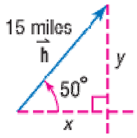
Solutions to Chapter 8 Targets

1a)



$\sin 50° = \frac{y}{15}$ $\quad$ $\cos 50° = \frac{x}{15}$

$y = 15 \sin 50°$ $\quad$ $x = 15 \cos 50°$

$y \approx 11$ $\quad$ $x \approx 10$

2a) $\overline{XY} = \langle 4 - (-2), -6 - 4\rangle$ or $\langle 6, -10\rangle$

2b) $|\overline{XY}| = \sqrt{(4-(-2))^2 + (-6-4)^2}$

$= \sqrt{136}$ or $2\sqrt{34}$

2c)

$\vec{\mathbf{m}} - \vec{\mathbf{p}} = \langle 2, -3\rangle - \langle -2, 4\rangle$

$= \langle 2 - (-2), -3 - 4\rangle$

$= \langle 4, -7\rangle$

$3\vec{\mathbf{n}} = 3\langle 1, 5\rangle$

$= \langle 3 \cdot 1, 3 \cdot 5\rangle$

$= \langle 3, 15\rangle$

$2\vec{\mathbf{m}} + 3\vec{\mathbf{p}} = 2\langle 2, -3\rangle + 3\langle -2, 4\rangle$

$= \langle 4, -6\rangle + \langle -6, 12\rangle$

$= \langle -2, 6\rangle$

2d) $\overline{AB} = \langle 7 - 3, 4 - (-2)\rangle$

$= \langle 4, 6\rangle$

Then write $\overline{AB}$ as the sum of unit vectors.

$\overline{AB} = 4\vec{\mathbf{i}} + 6\vec{\mathbf{j}}$

3a) $\overline{XY} = (3, -4, 1) - (4, 2, -5)$

$= \langle 3 - 4, -4 - 2, 1 - (-5)\rangle$

$= \langle -1, -6, 6\rangle$

3b) 8.54 units

3c) $4\vec{\mathbf{p}} - 3\vec{\mathbf{q}} = 4\langle 2, 5, 3\rangle - 3\langle 4, -2, 1\rangle$

$= \langle 8, 20, 12\rangle - \langle 12, -6, 3\rangle$

$= \langle -4, 26, 9\rangle$

3d) $\overline{AB} = (-3, 8, -1) - (4, 2, 6)$

$= \langle -3 - 4, 8 - 2, -1 - 6\rangle$

$= \langle -7, 6, -7\rangle$

$= -7\vec{\mathbf{i}} + 6\vec{\mathbf{j}} - 7\vec{\mathbf{k}}$

4a) $\vec{\mathbf{a}} \cdot \vec{\mathbf{b}} = (-4)(3) + (2)(6) + (5)(1)$ The two vectors are not perpendicular since their inner product is not zero.

$= -12 + 12 + 5$

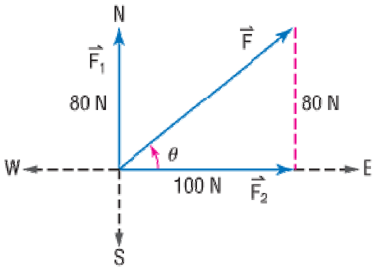
$= 5$

4b) $$\vec{\mathbf{v}} \times \vec{\mathbf{w}} = \begin{vmatrix} \mathbf{i} & \mathbf{j} & \mathbf{k} \\ 5 & 2 & 3 \\ -2 & 5 & 0 \end{vmatrix}$$

$$= \begin{vmatrix} 2 & 3 \\ 5 & 0 \end{vmatrix}\vec{\mathbf{i}} - \begin{vmatrix} 5 & 3 \\ -2 & 0 \end{vmatrix}\vec{\mathbf{j}} + \begin{vmatrix} 5 & 2 \\ -2 & 5 \end{vmatrix}\vec{\mathbf{k}}$$

$= -15\vec{\mathbf{i}} - 6\vec{\mathbf{j}} + 29\vec{\mathbf{k}}$ or $\langle -15, -6, 29\rangle$

5a)



5b) $|\vec{\mathbf{F}}|^2 = |\vec{\mathbf{F}}_1|^2 + |\vec{\mathbf{F}}_2|^2$

$|\vec{\mathbf{F}}|^2 = (80)^2 + (100)^2$

$|\vec{\mathbf{F}}|^2 = 16{,}400$

$\sqrt{|\vec{\mathbf{F}}|^2} = \sqrt{16{,}400}$ or about 128.1

5c) $\tan\theta = \frac{80}{100}$

$\theta = \tan^{-1}\frac{80}{100}$

$\theta \approx 38.7^\circ$ north of due east

6a) $\langle x - 3, y - 2\rangle = t\langle 4, -1\rangle$

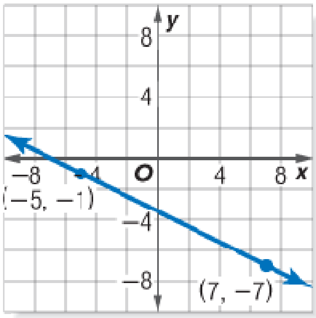
6b)

$x = x_1 + ta_1$ | $y = y_1 + ta_2$

$x = -1 + t(4)$ | $y = -3 + t(-2)$

$x = -1 + 4t$ | $y = -3 - 2t$

Now make a table of values for t.
Evaluate each expression to find values for x and y.
Then graph the line.



t	x	y
-1	-5	-1
0	-1	-3
1	3	-5
2	7	-7

6d) $x = t$ *and* $y = 3t - 5$

6e)

$x = 3 + 2t$ | $y = -1 - 4t$

$x - 3 = 2t$ | $y + 1 = -4t$

$\frac{x-3}{2} = t$ | $\frac{-1-y}{4} = t$

$\frac{x-3}{2} = \frac{-1-y}{4}$

$4(x - 3) = 2(-1 - y)$

$4x - 12 = -2 - 2y$

$y = -2x + 5$

7a)

$|\vec{\mathbf{v}}_x| = |\vec{\mathbf{v}}|\cos\theta$ | $|\vec{\mathbf{v}}_y| = |\vec{\mathbf{v}}|\sin\theta$

$|\vec{\mathbf{v}}_x| = 15\cos 40^\circ$ | $|\vec{\mathbf{v}}_y| = 15\sin 40^\circ$

$|\vec{\mathbf{v}}_x| \approx 11.5$ | $|\vec{\mathbf{v}}_y| \approx 9.6$

7b) $x = 93t\cos 60^\circ$ | *hint: use 32 ft/s for gravity*

$y = 93t\sin 60^\circ - 16t^2$

7c) $x = 93(5)\cos 60^\circ$ | $y = 93(5)\sin 60^\circ - 16(5^2)$

$x \approx 232.5$ | $y \approx 2.7$

After 5 seconds, the soccer ball has traveled 232.5 feet or 77.5 yards horizontally and is about 2.7 feet or 0.9 yard above the ground.