St. Patrick's High School, Keady

Mathematics Department

GCSE Mathematics Practice Booklet

M3

Topic 3 –Geometry and Measures 1

Perimeter, Area & Volume

Pythagoras' Theorem

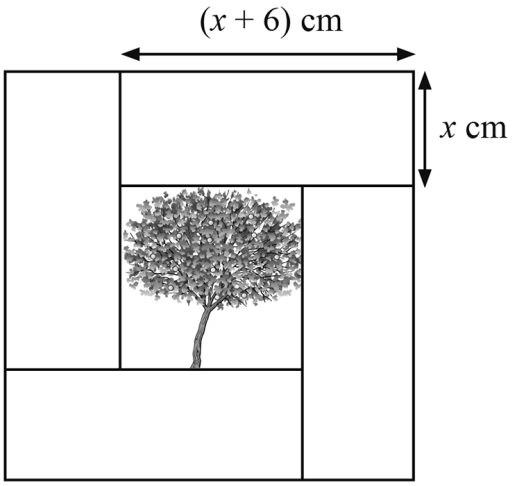
Trigonometry

Questions taken from CCEA Past Papers

Mark Scheme included at the end of this booklet

Q1 Four identical rectangular tiles surround a picture as shown in the diagram to form a frame.

The sides of the rectangular tile are x cm and $(x + 6)$ cm.



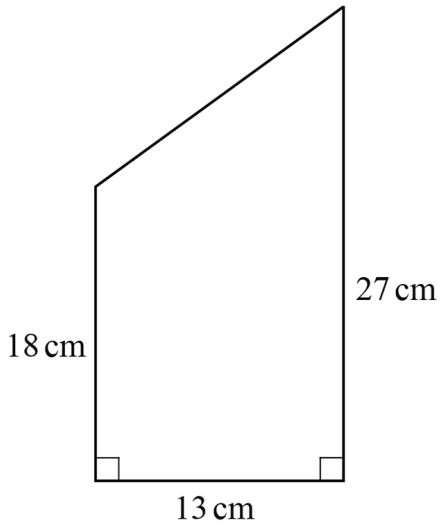
(a) Find a formula for the perimeter P of the frame in its simplest form.

Answer P = _____ [2]

(b) What is the area of the picture?

Answer _____cm^2 [2]

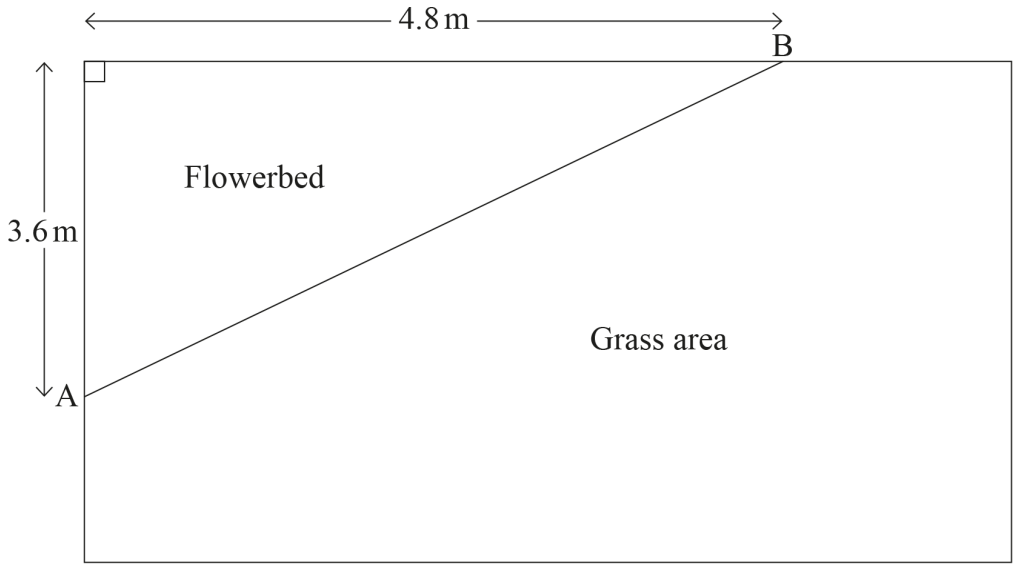
Q2 Find the area of this trapezium.



Answer _____ cm^2 [2]

Q3 A garden has a flowerbed in the corner.

A diagram of the garden is shown below.



(a) Calculate the area of the flowerbed.

Answer _____ m^2 [2]

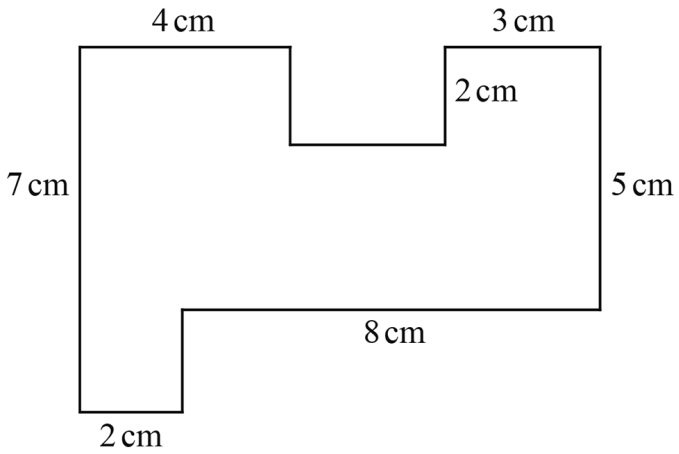
(b) There is a fence along the line AB separating the flowerbed from the grass area.

How long is the fence?

Answer _____ m [3]

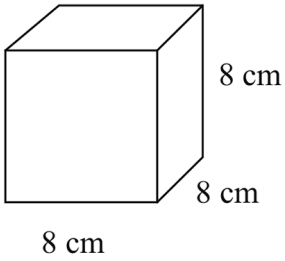
Q4 Calculate the area of the shape shown below.

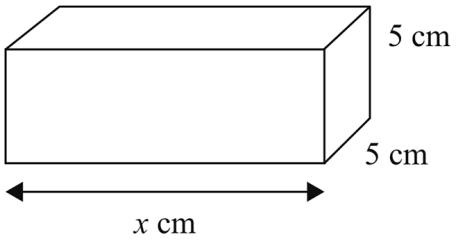
diagram not drawn to scale



Answer _____ cm^2 [3]

Q5

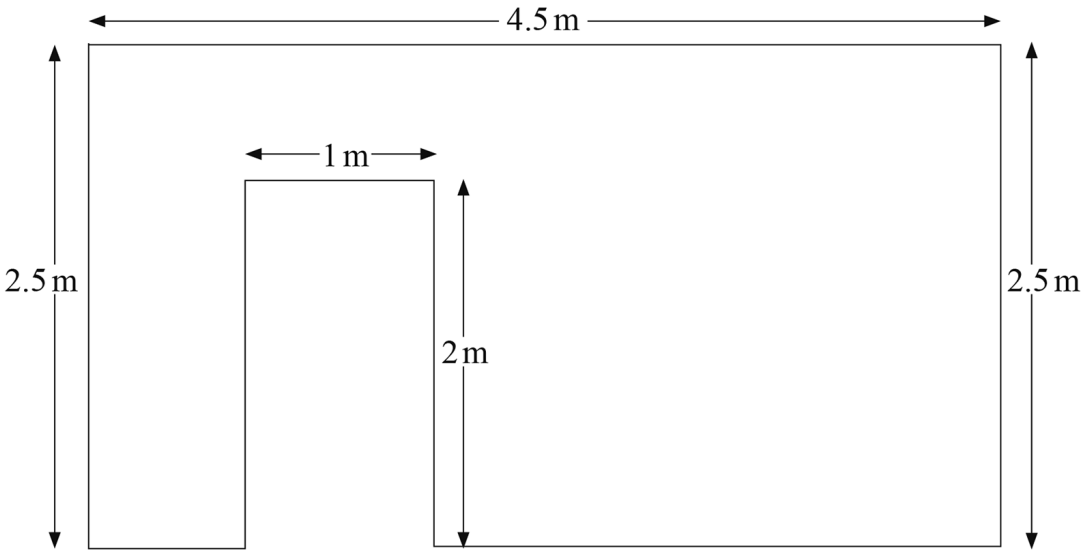




The surface area of a cube of side length 8 cm is the same as the surface area of the cuboid shown.
Find the value of the side marked x cm.

Answer _____ cm [4]

Q6



The diagram above represents a wall with an open entrance.

All the lines are either horizontal or vertical.

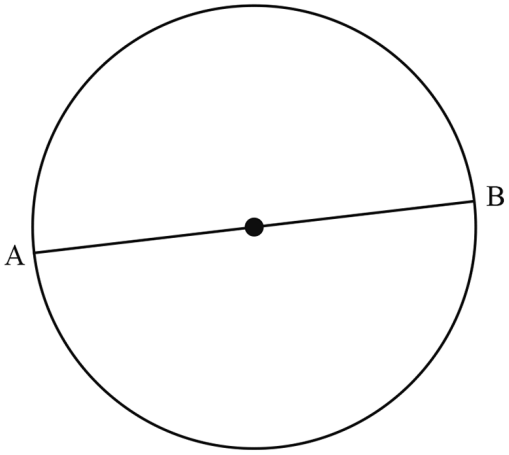
(a) Work out the perimeter.

Answer _____ m [1]

(b) Work out the area.

Answer _____ m^2 [2]

Q7

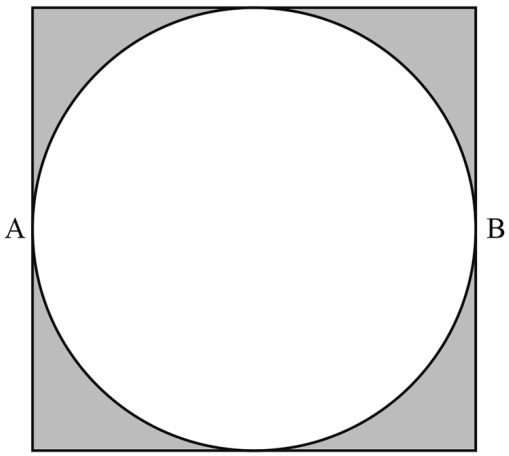


(a) AB is a diameter of the circle. AB is 13 cm.

Calculate the area of the circle.

Answer _____ [3]

(b) This circle is now set inside a square as shown. Find the shaded area.



Answer _____ [2]

Q8 **(a)** Calculate the circumference of a circle with diameter 2 m.

Answer _____ m [2]

(b) Hence calculate the perimeter of the window below, which is made up of a semicircle and a rectangle.

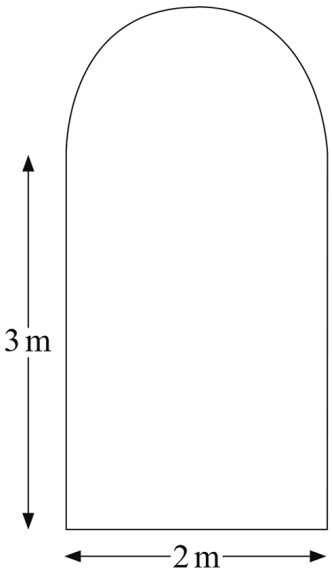


diagram not
drawn accurately

Answer _____ m [2]

Q9 Find the area of this triangle.

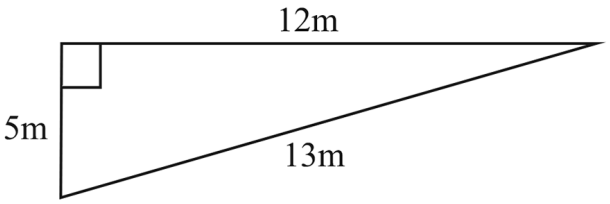
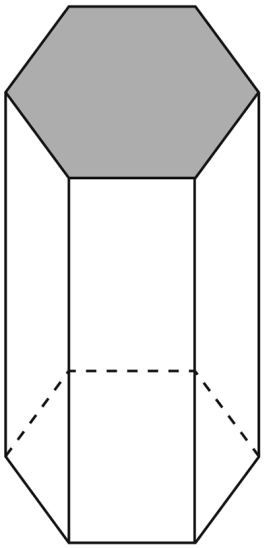


diagram not
drawn accurately

Answer _____ m^2 [3]

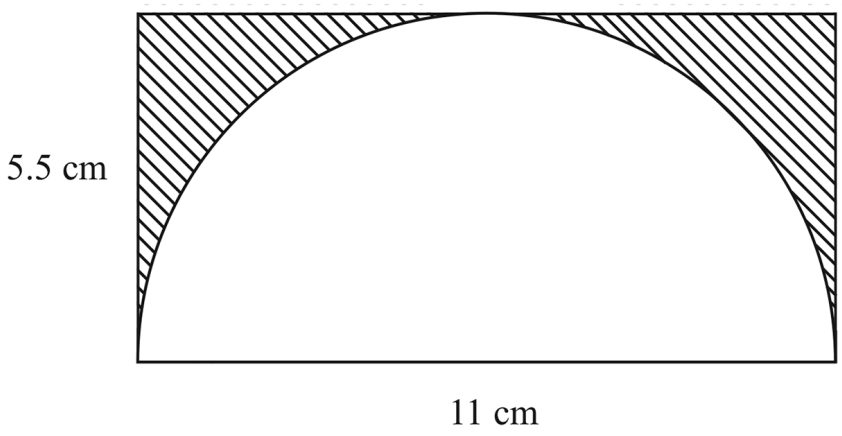
Q10 A pillar is in the shape of a hexagonal prism as shown below.



The area of the shaded cross section is $960\,cm^2$
The height of the pillar is $1.2\,m$.
Calculate the volume of the pillar.

Answer _____ [3]

Q11 The diagram shows a semicircle inside a rectangle.



Work out the area of the shaded region.

Answer _____ cm^2 [3]

Q12

Find the area of the kite below.

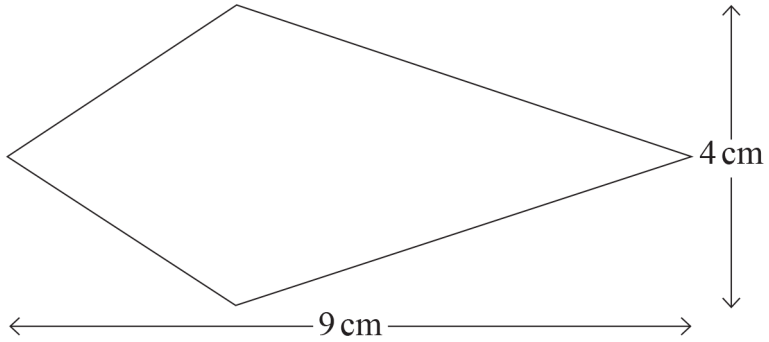


diagram
not drawn
to scale

Answer _____ cm^2 [2]

Q13 The front door of Martin's house is wooden.

The top of the door is a semicircle.

It has a window in the shape of a rhombus as shown in the diagram.

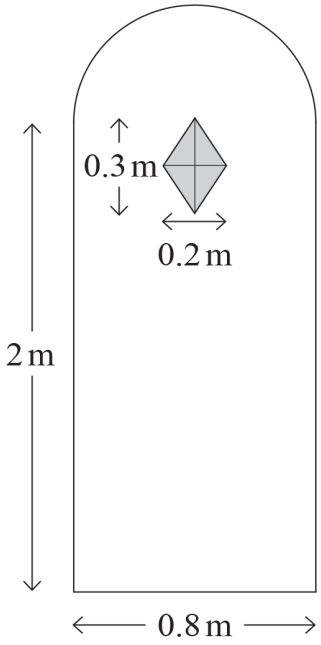


diagram
not drawn
accurately

What is the area of the wooden part of the door?

Answer _____ m^2 [5]

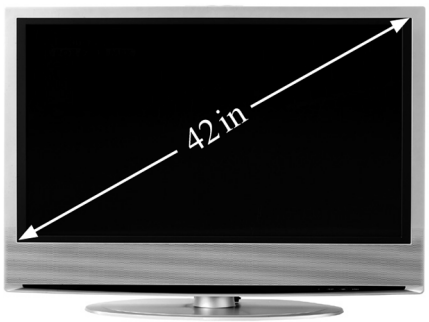
Q14

The size of a television is given as the length of the diagonal of the screen.

This television has a size of 42 inches.

The height of the screen is 20.4 inches.

What is the width of the screen?



Answer _____ inches [3]

Q15 The area of the right-angled triangle PQR is $24m^2$

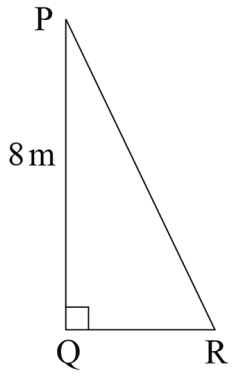


diagram not drawn accurately

Calculate the length of PR.

Show all your working.

Answer _____ m [4]

Q16

ABCD is a square of side 6 cm.

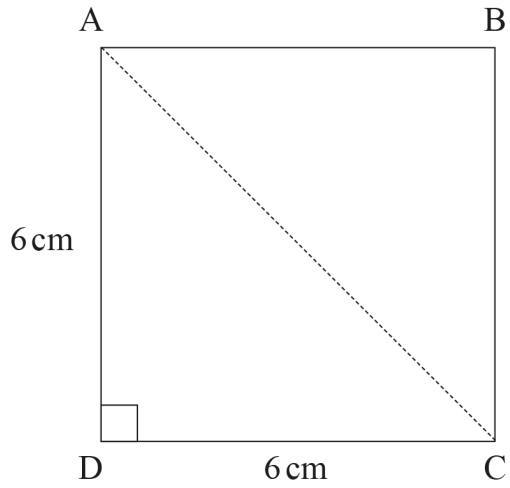


diagram not drawn accurately

How much longer is AC than AD?

You must show all your working.

Answer _____ cm [4]

Q17

Leah walks 4.7 m in a straight line.

She then turns 90° clockwise and walks 2.5 m in another straight line.

How far is Leah from where she started?

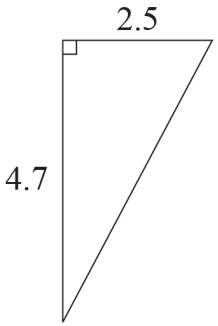


diagram not drawn accurately

Answer _____ m [3]

Q18

A sports referee trains by running diagonally across a rectangular pitch, as shown in the diagram below.

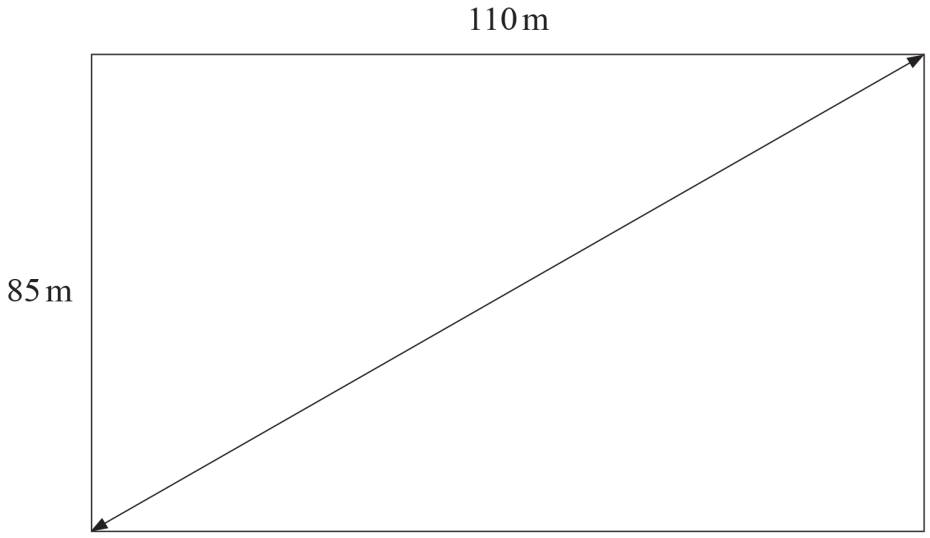


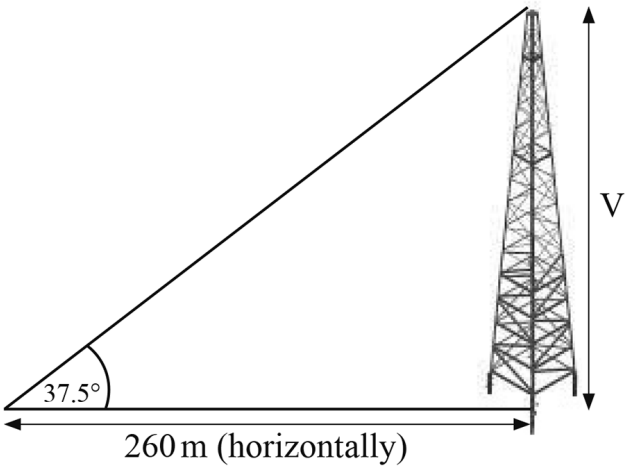
diagram not drawn to scale

The referee wants to run a distance of **at least** 1 km.

How many diagonal runs are needed?

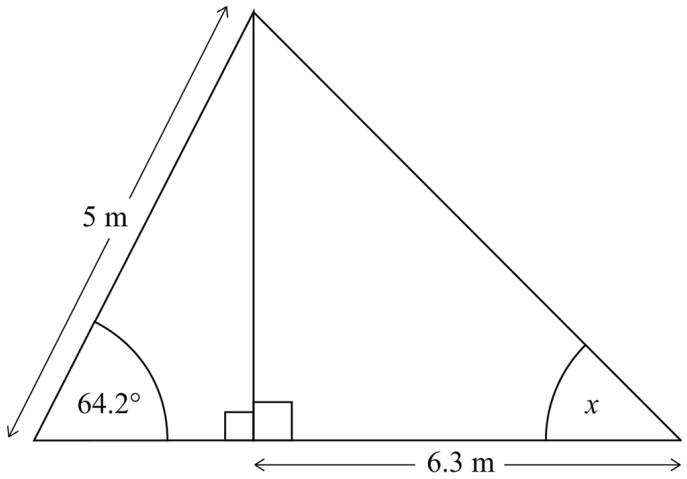
Answer _____ [5]

Q19 Calculate the height V of this vertical radio mast.



Answer _____ m [3]

Q20 Find the value of the angle marked x in the triangle shown.



Answer x = _____ ° [6]

Q21

PQR is a right-angled triangle.

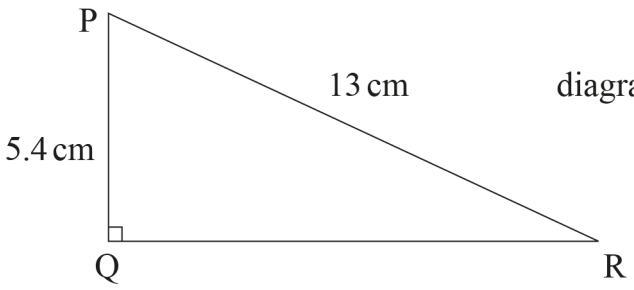


diagram not drawn accurately

By how many degrees is angle P bigger than angle R?

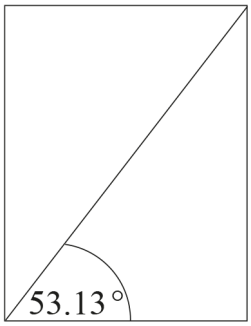
Give your answer to the nearest degree.

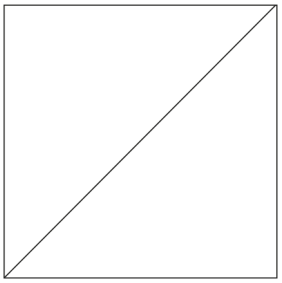
Show all your working clearly.

Answer _____ ° [5]

Q22

A rectangle and a square have the same length of diagonal.





diagrams not drawn accurately

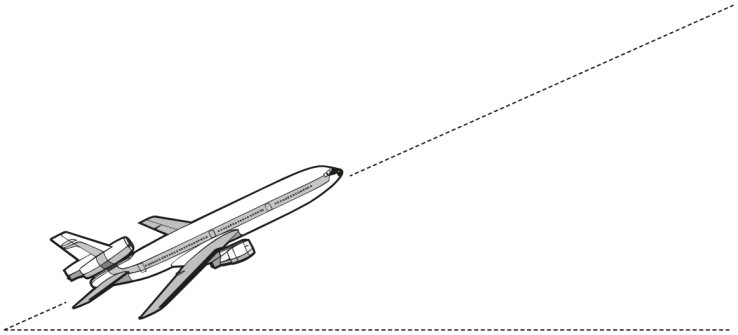
Calculate the length of the side of the square.

Give your answer correct to 1 decimal place.

Answer _____ cm [6]

Q23

After take-off, an aircraft flies for 16 km at an angle of 24° to the horizontal.



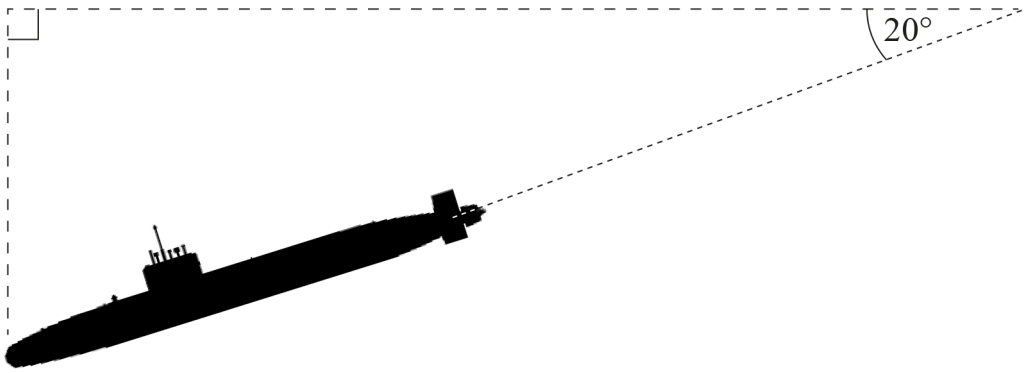
Calculate the height it reaches.

Answer _____ km [3]

Q24

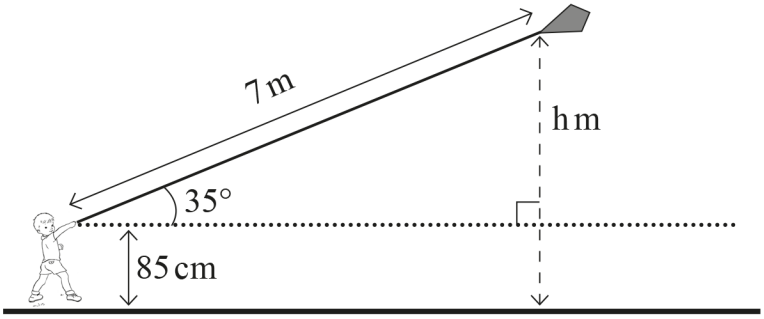
A submarine makes a diving angle of 20° below the horizontal as shown.
It travels at a constant speed of 12 m/s.

Work out how deep the front end of the submarine is after one minute.



Answer _____ m [4]

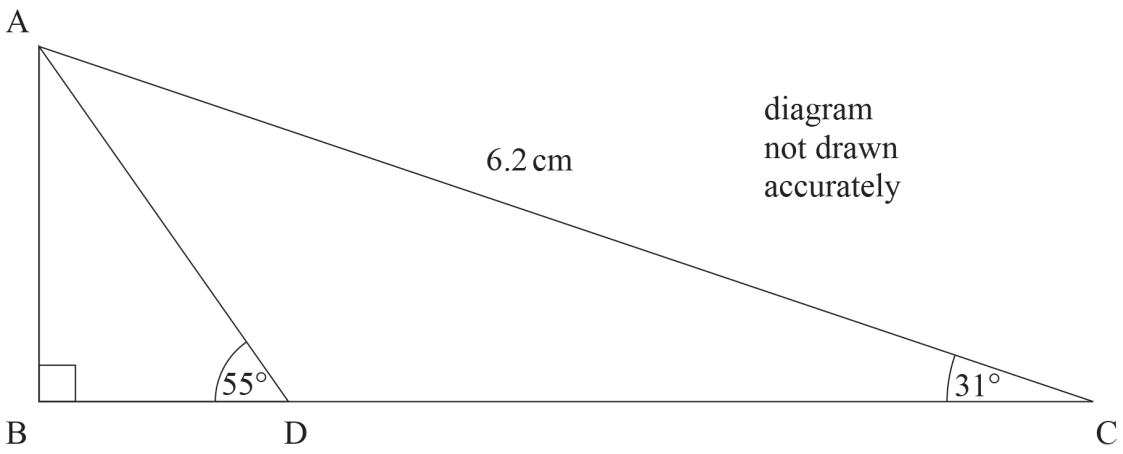
Q25 A boy is flying a kite as shown in the diagram.



Calculate h, the height of the kite above the ground.

Answer _____ m [4]

Q26



ABC is a right-angled triangle with angle BCA = 31°

AC = 6.2 cm

D is a point on the line BC such that angle ADB = 55°

Calculate the length of the line BD.

Give your answer to 3 significant figures.

Answer _____ cm [4]

1. **(a)** $4(x + 6) + 4x = 8x + 24$ M1 A1

(b) $6 \times 6 = 36$ M1 A1

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2. $\frac{1}{2}(18 + 27) \times 13$ M1

292.5 A1

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3. **(a)** $(3.6 \times 4.8) \div 2$ M1

8.64 A1

(b) $3.6^2 + 4.8^2$ MA1

36 M1

6 A1

4.

Identifying unknown lengths – horizontal 3 and vertical 2	A1
$(10 \times 7) - (3 \times 2) - (8 \times 2)$	MA1
$= 48$	A1

Alternatively

Identifying unknown lengths – horizontal 3 and vertical 2	A1
$(2 \times 4) + (2 \times 3) + (2 \times 2) + (10 \times 3)$	MA1
$= 48$	A1

5.

Surface area of cube $= 64 \times 6 = 384$	MA1
Surface area of cuboid $= 20x + 50$	MA1
$20x + 50 = 384 \quad 20x = 334$	MA1
$x = 16.7$cm	A1

6.

(a)	18	A1
(b)	$(4.5 \times 2.5) - (2 \times 1)$	M1
	$11.25 - 2 = 9.25$	A1

7.

(a) Radius = 6.5 cm
Area = $\pi \times 6.5^2$ MA1
$= 132.7(32\ldots)\,\text{cm}^2$ A1, A1 (units)

(b) Area of square = $13^2 = 169$ MA1
Area between square and circle = 169 – 132.7 = 36.3 A1
Do not penalise for units in **(b)**

8.

(a) $\pi \times 2$ MA1

6.2(83185307) A1

(b) 3.14 + 3 + 2 + 3 MA1

11.14(1592654) A1

9.

$\frac{1}{2} \times 5 \times 12$ M1 A1

30 A1

10.

960 × 120 **or** 0.096 × 1.2 M1

115 200 cm^3 0.1152 m^3 A1 A1 units

(an attempt to multiply 960 by 1.2 gains first mark only and no units mark)

11.

$\pi \times 5.5^2 = 95.033$ or 60.5	MA1
$\frac{1}{2} \times \pi \times 5.5^2 = 47.5166$	MA1
$60.5 - 47.5166 = 12.98$	MA1

12.

$0.5 \times 9 \times 4$	MA1
18	A1

13.

Area $= 2 \times 0.8$	MA1
$+ \frac{1}{2} \times \pi \times 0.4^2$	MA2
$- \frac{1}{2} \times 0.2 \times 0.3$	MA1
$= 1.82(1327412)$	A1

14.

$w^2 + 20.4^2 = 42^2$ **or** $w^2 = 42^2 - 20.4^2$	MA1
$w^2 = 1347.84$	A1
$w = 36.7$ (129405)	A1

15.

$\frac{1}{2} \times \text{base} \times 8 = 24$

$\text{base} = 6$ MA1

$PR = 6^2 + 8^2$ M1

$PR = 100$ A1

$PR = \sqrt{100} = 10$ MA1

16.

$AC^2 = 6^2 + 6^2$ MA1

$AC^2 = 72$

$AC = \sqrt{72}$ MA1

$AC = 8.485$ A1

$8.49 - 6 = 2.49\,\text{cm}$ MA1

17.

$x^2 = 4.7^2 + 2.5^2$ M1 A1

$x = 5.32(3532662)$ A1

18.

$85^2 + 110^2$	M1
$\sqrt{19325}$	MA1
139.014…..	A1
1000 ÷ 139.014….. = 7.193…..	MA1
8	A1

19.

$\text{Tan}\left(37.5 = \frac{V}{260}\right)$	MA1
260 tan 37.5 = V	MA1
199.5 (050169)	A1

20.

sin 64.2 = h/5	MA1
h = 5 sin 64.2	A1
h = 4.50159 …	A1
tan$x$ = 4.50159 …/6.3	M1A1
x = 35.547…	A1

21.

$\cos P = \frac{5.4}{13}$		M1 A1
$P = 65.45646012$		A1
$R = 24.54353988$		A1
$41°$		A1
alternative solution		
$\sin R = \frac{5.4}{13}$		M1 A1
$R = 24.54353988$		A1
$P = 65.45646012$		A1
$41°$		A1

22.

cos identified		A1
$\cos 53.13 = \frac{9}{x}$	Part of both solutions	MA1
$x = 14.99996427$ (15)		A1
$x^2 + x^2 = 225$	either 3 here	MA1
$x^2 = 112.5$		MA1
$x = 10.6$		MA1
alternative solution		
$\cos 45 = \frac{x}{15}$	or 3 here	MA1
$x = 15 \cos 45$		MA1
$= 10.6$		MA1

23.

$\sin 24 = \frac{x}{16}$ MA2

$x = 6.5\,\text{km}$ A1

24.

Distance travelled in 1 minute = 720 m MA1

$\sin\left(20 = \frac{x}{720}\right)$ MA1

$x = 720 \sin 20$ MA1

$x = 246.25\,\text{m}$ A1

25.

$\sin 35 = \frac{x}{7}$ MA1

$x = 7 \sin 35$ M1

$= 4.015(035054)$ A1

$4.015 + 0.85 = 4.865$ MA1

26.

$\sin 31 = \frac{AB}{6.2}$ MA1

$AB = 3.19(3236064)$ A1

$\tan 55 = \frac{3.19(3236064)}{BD}$ MA1

$BD = 2.24$ A1
