Section 0 Sets and Relations, p8 1-9 all, 11

In Exercises 1 through 4, describe the set by listing its elements.

1. $\{x \in \mathbb{R} \mid x^2 = 3\}$

$\{-\sqrt{3}, \sqrt{3}\}$

2. $\{m \in \mathbb{Z} \mid m^2 = 3\}$

$\emptyset$

3. $\{m \in \mathbb{Z} \mid mn = 60 \text{ for some } n \in \mathbb{Z}\}$

$\{-60, -30, -15, -12, -10, -6, -5, -4, -3, -2, -1, 1, 2, 3, 4, 5, 6, 10, 12, 15, 30, 60\}$

4. $\{m \in \mathbb{Z} \mid m^2 - m < 115\}$

$\{-10, -9, -8, -7, -6, -5, -4, -3, -2, -1, 0, 1, 2, 3, 4, 5, 6, 7, 8, 9, 10, 11\}$

In Exercises 5 through 10, decide whether the object described is indeed a set (is well defined). Give an alternate description of each set.

5. $\{n \in \mathbb{Z}^+ \mid n \text{ is a large number}\}$

This set is not well-defined, because there is no specific definition of what a "large" number is.

6. $\{n \in \mathbb{Z} \mid n^2 < 0\}$

This set is well defined, and in fact is the empty set, $\emptyset$.

7. $\{n \in \mathbb{Z} \mid 39 < n^3 < 57\}$

This set is well defined, and in fact is the empty set, $\emptyset$.

8. $\{x \in \mathbb{Q} \mid x \text{ is almost an integer}\}$

This set is not well-defined, because there is no specific definition of what "almost" an integer is.

9. $\{x \in \mathbb{Q} \mid x \text{ may be written with demoninator greater than } 100\}$

This set is well-defined, and in fact is $\mathbb{Q}$, since every fraction may be multiplied by $\pm 100/\pm 100$ to obtain a denominator greater than 100.

11. List the elements in $\{a, b, c\} \times \{1, 2, c\}$

$\{(a, 1), (a, 2), (a, c), (b, 1), (b, 2), (b, c), (c, 1), (c, 2), (c, c)\}$