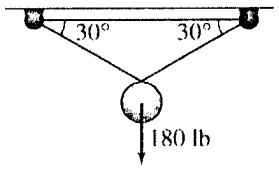
Chapter 6b Review Worksheet #2
Do #79, 83, 85, 87, 89, 95, 97-99, 101, 103, 104

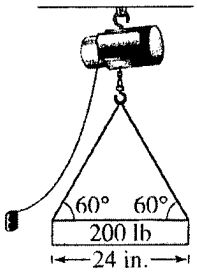
75. ***Resultant Force*** Three forces with magnitudes of 250 pounds, 100 pounds, and 200 pounds act on an object at angles of 60°, 150°, and −90°, respectively, with the positive x-axis. Find the direction and magnitude of the resultant of these forces.

76. ***Resultant Force*** Forces with magnitudes of 85 pounds and 50 pounds act on a single point. The angle between the forces is 15°. Describe the resultant force.

77. ***Tension*** A 180-pound weight is supported by two ropes, as shown in the figure. Find the tension in each rope.



78. ***Cable Tension*** In a manufacturing process, an electric hoist lifts 200-pound ingots. Find the tension in the supporting cables (see figure).



79. ***Navigation*** An airplane has an airspeed of 430 miles per hour at a bearing of 135°. The wind velocity is 35 miles per hour in the direction N 30° E. Find the resultant speed and direction of the plane.

80. ***Navigation*** An airplane has an airspeed of 724 kilometers per hour at a bearing of 30°. The wind velocity is from the west at 32 kilometers per hour. Find the resultant speed and direction of the plane.

6.4 In Exercises 81–84, find the dot product of u and v.

81. $\mathbf{u} = \langle 0, -2 \rangle$, $\mathbf{v} = \langle 1, 10 \rangle$
82. $\mathbf{u} = \langle -4, 5 \rangle$, $\mathbf{v} = \langle 3, -1 \rangle$
83. $\mathbf{u} = 6\mathbf{i} - \mathbf{j}$, $\mathbf{v} = 2\mathbf{i} + 5\mathbf{j}$
84. $\mathbf{u} = 8\mathbf{i} - 7\mathbf{j}$, $\mathbf{v} = 3\mathbf{i} - 4\mathbf{j}$

In Exercises 85–88, use the vectors $\mathbf{u} = \langle -3, -4 \rangle$ and $\mathbf{v} = \langle 2, 1 \rangle$ to find the indicated quantity.

85. $\mathbf{u} \cdot \mathbf{u}$
86. $\|\mathbf{v}\| - 3$
87. $4\mathbf{u} \cdot \mathbf{v}$
88. $(\mathbf{u} \cdot \mathbf{v})\mathbf{u}$

In Exercises 89–92, find the angle θ between the vectors.

89. $\mathbf{u} = \langle 2\sqrt{2}, -4 \rangle$, $\mathbf{v} = \langle -\sqrt{2}, 1 \rangle$
90. $\mathbf{u} = \langle 3, 1 \rangle$, $\mathbf{v} = \langle 4, 5 \rangle$
91. $\mathbf{u} = \cos\frac{7\pi}{4}\mathbf{i} + \sin\frac{7\pi}{4}\mathbf{j}$, $\mathbf{v} = \cos\frac{5\pi}{6}\mathbf{i} + \sin\frac{5\pi}{6}\mathbf{j}$
92. $\mathbf{u} = \cos 45°\mathbf{i} + \sin 45°\mathbf{j}$, $\mathbf{v} = \cos 300°\mathbf{i} + \sin 300°\mathbf{j}$

In Exercises 93–96, graph the vectors and find the degree measure of the angle between the vectors.

93. $\mathbf{u} = 4\mathbf{i} + \mathbf{j}$, $\mathbf{v} = \mathbf{i} - 4\mathbf{j}$
94. $\mathbf{u} = 6\mathbf{i} + 2\mathbf{j}$, $\mathbf{v} = -3\mathbf{i} - \mathbf{j}$
95. $\mathbf{u} = 7\mathbf{i} - 5\mathbf{j}$, $\mathbf{v} = 10\mathbf{i} + 3\mathbf{j}$
96. $\mathbf{u} = -5.3\mathbf{i} + 2.8\mathbf{j}$, $\mathbf{v} = -8.1\mathbf{i} - 4\mathbf{j}$

In Exercises 97–100, determine whether u and v are orthogonal, parallel, or neither.

97. $\mathbf{u} = \langle 39, -12 \rangle$, $\mathbf{v} = \langle -26, 8 \rangle$
98. $\mathbf{u} = \langle 8, -4 \rangle$, $\mathbf{v} = \langle 5, 10 \rangle$
99. $\mathbf{u} = \langle 8, 5 \rangle$, $\mathbf{v} = \langle -2, 4 \rangle$
100. $\mathbf{u} = \langle -15, 51 \rangle$, $\mathbf{v} = \langle 20, -68 \rangle$

In Exercises 101–104, find the value of k so that the vectors u and v are orthogonal.

101. $\mathbf{u} = \mathbf{i} - k\mathbf{j}$, $\mathbf{v} = \mathbf{i} + 2\mathbf{j}$
102. $\mathbf{u} = 2\mathbf{i} + \mathbf{j}$, $\mathbf{v} = -\mathbf{i} - k\mathbf{j}$
103. $\mathbf{u} = k\mathbf{i} - \mathbf{j}$, $\mathbf{v} = 2\mathbf{i} - 2\mathbf{j}$
104. $\mathbf{u} = k\mathbf{i} - 2\mathbf{j}$, $\mathbf{v} = \mathbf{i} + 4\mathbf{j}$

In Exercises 105–108, find the projection of u onto v. Then write u as the sum of two orthogonal vectors, one of which is $\text{proj}_{\mathbf{v}}\,\mathbf{u}$.

105. $\mathbf{u} = \langle -4, 3 \rangle$, $\mathbf{v} = \langle -8, -2 \rangle$
106. $\mathbf{u} = \langle 5, 6 \rangle$, $\mathbf{v} = \langle 10, 0 \rangle$
107. $\mathbf{u} = \langle 2, 7 \rangle$, $\mathbf{v} = \langle 1, -1 \rangle$
108. $\mathbf{u} = \langle -3, 5 \rangle$, $\mathbf{v} = \langle -5, 2 \rangle$

109. ***Work*** Determine the work done by a crane lifting an 18,000-pound truck 48 inches.

110. ***Braking Force*** A 500-pound motorcycle is headed up a hill inclined at 12°. What force is required to keep the motorcycle from rolling back down the hill when stopped at a red light?

Answers: 79) 422.30mph; 130.41° 83) 7 85) 25 87) −40 89) 2.802 radians 95) 52.2° 97) parallel 98) orthogonal 99) neither 101) $\frac{1}{2}$ 103) −1 104) 8