5.3 | General Launch Angle Projectiles
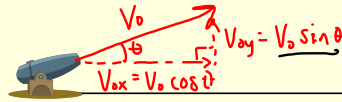
LEARNING TARGETS

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

PROJECTILE MOTION

General Launch Angle Projectiles ($y_f = y_i$)

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

$V_{oy} = V_o \sin\theta$

$V_{ox} = V_o \cos\theta$

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

$$\sin(2\theta)$$

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

SHORT CUT

Max Range $y_o = y_f$

X_f

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

Max Height

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

How Far?

If a soccer player kicks a ball 60.0-mph at an angle of 30° above the ground. $\approx 26.8\,m/s$
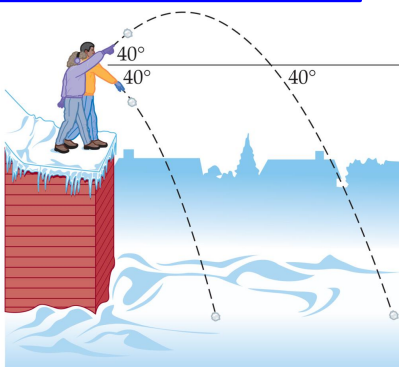
How far will it travel before it hits the ground?

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

What is the balls maximum height?

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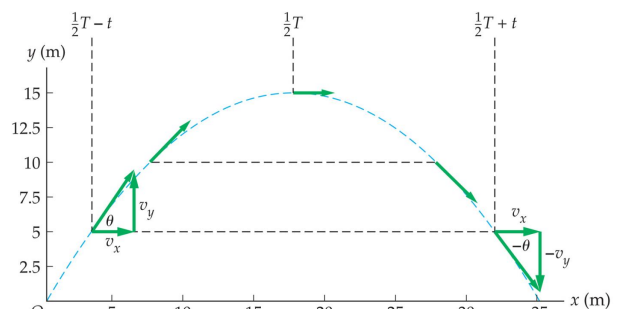

PROJECTILE MOTION

Compare Landing Speeds

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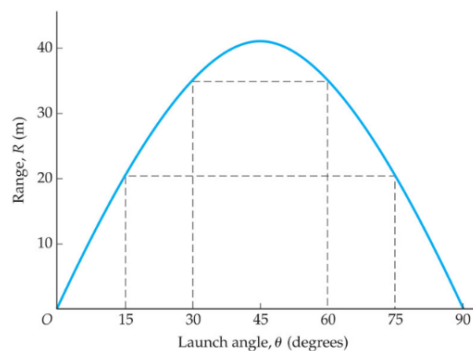
PROJECTILE MOTION

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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