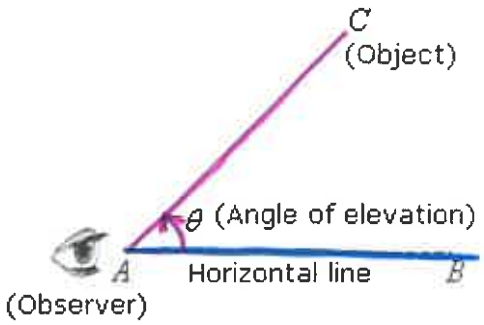
NOTES: Angles of Elevation and Depression

Date: Dec. 5

Angle of Elevation

The angle of elevation is the angle between a horizontal line from the observer and the line of sight to an object that is above the horizontal line.



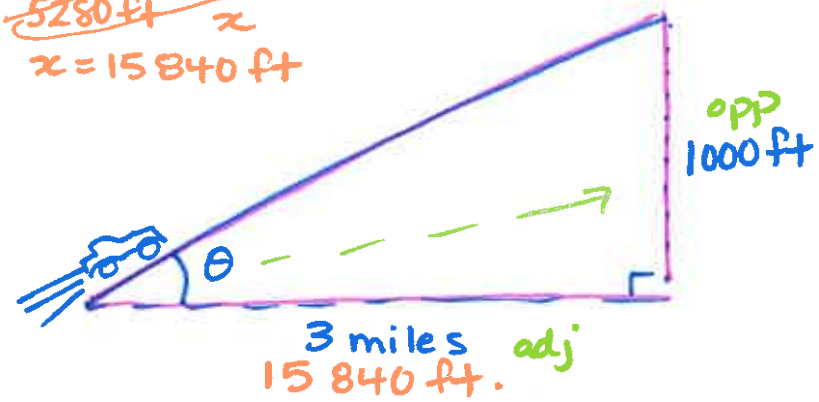
Examples

1. Over 3 horizontal miles, a road rises 1000 feet vertically. What is the angle of elevation?

Remember: 1 mile = 5280 feet

$\frac{1\text{ mi}}{5280\text{ ft}} = \frac{3\text{ mi}}{x}$

$x = 15840\text{ ft}$



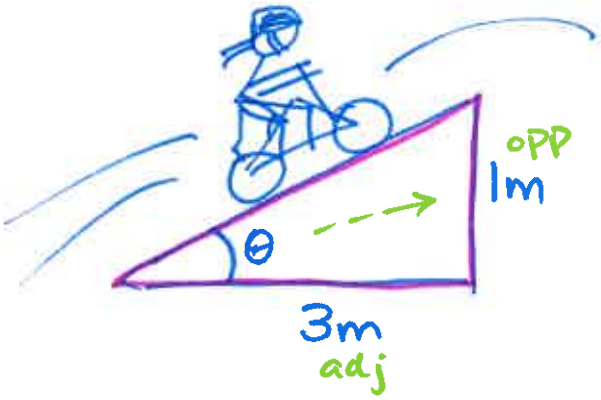
SOH CAH TOA

$\tan\theta = \frac{\text{opp}}{\text{adj}}$

$\theta = \tan^{-1}\left(\frac{1000}{15840}\right)$

$\theta = 3.6°$

2. What is the angle of elevation of ramp with a height of 1 metre and a horizontal length of 3 metres?



SOH CAH TOA

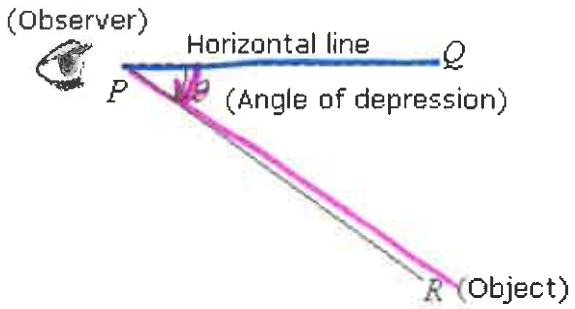
$\tan\theta = \frac{\text{opp}}{\text{adj}}$

$\theta = \tan^{-1}\left(\frac{1}{3}\right)$

$\theta = 18.4°$

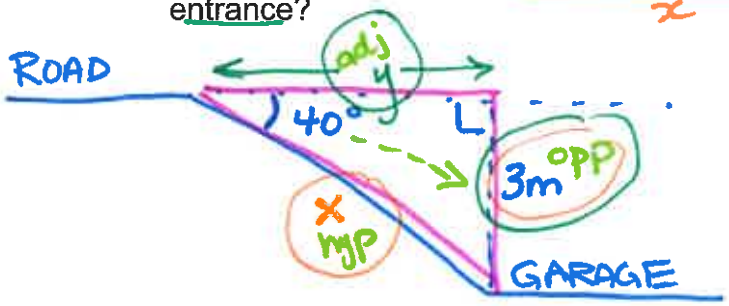
Angle of Depression

The angle of depression is the opposite angle, it is the angle between the horizontal line from the observer and the line of sight to an object that is below the horizontal line.



Examples

3. Mike needs to have his driveway re-paved. His driveway has an angle of depression of 40° from the flat roadway. If it levels off to the garage floor, which is 3 metres below the roadway, how long is the driveway and how far into the lot is the garage entrance?



x = length of driveway

y = horizontal distance to garage.

$\sin 40° = \frac{3}{x}$

$x = \frac{1 \times 3}{\sin 40°}$

$= 4.667...$

$= \boxed{4.7\text{m}}$ length of driveway

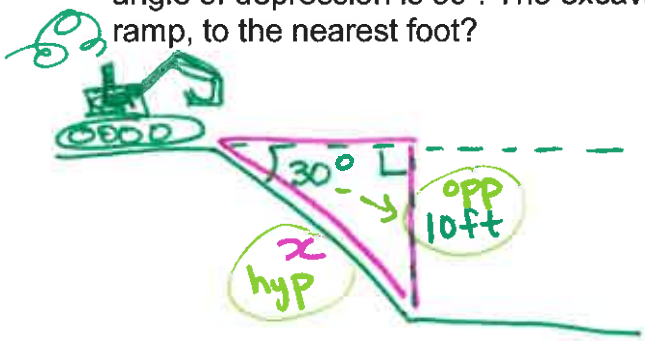
$\tan 40° = \frac{3}{y}$

$y = \frac{1 \times 3}{\tan 40°}$

$= 3.575...$

$= \boxed{3.6\text{m}}$ horizontal distance to garage.

4. An excavator operator needs to use a sloped ramp to lead down into a swimming pool excavation site in order to get the machine safely into and out of the hole. The angle of depression is 30°. The excavation is 10 feet deep. What is the length of the ramp, to the nearest foot?



SOH CAH TOA

$\sin 30° = \frac{10}{x}$

$x = \frac{1 \times 10}{\sin 30°}$

$= \boxed{20\text{ ft}}$ ramp length