1. Use the roster method to specify the elements in each of the following sets and then describe the set in words:
   (a) $\{x \in \mathbb{R} | 2x^2 + 3x - 2 = 0\}$.
   (b) $\{x \in \mathbb{Z} | 2x^2 + 3x - 2 = 0\}$.
   (c) $\{y \in \mathbb{Q} | \ |y - 2| = 2.5\}$.
   (d) $\{y \in \mathbb{Z} | \ |y - 2| = 2.5\}$.
   (e) $\{y \in \mathbb{Z} | \ |y - 2| \leq 2.5\}$.
   (f) Why can't $\{y \in \mathbb{Q} | \ |y - 2| \leq 2.5\}$ be written usefully in the roster method?

2. For each of the following sets, determine two elements of the set which aren't explicitly listed in the roster, and describe the set using set-builder notation.
   (a) $A = \{1, 4, 9, 16, 25, \ldots\}$.
   (b) $B = \{\frac{1}{2}, \frac{2}{3}, \frac{3}{4}, \frac{4}{5}, \ldots\}$.
   (c) $C = \{\ldots, -16, -11, -6, -1, 4, 9, 14, 19, \ldots\}$.
   (d) $D = \{1, \sqrt{3}, 3, 3\sqrt{3}, 9, \ldots, 81\}$.

3. Let $A = \left\{x \in \mathbb{R} \middle| x(x+2)^2(x - \frac{3}{2}) = 0\right\}$. Which of the following sets are equal to A? Which are subsets of A?
   (a) $\{-2, 0, 3\}$.
   (b) $\left\{-2, -2, 0, \frac{3}{2}\right\}$.
   (c) $\left\{\frac{3}{2}, -2, 0\right\}$.
   (d) $\left\{-2, \frac{3}{2}\right\}$.

4. Use the roster method to describe the set where each of the following open statements, defined over integers n, is true:
   (a) $n + 7 = 4$.
   (b) $n^2 = 64$.
   (c) $\sqrt{n} \in \mathbb{N}$ and $n < 50$.

5. Describe each of the following sets with set-builder-notation:
   (a) The set of all real numbers whose square is greater than 10.
   (b) The set of all even integers.

6. Recall that a set is *closed* over addition or multiplication when the sum or product of two elements of the set is guaranteed to be in the set. Explore whether each of the following sets is closed under multiplication and/or addition, producing justification for a conjecture or a counterexample.
   (a) The set A of all odd natural numbers.
   (b) The set B of all even integers.
   (c) The set $C = \{1, 4, 7, 10, 13, \ldots\}$.

(d) The set $D = \{\ldots, -9, -6, -3, 0, 3, 6, 9, \ldots\}$.
(e) The set $E = \{3n + 1 | n \in \mathbb{Z}\}$.
(f) The set $F = \{\frac{1}{2^n} | n \in \mathbb{N}\}$.

7. If A is closed under addition and is a subset of a set B, should B be closed under addition too?

8. If B is closed under addition and has a subset A, should A be closed under addition too?

9. Are there finite subsets of $\mathbb{R}$ which are closed under addition? How about over multiplication?