

TEST #6
Trigonometry

K/U 15 / 15

A 11 / 11

TIP 13 / 13

C 45 / Level

Knowledge and Understanding.

1. Which of the following ratios is equivalent to cosine?

a) $\frac{\text{opposite}}{\text{hypotenuse}}$

b) $\frac{\text{hypotenuse}}{\text{adjacent}}$

c) $\frac{\text{adjacent}}{\text{hypotenuse}}$

d) $\frac{\text{hypotenuse}}{\text{opposite}}$

e) $\frac{\text{opposite}}{\text{adjacent}}$

2. Determine the value of $\sin A$.

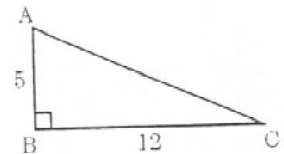
a) $\frac{5}{13}$

b) $\frac{5}{12}$

c) $\frac{12}{13}$

d) $\frac{12}{5}$

e) $\frac{13}{5}$

3. Determine the tangent of angle A ($\tan A$).

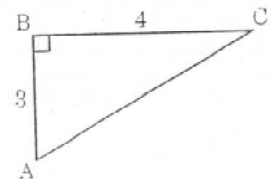
a) $\frac{3}{5}$

b) $\frac{3}{4}$

c) $\frac{4}{5}$

d) $\frac{4}{3}$

e) $\frac{5}{3}$



4. With the given triangle, which trigonometric ratio can be used to find the hypotenuse?

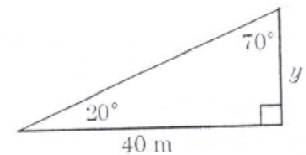
a) $\sin 20^\circ$

b) $\tan 70^\circ$

c) $\tan 20^\circ$

d) $\cos 70^\circ$

e) $\cos 20^\circ$

5. In the triangle shown, find $m\angle A$ to the nearest degree.

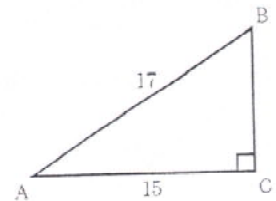
a) 8°

b) 28°

c) 41°

d) 49°

e) 62°

6. Find the value of y to the nearest tenth of a unit.

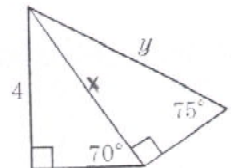
a) 3.6

b) 4.1

c) 4.3

d) 4.4

e) 5.1

7. Which of the following statements *must* be true?

I. If two triangles are similar they have the same shape.

II. If two triangles are similar they have the same size.

III. All equilateral triangles are similar.

IV. All isosceles triangles are similar.

a) I only

b) II only

c) I and II only

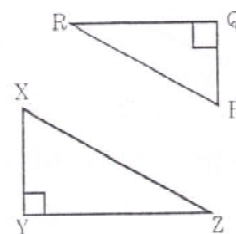
d) I and III only

e) all are true

7

8. Given that $\triangle PQR$ is similar to $\triangle XYZ$. XY corresponds to:

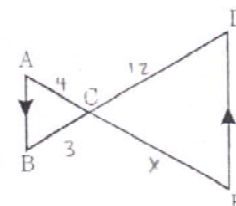
- a) XZ b) YZ c) PQ d) PR e) QR



9. In the diagram, $AB \parallel DE$, $AC = 4$, $BC = 3$, and $DC = 12$. Find the length of EC .

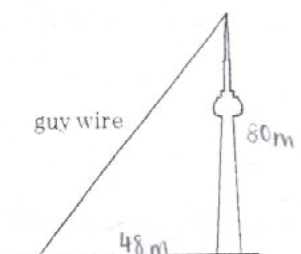
- a) 6 b) 9 c) 10 d) 14 e) 16

3



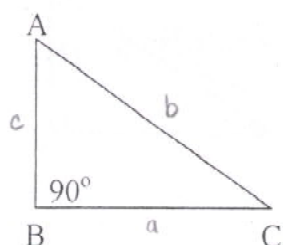
10. A guy wire attached to the top of an 80m radio antenna is bolted to the ground 48m from the base of the tower. If the wire is tight, how long is the wire? Express your answer to the nearest hundredth of a metre.

- a) 87.04 m b) 89.35 m c) 93.30 m d) 95.56 m e) 128.00 m



Part B. Full solutions. Show your calculations

[3] 11. Write all trig ratios for $\angle C$ in $\triangle ABC$.



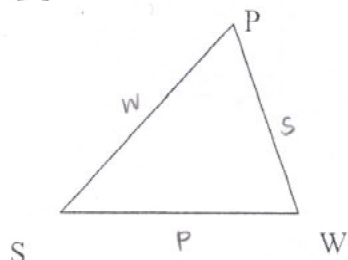
$$\sin C = \frac{c}{b}$$

$$\cos C = \frac{a}{b}$$

$$\tan C = \frac{c}{a}$$

3

[2] 12. Write cosine law for side s in the $\triangle PSW$.



$$s^2 = w^2 + p^2 - 2wp \cos S$$

$$\cos S = \frac{s^2 - w^2 - p^2}{-2wp}$$

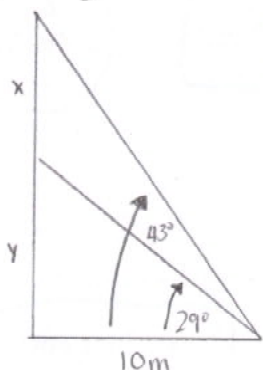
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Applications

[4] 13. A television antenna is supported by a wire connected to the mast. The angle of elevation of the guy wire is 29° , and the angle of elevation of the top of the antenna is 43° . If the guy wire is fixed to the ground 10 m from the base of the mast find to the nearest tenth of the meter:

- the distance from the ground to where the guy wire is connected.
- the height of the antenna



let "y" be the distance from the ground to where the guy wire is connected
let "x" be the height of the antenna.

$$\tan 29 = \frac{y}{10}$$

$$y = 5.543 \text{ m.}$$

$$\tan 43^\circ = \frac{x+y}{10}$$

$$x+y = 9.325$$

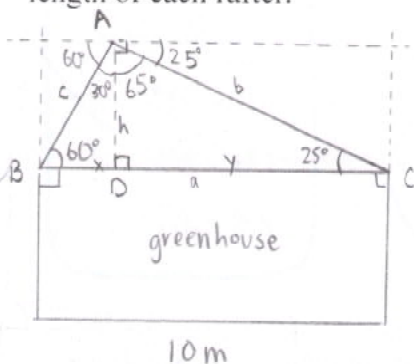
$$x = 9.325 - 5.543$$

$$x = 3.782$$

a) therefore, the distance from the ground to where the guy wire is connected is 5.5 m.

b) therefore, the height of the antenna is 3.8 m

[4] 14. A greenhouse is 10 m wide and the rafters make angles of 25° and 60° with the joints. Find the length of each rafter.



$$\tan 25^\circ = \frac{h}{y}$$

$$h = 0.466y$$

$$x = 10 - y$$

$$0.466y = 17.32 - 1.732y$$

$$2.198y = 17.32$$

$$y = 7.88 \text{ m.}$$

$$x = 10 - y$$

$$x = 2.12 \text{ m}$$

$$\tan 60^\circ = \frac{h}{x}$$

$$h = 1.732(10 - y)$$

$$h = 17.32 - 1.732y$$

$$h = 0.466y$$

$$= 0.466(7.88)$$

$$= 3.672 \text{ m.}$$

$$\cos 25^\circ = \frac{7.88}{b}$$

$$7.88 = 0.9b$$

$$b = 8.755 \text{ m.}$$

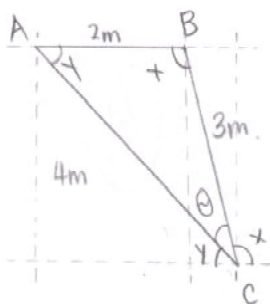
$$\cos 60^\circ = \frac{2.12}{c}$$

$$2.12 = 0.5c$$

$$c = 4.24 \text{ m.}$$

\therefore the length of the rafters are 8.76 m and 4.24 m.

[3] 15. A hockey net is 2 m wide. A player shoots from a point where the puck is 3 m from one goal post and 4 m from the other. Within what angle must he make his shots to hit the net?



$$c^2 = a^2 + b^2 - 2ab \cos \theta$$

$$2^2 = 3^2 + 4^2 - 2(3)(4) \cos \theta$$

$$\cos \theta = \frac{2^2 - 3^2 - 4^2}{-2(3)(4)}$$

$$\theta = 0.875 (\cos^{-1})$$

$$\theta = 29^\circ$$

Therefore, he must take his shot at 29° to get it in.

$$b^2 = a^2 + c^2 - 2ac \cos X$$

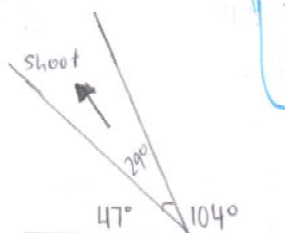
$$\cos X = \frac{4^2 - 3^2 - 2^2}{-2(3)(2)}$$

$$X = -0.25 (\cos^{-1})$$

$$X = 104^\circ$$

$$Y = 180 - 29 - 104$$

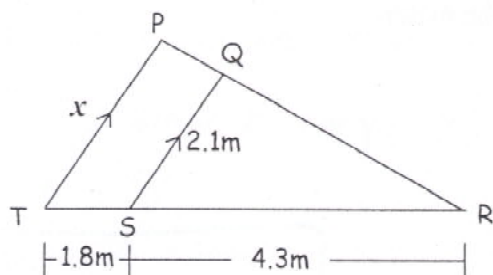
$$= 47^\circ$$



Therefore, the 29° has to be between 47° and 104°

Thinking/Inquiry/Problem Solving

[4] 16. Find side x . State if triangles are similar and why?



$$\triangle SQR \sim \triangle TPR$$

(SSS) \times AA \sim

$$\frac{SQ}{SR} = \frac{x}{TR}$$

$$\frac{2.1}{4.3} = \frac{x}{6.1}$$

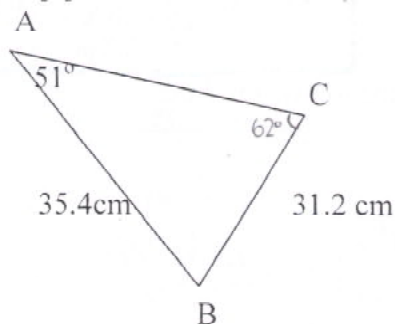
$$4.3x = 12.81$$

$$x = 2.979 \text{ m.}$$

\therefore side x is 2.979 m.

3.5

[4] 17. Solve $\triangle ABC$ (Find all angles and all sides)



$$\frac{\sin 51}{31.2} = \frac{\sin C}{35.4}$$

$$\sin C = \frac{27.51}{31.2}$$

$$C = \sin^{-1}(0.88)$$

$$\angle C = 62^\circ$$

$$\angle B = 180 - 51 - 62 = 67^\circ$$

$$\frac{\sin 67}{b} = \frac{\sin 51}{31.2}$$

$$0.77b = 28.71$$

$$b = 37.28 \text{ cm}$$

$$a = 31.2 \text{ cm}$$

$$b = 37.28 \text{ cm}$$

$$c = 35.4 \text{ cm}$$

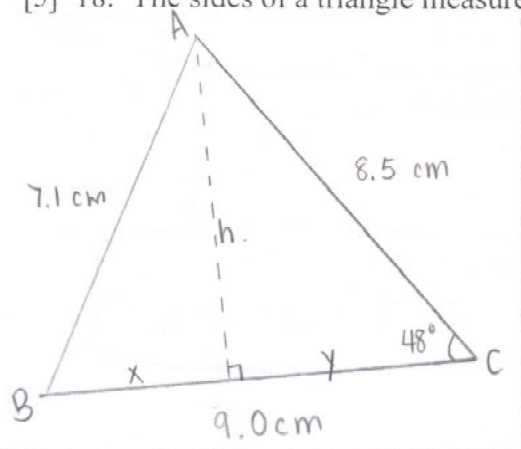
$$\angle A = 51^\circ$$

$$\angle B = 67^\circ$$

$$\angle C = 62^\circ$$

4

[5] 18. The sides of a triangle measures 9.0 cm, 7.1 cm and 8.5 cm. Find the area of the triangle.



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

$$\cos C = \frac{7.1^2 + 9^2 - 8.5^2}{-2(9)(8.5)}$$

$$C = \cos^{-1}(0.672)$$

$$\angle C = 48^\circ$$

$$\sin 48 = \frac{h}{5.688}$$

$$\tan? \quad h = 4.23 \text{ cm.}$$

$$\cos 48 = \frac{y}{8.5}$$

$$y = 5.688 \text{ cm}$$

$$\text{Area} = \frac{b \times h}{2}$$

$$= \frac{9 \times 4.23}{2}$$

$$= 19.035 \text{ cm}^2$$

\therefore the area of the triangle is 19.035 cm^2

4

11.5