

SOLUTIONS:

1. Listed union, intersection.

(a) $\{0, 1, 2\}, \{1\}$

(b) $\{-1, 0, 1, 2\}, \emptyset$

(c) \mathbb{R}, \mathbb{Q}

(d) $\mathbb{R}, \{0\}$

(e) $\mathbb{R} - \{0\}$ (or in set builder notation: $\{x \in \mathbb{R} : x \neq 0\}$), \emptyset .

(f) \mathbb{Z}, \emptyset

(g) \mathbb{Q}, \mathbb{Z}

2. (b), (e), and (f) are disjoint.

3. For (b) $\emptyset \subset \{-1, 0, 1, 2\}$, although if you missed this one don't worry. We define the empty set as a subset of every set. It works with the container metaphor, because every container full of stuff still has a container (every set has the empty set as a subset). For (c) $\mathbb{Q} \subset \mathbb{R}$, and for (g) $\mathbb{Z} \subset \mathbb{Q}$. For the rest, neither set is a subset of the other.

4. (a) $\{2, 3, 4, 5, 6, 7\}$.

(b) $\{n \in \mathbb{Z} : n \text{ is odd}\}$.

(c) $\{x \in \mathbb{R} : x < 0 \text{ or } x > 1\}$. Alternately we could write it as $(-\infty, 0) \cup (1, \infty)$.

(d) $\{x \in \mathbb{R} : x \leq 0 \text{ or } x \geq 1\}$. Alternately we could write it as $(-\infty, 0] \cup [1, \infty)$.

5. (a) 4

(b) 1

(c) ∞

(d) 0. This is because this is actually the empty set.

6. The sets in (d) are $\{x \in \mathbb{R} : x \leq 0\}$ and $\{x \in \mathbb{R} : x \geq 0\}$, respectively. The sets in (e) are $\{x \in \mathbb{R} : x < 0\}$ and $\{x \in \mathbb{R} : x > 0\}$, respectively.