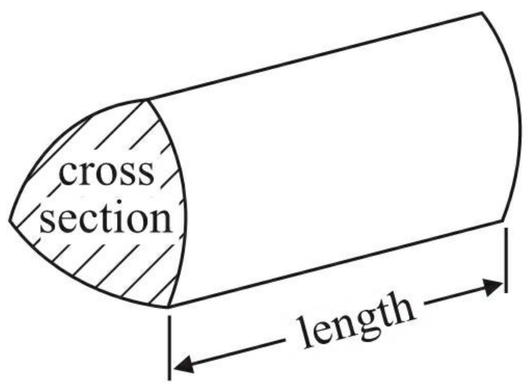
GCSE Mathematics 1MA0

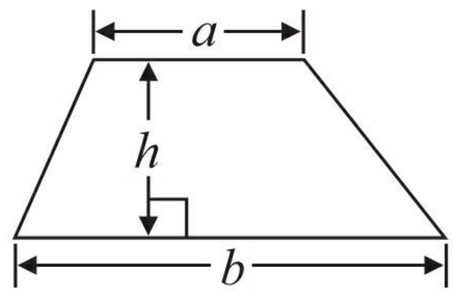
Formulae: Higher Tier

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 × length

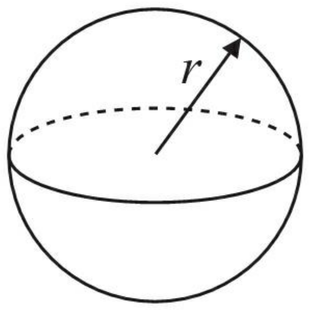


Area of trapezium = $\frac{1}{2}(a + b)h$



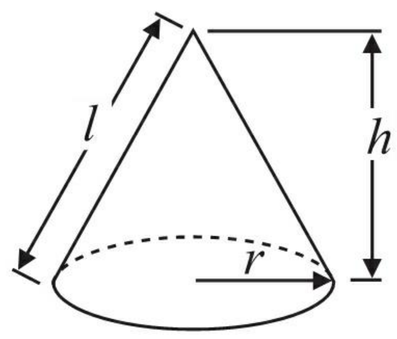
Volume of sphere = $\frac{4}{3}\pi r^3$

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

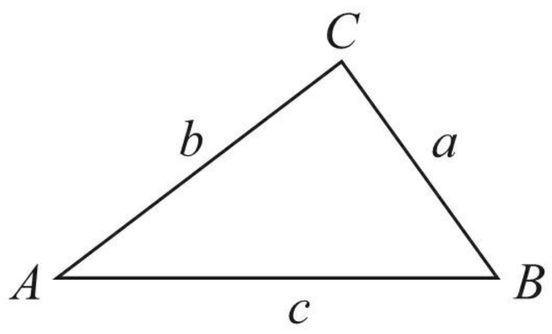


Volume of cone = $\frac{1}{3}\pi r^2 h$

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

$$x = \frac{-b \quad \sqrt{(b^2 - 4ac)}}{2a}$$

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 questions.

Write your answers in the spaces provided.

You must write down all stages in your working.

1

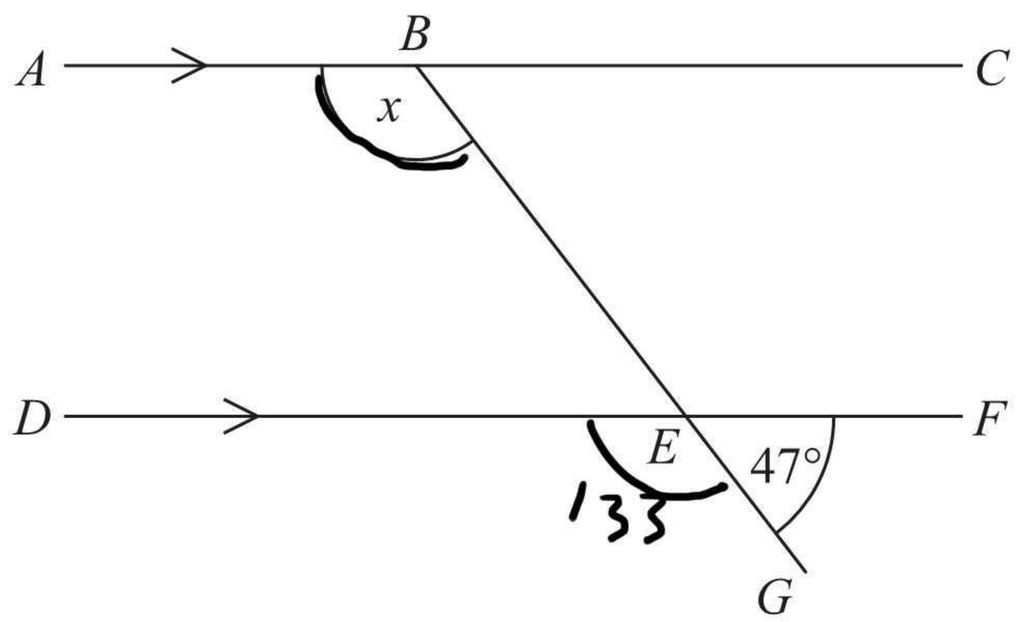


Diagram **NOT** accurately drawn

ABC and *DEF* are parallel lines.
BEG is a straight line.
Angle *GEF* = 47°.

Work out the size of the angle marked *x*.
Give reasons for your answer.

Angles on a straight line add up to 180°

Corresponding angles are equal

133 °

(Total for Question 1 is 3 marks)

2 (a) Use your calculator to work out $\dfrac{38.5 \times 14.2}{18.4 - 5.9}$

Write down all the figures on your calculator display.
You must give your answer as a decimal.

43.736

(2)

(b) Write your answer to part (a) correct to 1 significant figure.

40

(1)

(Total for Question 2 is 3 marks)

3 Pradeep wants to find out how much time people spend playing sport.

He uses this question on a questionnaire.

How much time do you spend playing sport?

☐ 0 – 1 hours ☐ 1 – 2 hours ☐ 3 – 4 hours

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

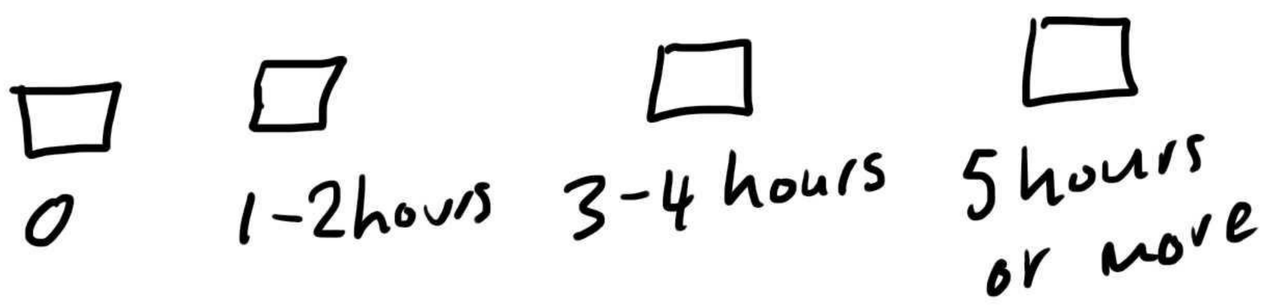
1 there is no timescale

2 there is no option for over 4 hours

(2)

(b) Design a better question for Pradeep's questionnaire to find out how much time people spend playing sport.

How much time do you spend playing sport a week?

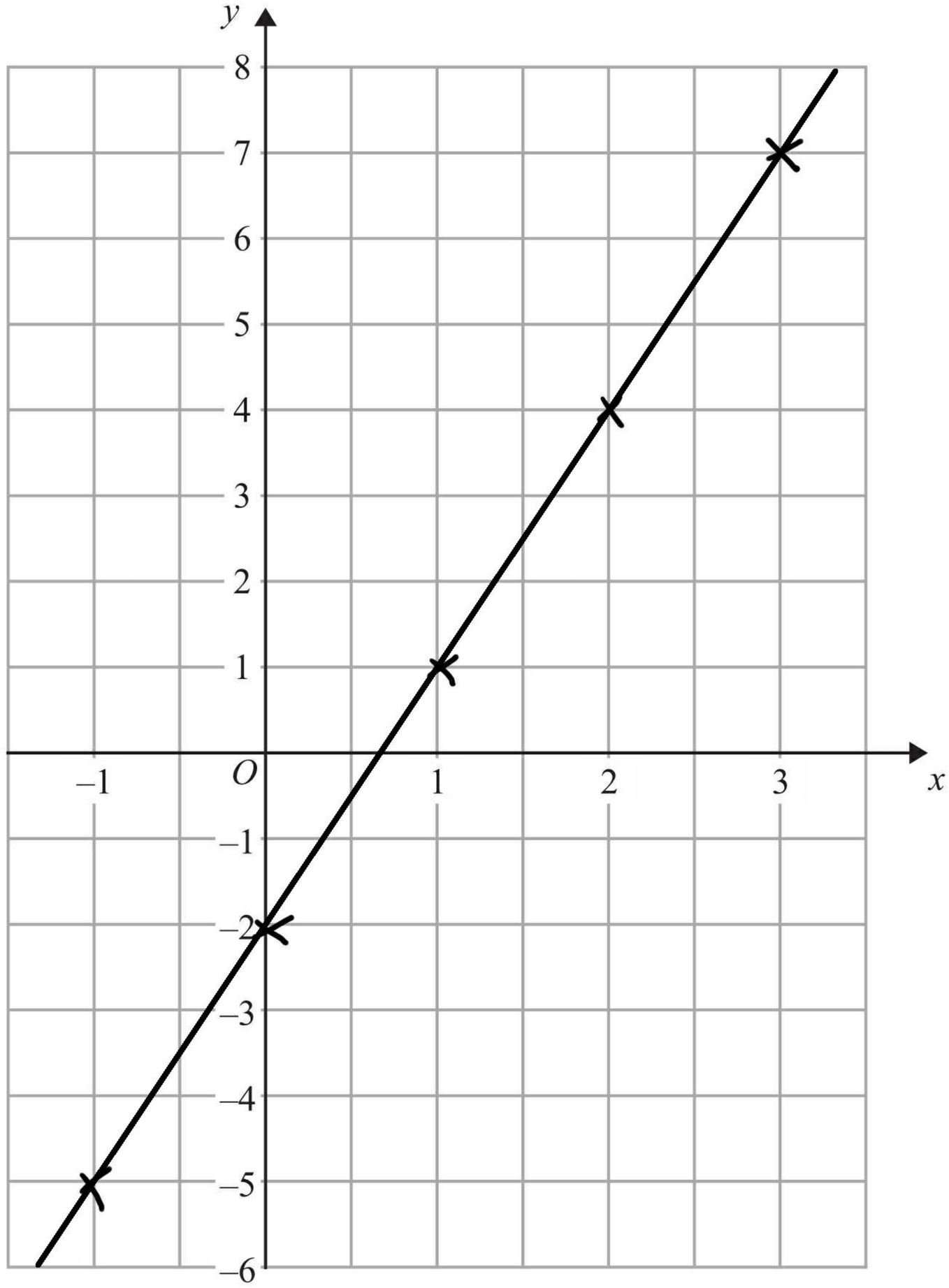


(2)

(Total for Question 3 is 4 marks)

4 On the grid, draw the graph of $y = 3x - 2$ for values of x from -1 to 3

x	-1	0	1	2	3
y	-5	-2	1	4	7



(Total for Question 4 is 3 marks)

***5** Mr Weaver's garden is in the shape of a rectangle.

In the garden

there is a patio in the shape of a rectangle
and two ponds in the shape of circles with diameter 3.8 m.

The rest of the garden is grass.

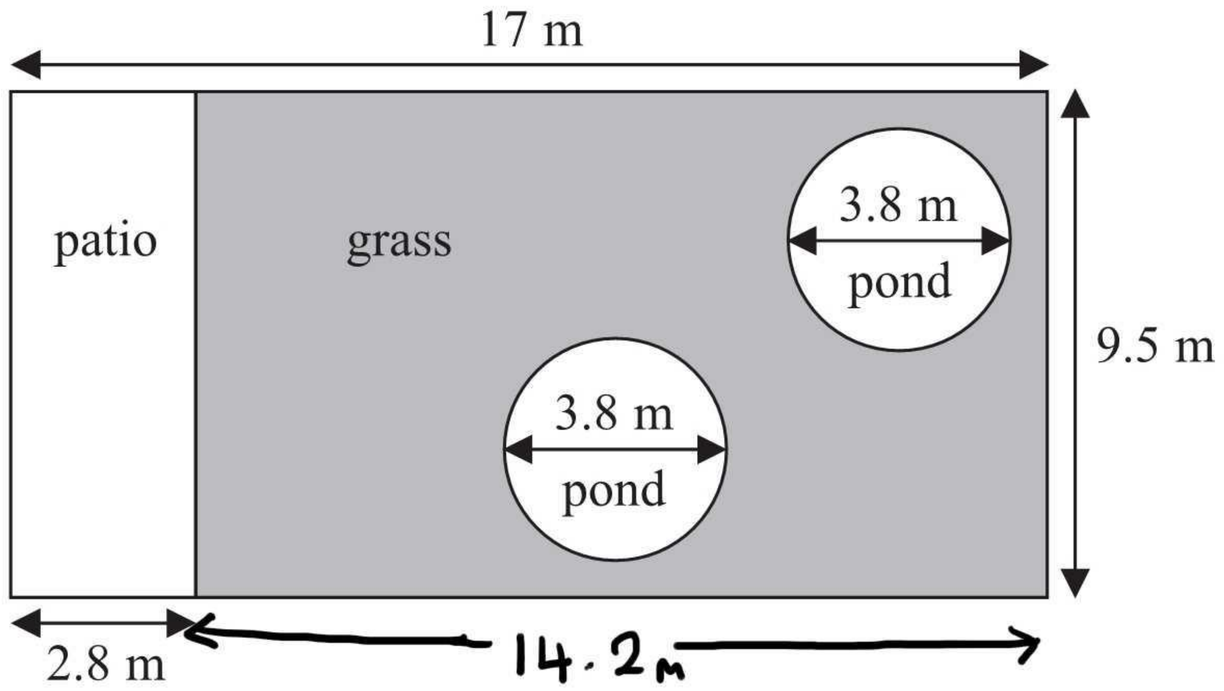


Diagram **NOT** accurately drawn

Mr Weaver is going to spread fertiliser over all the grass.
One box of fertiliser will cover 25 m^2 of grass.

How many boxes of fertiliser does Mr Weaver need?
You must show your working.

Area of rectangle : $14.2 \times 9.5 = 134.9$

Area of circle : $\pi \times (1.9)^2 = 11.34$

Area of grass = $134.9 - 2(11.34) = 112.21\ m^2$

25, 50, 75, 100, 125

Mr Weaver will need 5 boxes of fertiliser.

(Total for Question 5 is 5 marks)

*6 Potatoes cost £9 for a 12.5 kg bag at a farm shop.
The same type of potatoes cost £1.83 for a 2.5 kg bag at a supermarket.

Where are the potatoes the better value, at the farm shop or at the supermarket?
You must show your working.

£9 for 12.5kg in the farm shop

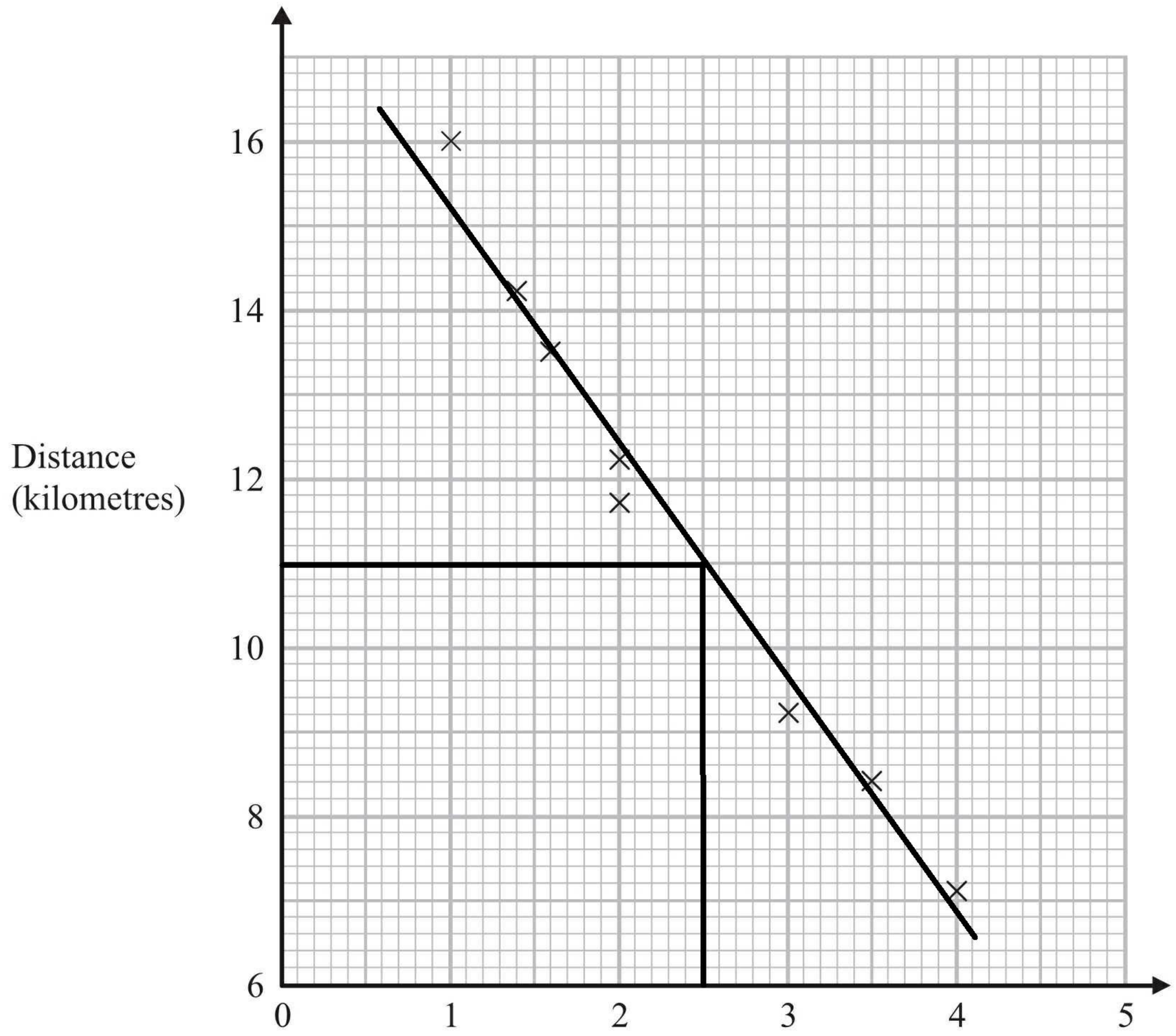
£1.83 for 2.5kg in the supermarket

(x5) £9.15 for 12.5kg

The potatoes are better value in the farm shop. 12.5kg of potatoes would cost 15p more in the supermarket.

(Total for Question 6 is 4 marks)

7 The scatter graph shows some information about 8 cars.
For each car it shows the engine size, in litres, and the distance, in kilometres, the car travels on one litre of petrol.



(a) What type of correlation does the scatter graph show?

negative

(1)

A different car of the same type has an engine size of 2.5 litres.

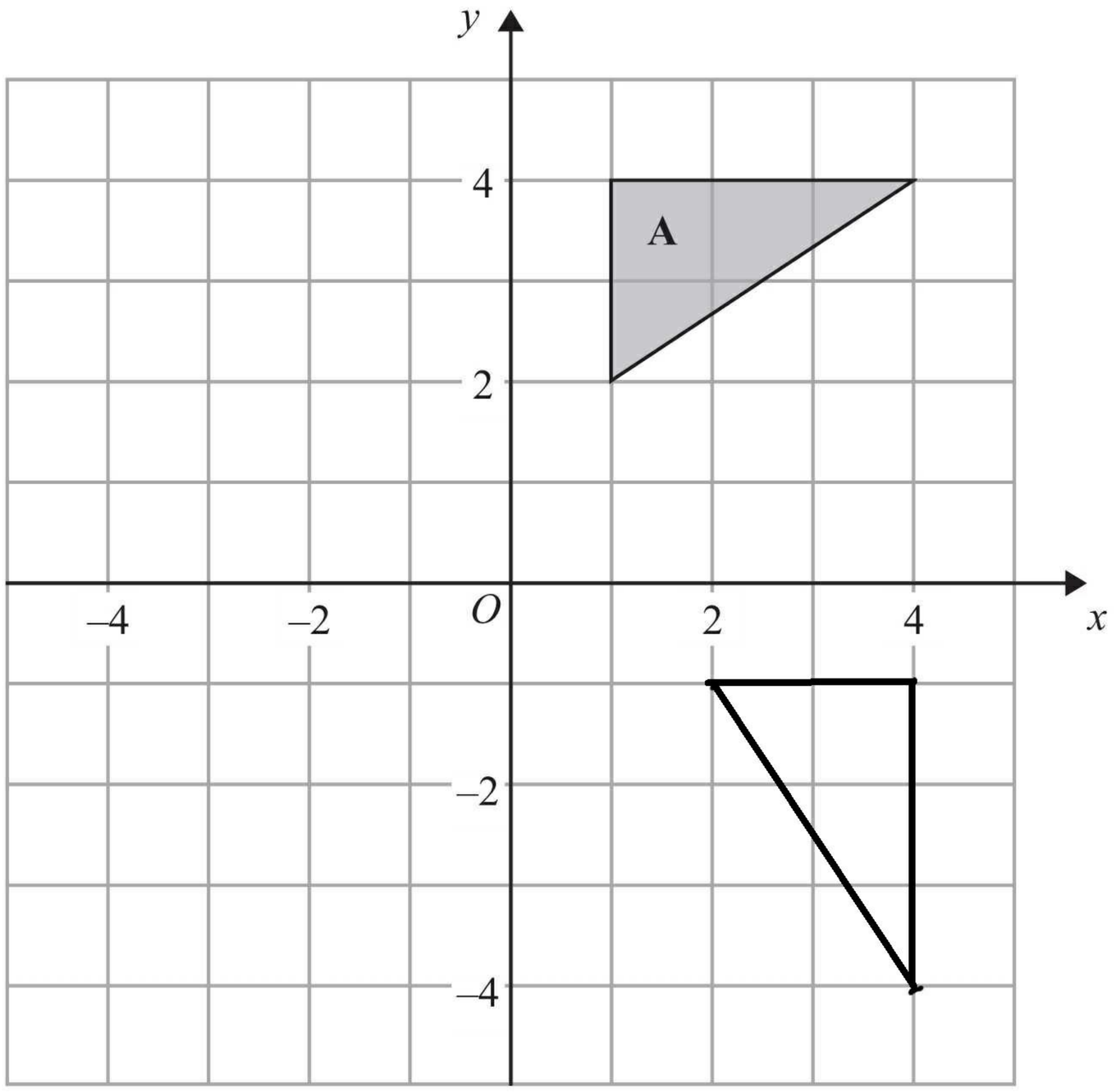
(b) Estimate the distance travelled on one litre of petrol by this car.

11 kilometres

(2)

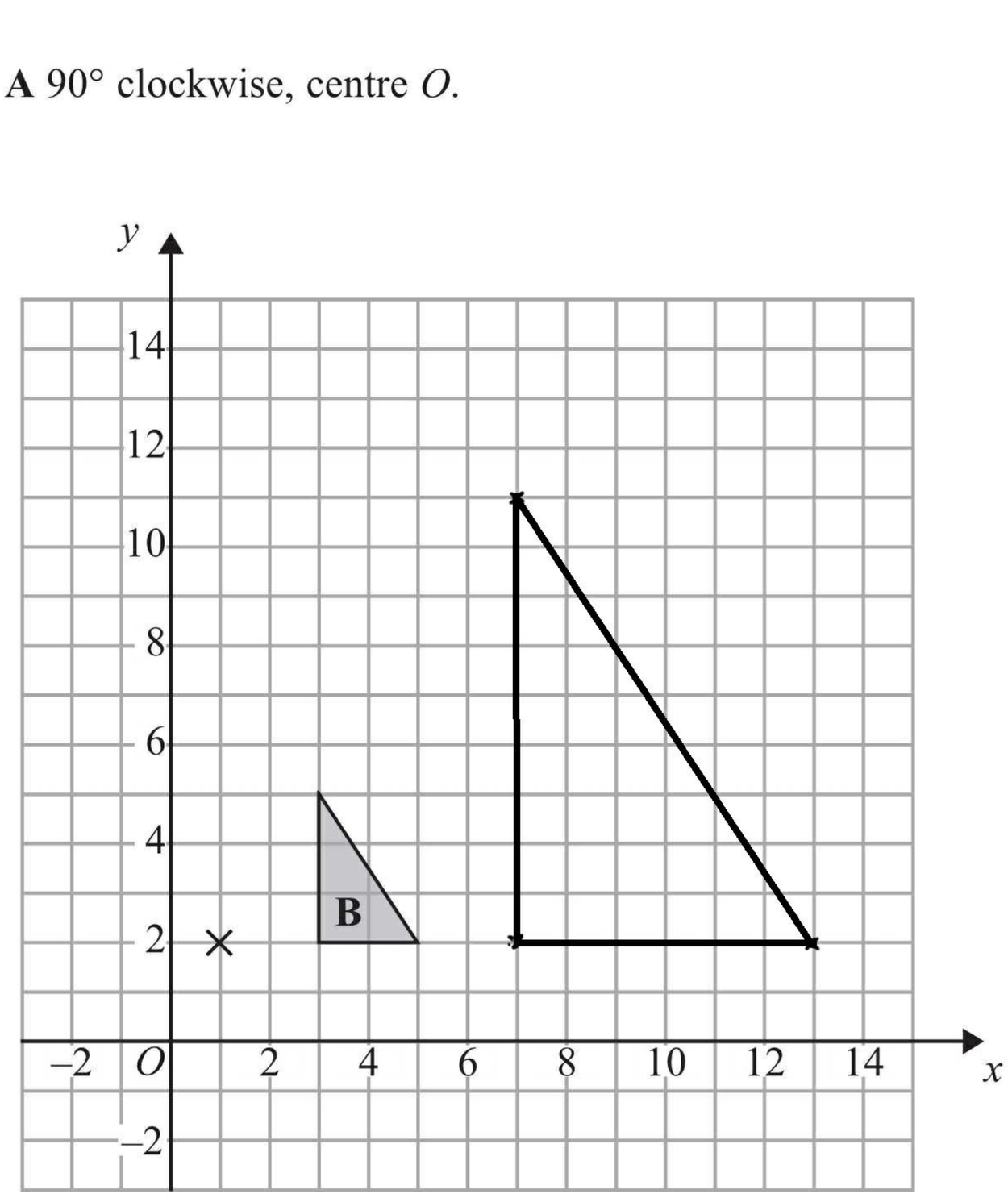
(Total for Question 7 is 3 marks)

8



(a) Rotate triangle **A** 90° clockwise, centre O.

(2)



(b) Enlarge triangle **B** by scale factor 3, centre (1, 2).

(3)

(Total for Question 8 is 5 marks)

9 Linda is going on holiday to the Czech Republic.
She needs to change some money into koruna.

She can only change her money into 100 koruna notes.

Linda only wants to change up to £200 into koruna.
She wants as many 100 koruna notes as possible.

The exchange rate is £1 = 25.82 koruna.

How many 100 koruna notes should she get?

$200 \times 25.82 = 5164$

51

(Total for Question 9 is 3 marks)

10 m is an integer such that $-2 < m \leqslant 3$

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

$-1, 0, 1, 2, 3$

(2)

(b) Solve $7x - 9 < 3x + 4$

$4x - 9 < 4$

$4x < 13$

$x < \frac{13}{4}$

$x < 3.25$

(2)

(Total for Question 10 is 4 marks)

11 The equation

$$x^3 - 6x = 72$$

has a solution between 4 and 5

Use a trial and improvement method to find this solution.
Give your answer correct to one decimal place.
You must show **all** your working.

x	$x^3 - 6x$	comment
4.5	$(4.5)^3 - 6(4.5)$ $= 64.125$	too small
4.7	75.623	too big
4.6	69.736	too small
4.65	72.644...	too big

$x =$ 4.6

(Total for Question 11 is 4 marks)

12 The probability that a biased dice will land on a five is 0.3

Megan is going to roll the dice 400 times.

Work out an estimate for the number of times the dice will land on a five.

400 × 0.3

120

(Total for Question 12 is 2 marks)

13 Bob asked each of 40 friends how many minutes they took to get to work.

The table shows some information about his results.

Time taken (m minutes)		Frequency	
$0 < m \leqslant 10$	5	× 3	15
$10 < m \leqslant 20$	15	× 8	120
$20 < m \leqslant 30$	25	× 11	275
$30 < m \leqslant 40$	35	× 9	315
$40 < m \leqslant 50$	45	× 9	405

Work out an estimate for the mean time taken.

$$\frac{15 + 120 + 275 + 315 + 405}{40} = 28.25$$

28.25 minutes

(Total for Question 13 is 4 marks)

14 (a) Expand and simplify $(p + 9)(p - 4)$

$p^2 - 4p + 9p - 36$

$p^2 + 5p - 36$

(2)

(b) Solve $\frac{5w - 8}{3} = 4w + 2$

$5w - 8 = 12w + 6$

$-8 = 7w + 6$

$-14 = 7w$

$-2 = w$

$w = -2$

(3)

(c) Factorise $x^2 - 49$

$(x + 7)(x - 7)$

(1)

(d) Simplify $(9x^8y^3)^{\frac{1}{2}}$

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

(2)

(Total for Question 14 is 8 marks)

*15 Henry is thinking about having a water meter.

These are the two ways he can pay for the water he uses.

Water Meter

A charge of £28.20 per year

plus

91.22p for every cubic metre of water used

1 cubic metre = 1000 litres

No Water Meter

A charge of £107 per year

Henry uses an average of 180 litres of water each day.

Henry wants to pay as little as possible for the water he uses.
Should Henry have a water meter?

180 litres a day

180 x 365 = 65700 (litres a year)

$\frac{65700}{1000}$ = 65.7 cubic metres a year

65.7 x 0.9122 = £59.93 (2dp) for units used

59.93 + 28.20 = £88.13

Henry should get a water meter. £88.13 is less than £107.

(Total for Question 15 is 5 marks)

16

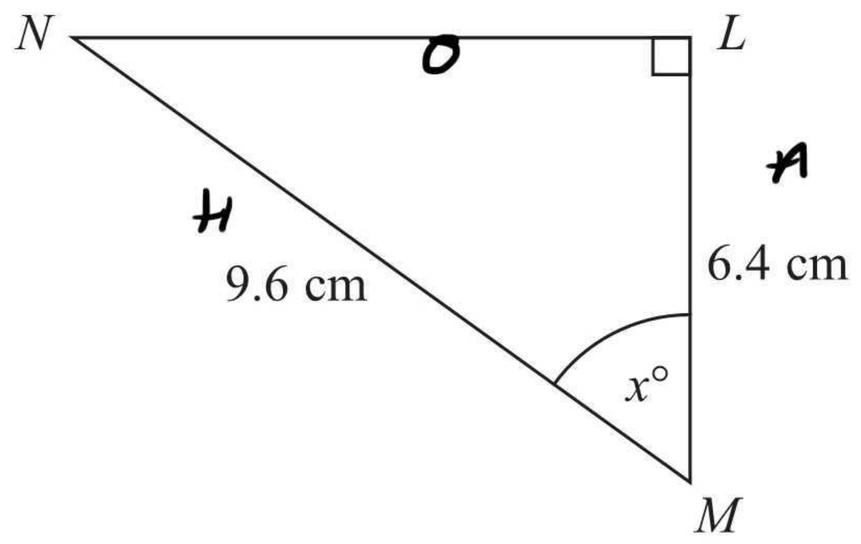


Diagram **NOT** accurately drawn

LMN is a right-angled triangle.
MN = 9.6 cm.
LM = 6.4 cm.

Calculate the size of the angle marked $x°$.
Give your answer correct to 1 decimal place.

$$\cos(x) = \frac{6.4}{9.6}$$

$$x = \cos^{-1}\left(\frac{6.4}{9.6}\right)$$

48.2 °

(Total for Question 16 is 3 marks)

17 Liam invests £6200 for 3 years in a savings account.
He gets 2.5% per annum compound interest.

How much money will Liam have in his savings account at the end of 3 years?

$$6200 \times 1.025^3$$

£ 6676.72

(Total for Question 17 is 3 marks)

18 The diagram shows a quadrilateral $ABCD$.

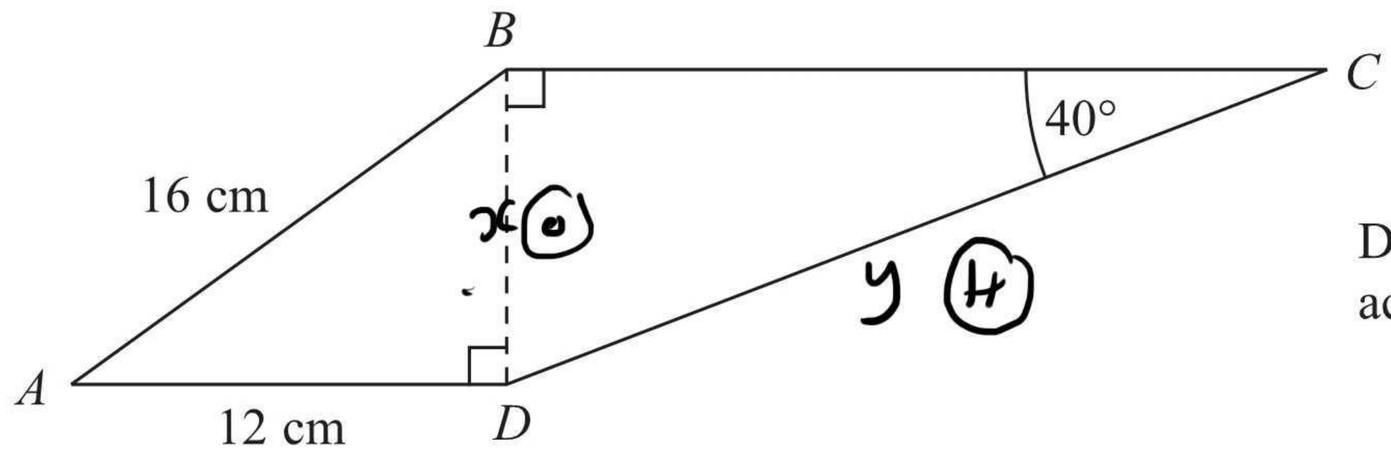


Diagram **NOT** accurately drawn

$AB = 16$ cm.
$AD = 12$ cm.
Angle $BCD = 40°$.
Angle ADB = angle $CBD = 90°$.

Calculate the length of CD.
Give your answer correct to 3 significant figures.

$$12^2 + x^2 = 16^2$$

$$144 + x^2 = 256$$

$$x^2 = 112$$

$$x = \sqrt{112}$$

$$\sin(40) = \frac{\sqrt{112}}{y}$$

$$y = \frac{\sqrt{112}}{\sin(40)}$$

16.5 ..... cm

(Total for Question 18 is 5 marks)