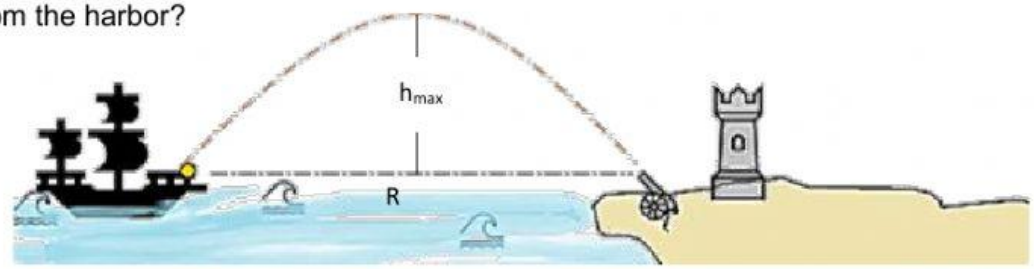
Name: _____ Score: _____

Program Year & Section: _____ Date: _____

Projectile Motion Worksheet

Directions: Solve the following word problems by filling-in the boxes with the correct answers.

1. A pirate ship, docked at sea a certain distance from the harbor, attacks a fort. The fort retaliates by firing cannonballs at a speed of 82 m/s at an angle of 27° above the horizontal. The cannonballs land on the target pirate ship. How far is the pirate ship from the harbor?



Given: v_i = m/s θ_i = ° g = m/s^2

Find: t_R and R

Solution:

$$t_R = \frac{2v_i \sin\theta_i}{g}$$

$$= \frac{2\left(\quad \frac{m}{s}\right)\sin(\quad °)}{\frac{m}{s^2}}$$

$$t_R = \quad \ldots s$$

$$t_R = \quad s$$

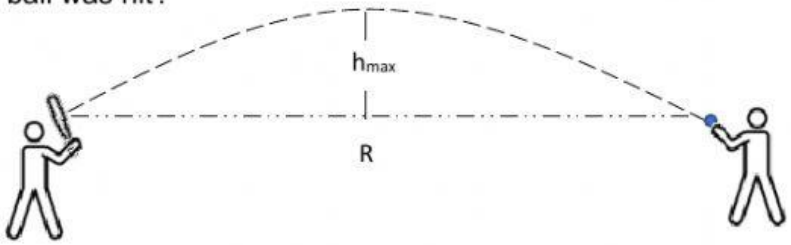
$$R = \frac{{v_i}^2 \sin 2\theta_i}{g}$$

$$R = \frac{\left(\quad \frac{m}{s}\right)^2 \sin 2(\quad °)}{\frac{m}{s^2}}$$

$$R = \quad \ldots m$$

$$R = \quad m$$

2. A baseball batter hits the ball that flies off at a speed of 40.0 m/s at an angle of 35.0° above the horizontal. An outfielder just catches the ball such that the distance of the ball from the ground when it was hit is the same as the distance of the ball from the ground when it was caught. (a) How far is the outfielder from the batter when he caught the ball? (b) How long did it take the outfielder to catch the ball (from the moment the ball was hit?



Given: v_i = m/s θ_i = ° g = m/s^2

Find: t_R and R

Solution:

$$t_R = \frac{2v_i \sin\theta_i}{g} \qquad R = \frac{{v_i}^2 \sin 2\theta_i}{g}$$

$$= \frac{2\left(\quad \frac{m}{s}\right)\sin(\quad °)}{\frac{m}{s^2}} \qquad R = \frac{\left(\quad \frac{m}{s}\right)^2 \sin 2(\quad °)}{\frac{m}{s^2}}$$

$t_R =$ ... s $R =$ ... m

$t_R =$ s $R =$ m

3. A golf ball is shot from ground level into the air. It lands on level ground 59 m from the point of release after 6.0 s. (a) With what speed was the ball hit? (b) At what angle above the level ground was it hit?

Given: R = m t_R = s g = m/s^2

Find: v_i and θ_i

Solution:

$$t_R = \frac{2v_i \sin\theta_i}{g} \qquad R = \frac{{v_i}^2 \sin 2\theta_i}{g}$$

$$gt_R = 2v_i \sin\theta_i \qquad R = \frac{{v_i}^2\, 2\sin\theta_i \cos\theta_i}{g} \; ; since \; 2\sin\theta_i \cos\theta_i = \sin 2\theta_i$$

$$\frac{gt_R}{2v_i} = \sin\theta_i \qquad R = \frac{{v_i}^2 \frac{gt_R}{2v_i} \cos\theta_i}{g} \; ; \textit{substitute the equivalent of } \sin\theta_i$$

$$R = \frac{{v_i}^2 gt_R \cos\theta_i}{2v_i g}$$

$$\frac{2R}{v_i t_R} = \cos\theta_i$$

$\tan\theta_i = \frac{\sin\theta_i}{\cos\theta_i}$; $\tan\theta_i = \frac{\frac{gt_R}{2v_i}}{\frac{2R}{v_i gt_R}}$

$= \frac{gt_R}{2v_i}\left(\frac{v_i t_R}{2R}\right)$

$= \frac{gt_R{}^2}{4R}$

$\tan\theta_i = \frac{\left(\quad \frac{m}{s^2}\right)(\quad s)^2}{4(\quad m)}$

$\tan\theta_i =$ ...

$\theta_i = tan^{-1}$ ...

$\theta_i =$ ... °

$\theta_i =$ °

$\frac{gt_R}{2\sin\theta_i} = v_i$

$v_i = \frac{\left(\quad \frac{m}{s^2}\right)(\quad s)}{2(\sin\quad °)}$

$v_i =$ ... $\frac{m}{s}$

$v_i = \quad \frac{m}{s}$