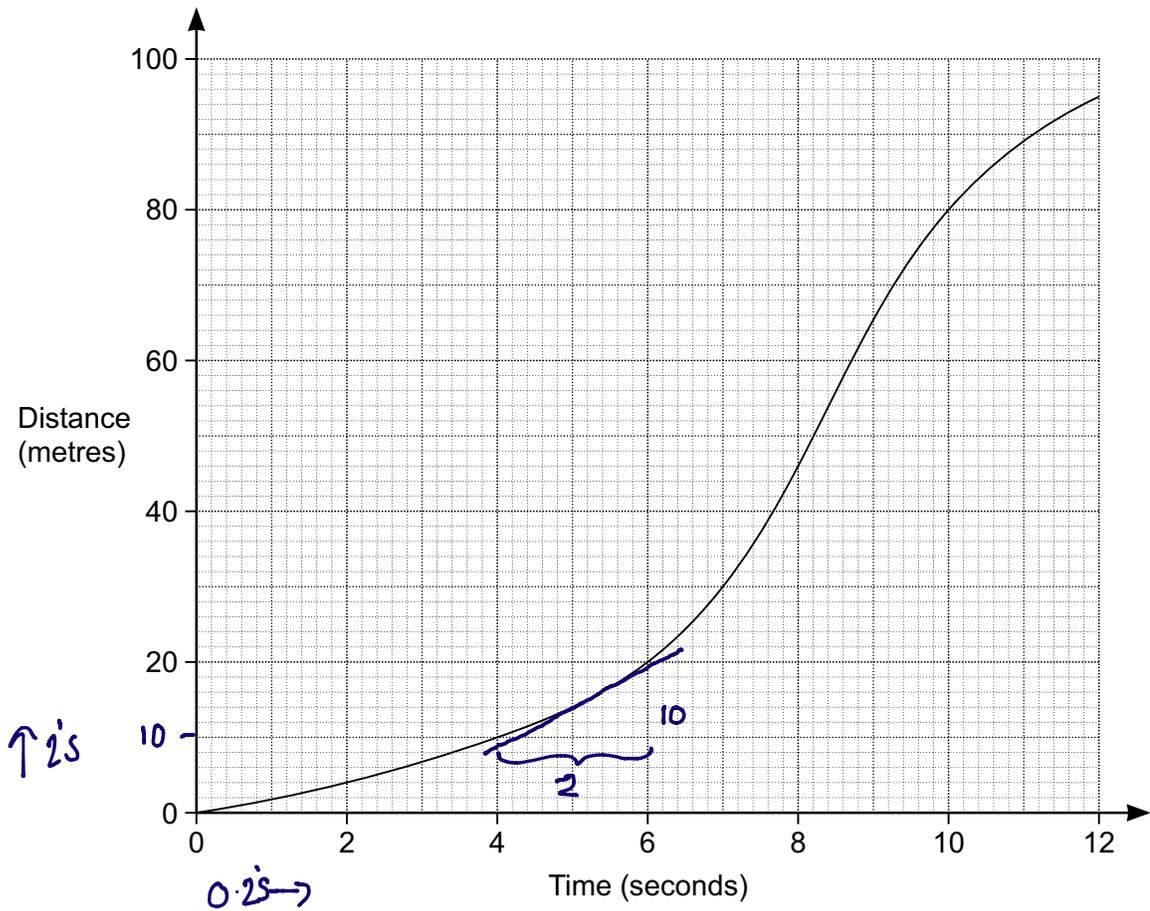
(b) The speed  $v$  of a train is 68 km/h, correct to the nearest km/h.

Write down an inequality to show the error interval for  $v$ .

$$68 \begin{array}{l} \nearrow 68.5 \\ \rightarrow 1 \text{ km/h} \\ \searrow 67.5 \end{array}$$

(b) .....  $67.5 \leq v < 68.5$  ..... [2]

(c) The graph shows the distance travelled by a lorry in 12 seconds.



Estimate the speed of the lorry after 5 seconds.

$$10 \div 2$$

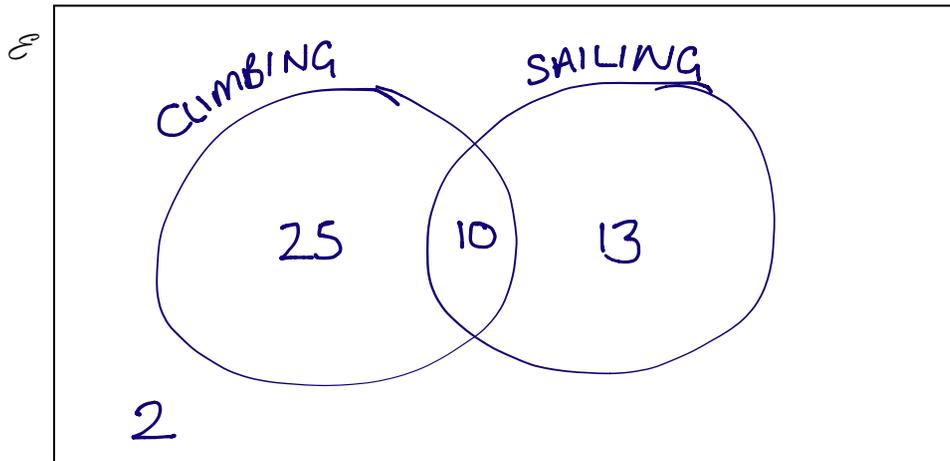
(c) .....5..... m/s [4]

14 An activity camp has climbing and sailing classes.

- 50 children attend the activity camp.
- 35 children do climbing.
- 10 children do both classes. ✓
- 2 children do neither class. ✓

$50 - 37$

(a) Represent this information on a Venn diagram.



[3]

(b) A child attending the activity camp is selected at random.

Find the probability that this child

(i) did exactly one class,

$25 + 13$

$\frac{38}{50}$

(b)(i) ..... [2]

(ii) did sailing, given that they did not do climbing.

$\frac{13}{15}$

(ii) ..... [2]

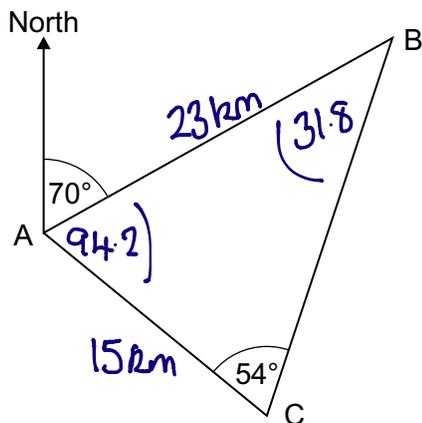
15 Show that

$$\frac{4}{x-3} - \frac{2}{x+1} = \frac{2(x+5)}{(x-3)(x+1)}$$

[3]

$$\begin{aligned} \frac{4(x+1) - 2(x-3)}{(x-3)(x+1)} &= \frac{4x+4-2x+6}{(x-3)(x+1)} \\ &= \frac{2x+10}{(x-3)(x+1)} = \frac{2(x+5)}{(x-3)(x+1)} \quad \text{QED} \end{aligned}$$

16 The diagram shows the positions of three hills, A, B and C.



Not to scale

$$\frac{23}{\sin 54} = \frac{15}{\sin B}$$

B is 23 km from A on a bearing of  $070^\circ$ .

C is 15 km from A.

Angle  $ACB = 54^\circ$ .

$$\sin B = \frac{15 \times \sin 54}{23}$$

Find the bearing of C from A.

$$B = \sin^{-1} \left( \frac{15 \sin 54}{23} \right)$$

$$= 31.8447735$$

$$= 31.8^\circ (1 \text{ dp})$$

$$A = 180 - (31.8 + 54)$$

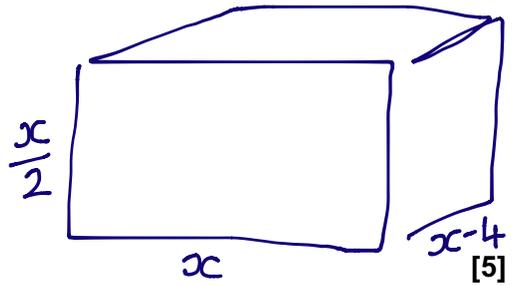
$$= 94.1552265$$

$$= 94.2^\circ (1 \text{ dp})$$

$$\text{bearing} = 70 + 94.2$$

$$\begin{array}{r} 164.2^\circ (1 \text{ dp}) \\ \hline 164^\circ \end{array} \quad [5]$$

- 17 A cuboid has length  $x$  cm.  
The width of the cuboid is 4 cm less than its length.  
The height of the cuboid is half of its length.



- (a) The surface area of the cuboid is  $90 \text{ cm}^2$ .  
*not volume!*

Show that  $2x^2 - 6x - 45 = 0$ .

$$2 \times \left[ \frac{x}{2} \times x \right] + [2 \times x(x-4)] + 2 \left[ \frac{x}{2}(x-4) \right] = 90$$

$$2 \times \frac{x^2}{2} + 2(x^2 - 4x) + 2\left(\frac{x^2}{2} - 2x\right) = 90$$

$$x^2 + 2x^2 - 8x + x^2 - 4x = 90$$

$$4x^2 - 12x - 90 = 0$$

$\div 2$

$$2x^2 - 6x - 45 = 0$$

- (b) Work out the volume of the cuboid.

need "x"  $2x^2 - 6x - 45 = 0$

$$x = \frac{-(-6) \pm \sqrt{6^2 - 4 \times 2 \times -45}}{2 \times 2}$$

$$= \frac{6 \pm \sqrt{396}}{4}$$

$$\frac{6 + \sqrt{396}}{4}$$

$$\frac{6 - \sqrt{396}}{4}$$

$$x = 6.474937186$$

not a solution

Volume =

$$\left( \frac{6 + \sqrt{396}}{4} \right) \times \frac{1}{2} \left( \frac{6 + \sqrt{396}}{4} \right)$$

$$\times \left( \frac{6 + \sqrt{396}}{4} - 4 \right)$$

$$= 51.880637 \dots$$

$$51.9 \text{ (1dp)}$$

(b) .....  $\text{cm}^3$  [6]

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