1. List the members of these sets.

a) $\{x \mid x \text{ is a real number such that } x^2 = 1\}$

b) $\{x \mid x \text{ is a positive integer less than } 12\}$

c) $\{x \mid x \text{ is the square of an integer and } x < 100\}$

d) $\{x \mid x \text{ is an integer such that } x^2 = 2\}$

2. Suppose that A, B, and C are sets such that $A \subseteq B$ and $B \subseteq C$. Show that $A \subseteq C$.

3. Determine whether each of these statements is true or false.

a) $0 \in \emptyset$

b) $\emptyset \in \{0\}$

c) $\{0\} \subset \emptyset$

d) $\emptyset \subset \{0\}$

e) $\{0\} \in \{0\}$

f) $\{0\} \subset \{0\}$

g) $\{\emptyset\} \subseteq \{\emptyset\}$

- 4 Draw the Venn diagrams for each of these combinations of the sets A, B, and C.

  a) $A \cap (B - C)$ **b)** $(A \cap B) \cup (A \cap C)$
  c) $(A \cap \overline{B}) \cup (A \cap \overline{C})$

- 5 Let $A_i = \{1, 2, 3, \ldots, i\}$ for $i = 1, 2, 3, \ldots$. Find

  a) $\bigcup_{i=1}^{n} A_i$. **b)** $\bigcap_{i=1}^{n} A_i$.

- 6 Let A, B, and C be sets. Use the identities in Table 1 to show that $\overline{(A \cup B)} \cap \overline{(B \cup C)} \cap \overline{(A \cup C)} = \overline{A} \cap \overline{B} \cap \overline{C}$.

- 7

Find these values.

a) $\lceil \frac{3}{4} \rceil$

b) $\lfloor \frac{7}{8} \rfloor$

c) $\lceil -\frac{3}{4} \rceil$

d) $\lfloor -\frac{7}{8} \rfloor$

e) $\lceil 3 \rceil$

f) $\lfloor -1 \rfloor$

g) $\lfloor \frac{1}{2} + \lceil \frac{3}{2} \rceil \rfloor$

h) $\lfloor \frac{1}{2} \cdot \lfloor \frac{5}{2} \rfloor \rfloor$

- 8

Determine whether the function $f: \mathbf{Z} \times \mathbf{Z} \to \mathbf{Z}$ is onto if

a) $f(m, n) = m + n$.

b) $f(m, n) = m^2 + n^2$.

c) $f(m, n) = m$.

d) $f(m, n) = |n|$.

e) $f(m, n) = m - n$.

- 9 Find these terms of the sequence $\{a_n\}$, where $a_n = 2 \cdot (-3)^n + 5^n$.

  a) a_0 **b)** a_1 **c)** a_4 **d)** a_5

- 10 Compute each of these double sums.

  a) $\sum_{i=1}^{2} \sum_{j=1}^{3} (i+j)$ **b)** $\sum_{i=0}^{2} \sum_{j=0}^{3} (2i+3j)$

  c) $\sum_{i=1}^{3} \sum_{j=0}^{2} i$ **d)** $\sum_{i=0}^{2} \sum_{j=1}^{3} ij$