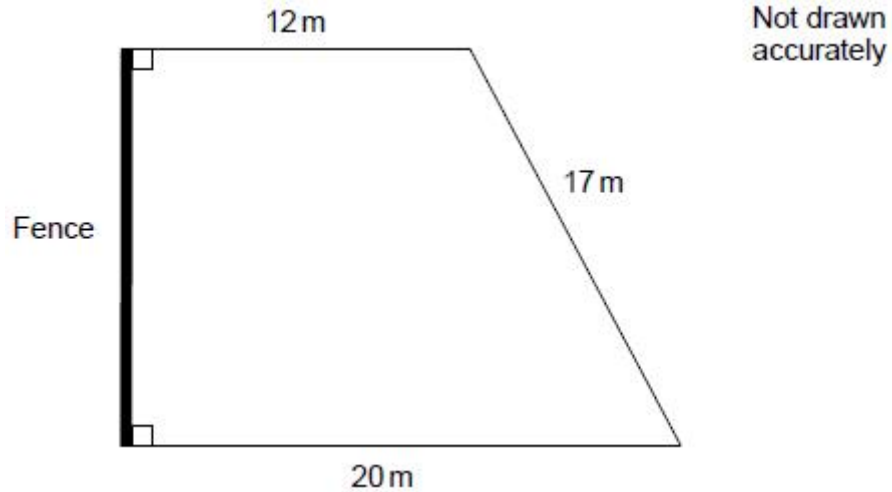


HIGHER OTHER PREDICTED TOPICS MIXED UP

Q1.

The diagram shows a lawn with a fence along one edge.



One can of weedkiller covers 90 square metres.
Each can costs £19.25

Work out the total cost of the cans of weedkiller needed to cover the lawn.

This image shows a blank sheet of white paper with horizontal ruling lines. The lines are evenly spaced and extend across the width of the page. There are no margins, text, or other markings on the paper.

Answer £ _____

(Total 5 marks)

Q2. A company makes boxes of cereal.

A box usually contains 450 grams of cereal.

Here are two options for a special offer.

Option A
20% more cereal
Price remains the same

Option B
Usual amount of cereal
15% off the price

Which option is the better value for the customer?

You **must** show your working.

Answer _____

(Total 3 marks)

Q3. Paul won a race with a time of 71.3 seconds.

This time, t , is to the nearest tenth of a second.

Complete the error interval due to rounding.

Answer $\leq t <$

(Total 2 marks)

Q4. Which of these when converted to decimals are recurring decimals?

Circle your answers.

$$\frac{1}{3}$$

$$\pi$$

$$\sqrt{3}$$

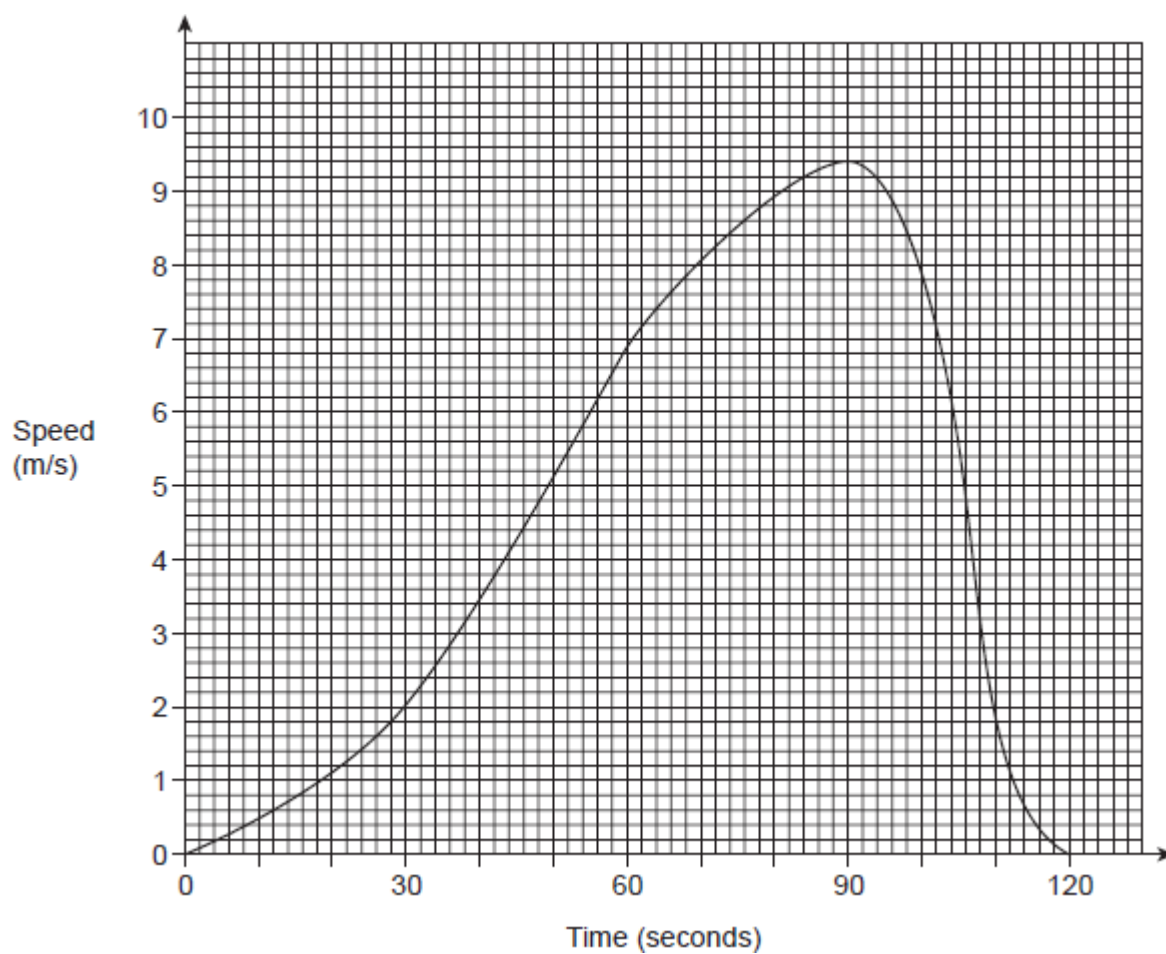
$$\frac{3}{16}$$

$$\frac{5}{7}$$

(Total 2 marks)

Q5.

The graph shows the speed of a snowboarder for 2 minutes.



- (a) Estimate the distance travelled by the snowboarder.
State the units of your answer.

Answer _____

(b) Work out the gradient of the graph at 70 seconds.

Answer _____ m/s²

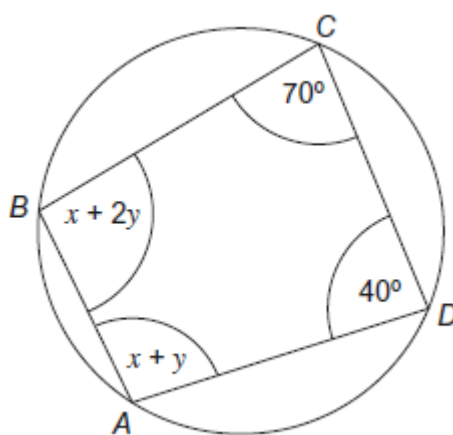
(3)

(Total 7 marks)

Q6.

$ABCD$ is a cyclic quadrilateral.

Not drawn accurately



Work out x and y .

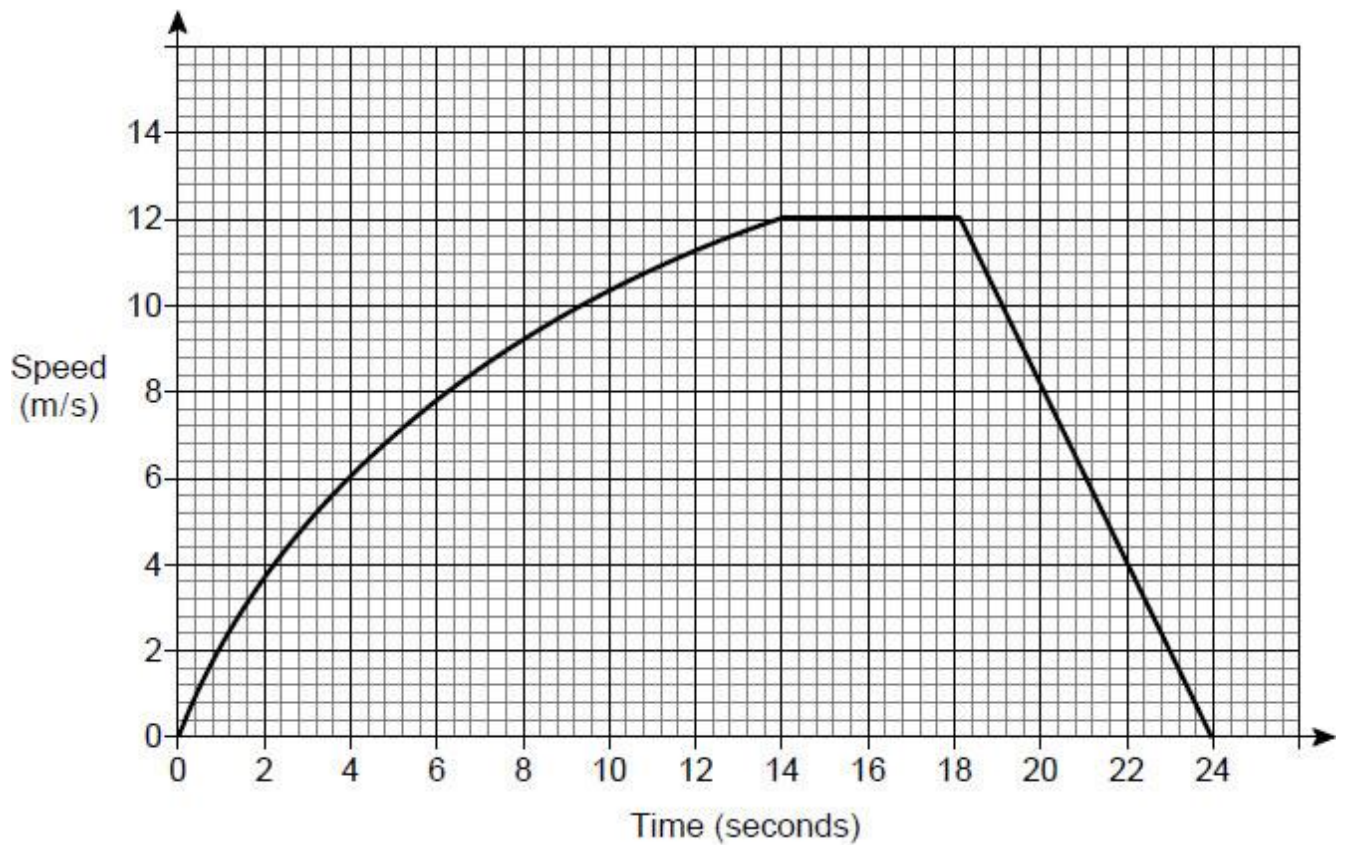
$x =$ _____ degrees

$y =$ _____ degrees

(Total 4 marks)

Q7.

The speed-time graph for a car's journey is shown.



- (a) Estimate the acceleration at 6 seconds.
You **must** show your working.

Answer _____ m/s^2

(3)

- (b) Estimate the average speed of the car for the journey.
You **must** show your working.

Answer _____ m/s

(4)

- (c) Evaluate your answer to part (b).

Tick a box.

☐

underestimate

☐

exact

☐

overestimate

Comment _____

(1)

(Total 8 marks)

Q8.

Written as the product of its prime factors

$$672 = 2^5 \times 3 \times 7$$

- (a) Write 252 as the product of its prime factors.

Answer _____

(2)

- (b) Work out the value of the highest common factor of 672 and 252

Answer _____

(1)

(Total 3 marks)

Q9.

- (a) What is the equation of a circle with centre (0, 0) and diameter 6 units?
Circle your answer.

$x^2 + y^2 = 3$

$x^2 + y^2 = 6$

$x^2 + y^2 = 9$

$x^2 + y^2 = 36$

(1)

- (b) Which of these points lie on the circumference of the circle $x^2 + y^2 = 25$?
Circle your answer.

$(-3, 4)$

$(6.25, 6.25)$

$(9, 16)$

$(-1, 12)$

(1)

- (c) Circle True (T) or False (F) for each statement.

The centre of the circle $x^2 + y^2 = 25$ is (0, 0)

T

F

The equation of the tangent to the circle $x^2 + y^2 = 25$
at the point (5, 0) is $y = 5$

T

F

The equation of a circle and the equation of a
straight line can have 0, 1 or 2 solutions if solved
simultaneously

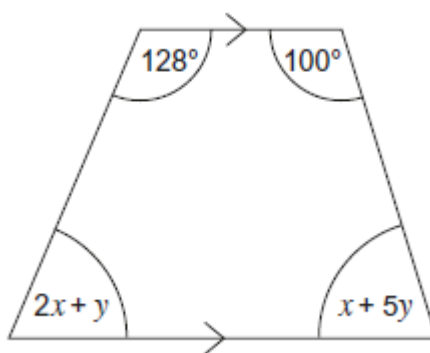
T

F

(2)**(Total 4 marks)**

Q10.

The diagram shows a trapezium.



Work out the values of x and y .

$x =$ _____ degrees

$y =$ _____ degrees

(Total 5 marks)

Q11.

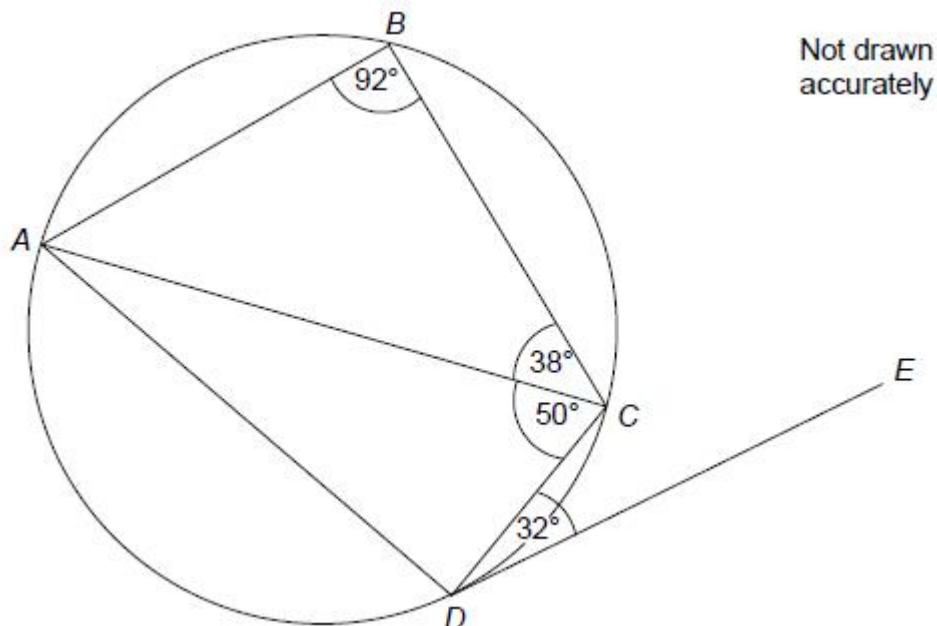
A, B, C and D are points on a circle.

$$\text{Angle } ABC = 92^\circ$$

$$\text{Angle } ACB = 38^\circ$$

$$\text{Angle } ACD = 50^\circ$$

$$\text{Angle } CDE = 32^\circ$$



Tick whether each statement is true or false.

Give a reason for each answer.

Statement

True

False

AC is a diameter

☐
☐

Reason _____

Statement

True

False

Angle $ADC = 88^\circ$

☐
☐

Reason _____

True False

Statement

$ABCD$ is a trapezium

☐☐

Reason _____

Statement

True

False

DE is a tangent to the circle

☐☐

Reason _____

(Total 4 marks)

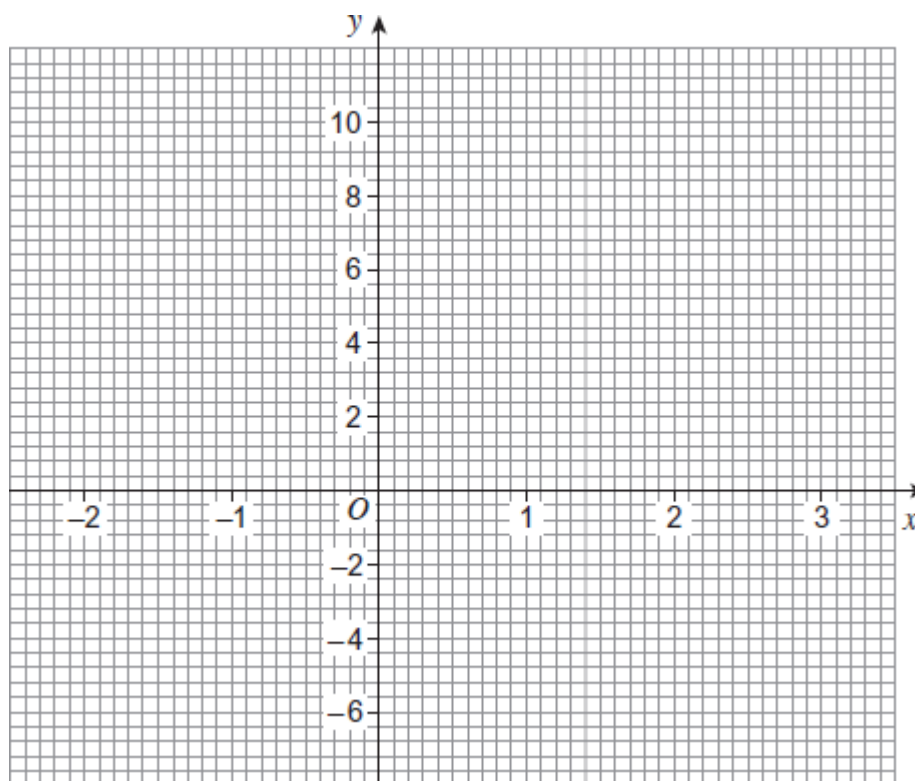
Q12.

- (a) Complete the table of values for $y = 2x^2 - x - 6$

x	-2	-1	0	1	2	3
y	4		-6	-5		9

(2)

- (b) On this grid, plot the graph of $y = 2x^2 - x - 6$ for values of x from -2 to 3



(2)

- (c) Use your graph to find the solutions of the equation $2x^2 - x - 6 = 0$

Answer _____ and _____

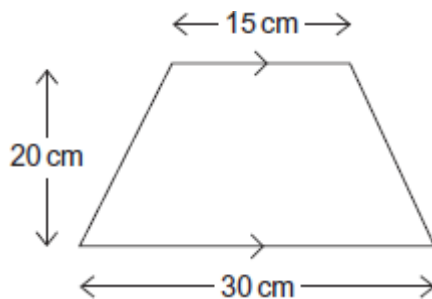
(2)

(Total 6 marks)

Q13.

The diagram shows a trapezium.

Not drawn accurately

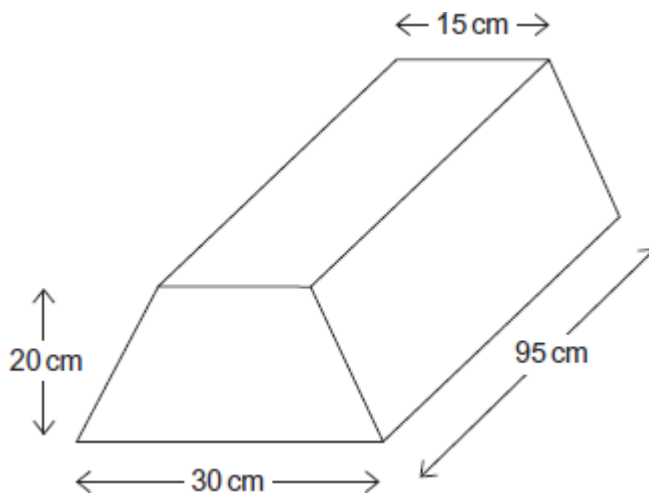


- (a) Work out the area of the trapezium.

Answer _____ cm^2

(2)

- (b) The trapezium is the cross-section of this prism.



Work out the volume of the prism.

Answer _____ cm^3

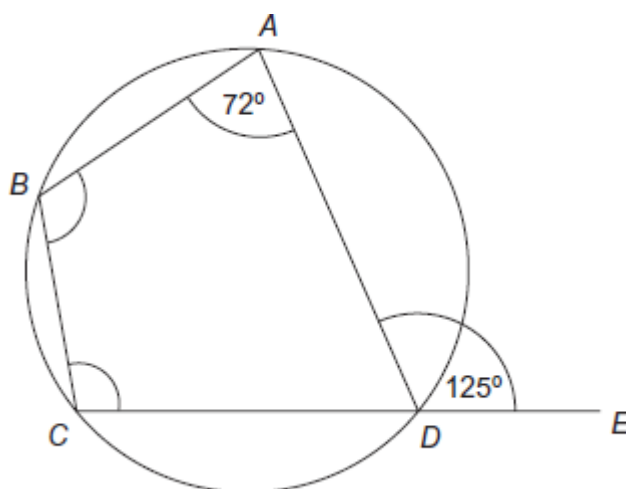
(2)

(Total 4 marks)

Q14.

Points A , B , C and D are on the circumference of the circle.
 CDE is a straight line.

Not drawn accurately



- (a) Work out the size of angle BCD .
 Give a reason for your answer.

Answer _____ degrees

Reason _____

(2)

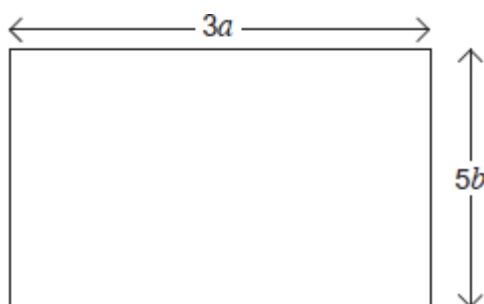
- (b) Work out the size of angle ABC .

Answer _____ degrees

(1)

(Total 3 marks)

Q15. The diagram shows a rectangle.



- (a) Write down an expression for the **area** of the rectangle.

Simplify your answer.

Answer _____

(2)

- (b) You are given that a and b are prime numbers.
The **area** of the rectangle is 315 cm^2

Work out the values of a and b .

Answer _____ cm and _____ cm

(2)

(Total 4 marks)

Q16.

a , b and c and **different** prime numbers less than 20

$$a = \sqrt{4b + c}$$

Work out **two** possible sets of values of a , b and c .

Set 1 $a =$ _____ $b =$ _____ $c =$ _____

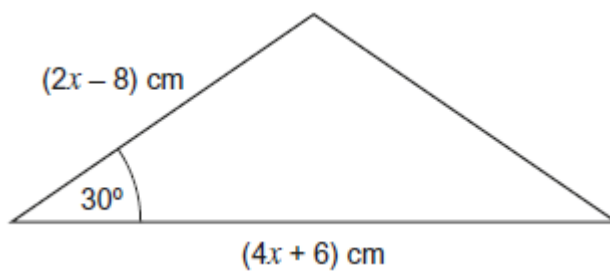
Set 2 $a =$ _____ $b =$ _____ $c =$ _____

(Total 3 marks)

Q17.

The area of this triangle is 14 cm^2

Not drawn accurately



- (a) Show that $2x^2 - 5x - 26 = 0$

(3)

- (b) Work out the value of x .
Give your answer to 2 significant figures.

Answer _____

(4)

(Total 7 marks)

Q18.

$$\mathbf{a} = \begin{pmatrix} 5 \\ -2 \end{pmatrix} \text{ and } \mathbf{b} = \begin{pmatrix} -2 \\ 3 \end{pmatrix}$$

Circle the vector $\mathbf{a} - \mathbf{b}$

$$\begin{pmatrix} -3 \\ -5 \end{pmatrix}$$

$$\begin{pmatrix} 7 \\ 1 \end{pmatrix}$$

$$\begin{pmatrix} 3 \\ 1 \end{pmatrix}$$

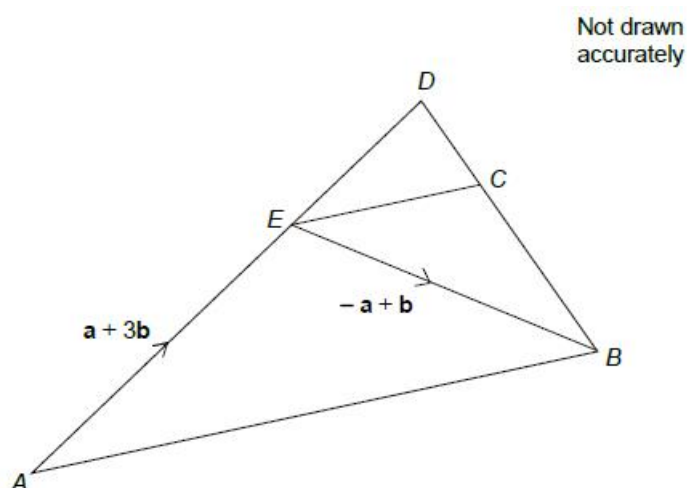
$$\begin{pmatrix} 7 \\ -5 \end{pmatrix}$$

(Total 1 mark)

Q19. AED is a straight line.

$$\vec{AE} = \mathbf{a} + 3\mathbf{b}$$

$$\vec{EB} = -\mathbf{a} + \mathbf{b}$$



(a) Work out the vector \vec{AB}

Answer _____

(1)

(b) Also $\vec{ED} = \frac{1}{3} \vec{AE}$ and $\vec{DC} = -\frac{1}{3} \mathbf{a}$

Prove that EC is parallel to AB .

(3)

(Total 4 marks)

Q20.

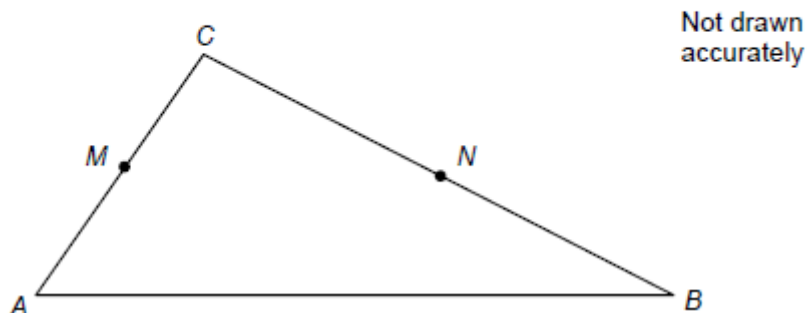
In triangle ABC

M is the midpoint of AC

N is the point on BC where $BN : NC = 2 : 3$

$$\vec{AC} = 2\mathbf{a}$$

$$\vec{AB} = 3\mathbf{b}$$



- (a) Work out \vec{MN} in terms of \mathbf{a} and \mathbf{b} .

Give your answer in its simplest form.

Answer _____

(3)

- (b) Use your answer to part (a) to explain why MN is **not** parallel to AB .

(1)

(Total 4 marks)

Q21.

Work out $\begin{pmatrix} -4 \\ -7 \end{pmatrix} - \begin{pmatrix} -5 \\ 3 \end{pmatrix}$
Circle your answer.

$$\begin{pmatrix} -9 \\ 4 \end{pmatrix}$$

$$\begin{pmatrix} 1 \\ 4 \end{pmatrix}$$

$$\begin{pmatrix} -1 \\ 4 \end{pmatrix}$$

$$\begin{pmatrix} 1 \\ -10 \end{pmatrix}$$

$$\begin{pmatrix} -9 \\ -10 \end{pmatrix}$$

(Total 1 mark)

Q22.

(a) Write $\frac{7}{13}$ as a recurring decimal.

Answer _____

(1)

(b) Circle the fraction that is equivalent to $0.4\dot{1}$

$$\frac{41}{99}$$

$$\frac{41}{100}$$

$$\frac{37}{99}$$

$$\frac{37}{90}$$

(1)

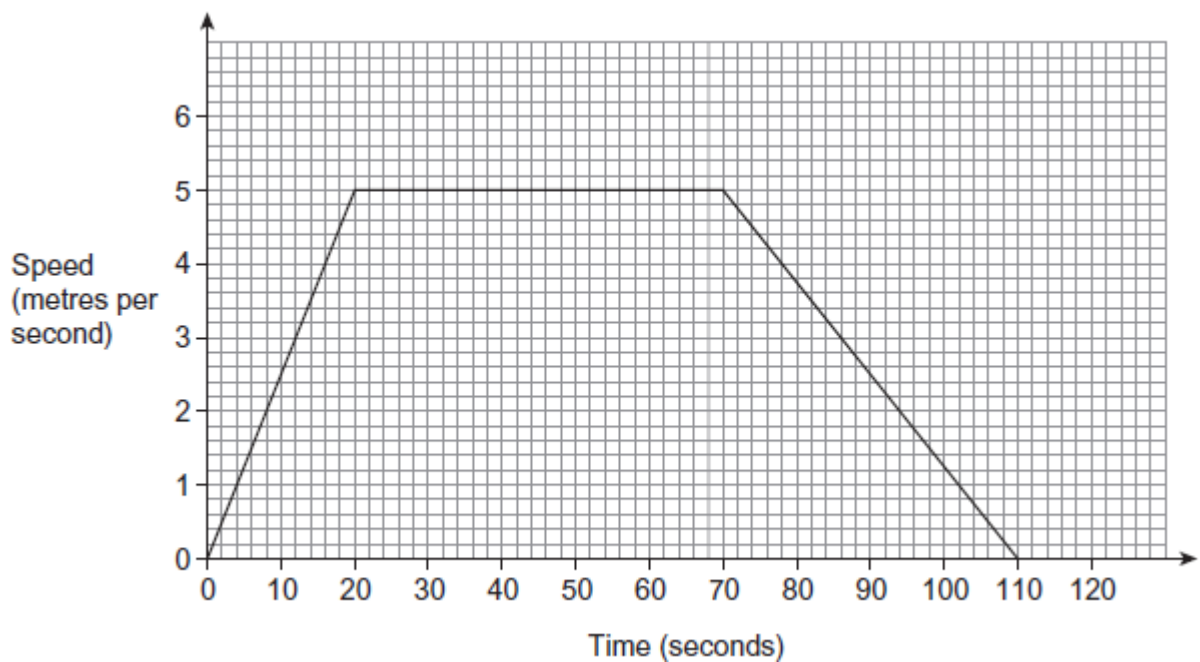
(Total 2 marks)

Q23.

The distance around a cycle track is 400 metres.

Robin cycles on the track.

Here is his speed-time graph.

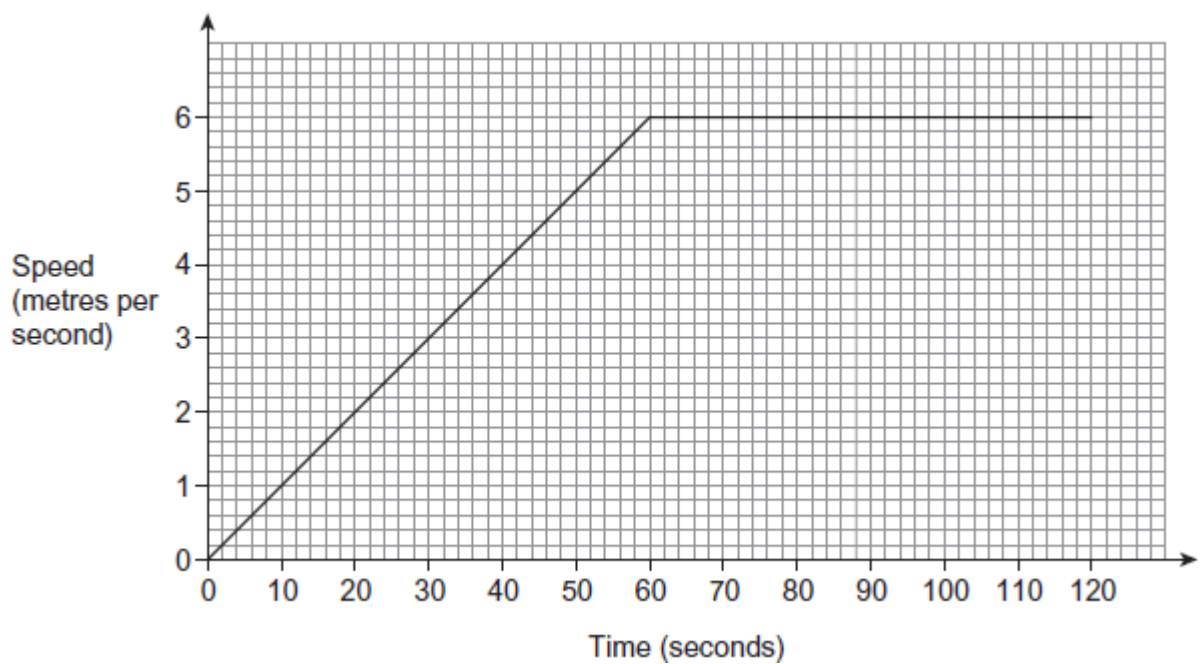


- (a) Show that Robin cycles **exactly** once around the track in 110 seconds.

(2)

- (b) Sanjay cycles on the same track.

Here is his speed-time graph.



Does Sanjay cycle the first 400 metres in a quicker time than Robin?
You **must** show your working.

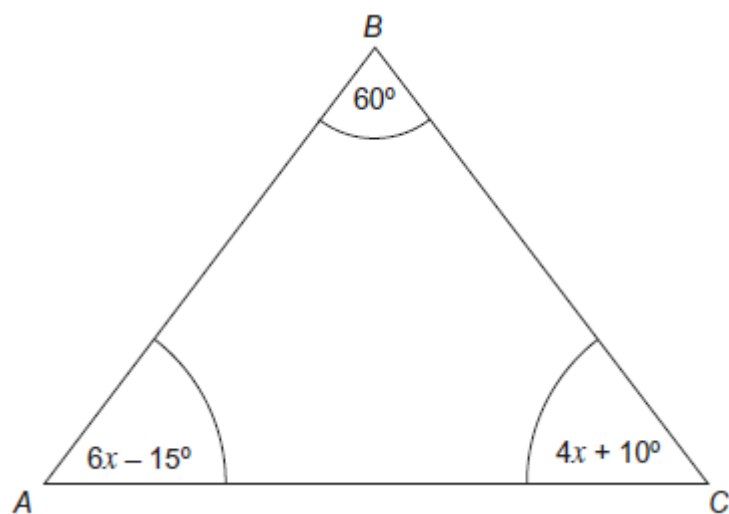
(3)

(Total 5 marks)

Q24.

Show that ABC is an equilateral triangle.

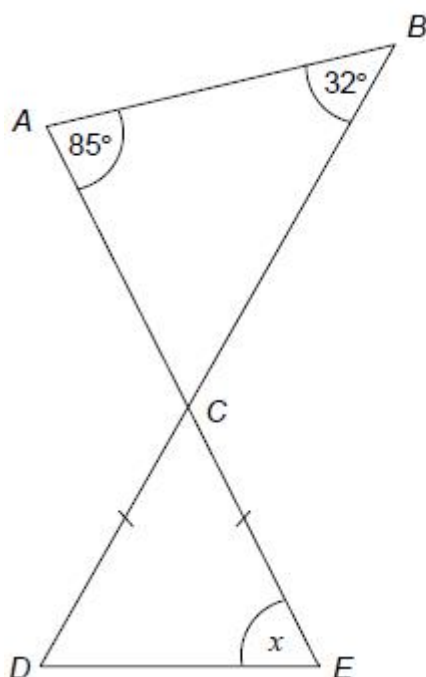
Not drawn accurately



(Total 5 marks)

Q25.

ACE and BCD are straight lines.
 $CD = CE$



Not drawn
accurately

Work out the size of angle x .

Answer _____ degrees
(Total 3 marks)

Q26.

A number, x , is 15.8 when rounded to 3 significant figures.
Circle the error interval.

$$15.75 < x < 15.85$$

$$15.75 \leq x < 15.85$$

$$15.75 < x \leq 15.85$$

$$15.75 \leq x \leq 15.85$$

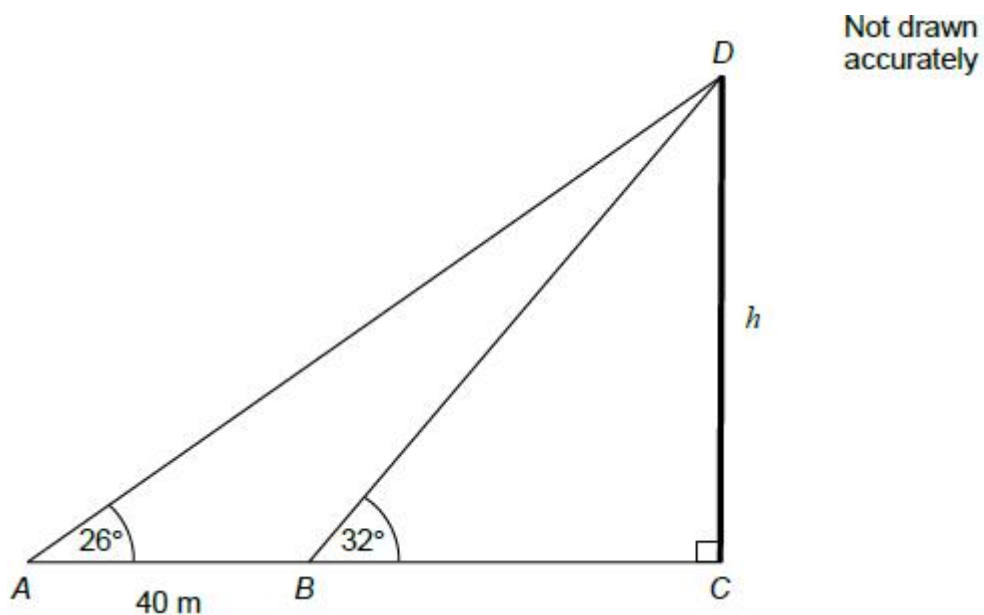
(Total 1 mark)

Q27.

The diagram shows a vertical tower CD of height, h , metres.

ABC is horizontal.

$AB = 40$ metres.

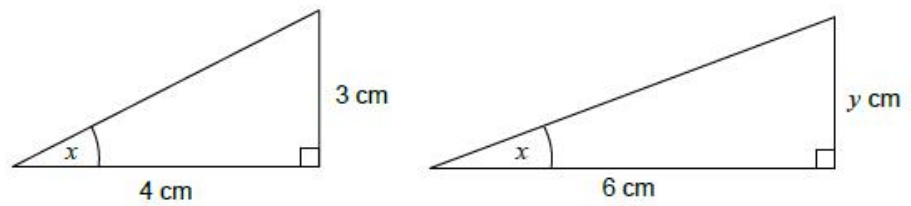


Work out the height, h , of the tower.

Answer metres
(Total 5 marks)

Q28.

These two right-angled triangles are similar.



- (a) Write down the value of $\tan x$.
Give your answer as a fraction.

Answer _____ (1)

- (b) Work out the value of y .

Answer _____ cm (2)
(Total 3 marks)

Q29. Boat A is 10 km north of a port.

Boat B is 5 km east of the same port.

Boat A sails in a straight line towards boat B.

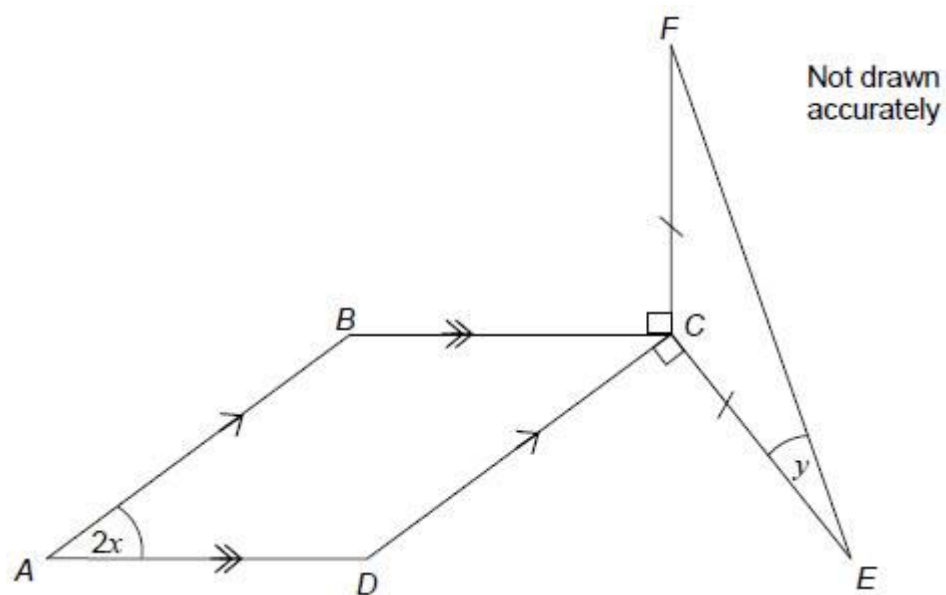
Work out the bearing on which boat A sails.

Answer _____° (Total 4 marks)

Q30.

$ABCD$ is a parallelogram.

$$CE = CF$$

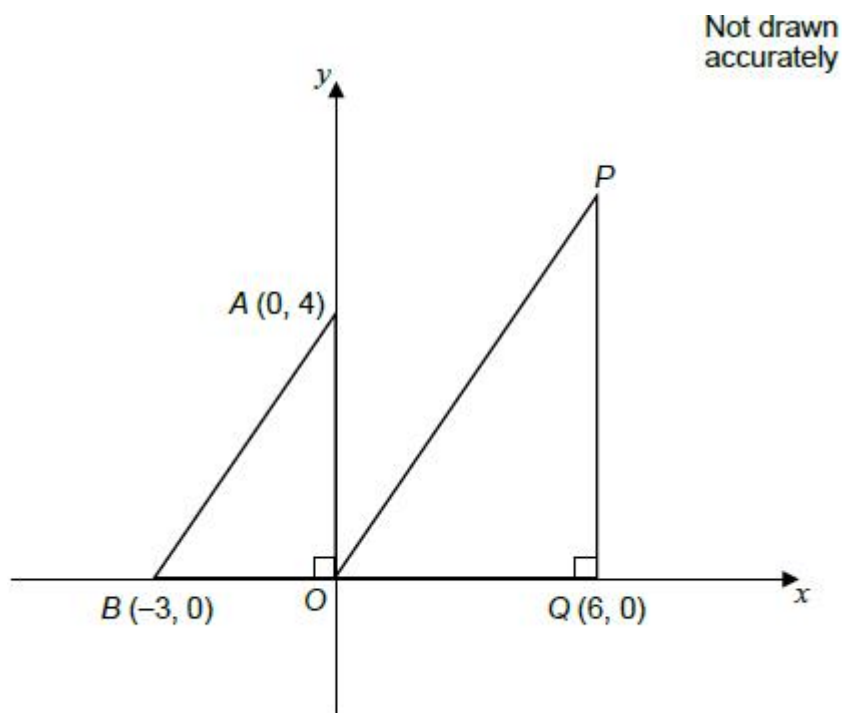


Prove that $y = x$

(Total 5 marks)

Q31.

Here are two right-angled triangles.



- (a) Assume that triangles AOB and PQO are similar.

Work out the area of triangle PQO .

Answer square units

(3)

- (b) In fact, QP is longer than it would be if the triangles were similar.

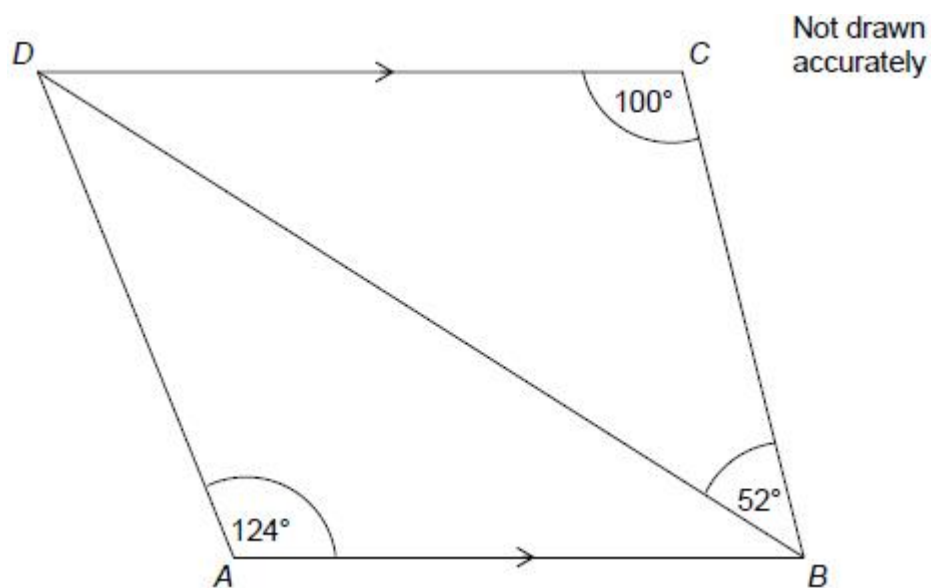
How does this affect your answer to part (a)?

(1)

(Total 4 marks)

Q32.

In the diagram, DC is parallel to AB .



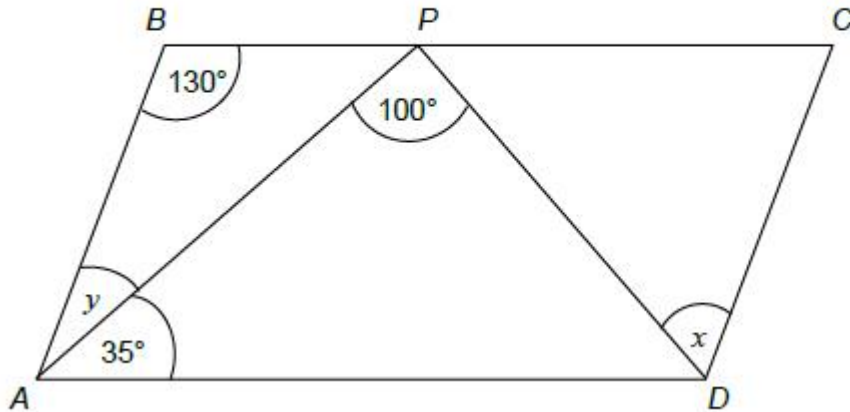
Show that triangle ABD is isosceles.

(Total 3 marks)

Q33.

The diagram shows a parallelogram $ABCD$.

Not drawn
accurately



P is a point on BC .

- (a) Work out the size of angle x .
You **must** show your working, which may be on the diagram.

Answer _____ degrees

(3)

- (b) Work out the size of angle y .

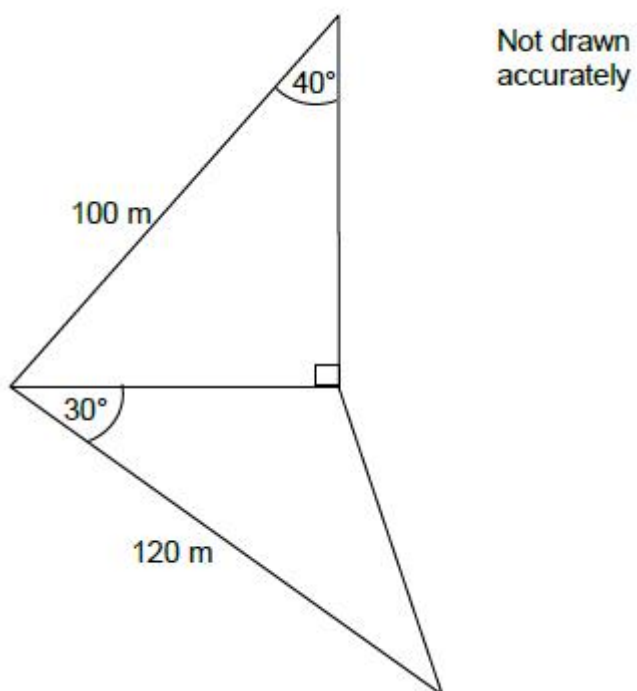
Answer _____ degrees

(1)

(Total 4 marks)

Q34.

Two triangular lawns are shown.
Wire fencing is needed for all **five** sides.



Wire fencing is sold in 50-metre rolls.

Work out the number of rolls needed.

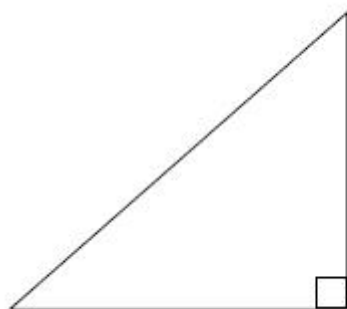
This image shows a blank sheet of white paper with horizontal ruling lines. The lines are evenly spaced and run across the width of the page. There are no margins, text, or other markings on the paper.

Answer _____

(Total 6 marks)

Q35.

The area of a **right-angled, isosceles** triangle is 4 cm^2



Not drawn
accurately

Work out the perimeter of the triangle in centimetres.

Give your answer in the form $a + b\sqrt{c}$, where a , b and c are integers.

Answer _____ cm

(Total 4 marks)

Mark schemes

Q1.

20 – 12 or 8 seen

M1

$\sqrt{17^2 - 8^2}$ or 15
oe

M1

$\frac{1}{2}$ (12 + 20) × 15 or 240
oe
Dependent on 2nd M1

M1dep

their 240 ÷ 90 or 2.66... or $2\frac{2}{3}$

M1dep

(3 × 19.25 =) 57.75

A1

[5]

Q2.

Alternative method 1

1.2 or 0.85

M1

1 ÷ 0.85 or 1.1(7...) or 1.18

M1

1.1(7...) or 1.18 and 1.2 and (Option) A

A1

Alternative method 2

1.2 or 0.85

M1

1 ÷ 1.2 or 0.83(...)

M1

0.83(...) and 0.85 and (Option) A

A1

Alternative method 3

450 × 1.2 or 540

or

$x \times 0.85$ or $0.85x$

x is the usual cost of the box and may be a numerical value

M1

$x \div$ their 540 or their $0.85x \div 450$

M1dep

0.00185(...)x and 0.00188(...)x and (Option) A
oe

A1

Alternative method 4

450 × 1.2 or 540
or
x × 0.85 or 0.85x

x is the usual cost of the box and may be a numerical value

M1

their 540 ÷ x or 450 ÷ their 0.85x

M1dep

$\frac{540}{x}$ and $\frac{529.(\dots)}{x}$ and (Option) A
oe

A1

Alternative method 5

$\frac{1}{6}$ (free for A)

oe fraction or decimal or percentage

M1

$\frac{3}{18}$ (free for A) and $\frac{3}{20}$ (free for B)

oe pairs of fractions or pairs of decimal or pairs of percentages

M1

$\frac{3}{18}$ (free for A) and $\frac{3}{20}$ (free for B) and (Option) A

A1

[3 marks]

Q3.

$71.25 \leq t < 71.35$

B1 1 correct bound

B2

Additional Guidance

Accept 71.349 for 71.35

[2]

Q4.

$\frac{1}{3}$ and $\frac{5}{7}$

*B1 for 2 correct and 1 incorrect
or for 1 correct and 1 incorrect*

or for 1 correct

B2

[2]

Q5.

- (a) Attempts to calculate an area

eg $\frac{1}{2} \times 90 \times 9.4$

Attempts to calculate average speeds over

equal time intervals **and** divides by number of intervals (**and** multiplies by 120)

M1

[545, 565]

A1 [530, 580]

A2

m(etres)

Allow correct conversion to other units if supported by an area

eg 0.564 km after 564 calculated for area

B1

- (b) Tangent drawn at 70 seconds

B1

Attempt at $\frac{y_2 - y_1}{x_2 - x_1}$ for their tangent

At least one of numerator or denominator correct

M1

[0.06, 0.14]

A1

[7]

Q6.

Alternative method 1

$$x + y + 70 = 180$$

$$\text{or } x + 2y + 40 = 180$$

oe

M1

$$x + y = 110$$

$$\text{and } x + 2y = 140$$

$$2x + 2y = 220$$

$$\text{and } x + 2y = 140$$

oe

Collects terms and equates coefficients

Equations may be implied from 110 or 140 on diagram in correct place

M1dep

$$x = 80 \text{ or } y = 30$$

A1

$$x = 80 \text{ and } y = 30$$

A1

Alternative method 2

$$x + y + 70 = 180$$

$$\text{or } x + y + 70 + x + 2y + 40 = 360$$

oe

M1

$$2x + 2y = 220$$

$$\text{and } 2x + 3y = 250$$

$$3x + 3y = 330$$

$$\text{and } 2x + 3y = 250$$

oe

Collects terms and equates coefficients

Equations may be implied from 110 or 140 on diagram in correct place

M1dep

$$x = 80 \text{ or } y = 30$$

A1

$$x = 80 \text{ and } y = 30$$

A1

Alternative method 3

$$x + 2y + 40 = 180$$

$$\text{or } x + y + 70 + x + 2y + 40 = 360$$

oe

M1

$$2x + 4y = 280$$

$$\text{and } 2x + 3y = 250$$

$$3x + 6y = 420$$

$$\text{and } 4x + 6y = 500$$

oe

Collects terms and equates coefficients

Equations may be implied from 110 or 140 on diagram in correct place

M1dep

$$x = 80 \text{ or } y = 30$$

A1

$$x = 80 \text{ and } y = 30$$

A1

Alternative method 4

$$x + y + 70 = 180$$

$$\text{or } x + 2y + 40 = 180$$

oe

M1

$$2y + 40 - (y + 70) = 0$$

$$\text{or } 2x + 140 - (x + 40) = 360 - 180$$

oe

Eliminates a variable

M1dep

$$x = 80 \text{ or } y = 30$$

A1

$$x = 80 \text{ and } y = 30$$

A1

Additional Guidance

$y = 30$ must come from correct equations not from $x + 2y = 70$ and $x + y = 40$

M0 M0 A0

[4]

Q7.

- (a) Draws a tangent at $t = 6$

B1

$\frac{\text{change in speed}}{\text{change in time}}$ for their tangent

M1

Correct answer for their tangent

A1ft

- (b) Attempts to work out area below straight lines

$$\text{eg } 4 \times 12 \text{ or } 48 \text{ and } \frac{1}{2} \times 6 \times 12 \text{ or } 36$$

M1

Attempts to work out estimate of area under the curve

$$\text{eg } \frac{1}{2} \times 14 \times 12 \text{ or } 84$$

$$\frac{1}{2} \times 14 \times (4 + 12) \text{ or } 112$$

M1

their total distance $\div 24$

M1

Their answer worked out correctly with no errors in area below straight lines

Their area must be in the range [168, 196]

A1

- (c) Correct box ticked with suitable comment

ft their answer to part (b)

eg their (b) 168

Underestimate ticked and triangle less than area under curve their (b) 196
Overestimate ticked and trapezium more than area under curve

B1ft

[8]

Q8.

- (a) Correct product using at least one prime factor

For example

2 (x) 126 or 3 (x) 84 or

7 (x) 36 or 2 (x) 2 (x) 63 or

2 (x) 3 (x) 42

May be implied

eg in a factor tree or repeated division

M1

$$2 \times 2 \times 3 \times 3 \times 7 \text{ or}$$

$$2^2 \times 3^2 \times 7$$

A1

- (b) 84

B1

[3]

Q9.

(a) $x^2 + y^2 = 9$

B1

(b) $(-3, 4)$

B1

(c) T F
T

B1 for 2 correct and 1 incorrect or incomplete

B2

[4]

Q10.

Alternative method 1

$$2x + y + 128 = 180$$

$$\text{or } x + 5y + 100 = 180$$

oe

M1

$$2x + y = 52$$

$$\text{and } x + 5y = 80$$

oe

Collecting terms

M1dep

$$2x + y = 52$$

$$10x + 5y = 260$$

$$2x + 10y = 160$$

$$x + 5y = 80$$

oe

Equating coefficients

M1dep

$$x = 20 \text{ or } y = 12$$

A1

$$x = 20 \text{ and } y = 12$$

$$\text{SC3 for } x = 41\frac{1}{3} \text{ or } 41 \text{ or } 41.3...$$

$$\text{and } y = 17\frac{1}{3} \text{ or } 17 \text{ or } 17.3...$$

$$\text{or } x = 60$$

$$\text{and } y = 8$$

$$\text{or } x = 38\frac{2}{3} \text{ or } 39 \text{ or } 38.6... \text{ or } 38.7$$

$$\text{and } y = 2\frac{2}{3} \text{ or } 3 \text{ or } 2.6... \text{ or } 2.7$$

A1

Alternative method 2

$$2x + y + 128 = 180$$

$$\text{or } 2x + y + x + 5y + 128 + 100 = 360$$

oe

M1

$$2x + y = 52$$

$$\text{and } 3x + 6y = 132$$

oe

Collecting terms

M1dep

$$6x + 3y = 156$$

$$12x + 6y = 312$$

$$6x + 12y = 264$$

$$3x + 6y = 132$$

oe

Equating coefficients

M1dep

$$x = 20 \text{ or } y = 12$$

A1

$$x = 20 \text{ and } y = 12$$

$$\text{SC3 for } x = 41\frac{1}{3} \text{ or } 41 \text{ or } 41.3...$$

$$\text{and } y = 17\frac{1}{3} \text{ or } 17 \text{ or } 17.3...$$

$$\text{or } x = 60$$

$$\text{and } y = 8$$

$$\text{or } x = 38\frac{2}{3} \text{ or } 39 \text{ or } 38.6... \text{ or } 38.7$$

$$\text{and } y = 2\frac{2}{3} \text{ or } 3 \text{ or } 2.6... \text{ or } 2.7$$

A1

Alternative method 3

$$x + 5y + 100 = 180$$

$$\text{or } 2x + y + x + 5y + 128 + 100 = 360$$

oe

M1

$$x + 5y = 80$$

$$\text{and } 3x + 6y = 132$$

oe

Collecting terms

M1dep

$$3x + 15y = 240$$

$$6x + 30y = 480$$

$$3x + 6y = 132$$

$$15x + 30y = 660$$

oe

Equating coefficients

M1dep

$$x = 20 \text{ or } y = 12$$

A1

$$x = 20 \text{ and } y = 12$$

$$\text{SC3 for } x = 41\frac{1}{3} \text{ or } 41 \text{ or } 41.3...$$

$$\text{and } y = 17\frac{1}{3} \text{ or } 17 \text{ or } 17.3...$$

$$\text{or } x = 60$$

$$\text{and } y = 8$$

$$\text{or } x = 38\frac{2}{3} \text{ or } 39 \text{ or } 38.6... \text{ or } 38.7$$

$$\text{and } y = 2\frac{2}{3} \text{ or } 3 \text{ or } 2.6... \text{ or } 2.7$$

A1

Alternative method 4

$$2x + y + 128 = x + 5y + 100$$

$$\text{or } 2x + y + 128 = 180$$

$$\text{or } x + 5y + 100 = 180$$

oe

M1

$$-x + 4y = 28$$

and

$$2x + y = 52 \text{ or } x + 5y = 80$$

oe

Collecting terms

M1dep

$$-2x + 8y = 56$$

$$-x + 4y = 28$$

$$2x + y = 52$$

$$x + 5y = 80$$

$$-x + 4y = 28$$

$$-5x + 20y = 140$$

$$8x + 4y = 208$$

$$4x + 20y = 320$$

oe

Equating coefficients

M1dep

$$x = 20 \text{ or } y = 12$$

A1

$$x = 20 \text{ and } y = 12$$

$$\text{SC3 for } x = 41\frac{1}{3} \text{ or } 41 \text{ or } 41.3\dots$$

$$\text{and } y = 17\frac{1}{3} \text{ or } 17 \text{ or } 17.3\dots$$

$$\text{or } x = 60$$

$$\text{and } y = 8$$

$$\text{or } x = 38\frac{2}{3} \text{ or } 39 \text{ or } 38.6\dots \text{ or } 38.7$$

$$\text{and } y = 2\frac{2}{3} \text{ or } 3 \text{ or } 2.6\dots \text{ or } 2.7$$

A1

Alternative method 5

$$2x + y + 128 = x + 5y + 100$$

$$\text{or } 2x + y + x + 5y + 128 + 100 = 360$$

M1

$$-x + 4y = 28$$

and $3x + 6y = 132$

oe
Collecting terms

M1dep

$$-3x + 12y = 84$$
$$-3x + 12y = 84$$

$$3x + 6y = 132$$
$$6x + 12y = 264$$

oe
Equating coefficients

M1dep

$$x = 20 \text{ or } y = 12$$

A1

$$x = 20 \text{ and } y = 12$$

$$\text{SC3 for } x = 41\frac{1}{3} \text{ or } 41 \text{ or } 41.3\dots$$

$$\text{and } y = 17\frac{1}{3} \text{ or } 17 \text{ or } 17.3\dots$$

$$\text{or } x = 60$$

$$\text{and } y = 8$$

$$\text{or } x = 38\frac{2}{3} \text{ or } 39 \text{ or } 38.6\dots \text{ or } 38.7$$

$$\text{and } y = 2\frac{2}{3} \text{ or } 3 \text{ or } 2.6\dots \text{ or } 2.7$$

A1

Alternative method 6

$$2x + y + 128 = 180$$

oe
or $x + 5y + 100 = 180$

M1

$$y = 52 - 2x$$
$$\text{or } y = \frac{80 - x}{5}$$

$$x = \frac{52 - y}{2}$$
$$\text{or } x = 80 - 5y$$

oe
Making one variable the subject

M1dep

$$52 - 2x = \frac{80 - x}{5}$$

$$\frac{52 - y}{2} = 80 - 5y$$

oe

Eliminating a variable

M1dep

$$x = 20 \text{ or } y = 12$$

A1

$$x = 20 \text{ and } y = 12$$

$$\text{SC3 for } x = 41\frac{1}{3} \text{ or } 41 \text{ or } 41.3\ldots$$

$$\text{and } y = 17\frac{1}{3} \text{ or } 17 \text{ or } 17.3\ldots$$

$$\text{or } x = 60$$

$$\text{and } y = 8$$

$$\text{or } x = 38\frac{2}{3} \text{ or } 39 \text{ or } 38.6\ldots \text{ or } 38.7$$

$$\text{and } y = 2\frac{2}{3} \text{ or } 3 \text{ or } 2.6\ldots \text{ or } 2.7$$

A1

Additional Guidance

Note $x = 20$ and $y = 12$ using trial and improvement or without working

5 marks

$x + 2y = 44$ may be used for $3x + 6y = 132$ when equating coefficients

For SC3 accept fractions written as decimals to 1dp or better

Alternative method 6 is one example of the principles of marking for the substitution method

[5]

Q11.

False – angle in semicircle = 90°
(not 92)

B1

True – opposite angles in cyclic quad total 180°

B1

True – alternate angles ACD and $CAB = 50^\circ$

or $92 + 88 = 180$ (allied)

50° angles may be on diagram – need not say angle sum of a triangle = 180°

B1

False – angle $CAD = 42^\circ$, should be 32° if DE is a tangent by alternate segment

B1

[4]

Q12.

- (a) -3 and 0
B1 for each
B2
- (b) their 6 points plotted within tolerance
 $\frac{1}{2}$ square tolerance
B1ft
- Smooth curve through their points
Must be U shape through 6 points
B1ft
- (c) -1.5 and 2
ft their graph
 $\frac{1}{2}$ square tolerance
B1 for each
[-1.55, -1.45] and [1.95, 2.05]
B2ft
- [6]

Q13.

- (a) $\frac{15+30}{2} \times 20$
oe
M1
- 450
A1
- (b) their 450 × 95
M1
- 42750
ft their 450
A1ft
- [4]

Q14.

- (a) 108
B1
- Opposite angle of a cyclic quadrilateral
Strand (i)
- (add up to 180)
Must have 108
Q1

Additional Guidance

Must see “opposite” and “cyclic” (oe e.g. quadrilateral in a circle)

- (b) 125
B1

Q15.(a) $15ab$ *B1 for $3a \times 5b$* *B1 for partially simplified answer**B1 for $15 \times ab$* **B2****Additional Guidance**Penalise further working, e.g. $3a \times 5b = 15ab = 3(5ab)$ gets B1 $15ba$ **B2** $A = 15ab$ **B2** $A(15ab)$ **B2** $15ab \text{ cm}^2$ **B2** $A(3a \times 5b)$ **B1** $(3a)(5b)$ **B1** $3a5b$ **B1** $15(ab)$ **B1** $3(5ab)$ **B1** $ab15$ **B1** $(15ab)^2$ **B0** $15ab^2$ **B0** $(3a \times 5b)^2$ **B0** $3a \times 5b^2$ **B0**(b) $315 \div 15$ or 21 seen**M1**

7 and 3 in any order
SC1 for 15 and 21
or 9 and 35

A1

Additional Guidance

1 and 21 on the answer line

M1A0

[4]

Q16.

Any two sets of

$$a = 5, b = 3, c = 13$$

$$a = 7, b = 11, c = 5$$

$$a = 5, b = 2, c = 17$$

B2 for any one set

$$B1 \ a = 5, b = 5, c = 5$$

or b and c prime and

a non-prime integer and

$$a = \sqrt{4b + c}$$

B3

[3]

Q17.

$$(a) \quad \frac{1}{2} \times (2x - 8)(4x + 6) \times \sin 30$$

oe

M1

$$8x^2 - 32x + 12x - 48$$

$$\text{or } 4x^2 - 16x + 6x - 24$$

$$\text{or } 2x^2 - 8x + 3x - 12 (= 14)$$

oe

$$8x^2 - 20x - 48$$

$$\text{or } 4x^2 - 10x - 24$$

$$\text{or } 2x^2 - 5x - 12$$

M1

$$2x^2 - 5x - 12 = 14$$

$$\text{or } 2x^2 - 5x - 12 - 14 = 0$$

$$\text{or } 2x^2 - 8x + 3x - 12 - 14 = 0$$

$$\text{or } 2x^2 - 8x + 3x - 26 = 0$$

and

$$2x^2 - 5x - 26 = 0$$

A1

Additional Guidance

$$\frac{1}{2} \times (2x-8)(4x+6) = 4x^2 - 16x + 6x - 24 \text{ not recovered}$$

M0M1A0

$$(b) \quad \frac{- -5 \pm \sqrt{(-5)^2 - (4 \times 2 \times -26)}}{2 \times 2}$$

Allow one error

M1

$$\frac{- -5 \pm \sqrt{(-5)^2 - (4 \times 2 \times -26)}}{2 \times 2}$$

$$\text{or } \frac{5 \pm \sqrt{25 + 208}}{4}$$

$$\text{or } \frac{5 \pm \sqrt{233}}{4}$$

Fully correct
oe

A1

5.06... (and -2.56...)

Allow 5.07

A1

5.1

Must ignore negative answer

A1

Additional Guidance

5.1 without working

4 marks

[7]

Q18.

$$\begin{pmatrix} 7 \\ -5 \end{pmatrix}$$

B1

[1]

Q19.

(a) 4b

B1

$$(b) \quad (\vec{ED} =) \frac{1}{3} (\mathbf{a} + 3\mathbf{b}) \text{ or } (\vec{ED} =) \frac{1}{3} \mathbf{a} + \mathbf{b}$$

B1

$$\vec{EC} = \text{their } \left(\frac{1}{3} \mathbf{a} + \mathbf{b} \right) - \frac{1}{3} \mathbf{a}$$

$$\text{or } \vec{EC} = \mathbf{b}$$

M1

Valid justification

$$\text{eg } \vec{ED} = \frac{1}{3} \mathbf{a} + \mathbf{b} \text{ and } \vec{EC} = \mathbf{b}$$

$$\text{and } \vec{AB} = 4 \vec{EC} \text{ (so } \vec{AB} \text{ is a multiple of } \vec{EC} \text{)}$$

A1

[4]

Q20.

(a) $\overrightarrow{BC} = 2\mathbf{a} - 3\mathbf{b}$ or

$$\overrightarrow{CB} = -2\mathbf{a} + 3\mathbf{b} \text{ or}$$

$$\overrightarrow{AM} = \mathbf{a} \text{ or } \overrightarrow{MA} = -\mathbf{a} \text{ or}$$

$$\overrightarrow{BN} = \frac{2}{5}\overrightarrow{BC} \text{ or } \overrightarrow{CN} = -\frac{3}{5}\overrightarrow{BC}$$

oe

M1

$$\mathbf{a} + \frac{3}{5}(-2\mathbf{a} + 3\mathbf{b})$$

$$-\mathbf{a} + 3\mathbf{b} + \frac{2}{5}(2\mathbf{a} - 3\mathbf{b})$$

oe

M1

$$-\frac{1}{5}\mathbf{a} + \frac{9}{5}\mathbf{b}$$

$$\text{oe eg } -0.2\mathbf{a} + 1.8\mathbf{b} \text{ or } \frac{1}{5}(9\mathbf{b} - \mathbf{a})$$

Must collect terms

A1

(b) \overrightarrow{MN} is not a multiple of \overrightarrow{AB}

oe

B1ft

[4]

Q21.

$$\begin{pmatrix} 1 \\ -10 \end{pmatrix}$$

B1

[1]

Q22.

(a) $0.\dot{5}3846\dot{1}$
or $0.\overline{538461}$

B1

Additional Guidance
Mark final answer

(b) $\frac{37}{90}$

B1

[2]

Q23.

(a) $0.5 \times 20 \times 5$ or 50
or
 5×50 or 250
or
 $0.5 \times 40 \times 5$ or 100
or
 $0.5 \times 5 \times (110 + 50)$

oe

Working may be on the diagram

e.g.1 Trapezium rule

e.g.2 Attempt to count squares and convert to a distance

For example

$0.5 \times 2 \times 5 = 5$ and their 5×10

M1

$0.5 \times 20 \times 5 + 5 \times 50 + 0.5 \times 40 \times 5 = 400$

or

$50 + 250 + 100 = 400$

or

$0.5 \times 5 \times (110 + 50) = 400$

oe

A1

(b) **Alternative method 1**

$0.5 \times 60 \times 6$ or 180

oe

Distance for first 60 seconds

M1

$0.5 \times 60 \times 6 + 50 \times 6$ or 480

oe

Distance for first 110 seconds

This mark implies the first M1

$0.5 \times (110 + 50) \times 6$ is M2

M1

480 and Yes

A1

Alternative method 2

$$0.5 \times 60 \times 6 \text{ or } 180$$

oe

Distance for first 60 seconds

M1

$$(400 - \text{their } 180) \div 6 \text{ or } [36, 37]$$

or

$$(400 - \text{their } 180) \div 50 \text{ or } 4.4$$

or

Correctly builds up to a distance ≥ 400

Remaining distance \div speed \rightarrow time

or

Remaining distance \div time \rightarrow speed

M1

[96, 97] and Yes

or

4.4 and Yes

or

Correct time for their build up and Yes

A1

[5]

Q24.

Alternative method 1

$$4x + 10 + 6x - 15 + 60 = 180$$

$$\text{or } 4x + 10 + 6x - 15 = 120$$

oe

M1

$$(x =)12.5$$

oe

A1

$$4 \times \text{their } 12.5 + 10$$

$$\text{or } 6 \times \text{their } 12.5 - 15$$

Dependent on M1

M1dep

$$(x =)12.5$$

A1

$$4 \times 12.5 + 10 = 60$$

$$\text{and } 6 \times 12.5 - 15 = 60$$

$$\text{or } 4 \times 12.5 + 10 = 60$$

$$\text{and } 180 - 60 - 60 = 60$$

$$\text{or } 6 \times 12.5 - 15 = 60$$

$$\text{and } 180 - 60 - 60 = 60$$

Strand (ii)

Accept 60, 60, 60 with 12.5 seen

Q1

Alternative method 2

$$6x - 15 = 4x + 10$$

$$\text{or } 2x = 25$$

oe

M1

$$(x =) 12.5$$

oe

A1

$$4 \times \text{their } 12.5 + 10$$

$$\text{or } 6 \times \text{their } 12.5 - 15$$

Dependent on M1

M1dep

$$60$$

A1

$$4 \times 12.5 + 10 = 60$$

$$\text{and } 6 \times 12.5 - 15 = 60$$

$$\text{or } 4 \times 12.5 + 10 = 60$$

$$\text{and } 180 - 60 - 60 = 60$$

$$\text{or } 6 \times 12.5 - 15 = 60$$

$$\text{and } 180 - 60 - 60 = 60$$

Strand (ii)

Accept 60, 60, 60 with 12.5 seen

Q1

Alternative method 3

$$6x - 15 = 60$$

$$\text{or } 4x + 10 = 60$$

oe

M1

$$(x =) 12.5$$

oe

A1

$$6 \times \text{their } 12.5 - 15$$

$$\text{or } 4 \times \text{their } 12.5 + 10$$

Dependent on M1

M1dep

$$60$$

A1

$$4 \times 12.5 + 10 = 60$$

$$\text{and } 6 \times 12.5 - 15 = 60$$

$$\text{or } 4 \times 12.5 + 10 = 60$$

$$\text{and } 180 - 60 - 60 = 60$$

$$\text{or } 6 \times 12.5 - 15 = 60$$

$$\text{and } 180 - 60 - 60 = 60$$

Strand (ii)

Accept 60, 60, 60 with 12.5 seen

Q1

Alternative method 4

$$6x - 15 = 60$$

oe

M1

$$(x =) 12.5$$

oe

A1

$$4x + 10 = 60$$

Dependent on M1

M1dep

$$60$$

A1

Valid statement

or

$$4 \times 12.5 + 10 = 60$$

$$\text{and } 6 \times 12.5 - 15 = 60$$

$$\text{or } 4 \times 12.5 + 10 = 60$$

$$\text{and } 180 - 60 - 60 = 60$$

$$\text{or } 6 \times 12.5 - 15 = 60$$

$$\text{and } 180 - 60 - 60 = 60$$

Strand (ii)

eg Since both x values are 12.5 then all angles are 60

Accept 60, 60, 60 with both A marks awarded

Q1

[5]

Q25.

$$180 - 85 - 32 \text{ or } 63$$

M1

$$(180 - \text{their } 63) \div 2$$

M1dep

$$58.5 \text{ or } 58 \frac{1}{2}$$

Accept 59 with working shown

A1

[3]

Q26.

$$15.75 \leq x < 15.85$$

B1

[1]

Q27.

Alternative method 1

$$\frac{AD}{\sin(180 - 32)} = \frac{40}{\sin(32 - 26)}$$

M1

$$\frac{40}{\sin(32 - 26)} \times \sin(180 - 32)$$

or 202.7... or 202.8

M1dep

$$\sin 26 = \frac{h}{\text{their } 202.8}$$

M1

$$\text{their } 202.8 \times \sin 26$$

M1

$$[88.89, 88.9] \text{ or } 89$$

A1

Alternative method 2

$$\frac{BD}{\sin 26} = \frac{40}{\sin(32 - 26)}$$

M1

$$\frac{40}{\sin(32 - 26)} \times \sin 26$$

or 167.7... or 167.8

M1dep

$$\sin 32 = \frac{h}{\text{their } 167.8}$$

M1

$$\text{their } 167.8 \times \sin 32$$

M1

$$[88.89, 88.9] \text{ or } 89$$

A1

Alternative method 3

$$BC \tan 32 = (BC + 40) \tan 26$$

oe

M1

$$(BC =) \frac{40 \tan 26}{\tan 32 - \tan 26}$$

or 142.26... or 142.3

M1dep

$$(AC =) \text{their } 142.26... + 40$$

or 182.26... or 182.3

$$\tan 32 = \frac{h}{142.26}$$

M1

their $182.26... \times \tan 26$
or their $142.26 \times \tan 32$

M1

[88.89, 88.9] or 89

A1

Alternative method 4

$$h = BC \tan 32$$

$$\text{and } h = (BC + 40) \tan 26$$

oe

M1

$$h = \left(\frac{h}{\tan 32} + 40 \right) \tan 26$$

$$\text{Using } BC = \frac{h}{\tan 32}$$

M1dep

$$h \tan 32 =$$

$$h \tan 26 + 40 \tan 26 \tan 32$$

M1

$$\left(\frac{40 \tan 26 \tan 32}{\tan 32 - \tan 26} \right)$$

M1

[88.89, 88.9] or 89

A1

[5]

Q28.

(a) $\frac{3}{4}$

oe

B1

(b) **Alternative method 1**

$$6 \div 4 \text{ or } 1.5 \text{ or } 4 \div 6 \text{ or } \frac{2}{3}$$

or

$$4 \div 3 \text{ or } \frac{4}{3} \text{ or } 3 \div 4 \text{ or } \frac{3}{4}$$

oe

M1

4.5

A1

Alternative method 2

$$\frac{y}{6} = \text{their } \frac{3}{4}$$

oe

M1

4.5

ft their $\tan x$ from (a)

A1ft

Alternative method 3

\tan^{-1} (their $\frac{3}{4}$) or [36.8, 36.9]

This could be on the diagram or seen in part (a)

M1

4.5

ft their $\tan x$ from (a)

A1ft

Additional Guidance

For M1, accept $\frac{2}{3}$ or $\frac{4}{3}$ given as a decimal truncated or rounded to 2dp or better
Award both marks for an answer of 8 in part (b) unless an incorrect statement is made; eg

M0A0

in (a), $\tan x = \frac{4}{3}$, in (b), $\frac{3}{4} = \frac{y}{6}$, answer 4.5

M1A1

in (a), $\tan x = \frac{4}{3}$, in (b), $\tan x = \frac{6}{y}$ (incorrect), $\frac{4}{3} = \frac{6}{y}$, answer 4.5

M0A0

in (a), $\tan x = \frac{4}{3}$, in (b), $\tan x = \frac{y}{6}$, $\frac{4}{3} = \frac{y}{6}$, answer 8

M1A1ft

If the answer line is blank, but 4.5 is seen correctly embedded or as the correct length on the diagram, award only the method mark

M1A0

In alt 2 and alt 3 their $\tan x$ must be a value for $\tan x$ and not a value for x

[3]

Q29.

use of tan

M1

$$\tan x = \frac{5}{10} \text{ or } \tan x = \frac{10}{5}$$

oe

M1dep

26.5(6...) or 26.57
or 26.6 or 27

63.4... or 63

A1

153.(...)

SC3 for 333.(...)

A1

Additional Guidance

Scale drawing with answer 153.(...)

4 marks

Scale drawing giving angle of 27 or 63

3 marks

154 on its own

M0

26 on its own

M0

Use of Pythagoras' theorem giving 11.18 or 11.2 and use of $\sin x$ or $\cos x$

M1

Use of Pythagoras' theorem giving 11.18 or 11.2 on its own

M0

[4]

Q30.

Angle $BCD = 2x$

Opposite angles of parallelogram are equal

M1

Angle $FCE = 360 - 90 - 90 - 2x$

or Angle $FCE = 180 - 2x$

oe

Angles at a point sum to 360°

M1

Angle $CFE = y$

or Angle $FCE = 180 - 2y$

oe

eg $2y + FCE = 180$

Isosceles triangle

M1

$180 - 2x + y + y = 180$

oe

Angles in a triangle sum to 180°

M1

$2y = 2x$

$y = x$

*All reasons **must** be stated*

A1

[5]

Q31.(a) **Alternative method 1**

(6, 8) identified

*May be on diagram***M1**

$$\frac{1}{2} \times 6 \times \text{their } 8$$

M1

24

A1**Alternative method 2**

$$\frac{1}{2} \times 3 \times 4 \text{ or } 6$$

M1their 6×2^2 or their 6×4 **M1**

24

A1

(b) (It is) larger

*oe**My answer was too small***B1****[4]****Q32.**

$$\angle CDB = 180 - 52 - 100 \text{ or } 28$$

$$\text{or } \angle ABD = 180 - 52 - 100 \text{ or } 28$$

*oe***M1**

$$\angle ADB = 180 - 124 - \text{their } 28$$

$$= 28$$

*oe***M1dep**

$$\angle ABD = 28 \text{ and } \angle ADB = 28$$

and isosceles or two angles equal

A1**[3]****Q33.**

$$(a) (\angle PCD \text{ or } \angle BAD \Rightarrow) 180 - 130 \text{ or } 50$$

or

$$(\angle CDA \Rightarrow) 130 \text{ or } (\angle APB \Rightarrow) 35$$

or

$$(\angle PDA \text{ or } \angle DPC \Rightarrow) 180 - 100 - 35$$

or 45

May be on diagram

M1

$$(\angle PCD \Rightarrow) 180 - 130 \text{ or } 50 \text{ and}$$

$$(\angle DPC \Rightarrow) 180 - 100 - 35 \text{ or } 45$$

or

$$(\angle CDA \Rightarrow) 130 \text{ and}$$

$$(\angle PDA \Rightarrow) 180 - 100 - 35 \text{ or } 45$$

May be on diagram

M1

85

A1

Additional Guidance

The angle being calculated must be clear from the diagram or working

(b) 15

B1

[4]

Q34.

Alternative method 1

$$\cos 40^\circ = \frac{y}{100} \text{ or } 100 \cos 40^\circ$$

$$\text{or } \sin 50^\circ = \frac{y}{100} \text{ or } 100 \sin 50^\circ$$

or 76.6(0...)

Any letter

y is the vertical side

May be seen on diagram

M1

$$\sin 40^\circ = \frac{x}{100} \text{ or } 100 \sin 40^\circ$$

$$\text{or } \cos 50^\circ = \frac{x}{100} \text{ or } 100 \cos 50^\circ$$

$$\text{or } \tan 40^\circ = \frac{\text{their } y}{\text{their } x} \text{ or}$$

$$\text{their } y \times \tan 40^\circ$$

$$\text{or } \tan 50^\circ = \frac{\text{their } y}{x}$$

$$\text{or } \frac{\text{their } y}{\tan 50^\circ}$$

$$\text{or } \sqrt{100^2 - \text{their } y^2}$$

$$\text{or } [64.27, 64.3]$$

Any letter

x is the horizontal side
May be seen on diagram

M1

$$\text{their } 64.3^2 + 120^2 - 2 \times \text{their } 64.3 \times 120 \times \cos 30^\circ$$

$$\text{or } [5169, 5172.4]$$

M1

$$\sqrt{\text{their } [5169, 5172.4]}$$

$$\text{or } [71.8, 71.92]$$

Dependent on third M1
May be seen on diagram

M1dep

$$\frac{\text{their } 76.6 + \text{their } [64.27, 64.3] + \text{their } [71.8, 71.92] + 100 + 120}{50}$$

M1dep

9

A1

Alternative method 2

$$\sin 40^\circ = \frac{x}{100} \text{ or } 100 \sin 40^\circ$$

$$\text{or } \cos 50^\circ = \frac{x}{100} \text{ or } 100 \cos 50^\circ$$

$$\text{or } [64.27, 64.3]$$

Any letter
 x is the horizontal side
May be seen on diagram

M1

$$\cos 40^\circ = \frac{y}{100} \text{ or } 100 \cos 40^\circ$$

$$\text{or } \sin 50^\circ = \frac{y}{100} \text{ or } 100 \sin 50^\circ$$

$$\text{or } \tan 40^\circ = \frac{\text{their } x}{y} \text{ or } \frac{\text{their } x}{\tan 40}$$

$$\text{or } \tan 50^\circ = \frac{y}{\text{their } x} \text{ or}$$

$$\text{or their } x \times \tan 50^\circ$$

$$\text{or } \sqrt{100^2 - \text{their } x^2}$$

$$\text{or } 76.6(0\dots)$$

Any letter
 y is the vertical side
May be seen on diagram

M1

$$\text{their } 64.3^2 + 120^2 - 2 \times \text{their } 64.3 \times 120 \times \cos 30^\circ$$

$$\text{or } [5169, 5172.4]$$

M1

$$\sqrt{\text{their } [5169, 5172.4]}$$

or [71.8, 71.92]

Dependent on third M1
May be seen on diagram

M1dep

$$\frac{\text{their } 76.6 + \text{their } [64.27, 64.3] + \text{their } [71.8, 71.92] + 100 + 120}{50}$$

M1dep

9

A1

Additional Guidance

First 2 M marks
 Sides have been transposed

M0 M0

Third M1 is not dependent

[6]

Q35.

$$\frac{1}{2}x^2 = 4 \text{ or } x^2 = 8$$

oe any letter
May be implied

M1

$$\sqrt{4 \times 2} \text{ or } \sqrt{8}$$

$$\text{or } 2\sqrt{2} \text{ or } 2.8(28\dots) \text{ or } 2.83$$

M1

(hypotenuse =)

$$\sqrt{(\sqrt{\text{their } 8})^2 + (\sqrt{\text{their } 8})^2}$$

$$\text{or } \sqrt{8+8} \text{ or } \sqrt{16} \text{ or } 4$$

M1

$$4 + 2\sqrt{8} \text{ or } 4 + 4\sqrt{2}$$

$$\text{or } 4 + (1)\sqrt{32}$$

A1

Additional Guidance

Condone $\pm \sqrt{8}$ and $\pm \sqrt{16}$ etc for 2nd and/or 3rd M1

[4]