

## Exercise 1.77

By using estimation techniques, determine which of the following is the heaviest and which is the lightest: a 5-lb bag of potatoes, a 5-kg bag of sugar, or 1 gal of water (density = 1.0 g/mL).

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### Solution

The heaviest item is the one with the highest mass.

$$\text{Potatoes: } 5 \text{ lb} = 5 \cancel{\text{ lb}} \times \frac{453.59 \text{ g}}{1 \cancel{\text{ lb}}} \times \frac{1 \text{ kg}}{1000 \text{ g}} \approx 2 \text{ kg}$$

$$\text{Sugar: } 5 \text{ kg}$$

$$\text{Water: } \text{Mass} = \text{Volume} \times \text{Density}$$

$$= (1 \text{ gal}) \times \left(1.0 \frac{\text{g}}{\text{mL}}\right)$$

$$= \left(1 \cancel{\text{ gal}} \times \frac{3.78 \cancel{\text{ L}}}{1 \cancel{\text{ gal}}} \times \frac{1000 \cancel{\text{ mL}}}{1 \cancel{\text{ L}}}\right) \times \left(1.0 \frac{\text{g}}{\cancel{\text{ mL}}} \times \frac{1 \text{ kg}}{1000 \text{ g}}\right)$$

$$\approx 3.78 \text{ kg}$$

The 5-kg bag of sugar is heaviest, and the 5-lb bag of potatoes is lightest.