

# Practice Problems 1 Solutions

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Be sure to provide an answer for each question. You may work with other students as well as use your notes, the book, and the internet. Do make sure you understand how to solve the problems and answer the questions, as similar ones may appear on the exams.

1. Given the following sets, for each set operation provide the elements of the resulting set in set notation or using a well known set, i.e.  $\mathbb{N}$ , the set of natural numbers.

$\mathbb{Z}$ , the set of all integers

$\mathbb{Z}^+$ , the set of all positive integers

$\mathbb{Z}^-$ , the set of all negative integers

$A$ , the set of all integers evenly divisible by 3

$B = \{4, 5, 9, 10\}$

$C = \{2, 4, 11, 14\}$

$D = \{3, 6, 9\}$

$E = \{4, 6, 16\}$

- a.  $B \cup C$   
 **$\{2, 4, 5, 9, 10, 11, 14\}$**
- b.  $A \cap D$   
 **$\{3, 6, 9\}$**
- c.  $A \cap C$   
 **$\{\}$  or  $\emptyset$**
- d.  $(B \oplus D) \oplus E$   
 **$\{3, 5, 10, 16\}$**
- e.  $A \cup D$   
 **$A$**
- f.  $E - D$   
 **$\{4, 16\}$**
- g.  $D - E$   
 **$\{3, 9\}$**
- h.  $(\mathbb{Z} - \mathbb{Z}^+) - \mathbb{Z}^-$   
 **$\{0\}$**

2. Given the following sets, for each set operation provide the elements of the resulting set in set notation or the cardinality of the set.

$$A = \{1, 2, 3, 4\}$$

$$B = \{-1, -2, -3\}$$

$$C = \{-1, 0, 1, 2, 3, 4\}$$

$$D = \{2, 3, 4, 5, 6, 7\}$$

$$E = \{x \in \mathbb{Z} : x \text{ is odd}\}$$

$$F = \{x \in \mathbb{Z}^+ : x \leq 7\}$$

$$G = \{x \in \mathbb{Z}^+ : x < 7\}$$

$$H = \{x \in \mathbb{Z}^+ : x \leq 6\}$$

a.  $|A \cup B|$

$$7$$

b.  $A \oplus B$

$$\{-1, -2, -3, 1, 2, 3, 4\}$$

c.  $A \oplus A$

$$\{\} \text{ or } \emptyset$$

d.  $P(B)$

$$\{\emptyset, \{-1\}, \{-2\}, \{-3\}, \{-1, -2\}, \{-1, -3\}, \{-2, -3\}, \{-1, -2, -3\}\}$$

e.  $|G - F|$

$$0$$

f.  $A \oplus (A \oplus B)$

$$\{-1, -2, -3\}$$

3. Using the previous sets from part 2, identify which of these relationships ( $\subset$ ,  $\subseteq$ ,  $\supset$ ,  $\supseteq$ ) applies to each pair of sets. Use the most accurate relationship.

a.  $A \subset C$

b.  $\{\} \subseteq \text{ or } \supseteq \emptyset$

c.  $F \supset G$

d.  $G \supseteq \text{ or } \subseteq H$

4. List all possible partitions of B from part 2.

$$\{-1, -2, -3\}$$

$$\{-1\}, \{-2\}, \{-3\}$$

$$\{-1, -2\}, \{-3\}$$

$$\{-1\}, \{-2, -3\}$$

$$\{-2\}, \{-1, -3\}$$

5. Generate the requested sets using only set builder notation and the provided sets. Some problems may require you to build one or more sets to be used in the generation of other sets.

$\mathbb{Z}$ , the set of all integers

$\mathbb{R}$ , the set of all real number

- a. Build the set that contains only positive, odd integers.

$$S = \{x \mid x \in \mathbb{Z} \text{ and } x > 0 \text{ and } x \% 2 = 1\}$$

- b. Build the set  $\{0,1\}$  without testing for a range or if an element is equal to 0 or 1.

$$S = \{x \% 2 \mid x \in \mathbb{Z}\}$$

- c. Build the set of real numbers between 0 and 1, inclusively.

$$S = \{x \mid x \in \mathbb{R} \text{ and } 0 \leq x \leq 1\}$$

- d. Build the set that contains all real numbers except integers.

$$S = \{x \mid x \in \mathbb{R} \text{ and } x \notin \mathbb{Z}\}$$