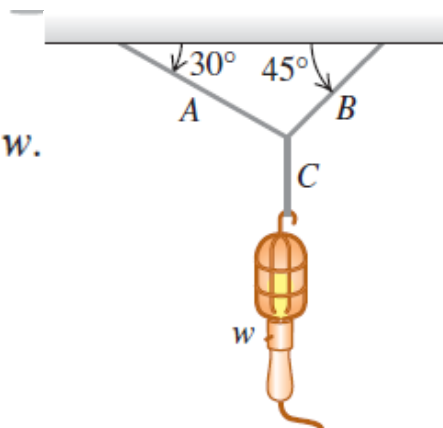


Name: \_\_\_\_\_ Student ID: \_\_\_\_\_

## Quiz 4 Mechanics II

**5.7 ••** Find the tension in each cord in Fig. E5.7 if the weight of the suspended object is  $w$ .



**IDENTIFY:** Apply  $\Sigma \vec{F} = m\vec{a}$  to the object and to the knot where the cords are joined.

**SET UP:** Let  $+y$  be upward and  $+x$  be to the right.

**EXECUTE:** (a)  $T_C = w$ ,  $T_A \sin 30^\circ + T_B \sin 45^\circ = T_C = w$ , and  $T_A \cos 30^\circ - T_B \cos 45^\circ = 0$ . Since  $\sin 45^\circ = \cos 45^\circ$ , adding the last two equations gives  $T_A(\cos 30^\circ + \sin 30^\circ) = w$ , and so

$$T_A = \frac{w}{1.366} = 0.732w. \text{ Then, } T_B = T_A \frac{\cos 30^\circ}{\cos 45^\circ} = 0.897w.$$

(b) Similar to part (a),  $T_C = w$ ,  $-T_A \cos 60^\circ + T_B \sin 45^\circ = w$ , and  $T_A \sin 60^\circ - T_B \cos 45^\circ = 0$ .

$$\text{Adding these two equations, } T_A = \frac{w}{(\sin 60^\circ - \cos 60^\circ)} = 2.73w, \text{ and } T_B = T_A \frac{\sin 60^\circ}{\cos 45^\circ} = 3.35w.$$

**EVALUATE:** In part (a),  $T_A + T_B > w$  since only the vertical components of  $T_A$  and  $T_B$  hold the object against gravity. In part (b), since  $T_A$  has a downward component  $T_B$  is greater than  $w$ .