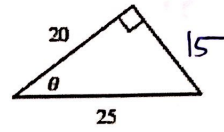


I. Trig Ratios

Write each trig ratio for θ in simplest form.

1. $\sin(\theta) = \frac{3}{5}$ (15/25) 2. $\cos(\theta) = \frac{4}{5}$ (20/25) 3. $\tan(\theta) = \frac{3}{4}$ (15/20)



$$\begin{aligned} 20^2 + x^2 &= 25^2 \\ 400 + x^2 &= 625 \\ x^2 &= 225 \\ x &= 15 \end{aligned}$$

II. Solve for the missing variables or the ? using Trigonometry. Round to the nearest tenth.

4. $\sin 62 = x/11$
 $11 \cdot \sin 62 = x$
 $x = 9.7$

5. $\cos X = 19/30$
 $X = \cos^{-1}(19/30)$
 $X = 50.7^\circ$

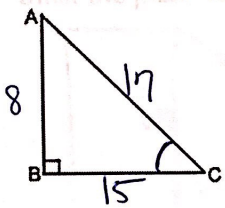
6. $\cos 34 = \frac{20}{x}$
 $x \cos 34 = 20$
 $x = \frac{20}{\cos 34}$
 $x = 24.1$

7. $\tan X = \frac{30}{44}$
 $X = \tan^{-1}(30/44)$
 $X = 34.3^\circ$

8. $\sin X = \frac{7}{14}$
 $X = \sin^{-1}(7/14)$
 $X = 30^\circ$

9. $\tan 20 = 12/x$
 $x \cdot \tan 20 = 12$
 $x = \frac{12}{\tan 20}$
 $x = 33$

10. For the triangle below, if $\cos C = \frac{15}{17}$, what is $\cos A$?



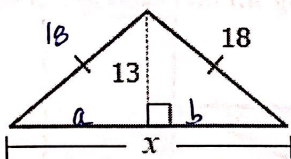
$$\begin{aligned} 15^2 + x^2 &= 17^2 \\ 225 + x^2 &= 289 \\ x^2 &= 64 \\ x &= 8 \end{aligned}$$

$\cos A = 8/17$

11. $4 \cos x - 1 = 2$

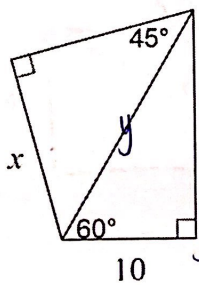
$$\begin{aligned} 4 \cos x &= 3 \\ \cos x &= 3/4 \\ x &= \cos^{-1}(3/4) \\ x &= 41.4^\circ \end{aligned}$$

12.



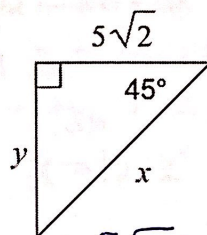
$$\begin{aligned} 13^2 + b^2 &= 18^2 \\ 169 + b^2 &= 324 \\ b^2 &= 155 \\ b &= 12.4 \\ a + b &= 12.4 + 12.4 \\ &= 24.8 \end{aligned}$$

15.



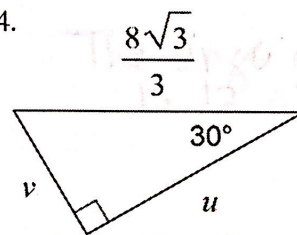
$$\begin{aligned} \cos 60 &= 10/y \\ y \cdot \cos 60 &= 10 \\ y &= \frac{10}{\cos 60} \\ y &= 20 \\ \sin 45 &= x/20 \\ x &= 20 \cdot \sin 45 \\ x &= 14.1 \end{aligned}$$

13.



$$\begin{aligned} \cos 45 &= \frac{5\sqrt{2}}{x} \\ x \cdot \cos 45 &= 5\sqrt{2} \\ x &= \frac{5\sqrt{2}}{\cos 45} \\ x &= 10 \\ \tan 45 &= y/5\sqrt{2} \\ 5\sqrt{2} \cdot \tan 45 &= y \\ y &= 7.1 \end{aligned}$$

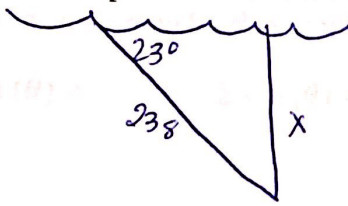
14.



$$\begin{aligned} \sin 30 &= v / \frac{8\sqrt{3}}{3} \\ \frac{8\sqrt{3}}{3} \cdot \sin 30 &= v \\ v &= 2.3 \\ \cos 30 &= \frac{u}{\frac{8\sqrt{3}}{3}} \\ u &= \frac{8\sqrt{3}}{3} \cdot \cos 30 \\ u &= 4 \end{aligned}$$

III. Application Problems. Round to the nearest tenth.

16. The radar from a ship on the surface of the water detects a submarine 238 feet away at an angle of depression of 23° . How deep underwater is the submarine?



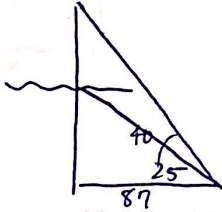
$$\sin 23 = \frac{x}{238}$$

$$x = 238 \cdot \sin 23$$

$$x = 93$$

The submarine is 93 feet below the surface.

17. A radio station tower was built in two sections. From a point 87 feet from the base of the tower, the angle of elevation to the top of the first section is 25° and the angle of elevation to the top of the second section is 40° . To the nearest tenth of a foot, what is the height of the top section of the tower?



$$\tan 40 = \frac{x + 73}{87}$$

$$87 \cdot \tan 40 = x + 73$$

$$x = 73 \text{ feet}$$

$$\tan 25 = \frac{x}{87}$$

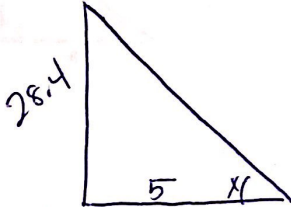
$$87 \cdot \tan 25 = x$$

$$x = 40.6 \text{ feet}$$

$$73 - 40.6 = 32.4$$

The top section is 32.4 feet tall.

18. A tower, 28.4 feet high, must be secured with a guy wire anchored 5 feet from the base of the tower. What angle will the guy wire make with the ground?



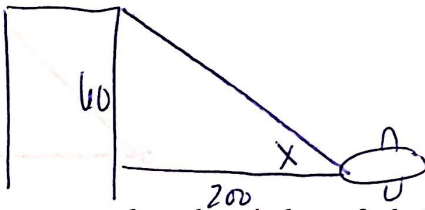
$$\tan x = \frac{28.4}{5}$$

$$x = \tan^{-1}(28.4/5)$$

$$x = 80^\circ$$

The guy wire will make an 80° angle with the ground.

19. An airplane takes off 200 yards in front of a 60-foot-tall building. To the nearest tenth, at what angle of elevation must the plane take off in order to avoid crashing into the building? $60/3 = 20$ yards



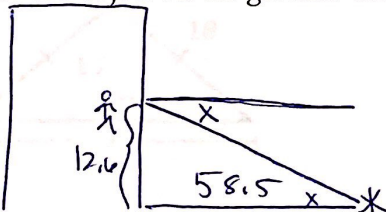
$$\tan x = \frac{20}{200}$$

$$x = \tan^{-1}(20/200)$$

$$x = 5.71^\circ$$

The angle must be greater than 5.7° .

20. A person stands at the window of a building so that his eyes are 12.6 meters above the level ground. An object is on the ground 58.5 meters away from the base of the building. Compute the angle of depression of the person's line of sight to the object on the ground. Round to the nearest tenth.



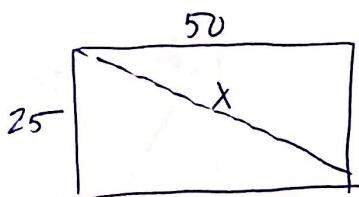
$$\tan x = 12.6/58.5$$

$$x = \tan^{-1}(12.6/58.5)$$

$$x = 12.2^\circ$$

The angle of depression is 12.2° .

21. An Olympic-size swimming pool is approximately 50 meters long by 25 meters wide. What distance will a swimmer travel if they swim from one corner to the opposite corner?



$$50^2 + 25^2 = x^2$$

$$2500 + 625 = x^2$$

$$x^2 = 3125$$

$$x = 55.9$$

The swimmer will swim 55.9 meters.