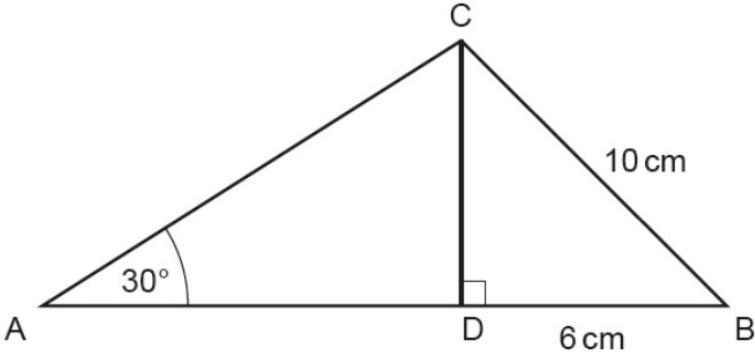


G48 - Trigonometry - Exact Values

OCR

22 The diagram shows triangle ABC.
D is a point on AB such that $DB = 6\text{ cm}$.
 $BC = 10\text{ cm}$, angle $CAD = 30^\circ$ and angle $BDC = 90^\circ$.



Not to scale

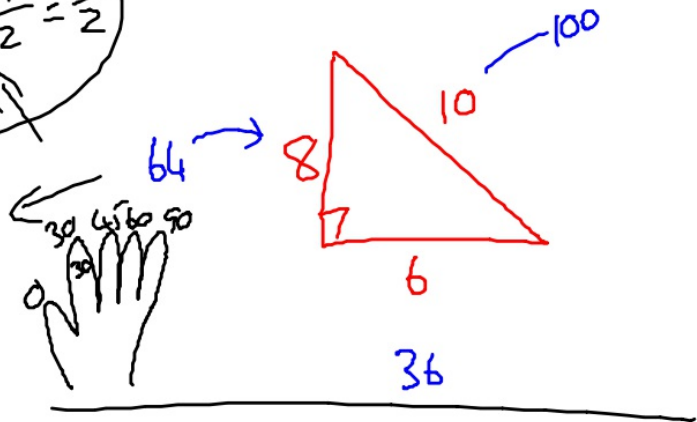
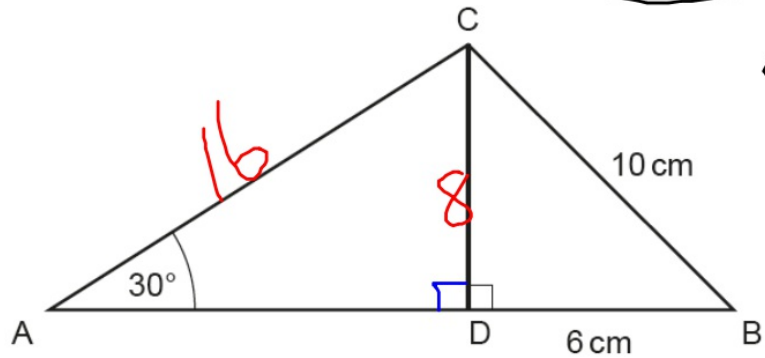
Work out the ratio length of AC : length of DB in its simplest form.

..... : [5]

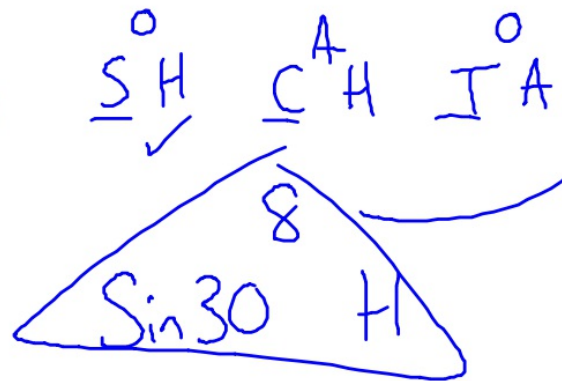
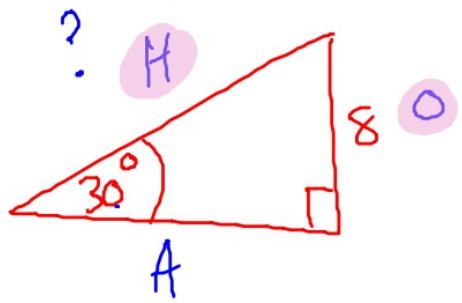
Created by W Neill

22 The diagram shows triangle ABC.
 D is a point on AB such that DB = 6 cm.
 BC = 10 cm, angle CAD = 30° and angle BDC = 90°.

$\sin 30 = \frac{\sqrt{1}}{2} = \frac{1}{2}$



Work out the ratio length of AC : length of DB in its simplest form.



$$H = \frac{8}{\sin 30}$$

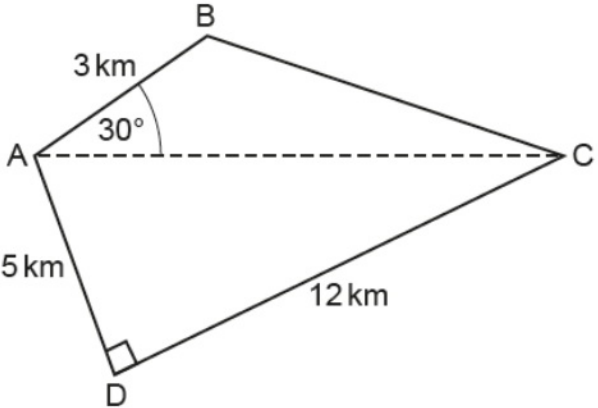
$$H = \frac{8}{0.5} = \frac{16}{1}$$

$$H = 16$$

$$\begin{matrix} 16 & : & 6 \\ 8 & : & 3 \\ 3 & : & 3 \end{matrix}$$

..... 8 : [5]

20 The diagram shows some land in the shape of a quadrilateral, ABCD.



Not to scale

AB = 3 km, AD = 5 km, CD = 12 km and angle BAC = 30°.

The land is sold for £10 million per square kilometre.

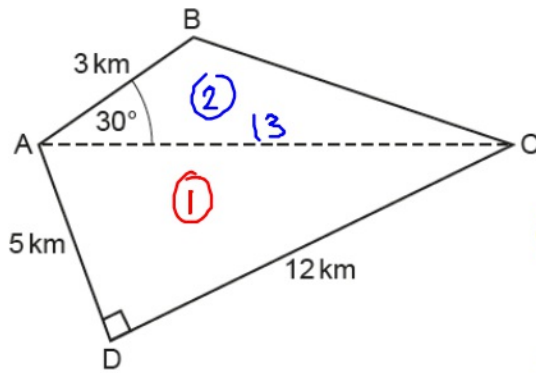
Calculate the total cost of the land.

£ million [7]

20 The diagram shows some land in the shape of a quadrilateral, ABCD.

Video created by W Neill

G43
G48
G59



Not to scale

$$\textcircled{1} \frac{B \times H}{2} = \frac{12 \times 5}{2} = \frac{60}{2} = 30 \text{ km}^2$$

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

$$\begin{aligned} AC^2 &= 12^2 + 5^2 \\ &= 144 + 25 \\ &= 169 \end{aligned}$$

$$AC = \sqrt{169} = 13$$

Area

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



$$\frac{1}{2} (3)(13) \sin 30^\circ$$

$$\frac{1}{2} (3)(13) \left(\frac{1}{2}\right)$$

$$13 \times 3 = 39$$

$$\div 2 = 19.5$$

$$\div 2 = 9.75 \text{ km}^2$$

$$\text{Total} = 39.75 \text{ km}^2 \times 10$$

$$397.5 \checkmark$$

£ million [7]

AB = 3 km, AD = 5 km, CD = 12 km and angle BAC = 30°.

The land is sold for £10 million per square kilometre.

Calculate the total cost of the land.

$$\sin 30^\circ =$$



$$\frac{\sqrt{1}}{2} = \frac{1}{2} = 0.5$$

8 The angles in a triangle are in the ratio 1 : 2 : 3.

(a) Show that the triangle is a right-angled triangle.

[2]

R15a

(b) The hypotenuse of the triangle is 15cm long.

G4b Calculate the length of the shortest side in the triangle.

(b) cm [4]

8 The angles in a triangle are in the ratio 1 : 2 : 3.

(a) Show that the triangle is a right-angled triangle.

[2]

R15a

180°

$180^\circ \dots 1 : 2 : 3$

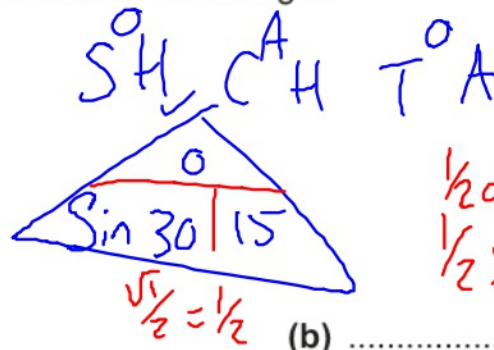
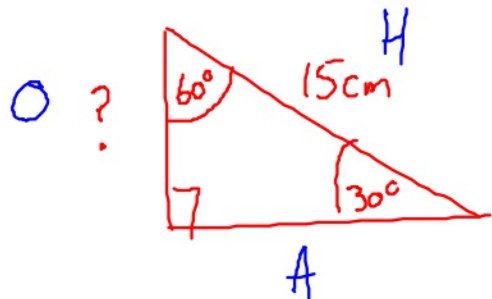
$\div 6 \left\{ \begin{array}{l} 180^\circ = 6 \text{ parts} \\ 30^\circ \quad 1 \text{ part} \end{array} \right. \div 6$

15cm
 $1 : 2 : 3$
 $\swarrow \quad \downarrow \quad \searrow$
 $30 \quad 60 \quad 90^\circ$
 Right angled as it has 90°

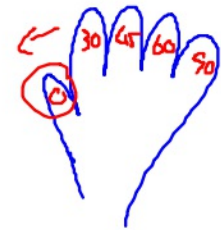
(b) The hypotenuse of the triangle is 15cm long.

G4b

Calculate the length of the shortest side in the triangle.



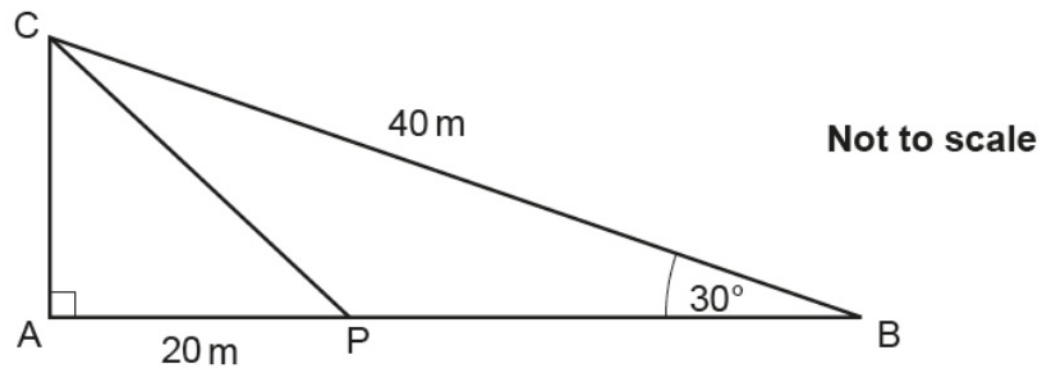
$\frac{1}{2}$ of 15
 $\frac{1}{2} \times 15$



$= 7.5$

(b) cm [4]

- 13 In the diagram, ABC is a right-angled triangle.
 P is a point on AB .
 $BC = 40\text{ m}$, $AP = 20\text{ m}$ and angle $ABC = 30^\circ$.



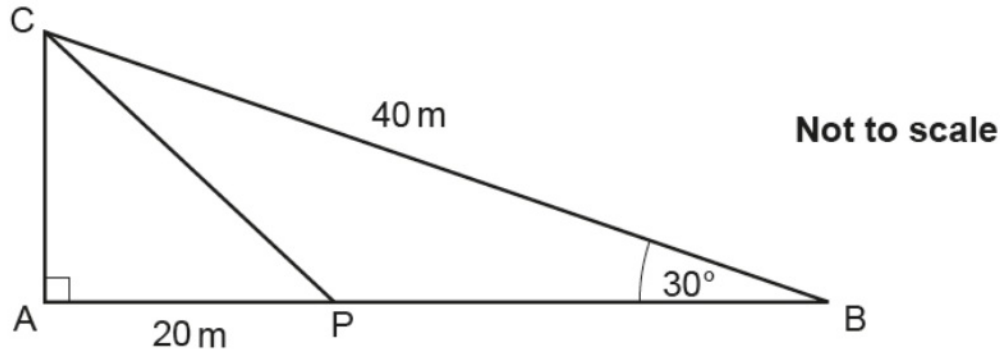
- (a) Show that $AC = 20\text{ m}$.

[3]

G46

G48

In the diagram, ABC is a right-angled triangle.
P is a point on AB.
BC = 40 m, AP = 20 m and angle ABC = 30°.

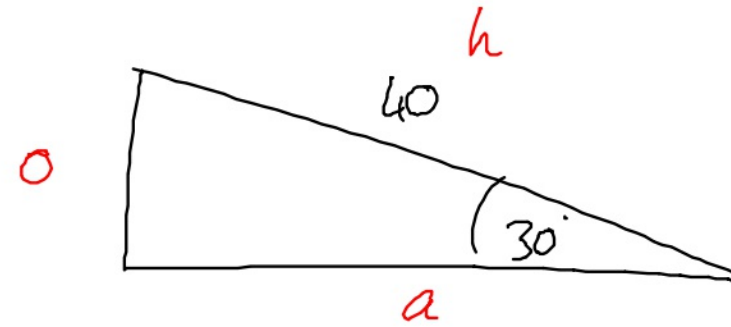
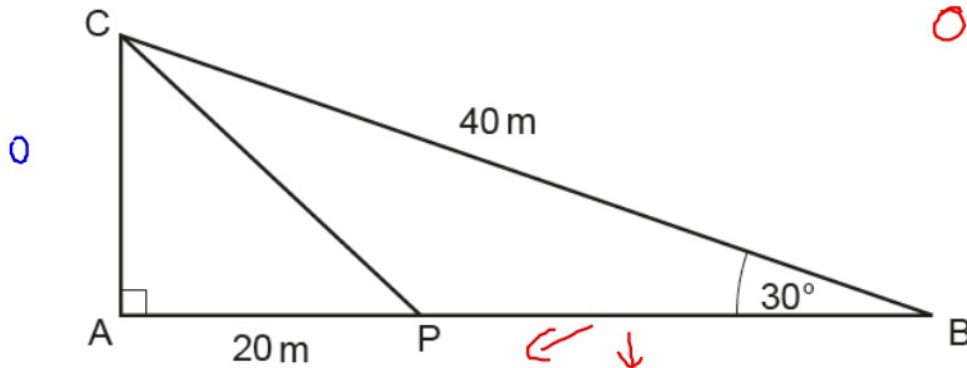


- (b) Find the length of PB.
Give your answer in the form $a(\sqrt{3} - b)$, where a and b are integers.

G43
N59

(b) [5]

- 13 In the diagram, ABC is a right-angled triangle.
 P is a point on AB.
 BC = 40 m, AP = 20 m and angle ABC = 30°.



S^oH C^AH T^oA



[3]

- (a) Show that AC = 20 m. ✓

G46

G48

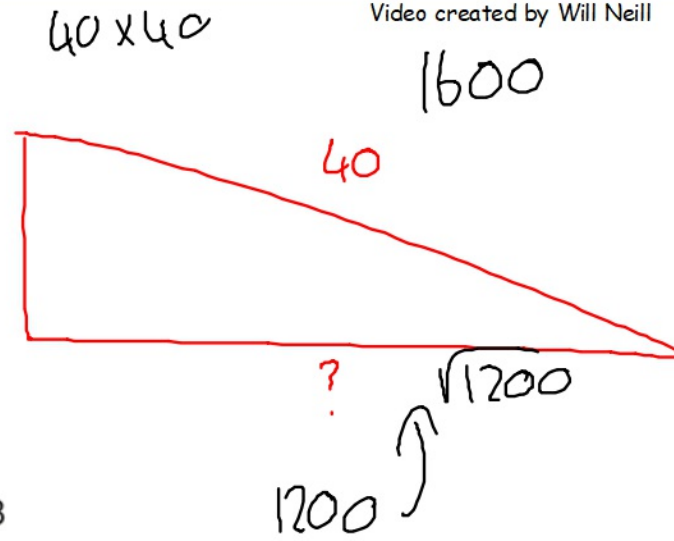
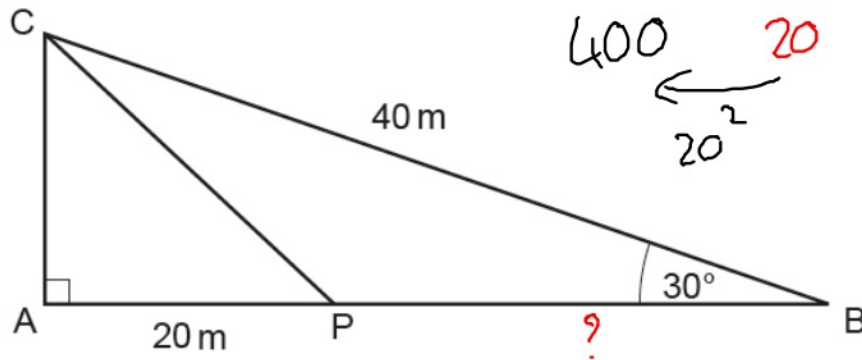
$\sin 30^\circ$

$\frac{\sqrt{1}}{2} = \frac{1}{2}$

$\frac{1}{2} \times 40$

$= 20 \text{ m} \checkmark$

In the diagram, ABC is a right-angled triangle.
 P is a point on AB.
 BC = 40 m, AP = 20 m and angle ABC = 30°.



- (b) Find the length of PB.
 Give your answer in the form $a(\sqrt{3} - b)$, where a and b are integers.

G43
 N59

$$PB = 20\sqrt{3} - 20$$

$$20(\sqrt{3} - 1)$$

$$\sqrt{1200}$$

$$\frac{\sqrt{400}\sqrt{3}}{20\sqrt{3}}$$

(b) 20(\sqrt{3} - 1) [5]

Edexcel

Created by W Neill

20 The table shows some values of x and y that satisfy the equation $y = a \cos x^\circ + b$

x	0	30	60	90	120	150	180
y	3	$1 + \sqrt{3}$	2	1	0	$1 - \sqrt{3}$	-1

Find the value of y when $x = 45$

.....
(Total for Question 20 is 4 marks)

20 The table shows some values of x and y that satisfy the equation $y = a \cos x^\circ + b$

x	0	30	60	90	120	150	180
y	3	$1 + \sqrt{3}$	2	1	0	$1 - \sqrt{3}$	-1



Cos $\sqrt{\text{finger}} / 2$

Find the value of y when $x = 45$

$$(\cos x^\circ)a + b$$

$$| a + b = 3$$

$$- \frac{1}{2}a + b = 2$$

$$\frac{1}{2}a = 1$$

$$a = 2$$

$$b = 1$$

$$\left(\frac{\sqrt{2}}{2}\right)a + b$$

$$\frac{\sqrt{2}}{2} \times 2 + 1$$

$$= \frac{2\sqrt{2}}{2} + 1$$

$$= \sqrt{2} + 1 \quad \checkmark$$

$$= 1 + \sqrt{2} \quad \checkmark$$

$$\cos 0^\circ = \frac{\sqrt{4}}{2} = \frac{2}{2} = 1$$

$$\cos 30^\circ = \frac{\sqrt{3}}{2}$$

$$\cos 45^\circ = \frac{\sqrt{2}}{2}$$

$$\cos 60^\circ = \frac{\sqrt{1}}{2} = \frac{1}{2}$$

$$\cos 90^\circ = \frac{\sqrt{0}}{2} = 0$$

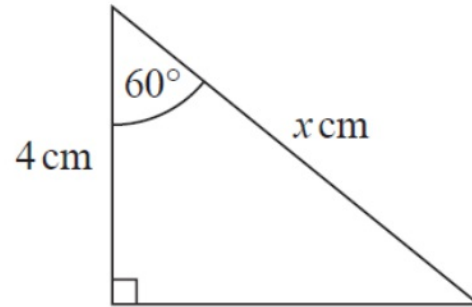
(Total for Question 20 is 4 marks)

8 (a) Write down the exact value of $\tan 45^\circ$

G48

.....
(1)

Here is a right-angled triangle.



$$\cos 60^\circ = 0.5$$

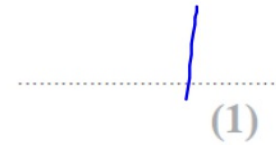
(b) Work out the value of x .

G46

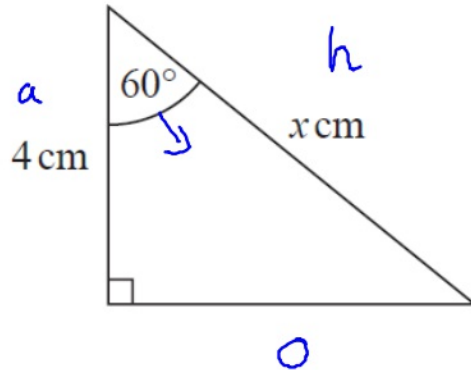
.....
(2)

8 (a) Write down the exact value of $\tan 45^\circ$ $\sqrt{\frac{2}{2}} = \sqrt{1}$

G48



Here is a right-angled triangle.



$\cos 60^\circ = 0.5$ ✓

(b) Work out the value of x .

G46

S^oH C^AH T^oA
 ✓
 4

$\cos 60$ h

$\frac{4}{0.5} = \frac{8}{1} = 8$

8 cm

 (2) ✓

AQA

27 Circle the value of $\cos 90^\circ$

G48

[1 mark]

0

$\frac{1}{2}$

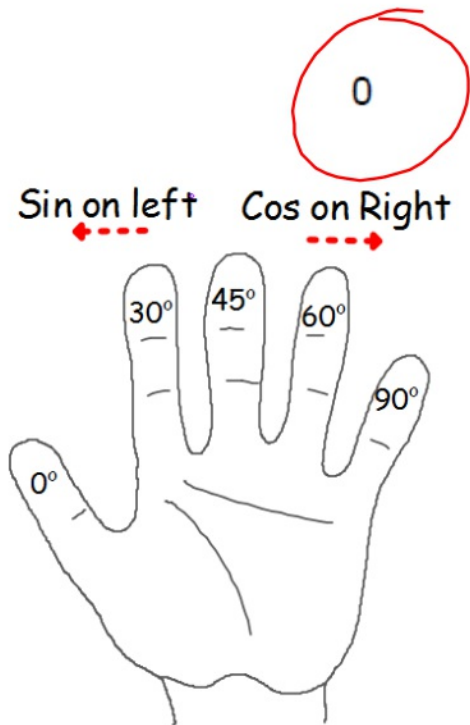
$\frac{\sqrt{3}}{2}$

1

27 Circle the value of $\cos 90^\circ$

G48

[1 mark]



$$\frac{1}{2}$$

$$\frac{\sqrt{3}}{2}$$

$$1$$

$$\frac{\sqrt{0}}{2} = \frac{0}{2} = 0$$

Square root the fingers and divide by 2

24

Circle the value of $\cos 30^\circ$

[1 mark]

G48

$$\frac{1}{2}$$

$$\frac{\sqrt{3}}{2}$$

0

1

24

Circle the value of $\cos 30^\circ$

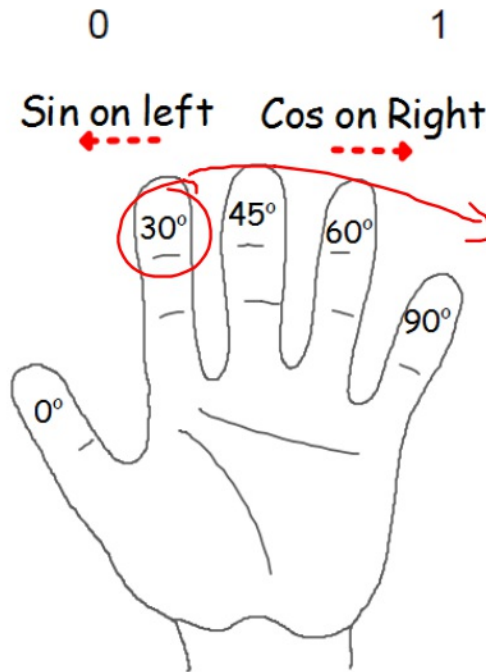
[1 mark]

G48

$$\frac{1}{2}$$

$$\frac{\sqrt{3}}{2}$$

$$\frac{\sqrt{3}}{2}$$



Square root the fingers and divide by 2

29

Simplify $\frac{2 \sin 45^\circ - \tan 45^\circ}{4 \tan 60^\circ}$

G48
N62

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

[4 marks]

29 Simplify $\frac{2 \sin 45^\circ - \tan 45^\circ}{4 \tan 60^\circ}$

G48

N62

Give your answer in the form $\frac{\sqrt{a} - \sqrt{b}}{c}$

where a , b and c are integers.

[4 marks]

$$\sin 45 = \frac{\sqrt{2}}{2} \times 2 = \frac{2\sqrt{2}}{2} = \sqrt{2}$$

$$\tan 45 = 1$$

$$\tan 60 = \sqrt{3} \times 4 = 4\sqrt{3}$$

$$\left. \begin{array}{l} \sqrt{3}(\sqrt{2} - 1) \\ \sqrt{6} - \sqrt{3} \end{array} \right\} \begin{array}{l} 4\sqrt{3} \times \sqrt{3} \\ = 4(3) \\ = 12 \end{array}$$

$$\frac{\sqrt{2} - 1}{4\sqrt{3}} \times \frac{\sqrt{3}}{\sqrt{3}}$$

$$= \frac{\sqrt{6} - \sqrt{3}}{12} \checkmark$$

Video created by W Neill

30 Show that the value of $\cos 30^\circ \times \tan 60^\circ + \sin 30^\circ$ is an integer.

[3 marks]

G48
N59

30

Show that the value of $\cos 30^\circ \times \tan 60^\circ + \sin 30^\circ$ is an integer.

Sin ← → Cos

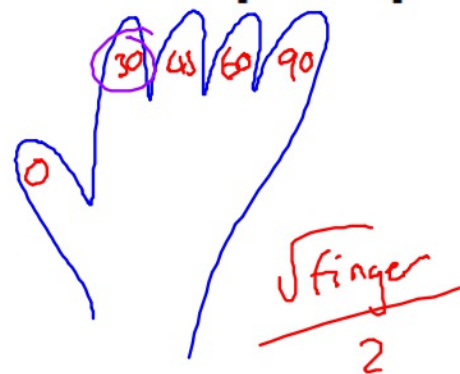
[3 marks]

G48
N59

$$\cos 30^\circ = \frac{\sqrt{3}}{2}$$

$$\tan 60^\circ = \sqrt{\frac{3}{1}} = \sqrt{3}$$

$$\sin 30^\circ = \frac{\sqrt{1}}{2} = \frac{1}{2}$$



$$\frac{\sqrt{3}}{2} \times \frac{\sqrt{3}}{1} + \frac{1}{2}$$

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

$$= 2 \quad \checkmark$$

26

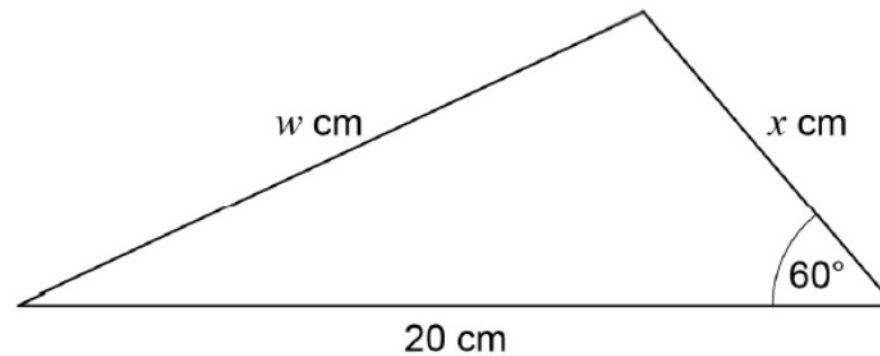
The area of this triangle is $25\sqrt{3}$ cm²

G48

G58

G59

Not drawn
accurately



Work out the value of w .

Give your answer in the form $a\sqrt{b}$ where a and b are integers greater than 1

[5 marks]

Answer _____

26

The area of this triangle is $25\sqrt{3} \text{ cm}^2$

G48

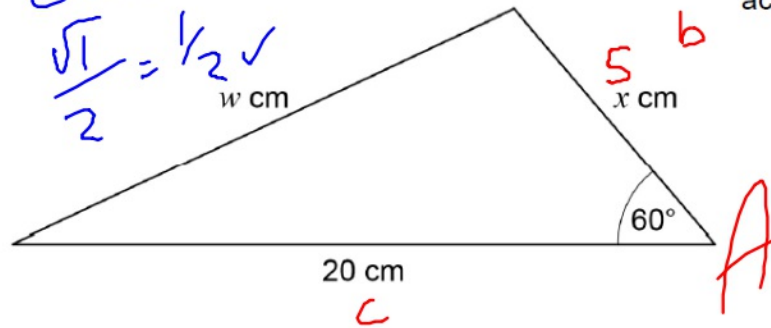
G58

G59

$$\frac{\sqrt{3}}{2}$$



$$\cos A = \frac{\sqrt{1}}{2} = \frac{1}{2} \checkmark$$



Not drawn accurately

Work out the value of w .Give your answer in the form $a\sqrt{b}$ where a and b are integers greater than 1

$$\frac{1}{2}ab \sin C = 25\sqrt{3}$$

$$\frac{1}{2}(x)(20) \frac{\sqrt{3}}{2} = 25\sqrt{3}$$

$$(x) \frac{10\sqrt{3}}{2} = 25\sqrt{3}$$

$$x = 25\sqrt{3} \div \frac{10\sqrt{3}}{2} \quad x = 5$$

$$\frac{25\sqrt{3}}{1} \times \frac{2}{10\sqrt{3}}$$

$$\frac{50}{10}$$

$$a^2 = b^2 + c^2 - 2bc \cos A$$

$$a^2 = 25 + 400 - 2(100) \frac{1}{2}$$

$$a^2 = 425 - 100$$

$$a^2 = 325$$

$$a = \sqrt{325}$$

$$a = \sqrt{25} \sqrt{13}$$

$$a = 5\sqrt{13} \checkmark$$

Answer _____

