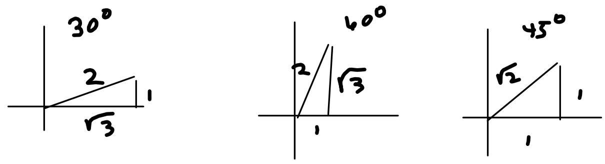
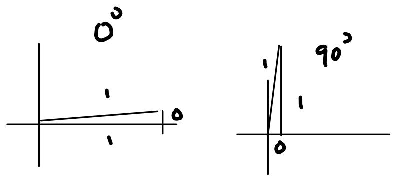
I'll be taking attendance with a screen shot of those in attendance. I'll let you know when I'm taking the screenshot, usually in the first 5 or 10 minutes of class. If you didn't hear me announce the roll-taking screen shot, make sure you're on the attendance sheet with a comment in the chat or by sticking around and saying something.

Today: Questions and 1.3.





Read sine, cosine, & tangent off these pictures.

§1.3 !

Right Triangle Definitions of Trigonometric Functions

Let θ be an *acute* angle of a right triangle. The six trigonometric function the angle θ are defined below. (Note that the functions in the second row the reciprocals of the corresponding functions in the first row.)

$\sin\theta = \frac{\text{opp}}{\text{hyp}} = \frac{y}{r} = \frac{o}{h}$ $\quad\cos\theta = \frac{\text{adj}}{\text{hyp}} = \frac{x}{r} = \frac{a}{h}$ $\quad\tan\theta = \frac{\text{opp}}{\text{adj}} = \frac{y}{x} = \frac{o}{a}$

$\boxed{\csc\theta = \frac{\text{hyp}}{\text{opp}} = \frac{r}{y} \quad \sec\theta = \frac{\text{hyp}}{\text{adj}} = \frac{r}{x} \quad \cot\theta = \frac{\text{adj}}{\text{opp}} = \frac{x}{y}}$

reciprocals of line above

The abbreviations

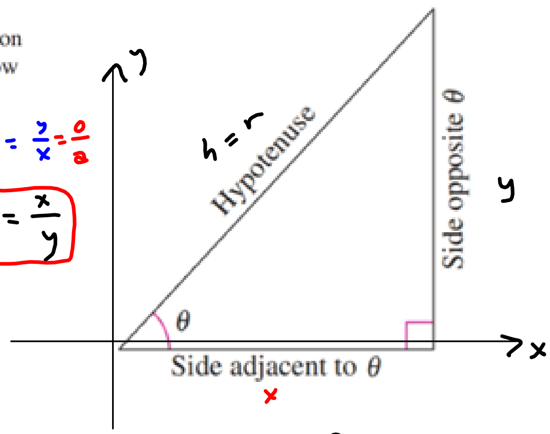
opp, *adj*, and *hyp*

represent the lengths of the three sides of a right triangle.

o = opp = the length of the side *opposite* θ

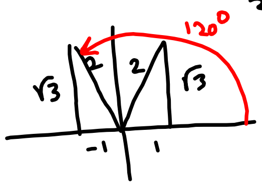
a = adj = the length of the side *adjacent to* θ

h = hyp = the length of the *hypotenuse*



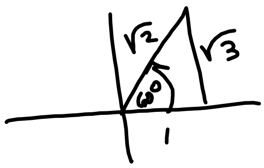
SOHCAHTOA - mnemonic for sine, cosine, & tangent.

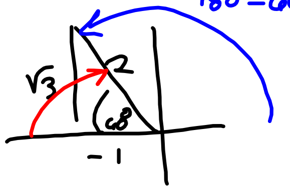
§1.4 $\sin(\theta) = \frac{\sqrt{3}}{2}$

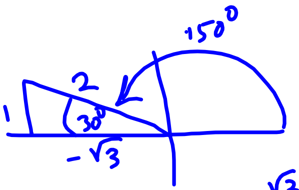


Two triangles satisfying $\sin\theta = \frac{\sqrt{3}}{2}$

Reference Angle: $60°$







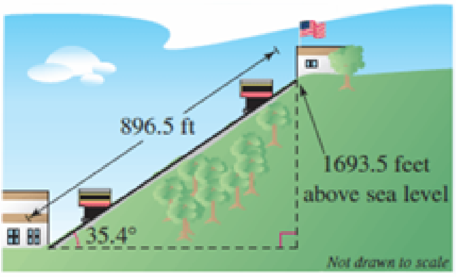
want $\sin\theta = \frac{\sqrt{3}}{2}$

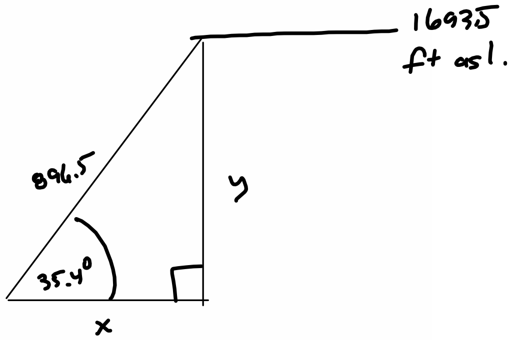
This is $\sin\theta = \frac{1}{2}$

https://harryzaims.com/

0/3 points LarTrig10 1.3.075. [3881624]

The Johnstown Inclined Plane in Pennsylvania is one of the longest and steepest hoists in the world. The railway cars travel a distance of 896.5 feet at an angle of approximately 35.4°, rising to a height of 1693.5 feet above sea level. (Round your answers to two decimal places.)





(a) Find the vertical rise of the inclined plane.

519.33 ft

water

$\frac{y}{r} = \sin\theta$ We want y, so

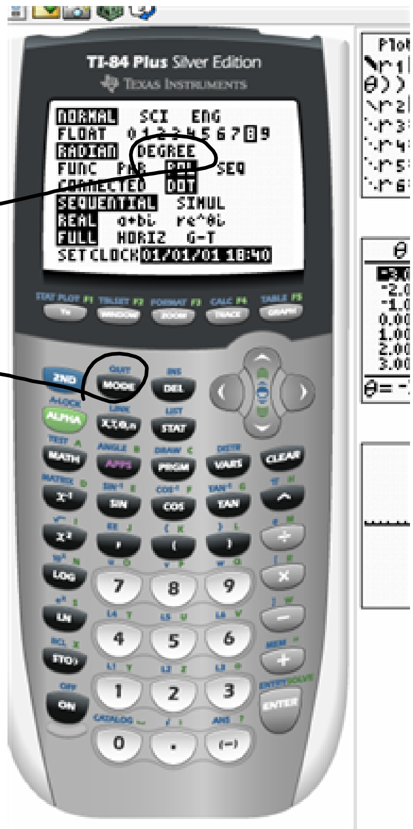
$y = r\sin\theta = (896.5)(\sin(35.4^\circ))$

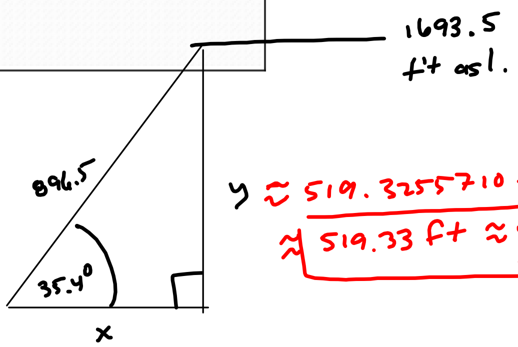
Question's in degrees. Make sure you're in degrees mode

896.5*sin(35.4)

$\boxed{519.3255710 \approx y}$

in feet.





$y \approx 519.3255710$ ft

$\boxed{\approx 519.33 \text{ ft} \approx y}$

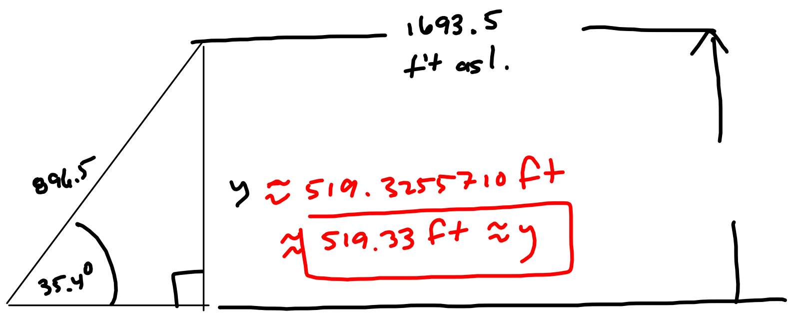
(b) Find the elevation of the lower end of the inclined plane.

[ ] ✗ 1174.17 ft

(c) The cars move up the mountain at a rate of 300 feet per minute. Find the rate at which they rise vertically.

[ ] ✗ 173.78 ft/min

(b)



$y \approx 519.3255710$ ft

$\boxed{\approx 519.33 \text{ ft} \approx y}$

is what altitude?

Subtract 519.33 from 1693.5 ft

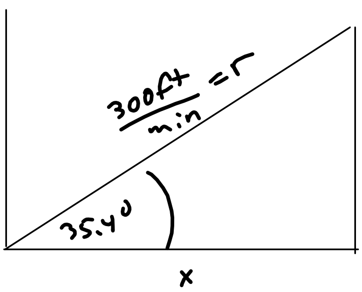
```
896.5*sin(35.4)
         519.3255710
Ans-1693.5
        -1174.174429
```

⇝ sign is wrong

(b) $1693.5 - 519.3255710 = 1174.17$ ft

(1174.174429)

(c) Rate triangle



$y = ?$ is the question

$$\frac{y}{r} = \sin\theta \Rightarrow$$

$$y = r\sin\theta$$

$$= \left(300\,\frac{\text{ft}}{\text{min}}\right)(\sin(35.4°))$$

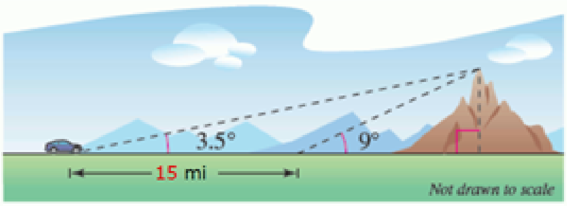
$$\approx \boxed{173.78\,\frac{\text{ft}}{\text{min}} \approx \text{vertical rate}}$$

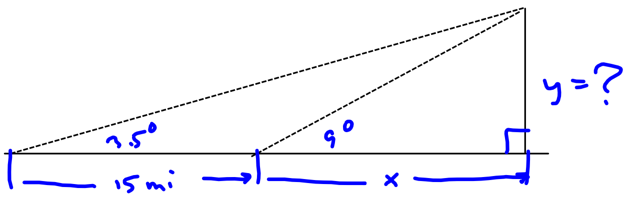
```
896.5*sin(35.4)
         519.3255710
Ans-1693.5
        -1174.174429
300sin(35.4)
         173.7843517
```

$\frac{\text{ft}}{\text{min}} \approx 173.78\,\frac{\text{ft}}{\text{min}}$

In traveling across flat land, you see a mountain directly in front of you. Its angle of elevation (to the peak) is 3.5°. After you drive 15 miles closer to the mountain, the angle of elevation is 9° (see figure). Approximate the height of the mountain. (Round your answer to one decimal place.)

[ ] ✗ 1.5 mi





Let y = height of the mountain above the plain, in miles

Looks like a tangent situation

$\tan(3.5°) = \dfrac{y}{15+x}$ AND $\tan(9°) = \dfrac{y}{x}$

Genius Move: $y = y$

$y = \tan(3.5°)(x+15)$ $\quad y = \tan(9°)\,x$

$\tan(3.5°)\,x + \tan(3.5°)(15) = \tan(9°)\,x$

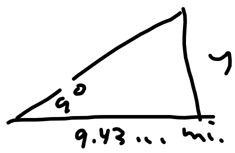
$\tan(3.5°)\,x - \tan(9°)\,x = -\tan(3.5°)(15)$

$\left(\tan(3.5°) - \tan(9°)\right)x = -\tan(3.5°)(15)$

```
        173.7843517
-tan(3.5)*15/(ta
n(3.5-tan(9))
       -15.71269510
-tan(3.5)*15/(ta
n(3.5)-tan(9))
  x ≈   9.43655756
```

$$x = \frac{-\tan(3.5°)(15)}{\tan(3.5°) - \tan(9°)}$$

So, horizontal distance from 1st reading to mtn is 15+9.43655756 mi (approx), but so what? Just use x & the 9° triangle



$\tan 9° = \dfrac{y}{x} \rightarrow$

$y = x \tan 9°$

$\approx (9.43\ldots)(\tan 9°)$

```
n(3.5-tan(9))
      -15.71269510
-tan(3.5)*15/(ta
n(3.5)-tan(9))
        9.43655756
Ans*tan(9)
        1.49460389
```

$\approx y$, so $\boxed{y \approx 1.5 \text{ mi.}}$

Fernando says do this

$\tan(3.5°) = \dfrac{y}{15+x}$ AND $\tan(9°) = \dfrac{y}{x}$ $\Rightarrow$

$x = \dfrac{y}{\tan(9°)}$

$\Rightarrow \tan(3.5°) = \dfrac{y}{15 + \frac{y}{\tan(9°)}}$

$\left(15 + \dfrac{y}{\tan(9°)}\right)\tan(3.5°) = y$

$15\tan(3.5°) + \dfrac{\tan(3.5°)}{\tan(9°)}y = y$

$15\tan(3.5°) = y - \dfrac{\tan(3.5°)}{\tan(9°)}y = \left(1 - \dfrac{\tan(3.5°)}{\tan(9°)}\right)y$

$\dfrac{15\tan(3.5°)}{1 - \frac{\tan(3.5°)}{\tan(9°)}} = y \approx 1.49460389 \text{ mi}$

$\approx \boxed{1.5 \text{ mi} \approx y}$

```
n(3.5)-tan(9))
        9.43655756
Ans*tan(9)
        1.49460389
15tan(3.5)/(1-ta
n(3.5)/tan(9))
        1.49460389
```

Section 1.4 extends 1.3 from the 1st quadrant to all 4 quadrants.

$\theta = \frac{50\pi}{3} > 2\pi$ = angle for one full revolution.

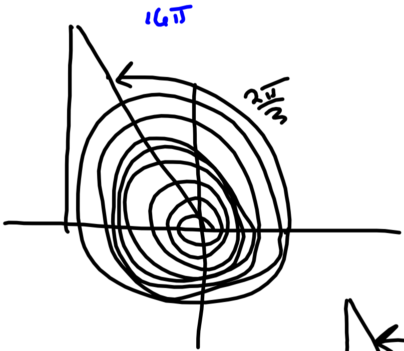
$\frac{50\pi}{3} \div 2\pi$ = # of revolutions = $8.\overline{3}$

So, 8 times around plus .33333... times around.

16π

$\frac{1}{3} \cdot 2\pi$ OR $.\overline{3} \cdot 2\pi$

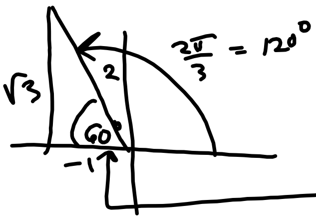
$= \frac{2\pi}{3}$



$\frac{2\pi}{3} \cdot \frac{180^\circ}{\pi} = 120^\circ$

$\cancel{8}.3\overline{3} \rightsquigarrow (.3\overline{3})(360^\circ)$

$= 120^\circ$



$180^\circ - 120^\circ = 60^\circ$

$\sin\theta = \frac{\sqrt{3}}{2}$

$\cos\theta = -\frac{1}{2}$

$\tan\theta = \frac{\sqrt{3}}{-1} = -\sqrt{3}$

$\csc\theta = \frac{2}{\sqrt{3}} \cdot \frac{\sqrt{3}}{\sqrt{3}} = \boxed{\frac{2\sqrt{3}}{3} = \csc\theta}$

$\boxed{\sec\theta = -2}$

$\cot\theta = -\frac{1}{\sqrt{3}} \cdot \frac{\sqrt{3}}{\sqrt{3}} = \boxed{-\frac{\sqrt{3}}{3} = \cot\theta}$