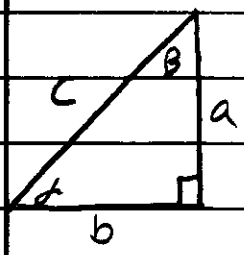
Trig 6.7 Applied Problems



$\alpha + \beta = 90°$ $\quad \sin\alpha = \frac{a}{c}$

$c^2 = a^2 + b^2$ $\quad \cos\alpha = \frac{b}{c}$

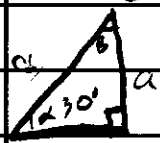
$\tan\alpha = \frac{a}{b}$

For triangle, we have (3 sides & 3 angles) 6 elements.

In a right triangle, one angle is 90°, if we are given another angle, then we know all 3.

In a right triangle, if given two sides, use pythagorean theorm to find the third side.

In a right triangle, if given one angle and one side, we need to find the other four elements.



3 angles $\alpha = 30°$ $\beta = ?$ $\gamma = 90°$ $\beta = 60°$

3 sides $a = ?$ $b = 20$ $c = ?$

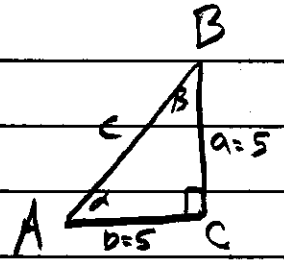
$\tan 30° = \frac{a}{b} = \frac{a}{20}$ $\quad \frac{\sqrt{3}}{3} = \frac{a}{20}$ $\quad a = \frac{20\sqrt{3}}{3}$

$\cos 30° = \frac{20}{c}$ $\quad \frac{\sqrt{3}}{2} = \frac{20}{c}$ $\quad c = \frac{40\sqrt{3}}{3}$

$a = 5$ $\quad b = 5$ Find c, α, β

$a^2 + b^2 = c^2$. $\quad 5^2 + 5^2 = c^2$ $\quad 50 = c^2$ $\quad c = 5\sqrt{2}$

$\tan\alpha = \frac{a}{b} = \frac{5}{5} = 1$ $\quad \alpha = 45°$ $\quad \beta = 45°$



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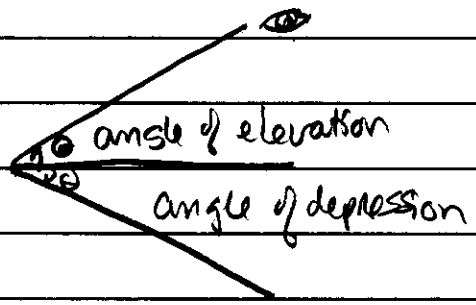
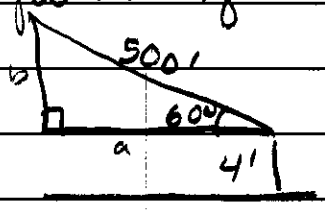


Trig 6.7

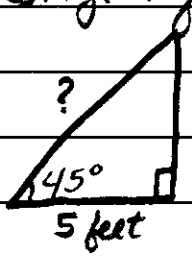
EX.1 A person flying a kite holds the string 4 feet above ground level. The string of a kite is taut and makes an angle of 60° with the horizontal. Approximate the height of the kite above the level ground if 500 feet of string is payed out.



$\sin 60° = \frac{b}{500}$ $\frac{\sqrt{3}}{2} = \frac{b}{500}$ $b = 250\sqrt{3}$

So height = $4 + 250\sqrt{3}$ feet

EX.2 A ladder is placed against a wall. Where the ladder is 5 feet from the wall (at the ground) the angle of elevation is 45°. What is the length of the ladder.



$\cos 45° = \frac{5}{c}$

$\frac{\sqrt{2}}{2} = \frac{5}{c}$ $c = \frac{10}{\sqrt{2}} = \frac{10\sqrt{2}}{2} = 5\sqrt{2}$

Ladder is $5\sqrt{2}$ feet long