Section 1.1

4. $\{x \in \mathbb{N} : -2 < x \leq 7\} = \{0, 1, 2, 3, 4, 5, 6, 7\}$
7. $\{x \in \mathbb{R} : x^2 + 5x = -6\} = \{-2, -3\}$
12. $\{x \in \mathbb{Z} : |2x| < 5\} = \{-2, -1, 0, 1, 2\}$
15. $\{5a + 2b : a, b \in \mathbb{Z}\} = \{-2, -1, 0, 1, 2\} = \mathbb{Z}$
17. $\{2, 4, 8, 16, 32, 64, ...\} = \{2^x : x \in \mathbb{N}, x \neq 0\}$
21. $\{0, 1, 4, 9, 16, 25, 36, ...\} = \{x^2 : x \in \mathbb{N}\}$
23. $\{3, 4, 5, 6, 7, 8\} = \{x \in \mathbb{N} : 3 \leq x \leq 8\}$

Section 1.2

Suppose $A = \{1, 2, 3, 4\}$ and $B = \{a, c\}$
a) $A \times B = \{(1, a), (1, c), (2, a), (2, c), (3, a), (3, c), (4, a), (4, c)\}$

b) $B \times A = \{(a, 1), (a, 2), (a, 3), (a, 4), (c, 1), (c, 2), (c, 3), (c, 4)\}$

c) $A \times A = \{(1, 1), (1, 2), (1, 3),$
$(1, 4), (2, 1), (2, 2), (2, 3), (2, 4), (3, 1), (3, 2), (3, 3), (3, 4), (4, 1), (4, 2), (4, 3), (4, 4)\}$

d) $B \times B = \{(a, a), (a, c), (c, a), (c, c)\}$

e) $\varnothing \times B = \{(a, b) : a \in ;, b \in B\} = \varnothing$

f) $(A \times B) \times B = \{((1, a), a), ((1, c), a), ((2, a), a), ((2, c), a), ((3, a), a), ((3, c), a), ((4, a), a), ((4, c), a),$
$((1, a), c), ((1, c), c), ((2, a), c), ((2, c), c), ((3, a), c), ((3, c), c), ((4, a), c), ((4, c), c)\}$

g) $A \times (B \times B) = \{(1, (a, a)), (1, (a, c)), (1, (c, a)), (1, (c, c)),$
$(2, (a, a)), (2, (a, c)), (2, (c, a)), (2, (c, c)), (3, (a, a)), (3, (a, c)),$
$(3, (c, a)), (3, (c, c)), (4, (a, a)), (4, (a, c)), (4, (c, a)), (4, (c, c))\}$

h) $B^3 = \{(a, a, a), (a, a, c), (a, c, a), (a, c, c), (c, a, a), (c, a, c), (c, c, a), (c, c, c)\}$

Section 1.3

8. Subsets of $\{\{0, 1\}, \{0, 1, \{2\}\}, \{0\}\} = \varnothing, \{\{0, 1\}\}, \{\{0, 1, \{2\}\}\}, \{\{0\}\}, \{\{0, 1\}, \{0, 1, \{2\}\}\},$
$\{\{0, 1, \{2\}\}, \{0\}\}, \{\{0, 1\}, \{0\}\}, \{\{0, 1\}, \{0, 1, \{2\}\}, \{0\}\}$

13. $\mathbb{R}^3 \subseteq \mathbb{R}^3$ is **true**, because every set is a subset of itself.

14. $\mathbb{R}^2 \subseteq \mathbb{R}^3$ is **false**, because $\mathbb{R}^2$ are vectors of two coordinates while $\mathbb{R}^3$ are vectors of three coordinates.

Section 1.4

1. $\mathcal{P}(\{\{a,b\},\{c\}\}) = \{\varnothing, \{\{a,b\}\}, \{\{c\}\}, \{\{a,b\},\{c\}\}\}$

2. $\mathcal{P}(\{1,2,3,4\}) = \{\varnothing, \{1\}, \{2\}, \{3\}, \{4\}, \{1,2\}, \{1,3\}, \{1,4\},$
$\{2,3\}, \{2,4\}, \{3,4\}, \{1,2,3\}, \{1,2,4\}, \{1,3,4\}, \{2,3,4\}, \{1,2,3,4\}\}$

3. $\mathcal{P}(\{\{\varnothing\},5\}) = \{\varnothing, \{\{\varnothing\}\}, \{5\}, \{\{\varnothing\},5\}\}$

14. $|\mathcal{P}(\mathcal{P}(A))| = 2^{2^n}$

15. $|\mathcal{P}(A \times B)| = 2^{mn}$

Section 1.5

d) $A - C = \{3,6,7,1,9\}$

e) $B - A = \{5,8\}$

f) $A \cap C = \{4\}$

g) $B \cap C = \{5,8,4\}$

h) $B \cup C = \{5,6,8,4\}$

i) $C - B = \varnothing$

Section 1.6

1 a) $\overline{A} = \{0,2,5,8,10\}$

1 e) $A - \overline{A} = A$

1 h) $\overline{A} \cap B = \{5,8\}$

2 f) $\overline{A \cup B} = \varnothing$

2 g) $\overline{A} \cap \overline{B} = \varnothing$