5.3 General Launch Angle Projectiles

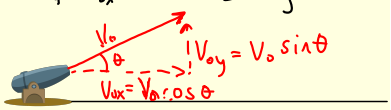
LEARNING TARGETS

5.3 I can interpret, analyze, and calculate the motion of a general launch angle projectile.

PROJECTILE MOTION

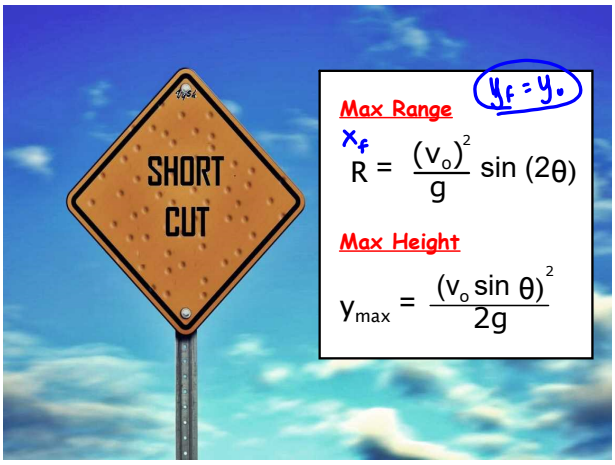
General Launch Angle Projectiles ($y_f = y_i$)

$X_f = V_{ox} t \qquad t = \frac{2V_{oy}}{g}$



$$X_f = (V_o \cos\theta)\left(\frac{2V_o \sin\theta}{g}\right)$$

$$X_f = \frac{V_o^2 \cdot (2\sin\theta\cos\theta)}{g} \qquad \sin(2\theta)$$



$y_f = y_o$

Max Range

$$R = \frac{(v_o)^2}{g}\sin(2\theta) \qquad x_f$$

Max Height

$$y_{max} = \frac{(v_o \sin\theta)^2}{2g}$$

How Far?

$= 26.8 \text{ m/s}$

If a soccer player kicks a ball 60.0-mph at an angle of 30° above the ground.

How far will it travel before it hits the ground?

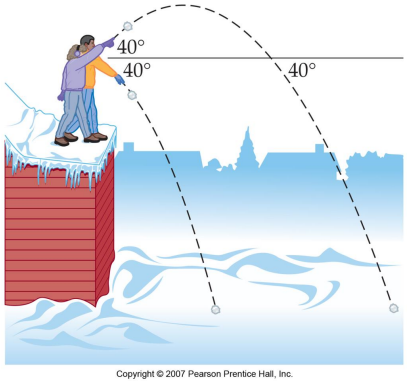
$$R = \frac{(26.8 \text{ m/s})^2}{9.8} \cdot \sin(2 \cdot 30) = 63 \text{ m}$$

What is the balls maximum height?

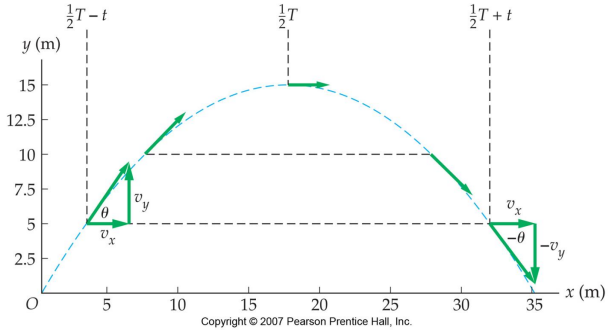
$$y_{max} = \frac{(26.8 \sin 30)^2}{(2 \cdot 9.8 \text{ m/s}^2)} = 9.2 \text{ m}$$

PROJECTILE MOTION

Compare Landing Speeds



PROJECTILE MOTION



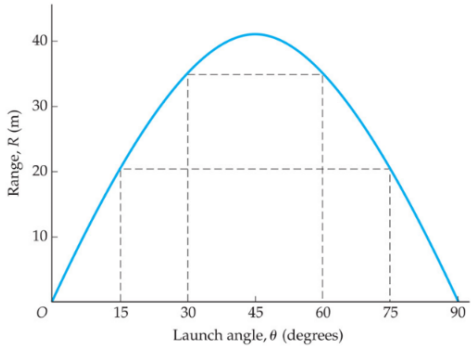
PROJECTILE SIMULATOR

Set the launch speed to 30 m/s and the launch height to 0 meters. Fill in the table below to investigate the effect of launch angle on horizontal displacement.

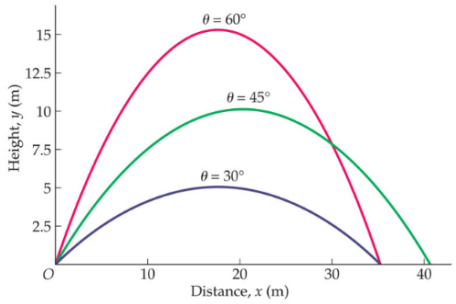
Launch Angle (deg)	Horizontal Displacement (m)
10	
20	
30	
40	
45	
50	
60	
70	
80	

*Write 3 verifying statements about your findings.

PROJECTILE MOTION



PROJECTILE MOTION



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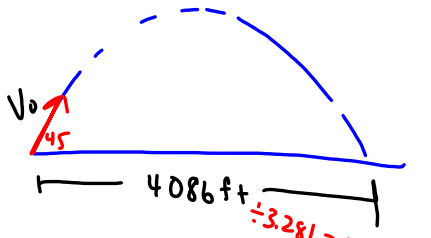

$$R = \frac{V_0^2}{g}\sin(2\theta)$$

$$1245m = \frac{V_0^2}{9.8\,m/s}\sin(2\cdot 45)$$