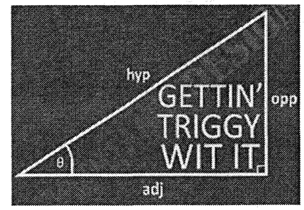
Name: Key Date:



Right triangle problem solving U6D3 Applications

DEGREE MODE

SHOW ALL WORK TO SUPPORT YOUR ANSWERS!!!!!!!

Draw diagrams to help yourself!!!!!!

SOH CAH TOA

1) In $\triangle ABC$, where $\angle C$ is a right angle, $\cos A = \frac{\sqrt{21}}{5}$. What is $\sin B$?

(1) $\frac{\sqrt{21}}{5}$ (3) $\frac{2}{5}$

(2) $\frac{\sqrt{21}}{2}$ (4) $\frac{5}{\sqrt{21}}$

$\underbrace{\sin A = \cos B}_{\text{complementary ∡'s}}$

co-functions

2) **In $\triangle ABC$, the complement of $\angle B$ is $\angle A$. Which statement is always true?**

(1) $\tan \angle A = \tan \angle B$ **(3) $\cos \angle A = \tan \angle B$**

(2) $\sin \angle A = \sin \angle B$ **(4) $\sin \angle A = \cos \angle B$**

same concept!

3) If $\cos(2x-1)^\circ = \sin(3x+6)^\circ$, then find the value of x.

$2x - 1 + 3x + 6 = 90$

$5x + 5 = 90$

$5x = 85$

$\boxed{x = 17}$

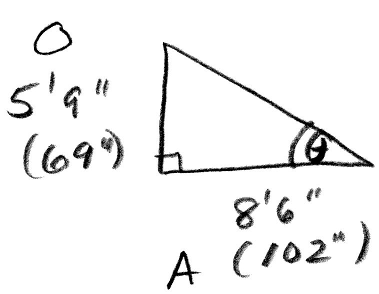
4) Find the value of R that will make the equation sin 73° cos R true when 0° < R <90°. Explain your answer.

1) sine & cosine are cofunctions

2) $\sin A = \cos B$ if $m∡A + m∡B = 90°$

3) $\underbrace{\sin 73° = \cos \underline{17}°}_{90°}$ $\boxed{R = 17°}$

5) **A man who is 5 feet 9 inches tall casts a shadow of 8 feet 6 inches. Assuming that the man is standing perpendicular to the ground, what is the angle of elevation from the end of the shadow to the top of the man's head, to the *nearest tenth of a degree*?**



convert to inches

$5 \times 12'' = 60'' + 9'' = 69''$

$8 \times 12'' = 96'' + 6'' = 102''$

$\tan \theta = \frac{69''}{102''}$

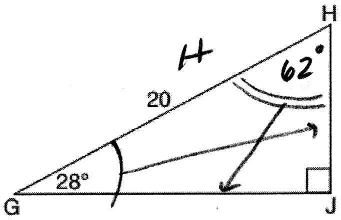
$\tan^{-1}\left(\frac{69}{102}\right) \approx 34.1°$

SOH CAH TOA

6) When instructed to find the length of $\overline{HJ}$ in right triangle HJG, Alex wrote the equation $\sin 28° = \frac{HJ}{20}$ while Marlene wrote $\cos 62° = \frac{HJ}{20}$. Are both students' equations correct? Explain why.

Both students are correct

$$\begin{array}{r} 28 \\ +62 \\ \hline 90° \end{array}$$

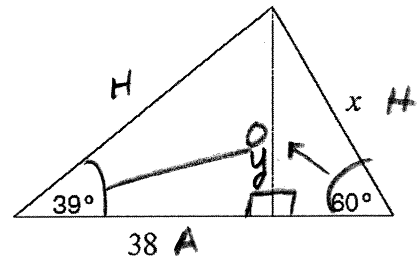


$\sin 28° = \frac{HJ}{20}$ ✓

$\cos 62° = \frac{HJ}{20}$ ✓

sine & cosine are cofunctions, so they will be equal when there angles are complements.

7) Find the value of x. ***Round to the nearest tenth.***



$\tan 39° = \frac{y}{38}$

$y \approx 30.77179326...$

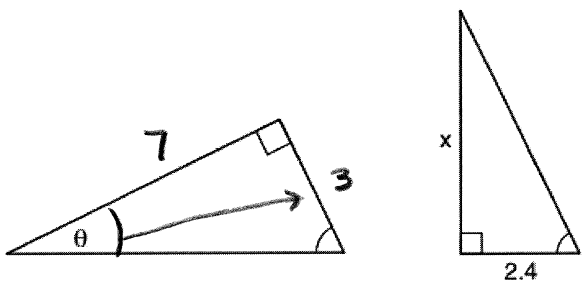
$\sin 60° = \frac{30.77...}{x}$

$\frac{(\sin 60°)x}{(\sin 60°)} = \frac{30.77...}{(\sin 60°)}$

$x \approx 35.5322...$

$\boxed{x \approx 35.5}$

8) The diagram below shows two similar triangles.



If $\tan \theta = \frac{3}{7}$, what is the value of x, to the *nearest tenth*?

(1) 1.2
(2) 5.6
(3) 7.6
(4) 8.8

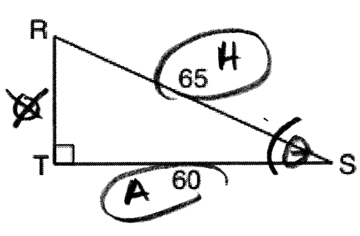
$\tan \theta = \frac{3}{7} \frac{O}{A}$

$\frac{7}{x} = \frac{3}{2.4}$

$3x = 16.8$

$x = 5.6$

9) In the diagram of $\triangle RST$ below, $m\angle T = 90°$, $RS = 65$, and $ST = 60$



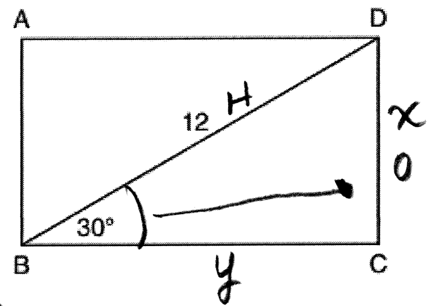
What is the measure of $\angle S$, to the *nearest degree*?

(1) 23°
(2) 43°
(3) 47°
(4) 67°

$\cos \theta = \frac{60}{65}$

$\cos^{-1}\left(\frac{60}{65}\right) \approx 22.619....$

10)
The diagram shows rectangle $ABCD$, with diagonal $\overline{BD}$.



$\sin 30° = \frac{x}{12}$

$x = 6$

Now, we need length of $\overline{BC}$ (y)

use trig or $a^2+b^2=c^2$

$y^2 + 6^2 = 12^2$

$y^2 = 108$

$y = \sqrt{108} \approx 10.39...$

What is the perimeter of rectangle $ABCD$, to the *nearest tenth*?

(1) 28.4
(2) 32.8
(3) 48.0
(4) 62.4

$P = 6 + 6 + 10.39... + 10.39...$

$\boxed{P \approx 32.8}$

11) Claire is holding her kite string 3 feet above the ground, as shown in the accompanying diagram. The distance between his hand and a point directly under the kite is 95 feet. If the angle of elevation to the kite is 50°, **find the height, *h*, of his kite. to the *nearest foot*.**

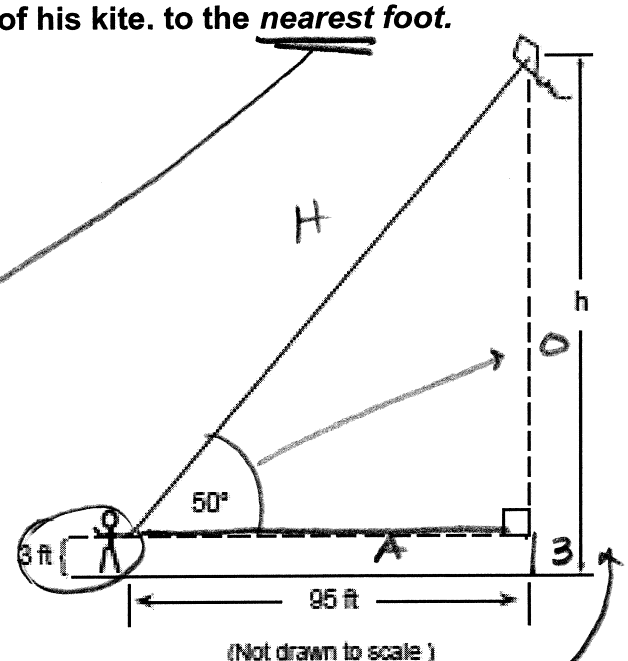
$\tan 50° = \frac{h}{95}$

$h \approx 113.2165913...$

$+ 3$

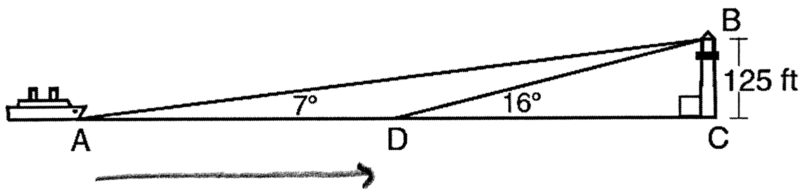
$116.216...$

116 feet

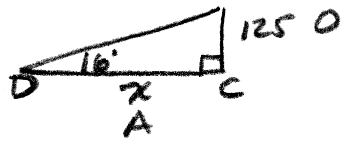


need
$h+3$ ☺

12) As shown in the diagram below, a ship is heading directly toward a lighthouse whose beacon is 125 feet above sea level. At the first sighting, point A, the angle of elevation from the ship to the light was 7°. A short time later, at point D, the angle of elevation was 16°.



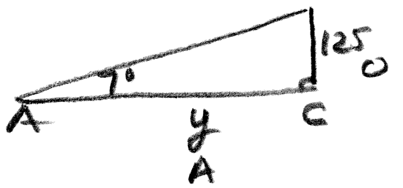
To the *nearest foot*, determine and state how far the ship traveled from point A to point D.



$\tan 16° = \frac{125}{x}$

$\frac{(\tan 16)x}{(\tan 16)} = \frac{125}{(\tan 16)}$

$x \approx 435.9268055...$



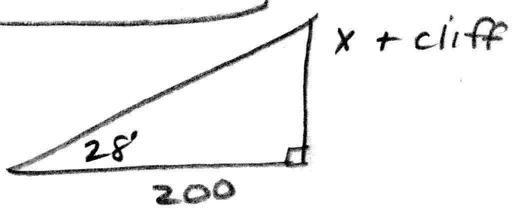
$\tan 7° = \frac{125}{y}$

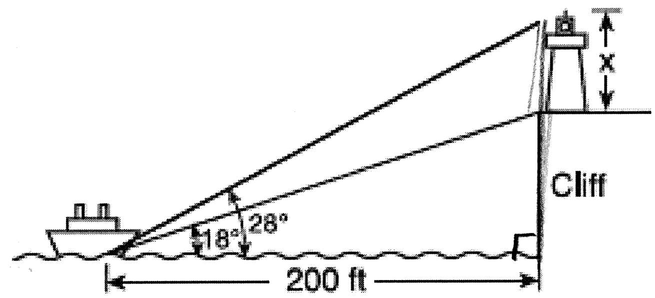
$y \approx 1018.0433303...$

$$\begin{array}{r} 1018.0433... \\ - \; 435.9268... \\ \hline 582.1164... \end{array}$$

$\boxed{582 \text{ feet}}$

13) A lighthouse is built on the edge of a cliff near the ocean, as shown in the accompanying diagram. From a boat located 200 feet from the base of the cliff, the angle of elevation to the top of the cliff is 18° and the ~~angle of elevation to~~ the top of the lighthouse is 28°. ***What is the height of the lighthouse, x, to the nearest tenth of a foot?***





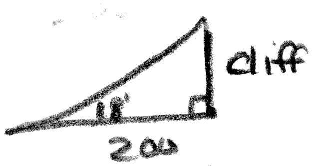
$\tan 28° = \frac{x + \text{cliff}}{200}$

$(\tan 28°)(200) = x + \text{cliff}$

$106.3418863... \approx x + \text{cliff}$

$$\begin{array}{r} 106.3418863... \\ - \; 64.983939... \\ \hline 41.3579... \end{array}$$

$\boxed{41.4 \text{ feet}}$

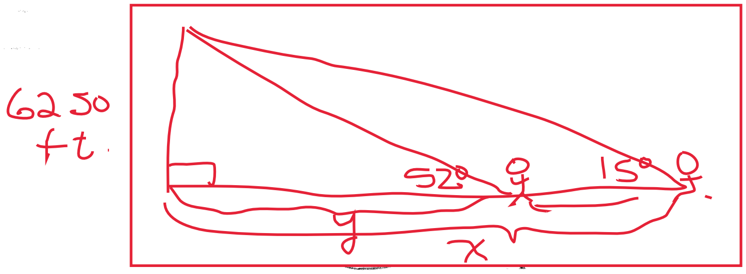


$\tan 18° = \frac{\text{cliff}}{200}$

$(\tan 18°)(200) = \text{cliff}$

$\text{cliff} \approx 64.98393925...$

14) Freda, who is training to use a radar system, detects an airplane flying at a constant speed and heading in a straight line to pass directly over her location. She sees the airplane at an angle of elevation of 15° and notes that it is maintaining a constant altitude of 6250 feet. One minute later, she sees the airplane at an angle of elevation of 52°. How far has the airplane traveled, to the *nearest foot*?



$\tan 15° = \frac{6250}{x}$ $\quad \frac{(\tan 15°)(x)}{(\tan 15)} = \frac{6250}{(\tan 15)}$ $\quad x \approx 23325.31755...$

$\tan 52° = \frac{6250}{y}$ $\quad \frac{(\tan 52)y}{(\tan 52)} = \frac{6250}{(\tan 52)}$ $\quad y \approx 4883.035166...$

$-$

18442.28238

$\boxed{18,442 \text{ feet}}$

Determine and state the speed of the airplane, to the *nearest mile per hour*.

$D = R \cdot T$

$\frac{18,442 \text{ feet}}{5,280 \text{ feet/mi}} \approx 3.4928... \text{ miles}$

$1 \text{ minute} = \frac{1}{60} \text{ hour}$

$(60)(3.4928) = R\left(\frac{1}{60}\right) 60$

$R = 209.568...$

$R \approx 210 \text{ mph}$