# Popper # 20

(1) $\cos(x) = \frac{\sqrt{2}}{2}$ on $[0, \pi)$

period $= 2\pi$ → we are getting half: $x = \frac{\pi}{4}$, ~~$\frac{7\pi}{4}$~~

A. $\frac{\pi}{4}$ B. $\frac{7\pi}{4}$ C. $\frac{\pi}{4}, \frac{7\pi}{4}$ D. $\frac{3\pi}{4}$

(2) $\sin(2x) = \frac{\sqrt{3}}{2}$ on $[0, \pi)$

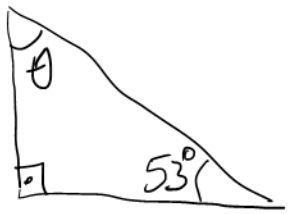
$\frac{\pi}{3}, \frac{2\pi}{3}$

period $= \frac{2\pi}{2} = \pi$ → full rotation

$x = \frac{\pi}{6}, \frac{2\pi}{6} = \frac{\pi}{3}$

A. $\frac{\pi}{3}, \frac{2\pi}{3}$ B. $\frac{\pi}{6}, \frac{\pi}{3}$ D. $\frac{\pi}{3}$ E. none

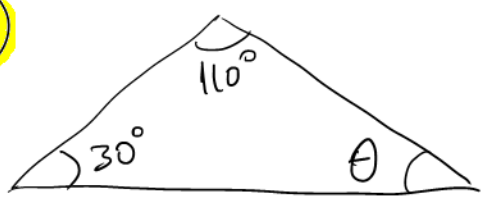
(3)




A. 53° B. 37° C. 90° D. none

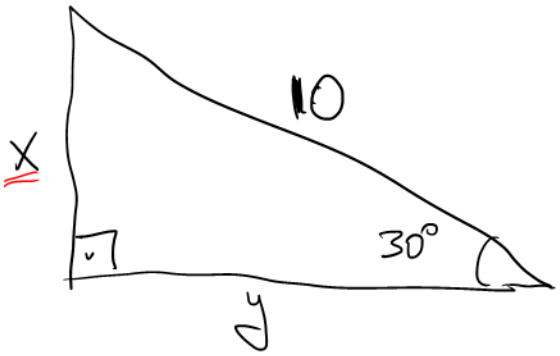
$\theta = 90° - 53° = 37°$

(4)




A. 60° B. 50° C. 40° D. 90°

$\theta = 180° - (110° + 30°) = 40°$



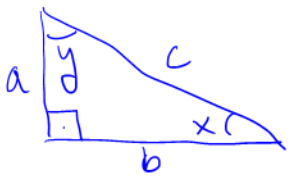

(5) Find x.

A. $10\sqrt{3}$ B. $5\sqrt{3}$ C. 5 D. none

(6) Find y

A. 5 B. $\sqrt{3}$ C. $10\sqrt{3}$ D. $5\sqrt{3}$

$x = 5 \cdot 1$ $y = 5\sqrt{3}$ $10 = 5 \cdot 2$




→ find all sides
→ find all angles

**Section 7.1 – Solving Right Triangles**

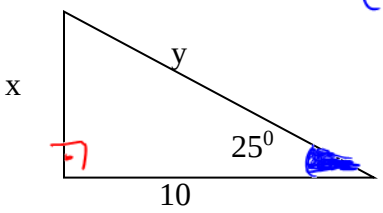
Don't forget
→ Pythagorean Thm
→ Trigonometric functions

Note that a calculator will be needed for most of the problems we will do in class. Test problems will involve angles for which no calculator is needed (e.g., 30°, 45°, 60°, 120°, etc.). So, you will still need those unit circle values.

We'll use right triangle trigonometry to find the lengths of all of the sides and the measures of all of the angles. In some problems, you will be asked to find one or two specific pieces of information, but often you'll be asked to "solve the triangle," that is, to find all lengths and measures that were not given.

Example 1: Find x and y.

Solve the right triangle.
(Relate the unknown with the known info.)




To find x:

$\tan(25°) = \frac{x}{10}$

$\Rightarrow x = 10\tan(25°)$

$x \simeq 4.66$

To find y:

$\cos(25°) = \frac{10}{y}$

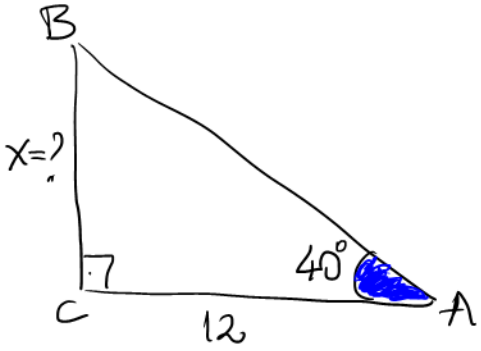
$\Rightarrow y = \frac{10}{\cos(25°)}$

$y \simeq 11.03$

Note: In the exam,

$x = 10\tan(25°)$, $y = \frac{10}{\cos(25°)}$

Example 2: In $\Delta ABC$ with right angle $C$, $\angle A = 40°$ and $AC = 12$. Find $BC$. Round the answer to the nearest hundredth. (two decimals)




Find the best relation between "x" and the known info.

$\tan 40° = \frac{x}{12}$

$\Rightarrow x = 12\tan(40°)$ (exam answer)

$x \simeq 10.07$ (with calculator)

# Unit Circle:

- $\cos\left(\frac{\pi}{3}\right) = \frac{1}{2}$ , $\cos^{-1}\left(\frac{1}{2}\right) = \frac{\pi}{3}$ unique

  ($\cos(x) = \frac{1}{2}$, QI)

- $\sin\left(\frac{3\pi}{4}\right) = \frac{\sqrt{2}}{2}$ , $\sin^{-1}\left(\frac{\sqrt{2}}{2}\right) = \frac{\pi}{4}$ unique

  ($\sin(x) = \frac{\sqrt{2}}{2}$, QI)

( Working with special angles $30^\circ, 45^\circ, 60^\circ$ and their corresponding values in QII, III and IV we can do evaluations back and forth. )

What if:

- $\cos(53^\circ) = ?$
- $\sin\left(\frac{\pi}{5}\right) = ?$

} use Calculator ⟹

$\cos(53^\circ) \cong 0.60$

$\sin\left(\frac{\pi}{5}\right) \cong 0.59$

- $\cos(x) = \frac{4}{7} \Rightarrow x = \cos^{-1}\left(\frac{4}{7}\right) \cong 55.15^\circ$ (I, Calculator)
- $\sin(x) = -\frac{2}{3} \Rightarrow x = \sin^{-1}\left(-\frac{2}{3}\right) \cong -41.81^\circ$ (IV, Calculator)

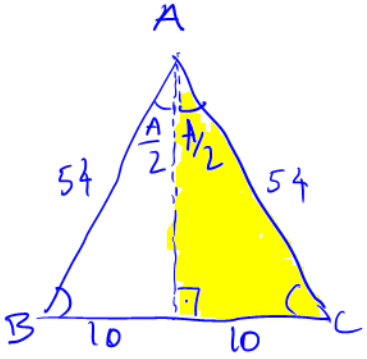
To be continued on Tuesday, 04/19

Always

Thursday 04/21

Example 3: Draw a diagram to represent the given situation. Then find the indicated measures to the nearest tenth of a degree.

An isosceles triangle has sides measuring 20 inches, 54 inches and 54 inches. What are the measures of its angles?




- Note that $m(\hat{B}) = m(\hat{C})$
- In the yellow-shaded right triangle
- $\cos(\hat{C}) = \frac{10}{54} = \frac{5}{27} \Rightarrow \hat{C} = \cos^{-1}\left(\frac{5}{27}\right)$

$\hat{C} = 79.3^\circ$

$\Rightarrow$ $m(\hat{B}) = m(\hat{C}) = 79.3^\circ$

$m(\hat{A}) = 2 \times 10.67^\circ = 21.4^\circ$

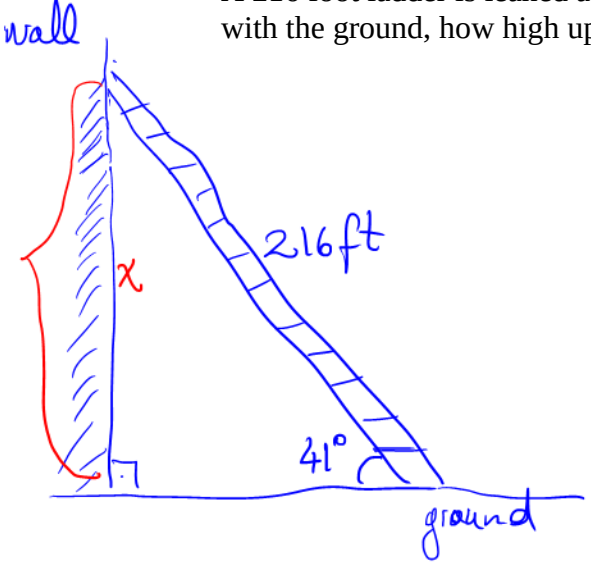
To find $\hat{A}$ $= 180^\circ - (79.3^\circ + 79.3^\circ) = 21.4^\circ$

- $\sin\left(\frac{\hat{A}}{2}\right) = \frac{10}{54} = \frac{5}{27} \Rightarrow \frac{\hat{A}}{2} = \sin^{-1}\left(\frac{5}{27}\right)$

$\frac{\hat{A}}{2} \cong 10.7^\circ$

Example 4: Draw a diagram to represent the given situation. Then find the indicated measure to the nearest tenth. one decimal

A 216 foot ladder is leaned against the side of a building. If the ladder forms a 41° angle with the ground, how high up the side of the building does the ladder reach?




All this problem is summed up to this equation:

$$\sin(41^\circ) = \frac{x}{216}$$

$\Rightarrow$ $x = 216 * \sin(41^\circ)$

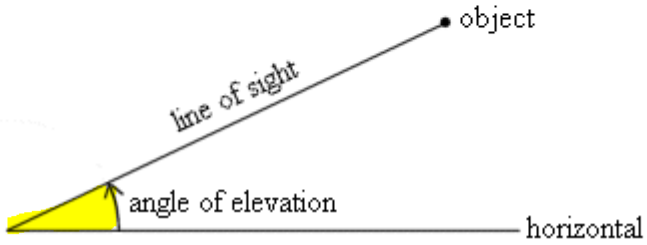
$x \cong 141.7$

nearest tenth

# Angle of Elevation; Angle of Depression:

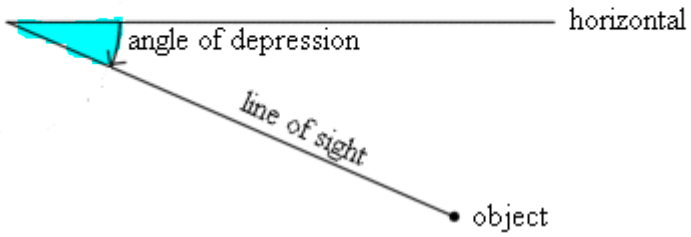
up

An angle of elevation is an angle that is formed by a horizontal ray and another ray above the horizontal. For example, in viewing an object at a point above the horizontal, the angle between the line of sight and the horizontal is the angle of elevation as shown in the figure below.



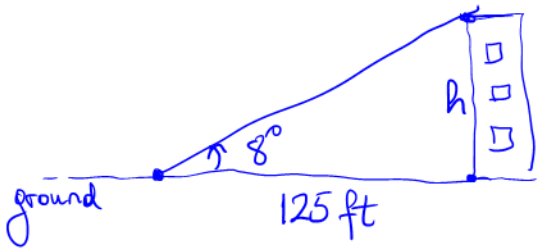

down

An angle of depression is an angle that is formed by a horizontal ray and another ray below the horizontal. For example, in viewing an object at a point below the horizontal, the angle between the line of sight and the horizontal is the angle of depression as shown in the figure below.

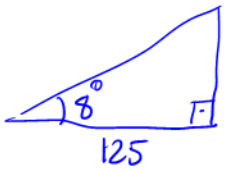


Example 5: Draw a diagram to represent the given situation. Then find the indicated measure to the nearest tenth. one-decimal

The angle of elevation to the top of a building from a point on the ground 125 feet away from the building is 8°. How tall is the building?




$\Rightarrow$



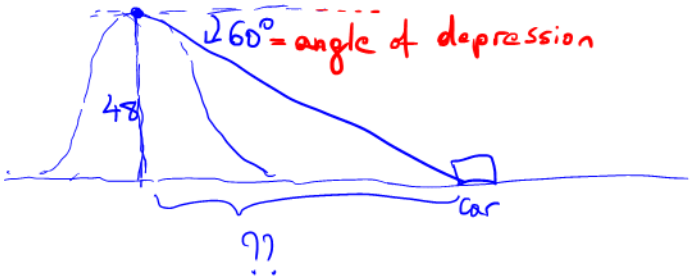

$\Rightarrow \tan 8^\circ = \frac{h}{125}$

$\Rightarrow$ $h = 125 \cdot \tan(8^\circ)$

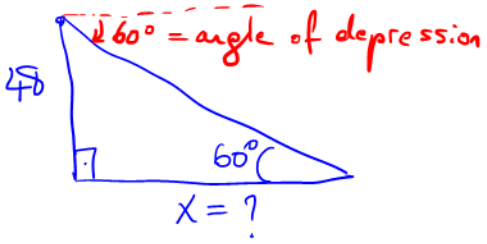
$h \cong 17.6$

Example 6: Draw a diagram to represent the given situation. Then find the indicated measure to the nearest tenth. one-decimal

Dave is at the top of a hill. He looks down and spots his car at a 60° angle of depression. If the hill is 48 meters high, how far is his car from the base of the hill?




$\Rightarrow$




$\tan 60^\circ = \frac{48}{X} \iff X = \frac{48}{\tan 60^\circ}$

$X = \frac{48}{\sqrt{3}} \cdot \frac{\sqrt{3}}{\sqrt{3}} = \frac{48\sqrt{3}}{3} = 16\sqrt{3}$ m

exam

$X \cong 27.7$ m calculator