Reading Quiz Section 4.1

1. Which of the following describe the set $\{0,1,2,3,4\}$? Select all that apply.
   (a) $\{x \in \mathbb{N}_0 : x \leq 4\}$
   (b) $\{x \in \mathbb{Q} : x \in [0,4]\}$
   (c) $\{x \in \mathbb{Z} : x \in [0,4)\}$
   (d) $\{x \in \mathbb{Z} : x \in [0,4]\}$
2. What is the cardinality of the set $\{\text{cat}, \{1,2\}, 2\}$?
   (a) 2
   (b) 3
   (c) 4
   (d) It is an infinite set
3. True or False: An open interval contains its endpoints.
4. True or False: $\{1,2,3\} = \{3,1,2\}$.
5. Which of the following sets are empty?
   (a) $\{x \in \mathbb{R} : x^2 < 0\}$
   (b) $\{x \in \mathbb{R} : x^2 \leq 0\}$
   (c) $\{x \in \mathbb{N} : x \in [0.5, 0.75)\}$
   (d) $[1,1]$
6. True or False: Every set has a proper subset.
7. True or False: $\{\mathbb{R}\} \subseteq \{\{\mathbb{R}\}\}$.
8. How many subsets has the set $A = \{0,1\}$?
   (a) 1
   (b) 2
   (c) 3
   (d) 4
9. $A = B$ if and only if
   (a) $A \subseteq B$
   (b) $A \subseteq B$ and if $x \notin A$, then $x \notin B$.
   (c) $B \subseteq A$
   (d) $A \subsetneq B$ and B is finite.
10. Explain why $|A| \leq |B| \implies A \subseteq B$.

Practice Problems Section 4.1

1. Write each of the following sets in roster notation (i.e. list their elements).
   (a) $\{x \in \mathbb{R} : x^2 - 5x + 4 = -2\}$
   (b) $\{x \in \mathbb{Q} : 2x \in \mathbb{Z}\}$
   (c) $\{n^2 - 1 \in \mathbb{Z} : n \in \{-3, -1, 1, 3\}\}$
   (d) $\{x \in 2\mathbb{Z} + 1 : x \in (0, 10]\}$

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2. Write each of the following sets in set-builder notation.
   (a) $\{\ldots, -8, -3, 2, 7, 12, 17, \ldots\}$
   (b) $\{2, 3, 5, 7, 11, 13\}$
   (c) $\{1, \frac{1}{4}, \frac{1}{16}, \frac{1}{64}, \ldots\}$

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3. Let $A = \Big\{0, \{0\}, \{1, 2\}, \{0, \{1, 3\}\}\Big\}$.
   Answer each of the following true or false:
   (a) $0 \in A$
   (b) $\{0\} \in A$
   (c) $1 \in A$
   (d) $\{1\} \in A$
   (e) $\{1, 3\} \in A$
   (f) $\{0, \{1, 3\}\} \in A$

   What is the cardinality of A?
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4. Continuing the previous question, answer true or false:
   (a) $\emptyset \subsetneq A$
   (b) $\{0\} \subseteq A$
   (c) $\{\{0\}\} \subseteq A$
   (d) $\{1, 2\} \subseteq A$
   (e) $\{\{1, 2\}\} \subseteq A$
   (f) $\{0, \{0\}, \{1, 3\}\} \subseteq A$
   (g) $A \subsetneq A$

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5. Suppose $A \subseteq B \subseteq C$ and $A = C$. Show that $A = B$ and $B = C$.
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