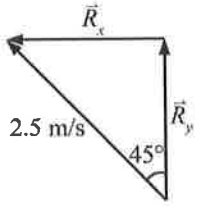
Find x- and y-components of 2.5 m/s 45.0° W of N (45.0° N of W)



$$R_{2x} = v\sin\theta$$
$$= (2.5 \text{ m/s})(\sin 45.0°)$$
$$= 1.77 \text{ m/s}$$
$$\vec{R}_{2x} = -1.77 \text{ m/s}$$
$$R_{2y} = v\cos\theta$$
$$= (2.5 \text{ m/s})(\cos 45.0°)$$
$$= 1.77 \text{ m/s}$$
$$\vec{R}_{2y} = 1.77 \text{ m/s}$$

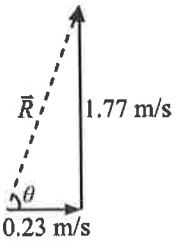
Add x-components.

$$\vec{R} = \vec{R}_{1x} + \vec{R}_{2x}$$
$$= 2.0 \text{ m/s} + (-1.77 \text{ m/s})$$
$$= 0.23 \text{ m/s}$$

Add y-components.

$$\vec{R}_y = \vec{R}_{1y} + \vec{R}_{2y}$$
$$= 0 + 1.77 \text{ m/s}$$
$$= 1.77 \text{ m/s}$$

Add $\vec{R}_x$ and $\vec{R}_y$.



$$R = \sqrt{R_x^2 + R_y^2}$$
$$= \sqrt{(0.23 \text{ m/s})^2 + (1.77 \text{ m/s})^2}$$
$$= 1.8 \text{ m/s}$$
$$\tan\theta = \frac{R_y}{R_x}$$
$$= \frac{1.77 \text{ m/s}}{0.23 \text{ m/s}}$$
$$\theta = \tan^{-1}\left(\frac{1.77 \text{ m/s}}{0.23 \text{ m/s}}\right)$$
$$= 83°$$
$$\vec{R} = 1.8 \text{ m/s } 83° \text{ N of E}$$

Lesson 4—Projectile Motion (Thrown Horizontally)

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PRACTICE EXERCISES ANSWER AND SOLUTIONS

NOTE: For all projectile motion problems in this section, consider down as the positive direction.

1. We are asked to find the horizontal component.

$\therefore$ use $v = \frac{d}{t}$

Find t from the vertical component.

v_0	v	a	d	t
0	×	9.81 m/s^2	90.0 m	?

$$d = v_0 t + \frac{1}{2}at^2$$
$$90.0 \text{ m} = \frac{1}{2}(9.81 \text{ m/s}^2)t^2$$
$$t = \sqrt{\frac{2(90.0 \text{ m})}{9.81 \text{ m/s}^2}}$$
$$= 4.28 \text{ s}$$

$$v = \frac{d}{t}$$

Therefore the range of the object

$$d = vt$$
$$= (10.0 \text{ m/s})(4.29 \text{ s})$$
$$= 42.9 \text{ m}$$

2. We are asked to find the horizontal component

$\therefore$ use $v = \frac{d}{t}$

Find t from vertical component

v_0	v	a	d	t
0	×	9.81 m/s^2	1.50×10^2 m	?

$$d = v_0 t + \frac{1}{2}at^2$$
$$1.50\times10^2 \text{ m} = \frac{1}{2}(9.81 \text{ m/s}^2)t^2$$
$$= \sqrt{\frac{2(1.50\times10^2 \text{ m})}{9.81 \text{ m/s}^2}}$$
$$= 5.53 \text{ s}$$

