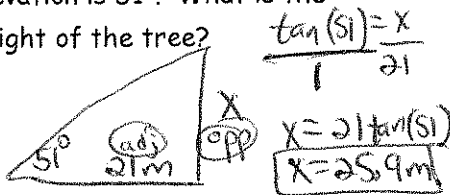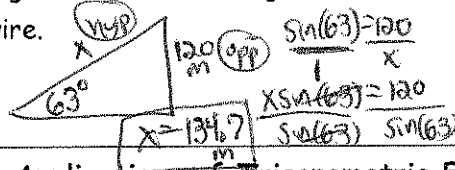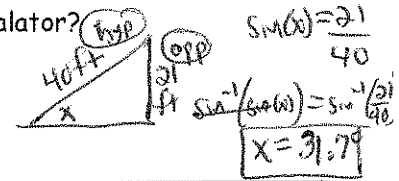| Day 3: Applications of Trigonometric Functions |
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Warm-Up:

1. A tree casts a shadow 21m long while the sun's angle of elevation is 51°. What is the height of the tree?

$$\frac{\tan(51) = \frac{x}{21}}{1}$$

$x = 21\tan(51)$

$x = 25.9m$

2. A guy wire reaches from the top of a 120m TV tower to the ground making an angle of 63° with the ground. Find the length of the wire.

$$\frac{\sin(63) = \frac{120}{x}}{1}$$

$x\sin(63) = 120$

$\frac{x\sin(63)}{\sin(63)} = \frac{120}{\sin(63)}$

$x = 134.7 m$

3. A 40 foot escalator rises to a height of 21 feet. What is the angle of inclination (elevation) of the escalator?

$$\sin(x) = \frac{21}{40}$$

$\sin^{-1}(\sin(x)) = \sin^{-1}(\frac{21}{40})$
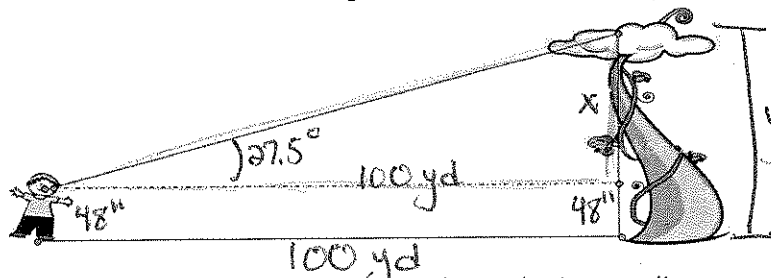
$x = 31.7°$

Notes Day 3 – More with Applications of Trigonometric Functions

Preparation for Clinometer Lab

Example:

Jack was bragging about climbing a beanstalk. One of his friends, tired of hearing the story for the umpteenth time asked, "Jack, how tall was the beanstalk?" Knowing that his friends would pester him forever, Jack decided to find out...

$$\frac{\tan(27.5) = \frac{x}{100}}{1}$$

$x = 100\tan(27.5)$

$x = 52.06\, yd$

$\times\ 3\ ft/yd$

$x = 156.17\, ft$

Jack stood 100 yards away from the point directly under where the beanstalk meets the clouds and used his clinometer to look at the top of the stalk (where it met the clouds). He measured the angle of elevation to be 27.5°. Using this information, what is the distance from the top of the bean stalk to Jack's line of sight?

52.06 yd = 156.17 feet = x

Jack then measured from his eyes to the ground (it was 48 inches). He then concluded that the stalk was

160.17 feet tall. = y

$x + 48" = y$ $156.17 + 4ft = y$

$x + 4ft = y$ $160.17 ft = y$

Example

While flying in a hot air balloon, Dorothy and the Wizard looked back at the Emerald City. Dorothy wondered, "How high was that lovely green castle?" Using her clinometer, she decided to find out! She knew (using her range finder, she knows that the horizontal distance to the city is 150 yards).
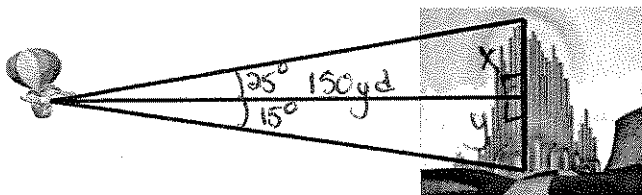
$$\frac{\tan(25) = \frac{x}{150}}{1}$$

$x = 150\tan(25)$

$x = 69.95\, yd$

$$\frac{\tan(15) = \frac{y}{150}}{1}$$

$y = 150\tan(15)$

$y = 40.19\, yd$

Dorothy measured the angle of depression from the balloon to the base of the emerald castle to be 15° and the angle of elevation to the top of the castle to be 25°. Based on these measurements, how tall is the castle?

$x + y = 69.95 yd + 40.19 yd$

$110.14 yd$