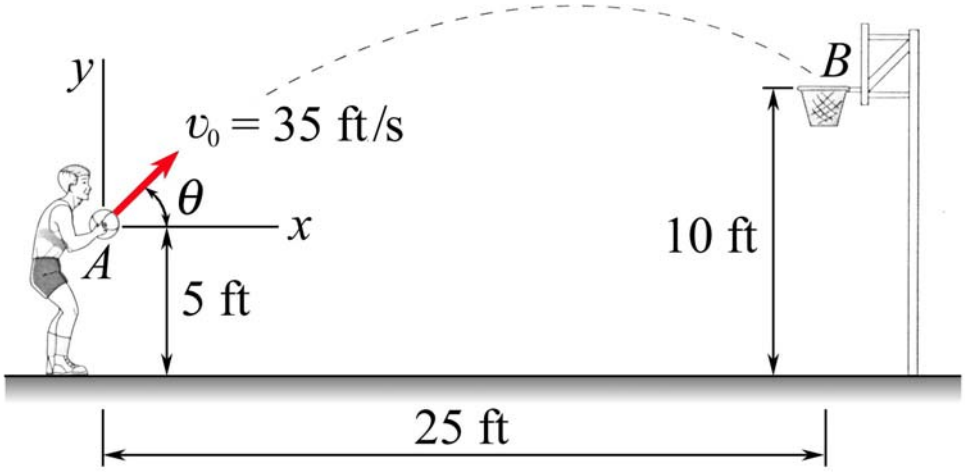
MEEG 2013 Quiz #1.m07

A basketball is thrown with an initial velocity $\mathbf{v}_0$ and enters the basket at B as shown. Determine the possible values of θ.



$$x = (v_0)_x t: \qquad 25 = 35(\cos\theta)t_B \qquad t_B = \frac{25}{35\cos\theta} \qquad ②$$

$$y = (v_0)_y t - \frac{1}{2}gt^2: \qquad 10 - 5 = 35(\sin\theta)t_B - \frac{1}{2}(32.2)t_B^2 \qquad ②$$

$$5 = 35\sin\theta \cdot \frac{25}{35\cos\theta} - 16.1\left(\frac{25}{35\cos\theta}\right)^2 \qquad ②$$

$$5 = 25\tan\theta - 8.21429\sec^2\theta$$
$$= 25\tan\theta - 8.21429(1+\tan^2\theta)$$

$$8.21429\tan^2\theta - 25\tan\theta + 13.21429 = 0 \qquad ②$$

$\tan\theta = 2.36257$ $\qquad \theta = 67.059°$ $\qquad \theta = 67.1°$ ①

$\tan\theta = 0.68091$ $\qquad \theta = 34.251°$ $\qquad \theta = 34.3°$ ①