



Oxford Cambridge and RSA

H

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					
Last name					
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 π button on your calculator or take π 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?

$$\frac{2}{3+5+2} = \frac{2}{10} = \frac{1}{5}$$

(a) $\frac{1}{5}$ [1]

(b) One day 460 medium pies are baked.

Work out how many small pies are baked.

$$\frac{460}{5} \times 3 = 276$$

(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.

$$a^2 + b^2 = c^2 \quad \text{Pythagorean Theorem}$$

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

$$\sqrt{1539.88} = 39.2$$

39.2 \neq 39.6, so the triangle is not right-angled.

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

3 (a) Solve.

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

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

$$+ 2x$$

$$6x - 7 = 8$$

$$+ 7$$

$$6x = 15$$

$$\div 6$$

$$x = 2.5$$

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

(b) Solve this inequality.

$$5x + 9 > 13$$

$$- 9$$

$$5x > 4$$

$$\div 5$$

$$x > \frac{4}{5}$$

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

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

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

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

$$+ 3$$

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

$$\div 4$$

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

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

4 John is going to drive from Cambridge to Newcastle.



Scale: 1 cm represents 50 miles

- (a) John needs to be in Newcastle at 11 am.
He drives at an average speed of 60 miles per hour.

What time does he need to leave Cambridge?

$$\text{time} = \frac{\text{distance}}{\text{speed}}$$

$$= \frac{4 \times 50}{60}$$

$$= \frac{10}{3}$$

$$= 3 \frac{1}{3} \text{ hours}$$

$$\frac{1}{3} \times 60 = 20 \text{ minutes}$$

$$11\text{am} - 3\text{hrs} - 20 \text{ mins} = 7:40\text{am}$$

(a) 7:40am [5]

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

Assumed distance is a straight line, so distance is an underestimate

and time taken will increase.

[2]

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

What volume of water freezes to make 1962 cm^3 of ice?

$$1962 - 1.09 = 1800 \text{ cm}$$

$$\uparrow 109\% = \frac{109}{100} = 1.09$$

..... 1800 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 (£)
2002	5.94×10^7	8.14×10^{10}
2007	6.13×10^7	1.20×10^{11}
2012	6.37×10^7	1.45×10^{11}

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

$$(1.20 \times 10^{11}) - (8.14 \times 10^{10}) = £3.86 \times 10^{10} \\ = 38,600 \text{ million}$$

(a) £ ³⁸⁶⁰⁰ 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.

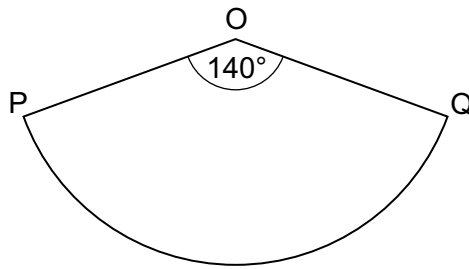
$$\frac{8.14 \times 10^{10}}{5.94 \times 10^7} = £1370.37$$

$$\frac{1.45 \times 10^{11}}{6.37 \times 10^7} = £2276.30$$

$$2276.30 \div 1370.37 = 1.66$$

.....
1.66 \neq 2 so spending per person has not doubled. [4]

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



Not to scale

Find the perimeter of the sector.
Give your answer in terms of π .

Circumference = $2\pi r$

$$2 \times \pi \times 9 \times \frac{140}{360} = 7\pi$$

$$7\pi + 9 + 9 = 7\pi + 18 \text{ cm}$$

..... $7\pi + 18$ cm [3]

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

$$\frac{1}{8}$$

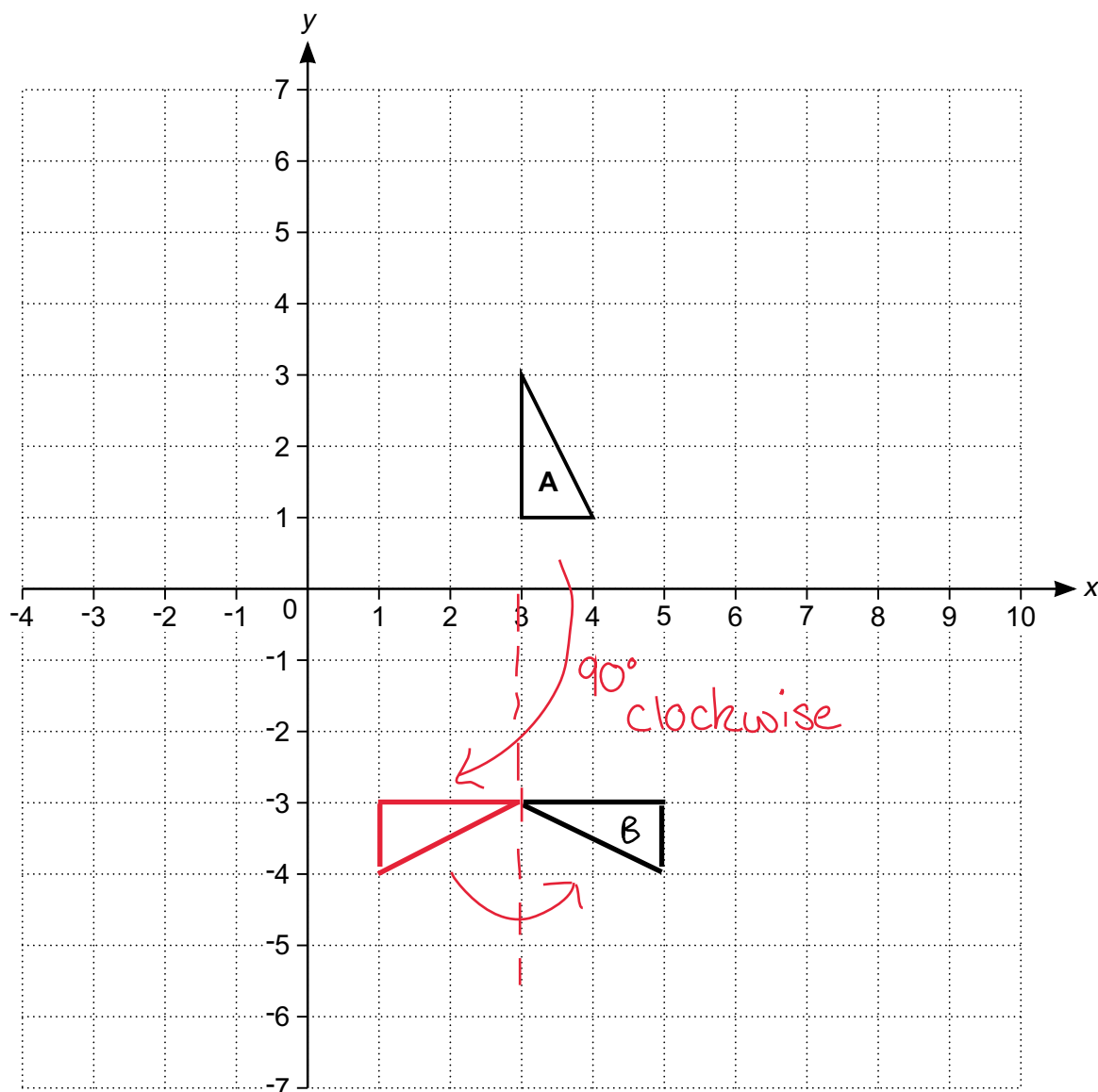
(a) $\frac{1}{8}$ [1]

- (b) Work out the value of k .

$$\begin{aligned} 4^5 \times 2^{-4} &= 2^k \\ &= (2^2)^5 \times 2^{-4} \\ &= 2^{2 \times 5} \times 2^{-4} \\ &= 2^{10} \times 2^{-4} \\ &= 2^{10 + (-4)} \\ &= 2^{10-4} \\ &= 2^6 \text{ so } k=6 \end{aligned}$$

(b) 6 [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° 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**.

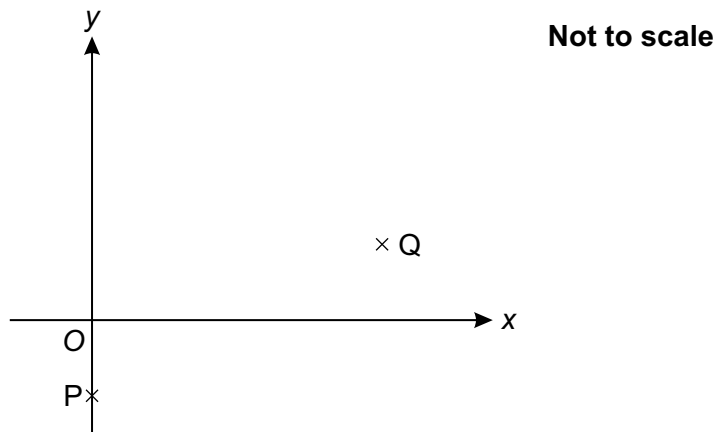
[3]

(b) Describe fully transformation T.

Translation $\begin{pmatrix} 6 \\ 0 \end{pmatrix}$. 6 across (right) and 0 up.

[3]

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



(a) Find the equation of line PQ.

$$\text{Gradient } m = \frac{y_2 - y_1}{x_2 - x_1} = \frac{1 - (-1)}{4 - 0} = \frac{1}{2}$$

$$\begin{aligned} y &= mx + c \\ -1 &= \frac{1}{2} \times 0 + c \\ -1 &= c \\ y &= \frac{1}{2}x - 1 \end{aligned}$$

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

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

Find the equation of line QR.

$$\text{Gradient } m = -\frac{1}{1/2} = -2$$

Gradient of perpendicular is the reciprocal: $m_1 \times m_2 = -1$ so $m_2 = -1 \div m_1$

$$y = mx + c$$

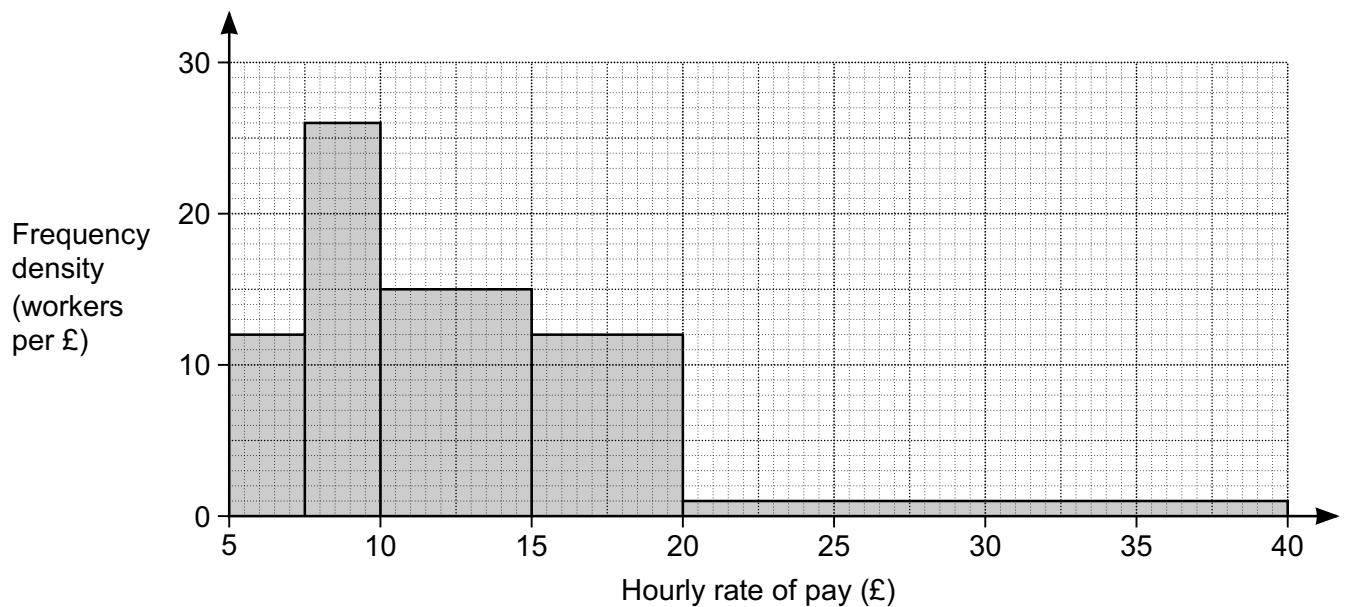
$$1 = -2 \times 4 + c \quad \text{Sub in } (4, 1)$$

$$\begin{aligned} 1 &= -8 + c \\ +8 \quad +8 & \\ 9 &= c \end{aligned}$$

$$y = -2x + 9$$

(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]

$$\text{frequency} = \text{frequency density} \times \text{class width}$$

$$2.5 \times 12 + 2.5 \times 26 + 5 \times 15 + 5 \times 12 + 20 \times 1 = 250$$

- (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.

$$2.5 \times 12 = 30$$

$$7.85 - 7.5 = 0.35$$

$$0.35 \times 26 = 9.1$$

$$30 + 9.1 = 39.1$$

$$\frac{39.1}{250} = 0.1564$$

$0.1564 \neq \frac{1}{5}$ so Omar's survey does not support the statement in the newspaper.

.....
 [4]

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

The distribution of workers in the £7.50 to £10 group is not known. [1]

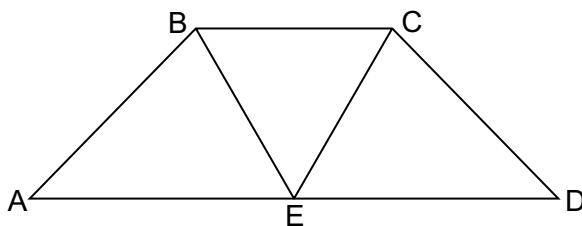
- (c) Omar used this table to record the ages of the people in his survey.

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

Comment on one problem with his table.

20, 30, 40, and 50 are included in more than one group. [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.

$BE = CE$ Equilateral triangle.
 $AE = DE$ E is the midpoint of AD.

$\hat{B}EA = \hat{C}ED = 60$ Alternate angles and BCE is an equilateral triangle.

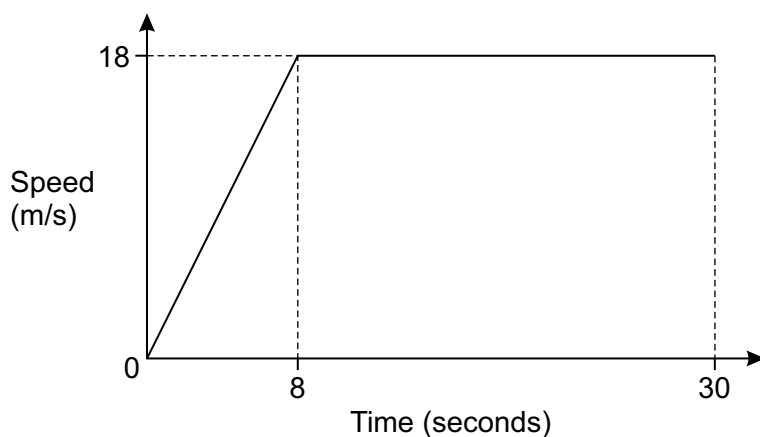
$\hat{C}ED = \hat{B}CE = 60$ ↑↑

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

SAS (side-angle-side)

[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.

Acceleration = gradient

(a)(i) 0 m/s² [1]

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

$$\frac{1}{2} \times 8 \times 18 + (30 - 8) \times 18 = 468 \text{ m}$$

distance = area under graph

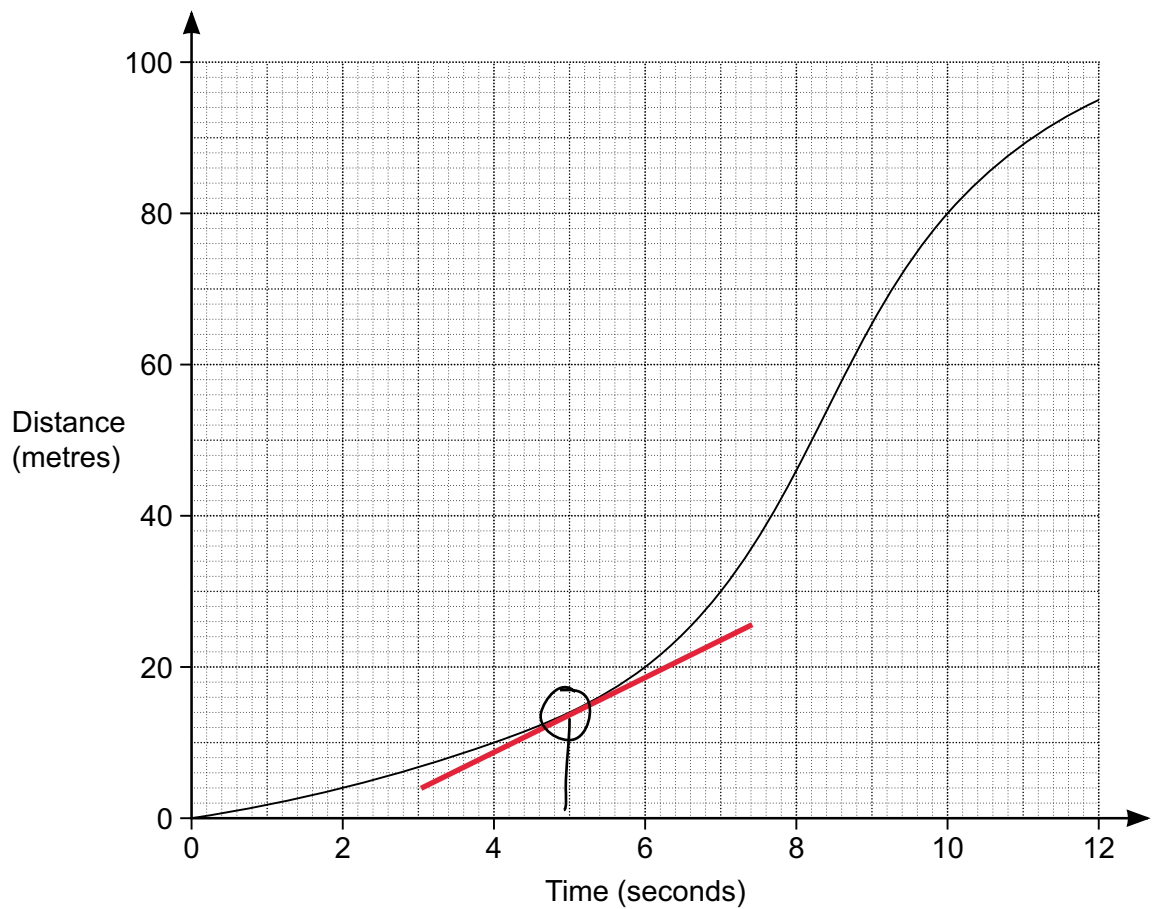
(ii) 468 m [3]

- (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 .

(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.

Draw a tangent at time (seconds) = 5.
Find the gradient of the tangent.
speed = gradient.

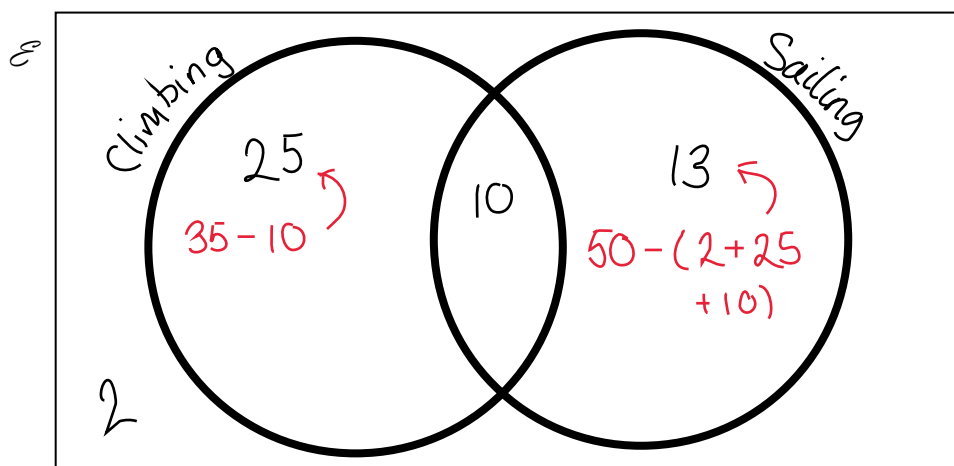
$$\frac{13.9 - 6}{10 - 3} = 4.71$$

(c) 4.71 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.

(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,

$$\frac{25}{50} \text{ (or) } + \frac{13}{50} = \frac{19}{25}$$

(b)(i) $\frac{19}{25}$ [2]

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

$$\frac{13}{13+2} = \frac{13}{15}$$

(ii) $\frac{13}{15}$ [2]

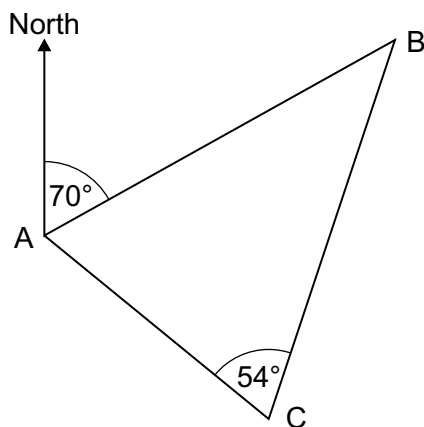
15 Show that

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

[3]

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

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



Not to scale

B is 23 km from A on a bearing of 070°.

C is 15 km from A.

Angle ACB = 54°.

Find the bearing of C from A.

$$\begin{aligned} \frac{\sin A}{a} &= \frac{\sin B}{b} \quad \text{so} \quad \frac{\sin 34}{23} = \frac{\sin B}{15} \\ \underbrace{\hspace{10em}}_{\text{sine rule}} \\ \sin B &= \frac{15 \sin 34}{23} \\ \sin^{-1} \left(\frac{15 \sin 34}{23} \right) &= B \\ B &= 31.8^\circ \end{aligned}$$

angles in a triangle = 180°

$$180 - (54 + 31.8) = 94.2$$

$$70 + 94.2 = 164.2^\circ$$

$$164.2^\circ$$

[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 cm^2 .

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

[5]

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

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

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

$$\begin{array}{r} -90 \\ 4x^2 - 12x - 90 = 0 \end{array}$$

$$\begin{array}{r} \div 2 \\ 2x^2 - 6x - 45 = 0 \end{array}$$

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

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

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

$$= 6.47 \text{ and } -3.47 \text{ length cannot be negative.}$$

$$V = 6.47 \times (6.47 - 4) \times \left(\frac{6.47}{2}\right) = 51.7 \text{ cm}^3$$

(b) 51.7 cm^3 [6]

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