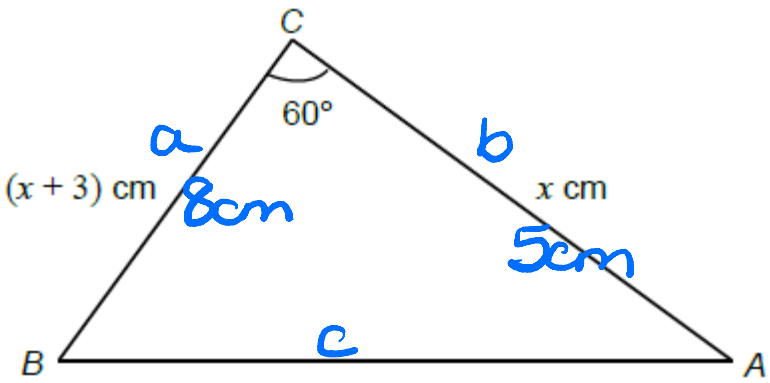
Trigonometry 2 (H)

A collection of 9-1 Maths GCSE Sample and Specimen questions from AQA, OCR, Pearson-Edexcel and WJEC Eduqas.

Name:	Mel@JustMaths
Total Marks:	

1. The area of the triangle is $\sqrt{300}$ cm^2.

$\sqrt{300}$
$= \sqrt{100} \times \sqrt{3}$
$= 10\sqrt{3}$



Calculate the length of AB.

area $= \frac{1}{2} ab \sin C$

$\sqrt{300} = \frac{1}{2} \times (x+3) \times x \times \sin 60$

$10\sqrt{3} = \frac{1}{2} x(x+3) \times \frac{\sqrt{3}}{2}$

$\times 2$ ($\div \sqrt{3}$

$20 = \frac{1}{2}x^2 + \frac{3}{2}x$

$\times 2$ (

$x^2 + 3x - 40 = 0$

$(x+8)(x-5) = 0$

$x = -8 \quad x = 5$

↑ not a solution.

then using

$c^2 = b^2 + a^2 - 2ba\cos C$

$= 5^2 + 8^2 - 2 \times 5 \times 8 \cos 60$

$= 25 + 64 - 80 \times 0.5$

$= 89 - 40$

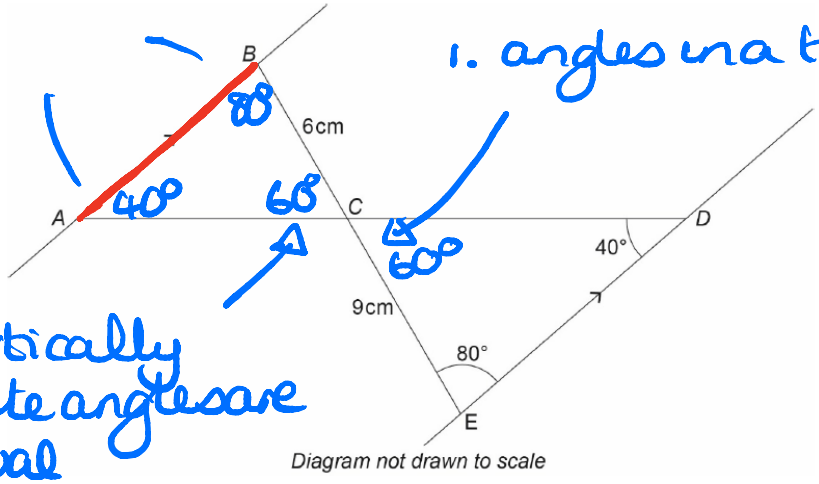
$c = \sqrt{49}$

$c = 7$cm

$\therefore$ AB = 7cm

[8]

2. 3. both of these are alternate angles which are equal



1. angles in a triangle = 180

2. vertically opposite angles are equal

Given that AB is parallel to *ED*, calculate the length of *AB*.

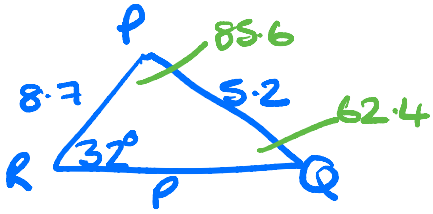
using $\frac{AB}{\sin 60} = \frac{6}{\sin 40} = \frac{AC}{\sin 80}$

$AB = \frac{6}{\sin 40} \times \sin 60 = 8.0837...$

$\therefore AB = 8.1\text{cm}$ (1dp) [4]

3. In triangle RPQ,

RP = 8.7 cm
PQ = 5.2 cm
Angle PRQ = 32°



(a) Assuming that angle PQR is an acute angle, calculate the area of triangle RPQ.

Give your answer correct to 3 significant figures.

using $\frac{\sin 32}{5.2} = \frac{\sin Q}{8.7} = \frac{\sin P}{p}$

$\sin Q = \frac{\sin 32}{5.2} \times 8.7$ $Q = \sin^{-1} 0.886...$

$Q = 62.4°$ (3sf)

$\therefore R\hat{P}Q = 180 - (62.4 + 32) = 85.6°$

area $= \frac{1}{2} \times 8.7 \times 5.2 \times \sin 85.6$

$= 22.55185...$

22.6 (3sf) ..... cm² [4]

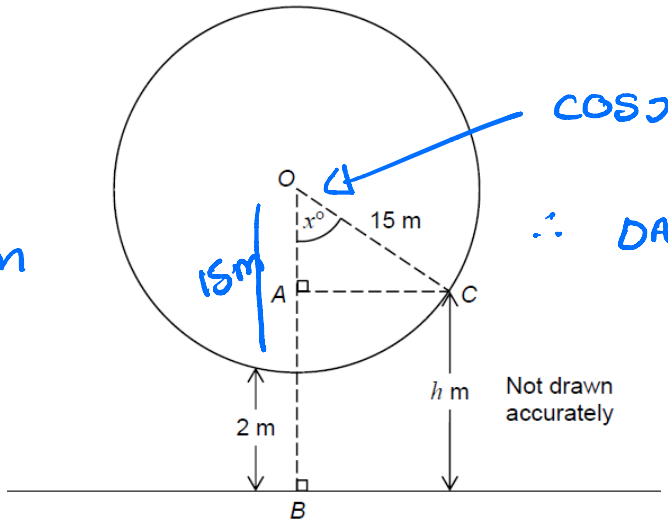
(b) If you did not know that angle PQR is an acute angle, what effect would this have on your calculation of the area of triangle RPQ?

it would be smaller because angle RPQ would be smaller.

[1]

4. A Big Wheel is modelled as a circle with centre *O* and radius 15 metres.
The wheel turns in an anticlockwise direction.

The lowest point on the wheel is always 2 metres above horizontal ground.



$\cos x = \frac{OA}{15}$

$\therefore OA = 15\cos x$

$OB = 15 + 2 = 17m$

(a) *C* is a point on the wheel, *h* metres above horizontal ground.

Angle *COB* = $x°$

Show that $h = 17 - 15\cos x°$

$h = OB - BA$

$= 17 - 15\cos x$ QED

[2]

(b) *D* is a point on the wheel.

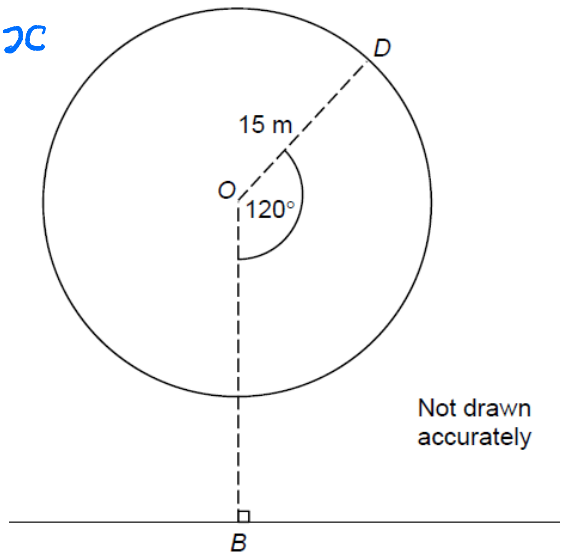
using $h = 17 - 15\cos x$

$= 17 - (15\cos 120°)$

$= 17 - (-7.5)$

$= 17 + 7.5$

$h = 24.5m$

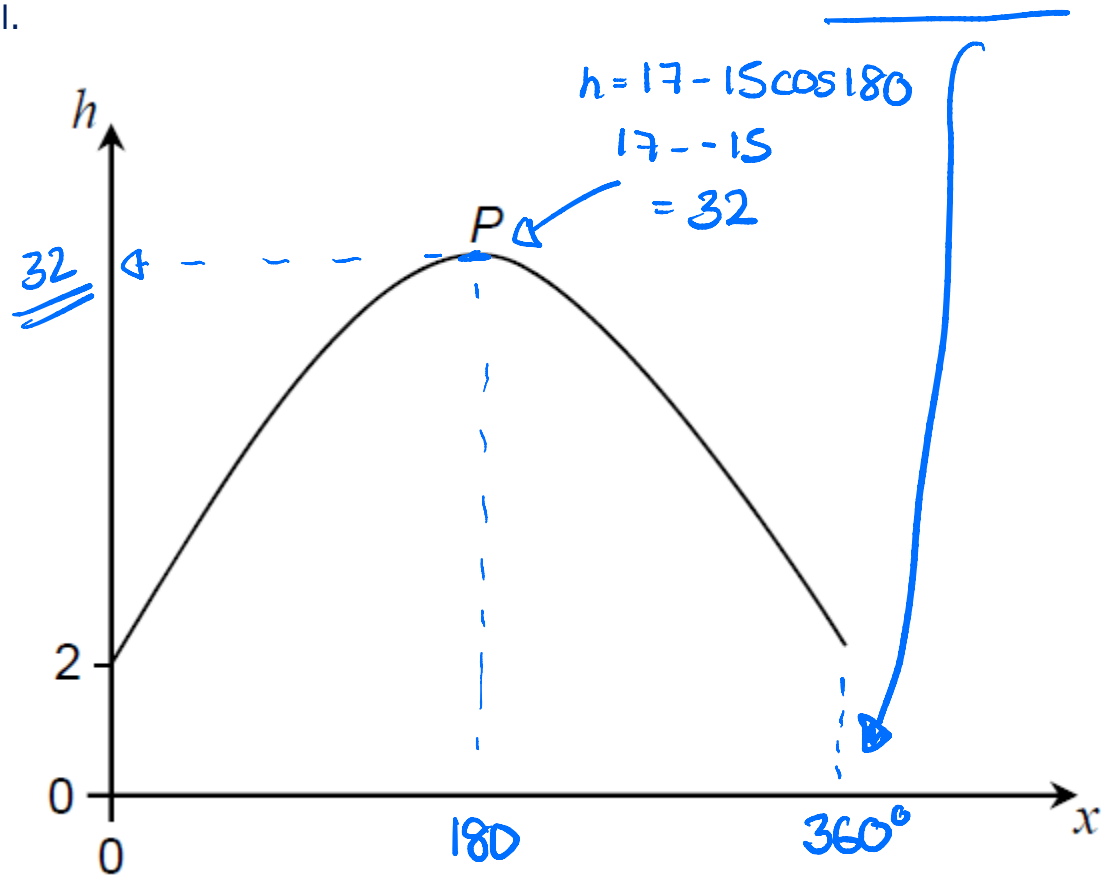


Angle *DOB* = 120°

Work out the height of *D* above horizontal ground.

[2]

(c) Here is a sketch of the graph h = 17 - 15 cos x° for one complete turn of the wheel.



$h = 17 - 15\cos 180$

$17 - -15$

$= 32$

P is the highest point on the graph.

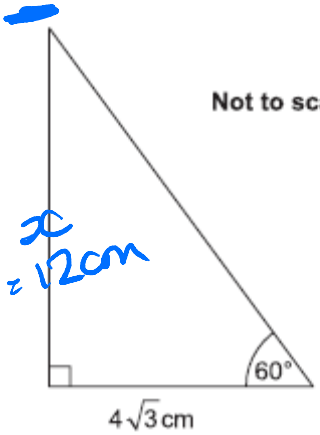
Work out the coordinates of P.

(180° , 32) [2]

5. (a) Write down the exact value of tan 60°.

(a) $\tan 60° = \sqrt{3}$ [1]

(b) Find the exact area of this triangle.



SOH CAH TOA

$\tan 60 = \frac{x}{4\sqrt{3}}$

$\sqrt{3} \times 4\sqrt{3} = x$

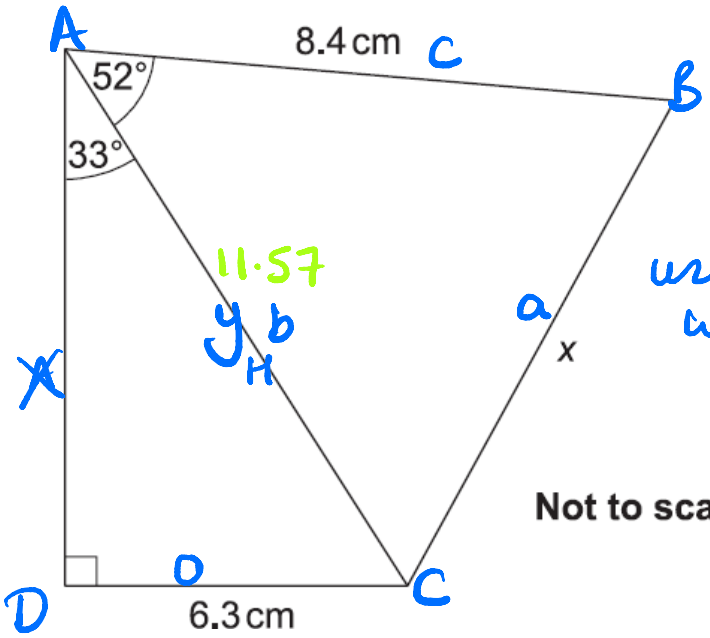
$x = 12$ cm ✓

$\text{area} = \frac{1}{2} \times 4\sqrt{3} \times 12$

$= 24\sqrt{3}$

(b) $24\sqrt{3}$ cm² [4]

6. Calculate x.



Not to scale

triangle ACD

$\sin 33 = \frac{6.3}{y}$

$y = \frac{6.3}{\sin 33} = 11.5672...$

using $a^2 = b^2 + c^2 - 2bc\cos A$ with $\triangle ABC$

$x^2 = 11.57^2 + 8.4^2 - 2 \times 8.4 \times 11.57 \times \cos 52$

$x^2 = 84.720$

$x = 9.204$

9.204 ..... cm [5]

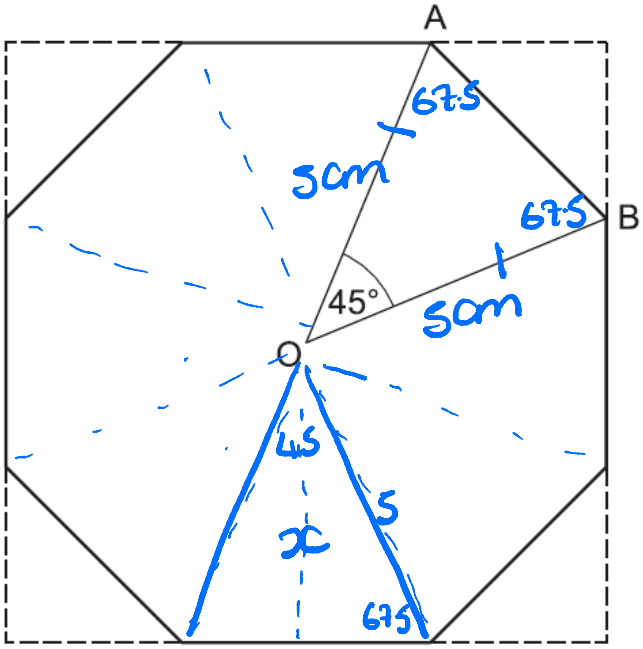
7. Simon cuts the corners off a square piece of card to leave the regular octagon shown below.

O is the centre of the octagon.

A and B are vertices of the octagon.

OA = OB = 5 cm.

Angle AOB = 45°.



Not to scale

$\triangle OAB$ is isosceles so

$180 - 45 = 135 \quad \frac{135}{2} = 67.5$

part (b)

$\sin 67.5 = \frac{x}{5}$

$x = 5\sin 67.5$

$x = 4.619397...$

so height of oval

$= 4.62 \times 2$

$= 9.23879...$

a) (i) Work out the area of the octagon.

area of △ OAB

using $\frac{1}{2}ab\sin C$

$= \frac{1}{2} \times 5 \times 5 \times \sin 45$

$= \frac{25\sqrt{2}}{4}$

octagon $= 8 \times \frac{25\sqrt{2}}{4} = 50\sqrt{2}$

$= 70.7106...$

(a)(i) ....70.7 (3sf).... cm^2 [3]

(ii) Work out the area of the original square piece of card.

using previous work.

area $= 9.238... \times 9.238...$

$= 85.35533...$

(ii) ....85.4.... cm^2 [5]

b) Simon now makes a table top using the card as a model.

The sides of the table top are 8 times as long as the sides of the card model.

Find the ratio of the area of Simon's table top to the area of the card model.

length scale factor = 8

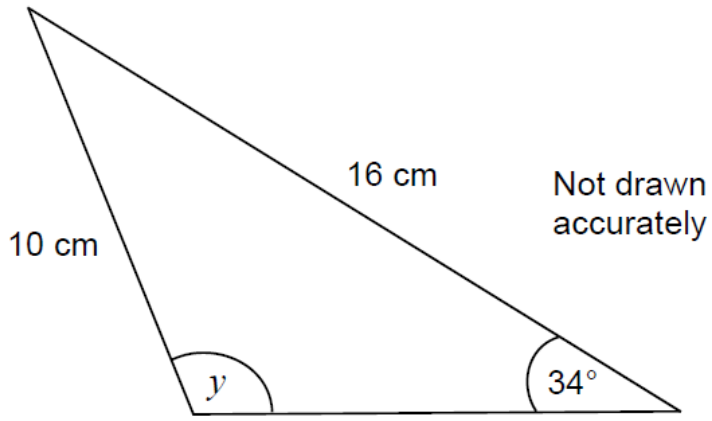
area SF = 8^2

volume SF = 8^3

area of table top : area of model

b) ....64.... : ....1.... [2]

8. In the triangle, angle y is obtuse.



Work out the size of angle y.

using $\frac{\sin 34}{10} = \frac{\sin y}{16}$

$\sin y = \frac{\sin 34 \times 16}{10}$

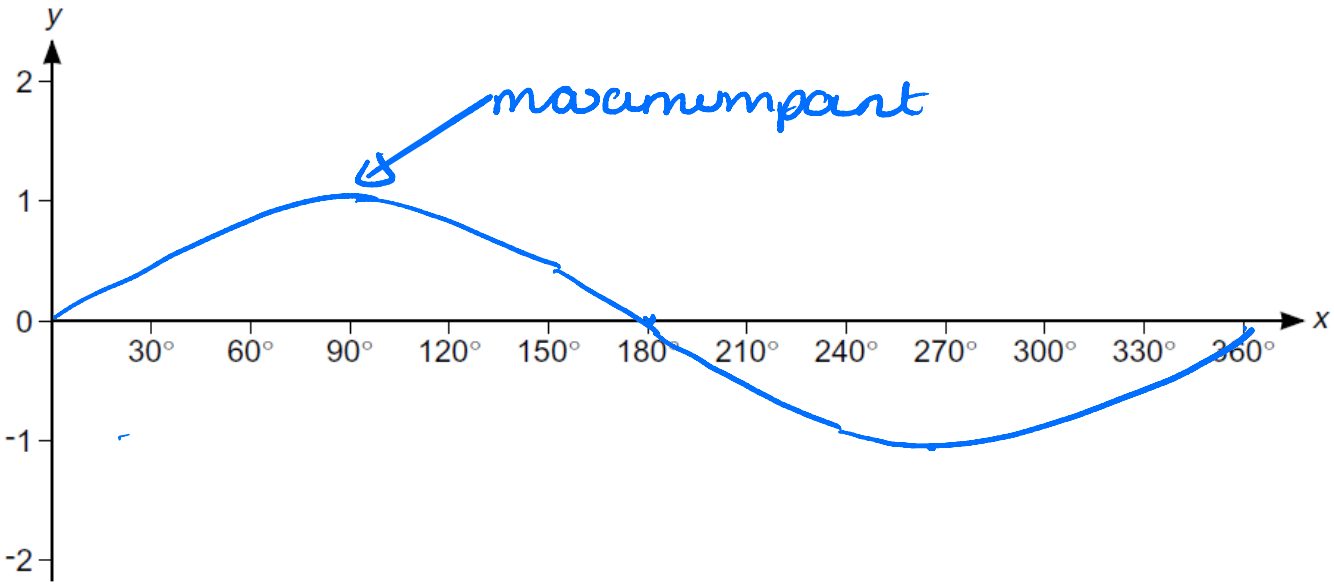
$y = \sin^{-1} 0.894\ldots$

$= 63.47103\ldots$

$= 63.5^\circ$

[3]

9. (a) Sketch the graph of $y = \sin x$ for $0^\circ \leq x \leq 360^\circ$.



[2]

b) (i) Write down the coordinates of the maximum point of $y = \sin x$ for $0^\circ \leq x \leq 360^\circ$.

b)(i) (90° , 1) [1]

ii) Write down the coordinates of the maximum point of $y = 3 + \sin x$ for $0^o \le x \le 360^o$.

ii) (90° , 4) [1]

c) One solution to the equation $4 \sin x = k$ is $x = 60^o$.

i) Find the value of k .

$\sin 60 = \frac{\sqrt{3}}{2}$ $\quad 4 \times \frac{\sqrt{3}}{2} = 2\sqrt{3}$

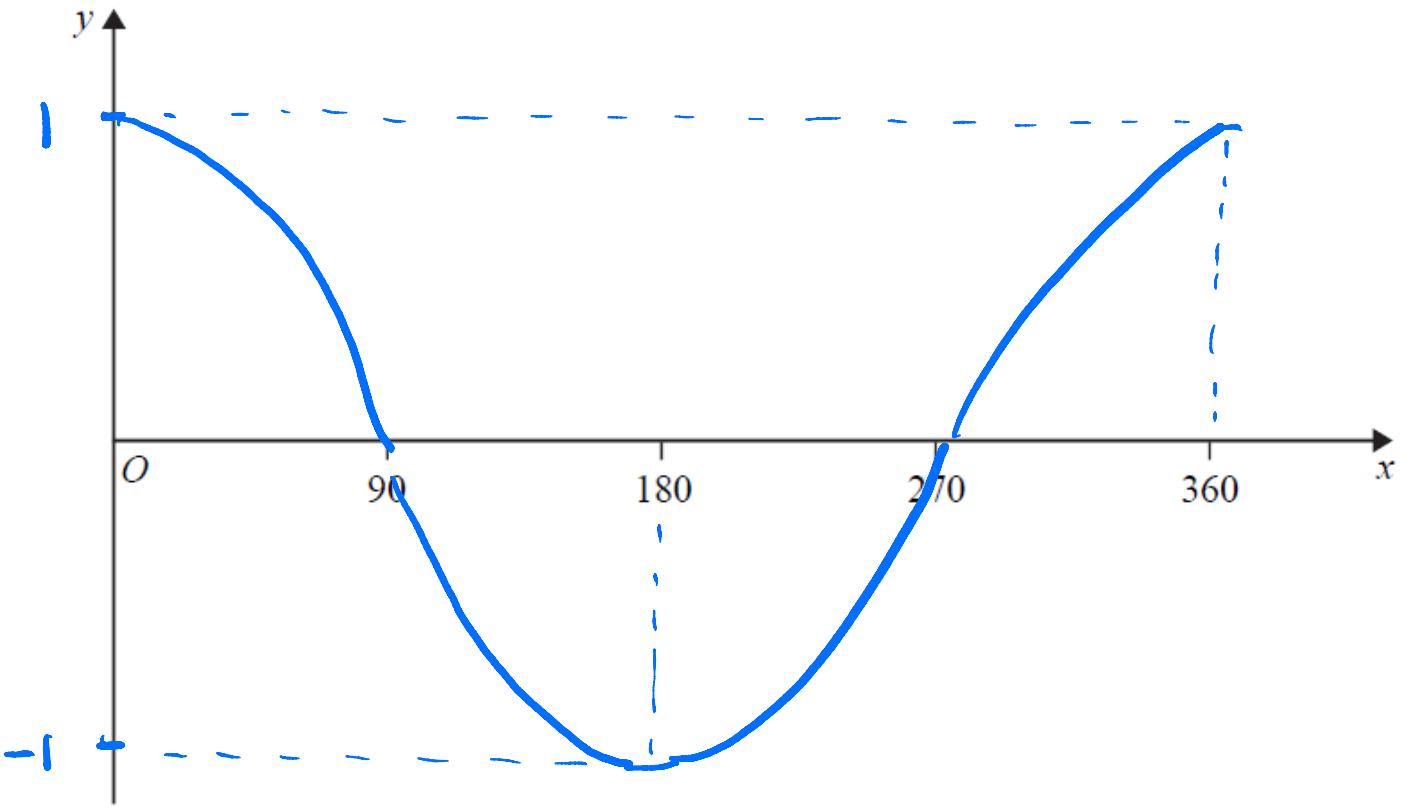
c)(i) k = $2\sqrt{3}$ [2]

ii) Find another solution for x in the range $0^o \le x \le 360^o$.

$\sin x = \frac{\sqrt{3}}{2}$

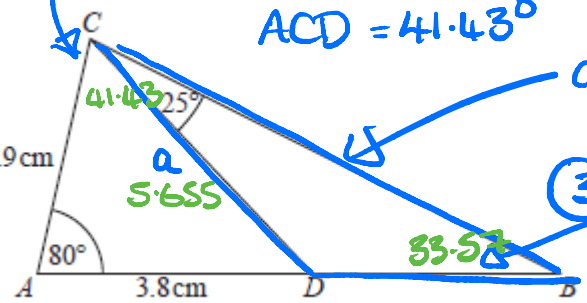
$x = 0 + 60^o$ $\quad x = 180^o - 60 =$ ii) x = 120° ° [1]

10 Sketch the graph of $y = \cos x°$ for $0 \le x \le 360$



[2]

11.



ABC is a triangle.

D is a point on AB.

Work out the area of triangle *BCD*.

Give your answer correct to 3 significant figures.

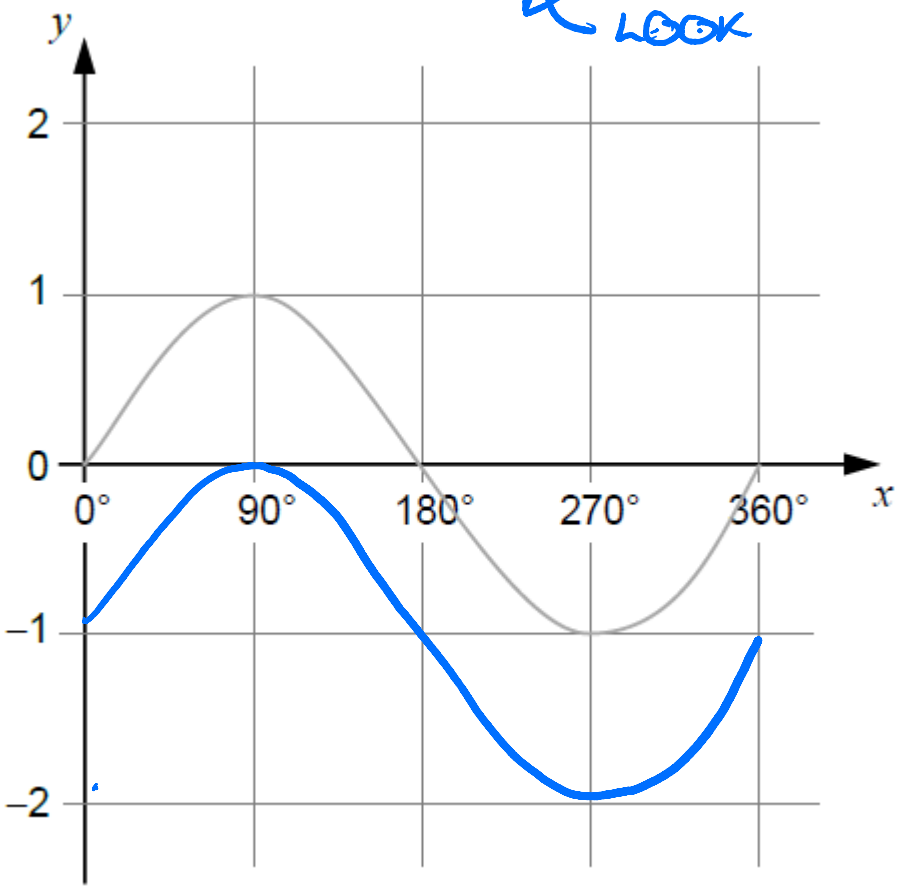
area BCD = area ACB − area ACD

$= \left(\frac{1}{2} \times 8{\cdot}122 \times 4{\cdot}9 \sin 80\right) - \left(\frac{1}{2} 3{\cdot}8 \times 4{\cdot}9 \times \sin 80\right) = 10{\cdot}43$

..... cm^2 [5]

12. a) The graph of y = sin x is shown for 0° ⩽ x ⩽ 360°

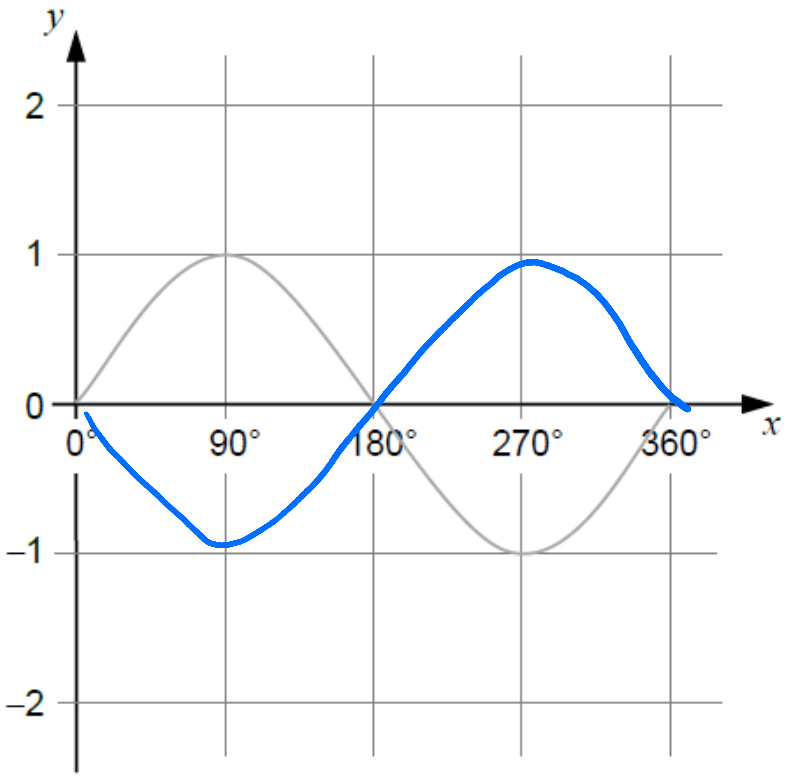
On the grid sketch the graph of y = sin x −1 for 0° ⩽ x ⩽ 360°



[1]

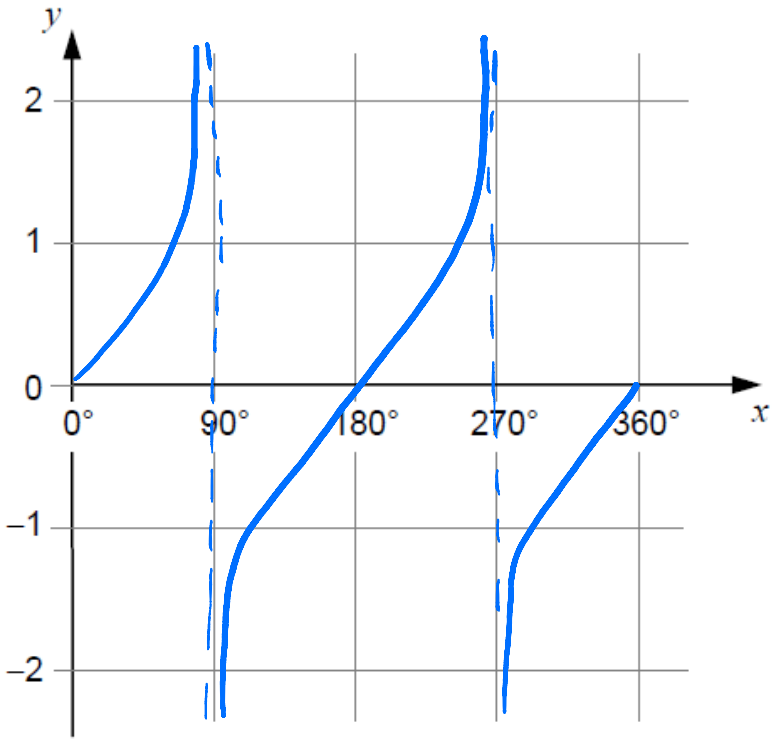
b) The graph of y = sin x is shown on the grid for 0° ⩽ x ⩽ 360°

On this grid sketch the graph of y = −sin x for 0° ⩽ x ⩽ 360°



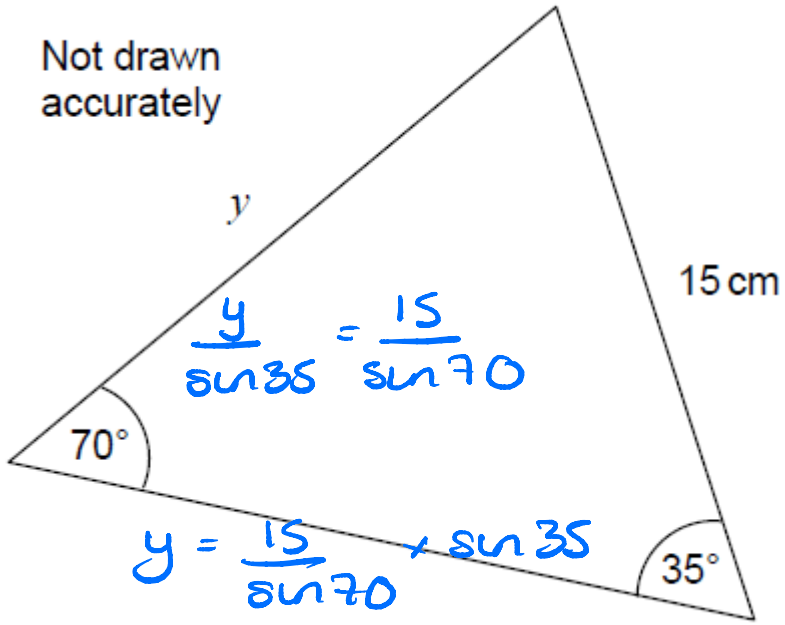
[1]

c) On this grid sketch the graph of y = tan x for 0° ⩽ x ⩽ 360°



[1]

13.



$\frac{y}{\sin 35} = \frac{15}{\sin 70}$

$y = \frac{15}{\sin 70} \times \sin 35$

$= 9.16\text{cm}$ 3sf

Work out the value of y.

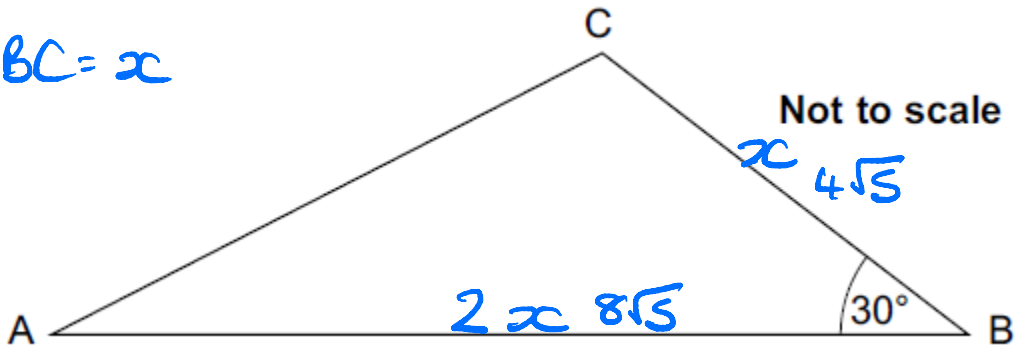
[2]

14. Triangle ABC has area 40 cm^2.

AB = 2BC.

$2x$

let $BC = x$



Work out the length of BC.

Give your answer as a surd in its simplest form.

$\text{area} = \frac{1}{2} \times 2x \times x \times \sin 30$

$\frac{40 \times 2}{2} = x^2 \times \frac{1}{2}$

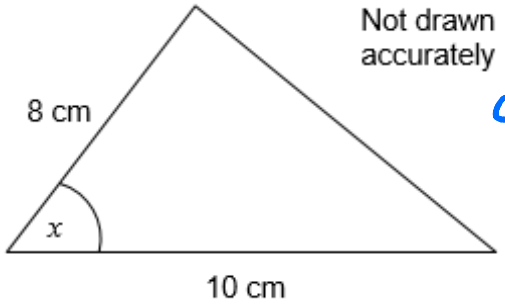
$x^2 = 80$ $\quad x = \sqrt{80}$

$= \sqrt{16}\sqrt{5}$

$= 4\sqrt{5}$

$4\sqrt{5}$ ..... cm [6]

15. Which expression gives the area, in cm^2, of this triangle?



$\text{area} = \frac{1}{2} \times 8 \times 10 \times \sin x$

$= 40 \sin x$

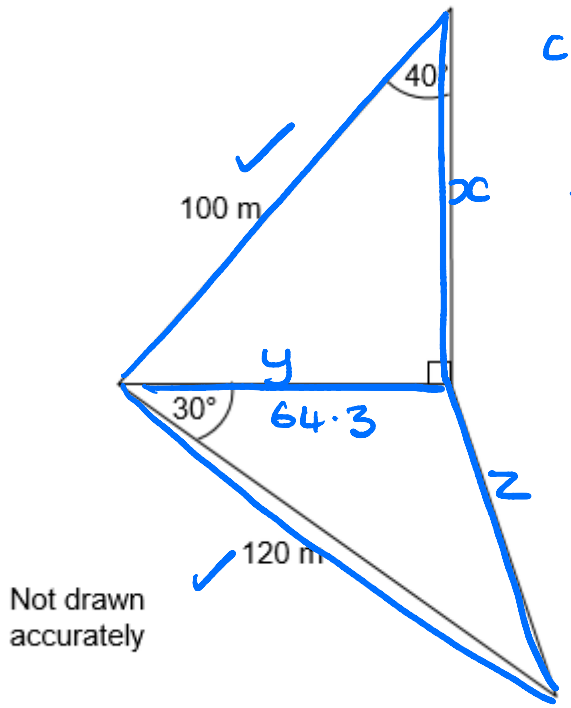
Circle your answer.

[1]

80 sin x | 40 sin x | 80 cos x | 40 cos x

16. Two triangular lawns are shown.

Wire fencing is needed for all five sides.



$\cos 40 = \frac{xc}{100}$

$xc = 100 \cos 40$

$= 76.6\text{m}$

$\sin 40 = \frac{y}{100}$

$y = 100 \sin 40$

$= 64.3\text{m}$

Wire fencing is sold in 50-metre rolls.

Work out the number of rolls needed.

$z^2 = 64.3^2 + 120^2 - 2 \times 64.3 \times 120 \times \cos 30$

$= 5171.669...$

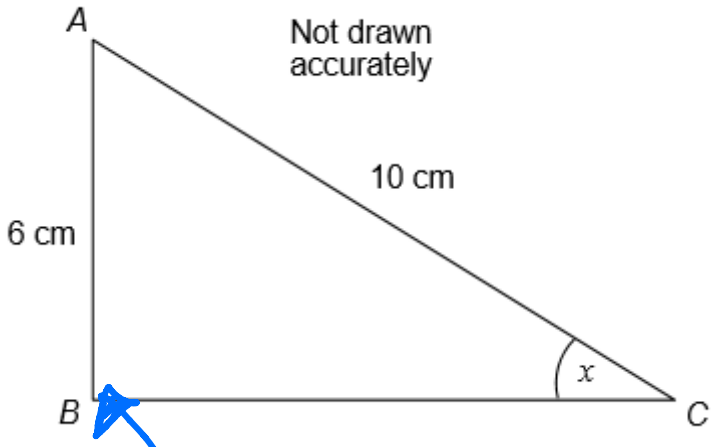
$z = 71.9\text{m}$

Total $= 100 + 120 + 76.6 + 64.3 + 71.9 = 432.8$

$\therefore 9$ rolls are needed

[6]

17.



Kernal is using trigonometry to work out the size of angle x.

He assumes that angle ABC is a right angle.

In fact, the size of angle ABC is 85°

What is the effect of his assumption on the accuracy of his answer?

You must show your working.

[3]

if $A\hat{B}C$ is a right angle.

$\sin x = \frac{6}{10}$

$x = \sin^{-1}\left(\frac{6}{10}\right)$

$= 36.87°$

if its 85° we need to use the Sine Rule

$\frac{\sin 85}{10} = \frac{\sin x}{6}$

$\sin x = \frac{\sin 85 \times 6}{10}$

$x = 36.706....$

$= 36.71°$

By assuming it is 90° it leads to an overstatement of the answer of 0.16°