

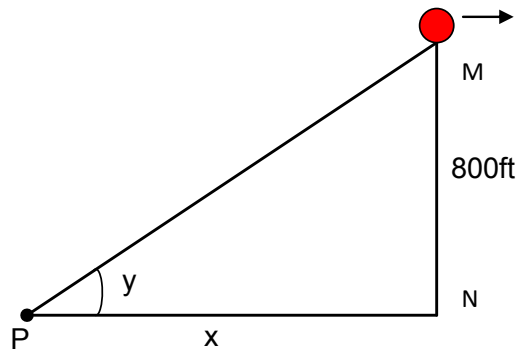
A hot-air balloon over Albuquerque, New Mexico, is being blown due east from point P and traveling at a constant height of 800 ft. The angle y is formed by the ground and the line of vision from P to the balloon. This angle changes as the balloon travels.

(a) Express the horizontal distance x as a function of the angle y .

(b) When the angle is $\frac{\pi}{20}$ rad, what is its horizontal distance from P?

(c) An angle of $\frac{\pi}{20}$ rad is equivalent to how many degrees?

Solution:



(a) $\triangle PMN$ is a right-angled triangle, where PM is the hypotenuse, MN is the side opposite the angle y and PN is the side adjacent to y .

$$\cot y = \frac{PN}{MN}, \text{ so}$$

$$\cot y = \frac{x}{800}, \text{ so}$$

$$x = 800 \cot y$$

(b) Given $y = \frac{\pi}{20}$ rad

$$x = 800 \cot \frac{\pi}{20} = 5,051 \text{ ft}$$

(c) $\pi \text{ rad} = 180^\circ$, so $\frac{\pi}{20} \text{ rad} = \frac{180^\circ}{20} = 9^\circ$