

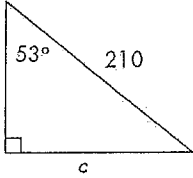
Name \_\_\_\_\_

**Trigonometry stage 5-3**  
**why? just cos!**

(Total marks: 44)

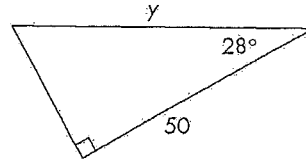
**Question 1 (2)**

Find the value of the pronumeral in this diagram:



**Question 2 (3)**

Find the value of the pronumeral in this diagram:



**Question 3 (3)**

A wheelchair access ramp 6.4 m long makes an angle of  $14^\circ 25'$  with the ground. How far above the lower end is the upper end of the ramp?

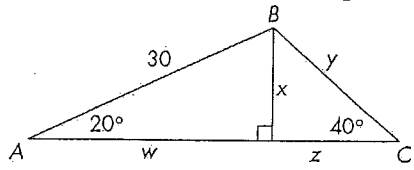
**Question 4 (3)**

A ladder leans against a vertical wall. The base of the ladder is 1.5 m from the base of the wall and the ladder reaches 3.5 m up the wall. What is the angle the ladder makes with the wall, to the nearest minute?

**Question 5**

(4)

The diagram shows two right-angled triangles side by side, forming a non-right-angled triangle.

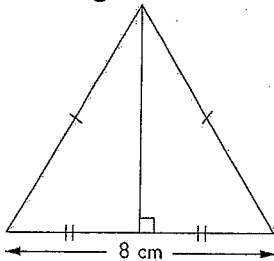


Find lengths  $w$ ,  $x$ ,  $y$  and  $z$ . (now I know my ABC.....)

**Question 6**

(2)

The diagram shows an equilateral triangle with base  $8$  cm. (The base angle is  $60^\circ$ .)

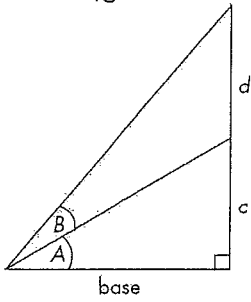


Find its height.

**Question 7**

(4)

The diagram shows two triangles with a common side. The base length is 20 m.



(a) Lengths  $c$  and  $d$  are each equal to 10 m.  
Find the size of angle  $A$ .

(b) Find the size of angle  $B$ .

(c) Explain why angles  $A$  and  $B$  are not equal.

(d) Now make angles  $A$  and  $B$  each equal to  $30^\circ$ . Find the new lengths of  $c$  and  $d$ .

**Question 8**

(3)

Find the exact values for sine, cosine and tangent for  $150^\circ$ .

**Question 9(1)**

Which of the following statements is untrue?

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

B  $\tan 60^\circ = \sqrt{3}$

C  $\sin 0^\circ = 0$

D  $\cos 45^\circ = \frac{1}{\sqrt{3}}$

**Question 10(1)**

Which of the following statements is untrue?

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B  $\tan 30^\circ = \sqrt{3}$

C  $\tan 0^\circ = 0$

D  $\sin 45^\circ = \frac{\sqrt{2}}{2}$

**Question 11**

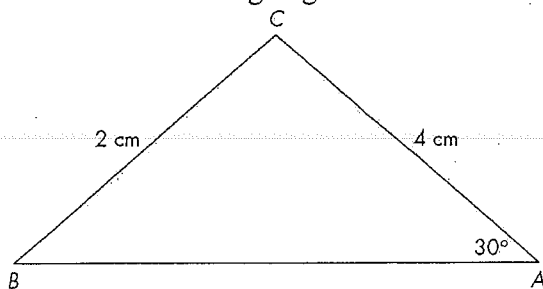
(3)

Lachlan's house is situated on a triangular block, such that the three roads surrounding it form a right-angled triangle. The angles formed at the points where the roads meet are  $30^\circ$ ,  $60^\circ$  and  $90^\circ$ . If the longest road is 88 m long, calculate the length of the two remaining roads, without using a calculator.

**Question 12**

(3)

Given the following angle and two sides in the diagram below, find the remaining angles.

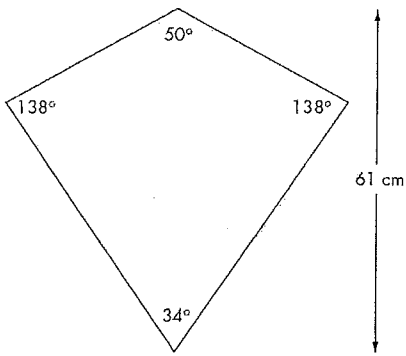


(Answer in degrees and minutes.)

**Question 13**

(3)

Martin's kite has angles of  $138^\circ$ ,  $138^\circ$ ,  $50^\circ$  and  $34^\circ$ . If the height from the top to the bottom is 61 cm, find:



(a) the length of all the sides on his kite, correct to two decimal places

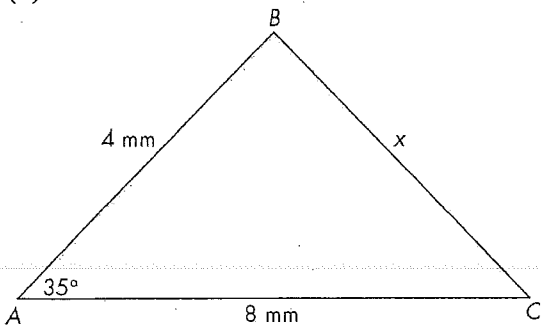
(b) the total area of material in  $\text{cm}^2$  that covers the kite, correct to two decimal places

**Question 14**

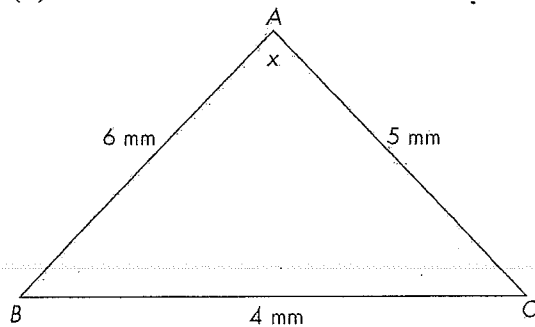
(4)

Find  $x$  in each of the following triangles to two decimal places or in degrees and minutes.

(a)



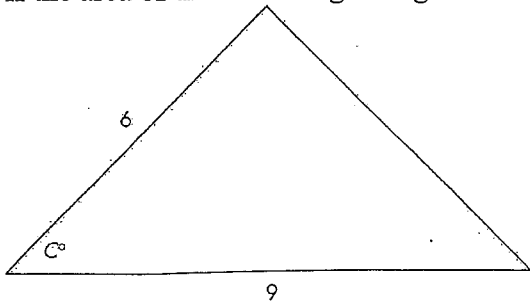
(b)



**Question 15**

(2)

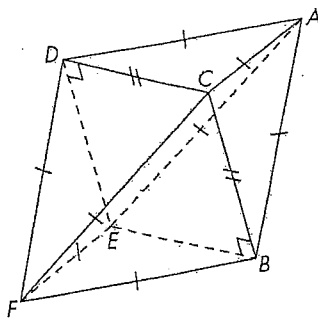
If the area of the following triangle is  $20 \text{ m}^2$ , find  $C$  in degrees and minutes.



**Question 16**

(3)

An 8-sided die is made by joining two identical square pyramids by their bases, as shown in the diagram below.



Find the length of  $AF$  if the length of  $AC$  is 16 cm, and the length of  $BC$  is 20 cm.



Name \_\_\_\_\_

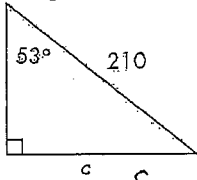
## Trigonometry stage 5-3 why? just cos!

See correction 7(d)

(Total marks: 44)

**Question 1 (2)**

Find the value of the pronumeral in this diagram:



$$\frac{c}{\sin 53^\circ} = \frac{210}{\sin 90^\circ}$$

$$c = \frac{210}{1} \times \sin 53^\circ$$

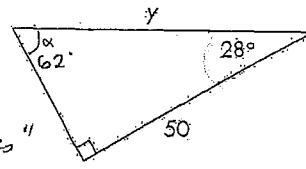
$$= 167.7134571$$

$$(2.d.p) \doteq 167.71$$

Don't use sine rule for  
"Right-angled triangles"

**Question 2 (3)**

Find the value of the pronumeral in this diagram:



$$\alpha = 180 - 90 - 28$$

$$= 62$$

$$\frac{y}{\sin 90^\circ} = \frac{50}{\sin 62^\circ}$$

$$y = \frac{50}{1} \times \sin 90^\circ$$

$$= 56.62850253$$

$$(2.d.p) \doteq 56.63$$

$$\sin 53^\circ = \frac{c}{210}$$

$$c = \sin 53^\circ \times 210$$

$$= 167.71$$

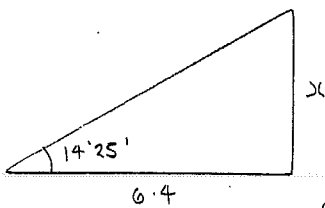
$$\cos 28^\circ = \frac{50}{y}$$

$$y = \frac{50}{\cos 28^\circ}$$

$$= 56.63$$

**Question 3 (3)**

A wheelchair access ramp 6.4 m long makes an angle of  $14^\circ 25'$  with the ground. How far above the lower end is the upper end of the ramp?



$$\tan(14^\circ 25') = \frac{x}{6.4}$$

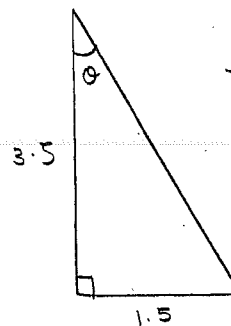
$$x = \tan(14^\circ 25') \times 6.4$$

$$= 1.645225269$$

$$(2.d.p) \doteq 1.65$$

**Question 4 (3)**

A ladder leans against a vertical wall. The base of the ladder is 1.5 m from the base of the wall and the ladder reaches 3.5 m up the wall. What is the angle the ladder makes with the wall, to the nearest minute?



$$\tan \theta = \frac{1.5}{3.5}$$

$$\theta = 23.19859051$$

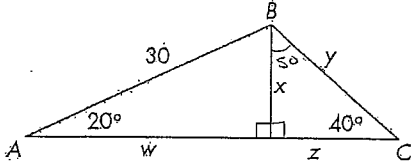
$$= 23^\circ 11' 54.93''$$

$$= 23^\circ 12'$$

Question 5

(4)

The diagram shows two right-angled triangles side by side, forming a non-right-angled triangle.



Find lengths  $w$ ,  $x$ ,  $y$  and  $z$ . (now I know my ABC.....)

$$W = \cos 20^\circ = \frac{W}{30} \quad \checkmark$$

$$\begin{aligned} W &= \cos 20 \times 30 \\ &= 28.19077862 \\ &\approx 28.19 \quad \checkmark \\ &\approx 28 \end{aligned}$$

$$X = x^2 + 28.19^2 = 30^2$$

$$\begin{aligned} x^2 + 794.6761 &= 900 \quad \checkmark \\ x^2 &= 105.3239 \\ x &= 10.2627433 \\ &\approx 10.26 \quad \checkmark \\ &\approx 10 \quad \checkmark \end{aligned}$$

$$Y = \cos 50 = \frac{10}{Y}$$

$$\begin{aligned} Y &= \frac{10}{\cos 50} \quad \checkmark \\ &= 15.55723827 \quad \checkmark \\ &\approx 15.56 \end{aligned}$$

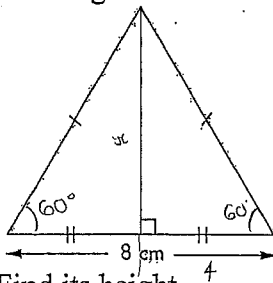
$$Z = \tan 40^\circ = \frac{10}{Z} \quad \checkmark$$

$$\begin{aligned} Z &= \frac{10}{\tan 40} \\ &= 11.91753593 \\ &\approx 11.92 \quad \checkmark \\ &\approx 12 \quad \checkmark \end{aligned}$$

Question 6

(2)

The diagram shows an equilateral triangle with base 8 cm. (The base angle is  $60^\circ$ .)



Find its height.

$$\tan 60^\circ = \frac{x}{4} \quad \checkmark$$

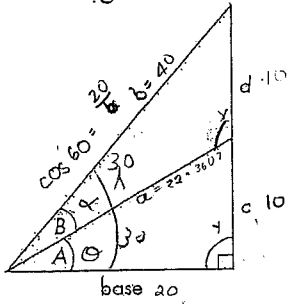
$$\begin{aligned} x &= \tan 60 \times 4 \\ &= 6.92820323 \\ &\approx 6.93 \quad \checkmark \end{aligned}$$



Question 7

(4)

The diagram shows two triangles with a common side. The base length is 20 m.



$$\tan \lambda = \frac{20}{20}$$

$$\lambda = 45^\circ$$

(a) Lengths  $c$  and  $d$  are each equal to 10 m. Find the size of angle  $A$ .

$$\tan A = \frac{10}{20}$$

$$\theta = \tan^{-1}\left(\frac{10}{20}\right)$$

$$\theta = 26^\circ 33' 54.15''$$

$$= 26^\circ 34'$$

(b) Find the size of angle  $B$ .

$$\lambda - \theta = \alpha$$

$$45 - 26^\circ 34' = 18^\circ 26'$$

(c) Explain why angles  $A$  and  $B$  are not equal.

$\angle A \Rightarrow$  THE TRIANGLE IS A RIGHT ANGLE

$\angle B \Rightarrow$  THE TRIANGLE IS NOT A RIGHT ANGLE; THE TOP OF THE LINE TO  $\angle B$  IS LONGER  $\therefore \angle B$  WILL BE SHORTER

(d) Now make angles  $A$  and  $B$  each equal to  $30^\circ$ . Find the new lengths of  $c$  and  $d$ .

$$\tan 30 = \frac{c}{20}$$

$$c = \tan 30 \times 20$$

$$c = 11.54700538$$

$$\approx 11.55$$

*these sides did not come from 30°*

$$d^2 = 40^2 + 22.36^2 - 2 \times 40 \times 22.36 \cos 30$$

$$d^2 = 550.8233377$$

$$d = 23.47 \text{ X}$$

Try again using

$$\tan 60 = \frac{(c+d)}{20}$$

Question 8

(3)

Find the exact values for sine, cosine and tangent for  $150^\circ$ .

$$\sin 150 = \sin 30$$

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

$$\cos 150 = -\cos 30$$

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

$$\tan 150 = -\tan 30$$

$$= -\frac{1}{\sqrt{3}}$$

**Question 9(1)**

Which of the following statements is untrue?

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

B  $\tan 60^\circ = \sqrt{3}$

C  $\sin 0^\circ = 0$

~~D~~  $\cos 45^\circ = \frac{1}{\sqrt{3}}$  ✓

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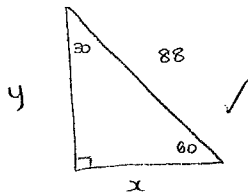
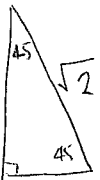
~~B~~  $\tan 30^\circ = \sqrt{3}$  ✓

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D  $\sin 45^\circ = \frac{\sqrt{2}}{2}$

**Question 11**

Lachlan's house is situated on a triangular block, such that the three roads surrounding it form a right-angled triangle. The angles formed at the points where the roads meet are  $30^\circ$ ,  $60^\circ$  and  $90^\circ$ . If the longest road is 88 m long, calculate the length of the two remaining roads, without using a calculator. (3)



$$\cos 60 = \frac{x}{88}$$

$$\cos 60 = \frac{1}{2} \therefore \frac{1}{2} = \frac{x}{88} \checkmark$$

$$\underline{x = 44} \checkmark$$

$$\sin 60 = \frac{y}{88}$$

$$\sin 60 = \frac{\sqrt{3}}{2} \checkmark$$

$$\therefore \frac{\sqrt{3}}{2} = \frac{y}{88} \checkmark$$

$$\frac{44 \times \sqrt{3}}{1} \times \frac{\sqrt{3}}{21} \checkmark$$

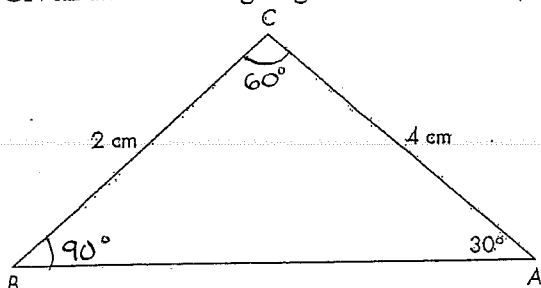
$$= 44\sqrt{3} \checkmark$$

$$= 76.21$$

$$\underline{y = 76.21}$$

**Question 12**

Given the following angle and two sides in the diagram below, find the remaining angles. (3)



(Answer in degrees and minutes.)

$$\frac{\sin A}{a} = \frac{\sin B}{b} = \frac{\sin C}{c}$$

$$\frac{\sin B}{4} = \frac{\sin 30}{2}$$

$$\sin B = \frac{\sin 30}{2} \times 4 \checkmark$$

$$B = 90^\circ \checkmark$$

$$C = 180^\circ - 30^\circ - 90^\circ$$

$$= 60^\circ \checkmark$$

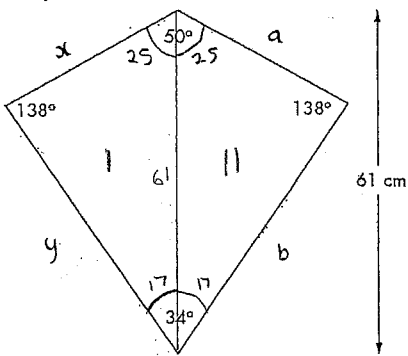
$$\therefore \angle B = 90^\circ$$

$$\angle C = 60^\circ \checkmark$$

**Question 13**

(3)

Martin's kite has angles of  $138^\circ$ ,  $138^\circ$ ,  $50^\circ$  and  $34^\circ$ . If the height from the top to the bottom is 61 cm, find:



(a) the length of all the sides on his kite, correct to two decimal places

(b) the total area of material in  $\text{cm}^2$  that covers the kite, correct to two decimal places

$$\frac{a}{\sin 17} = \frac{61}{\sin 138}$$

$$a = \frac{61}{\sin 138} \times \sin 17$$

$$a = 26.65$$

$$\frac{b}{\sin 25} = \frac{61}{\sin 138}$$

$$b = \frac{61}{\sin 138} \times \sin 25$$

$$b = 38.53$$

\* Sides  $x = a$   
 $y = b$  ] similar  $\Delta$ 's

$$\frac{x}{\sin 17} = \frac{61}{\sin 138}$$

$$x = \frac{61}{\sin 138} \times \sin 17$$

$$x = 26.65$$

$$\frac{y}{\sin 25} = \frac{61}{\sin 138}$$

$$y = \frac{61}{\sin 138} \times \sin 25$$

$$y = 38.53$$

$$A_1 = \frac{1}{2} \times 26.65 \times 38.53 \sin 138$$

$$= 343.5398502$$

$$= 343.54 \text{ cm}^2$$

$$A_{II} = \frac{1}{2} \times 26.65 \times 38.53 \sin 138$$

$$= 343.54 \text{ cm}^2$$

$$\therefore A_1 + A_{II} = 343.54 + 343.54$$

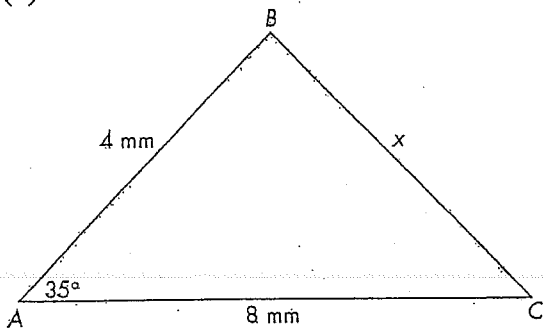
$$= 687.08 \text{ cm}^2$$

**Question 14**

(4)

Find  $x$  in each of the following triangles to two decimal places or in degrees and minutes.

(a)



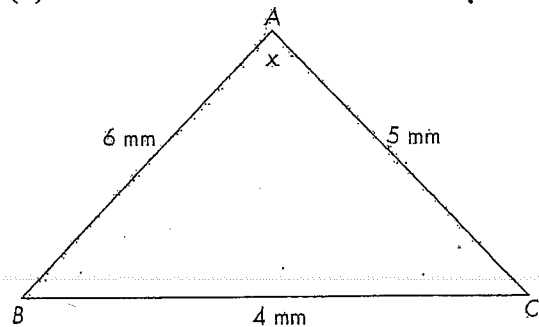
$$x^2 = 4^2 + 8^2 - 2 \times 4 \times 8 \cos 35^\circ$$

$$x^2 = 27.57426917$$

$$x = 5.251126753$$

$$x = 5.25 \text{ mm}$$

(b)



$$\cos A = \frac{6^2 + 5^2 - 4^2}{2 \times 6 \times 5}$$

$$\cos A = \frac{3}{4}$$

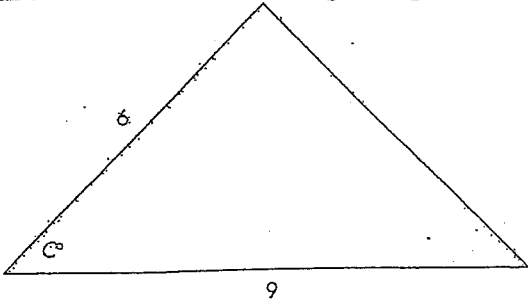
$$\angle A = 41^\circ 24' 34.64''$$

$$= 41^\circ 25'$$

Question 15

(2)

If the area of the following triangle is  $20 \text{ m}^2$ , find  $C$  in degrees and minutes.



$$\text{Area} = \frac{1}{2} ab \sin C$$

$$20 = \frac{1}{2} ab \sin C$$

$$20 = \frac{1}{2} \times 6 \times 9 \times \sin C$$

$$\frac{20}{27} = \frac{27 \times \sin C}{27}$$

$$\sin C = \frac{20}{27}$$

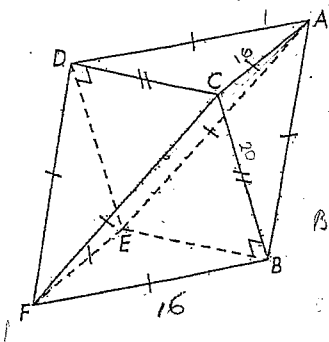
$$C = 47^\circ 47' / 40.39''$$

$$= 47^\circ 48'$$

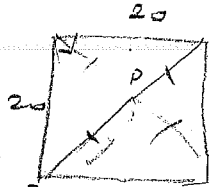
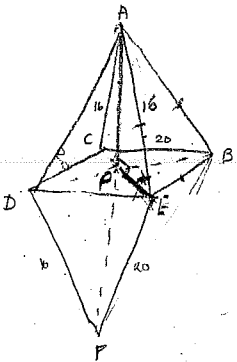
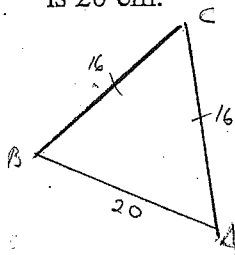
Question 16

(3)

An 8-sided die is made by joining two identical square pyramids by their bases, as shown in the diagram below.



Find the length of  $AF$  if the length of  $AC$  is 16 cm, and the length of  $BC$  is 20 cm.



$$x^2 = 20^2 + 20^2$$

$$x^2 = 800$$

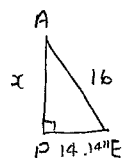
$$x = 28.28427125$$

$$x = 28.284$$

$$PE = \frac{28.284}{2}$$

$$= 14.14213562$$

$$\approx 14.1421$$



$$AF \therefore = 14.97 \text{ cm}$$

$$x^2 + 14.1421^2 = 16^2$$

$$x^2 + 200 = 256$$

$$x^2 = 56$$

$$x = 7.483314774$$

$$AF = 7.483314774 \times 2$$

$$= 14.96662953$$

$$(2 \times 7.483314774)$$