I. Section 1.1.

1. Let \( A = \{ -3, 0, 1, \pi, 4 \} \), \( B = \{ -7, -3, 0, \frac{7}{3} \} \) and \( C = \{ 1, 3.14, 12 \} \). Find:

   (a) \( A \cup B \)

   (b) \( A \cap B \)

   (c) \( A \cap C \)

   (d) \( B \cap C \)

2. Let \( A = \{ x : x \leq \frac{1}{2} \} \), \( B = \{ x : -1 < x \leq \sqrt{2} \} \) and \( C = \{ x : 0 < x < 1 \} \).

   (a) Write \( A, B \) and \( C \) using interval notation. Graph each set on a number line.

   (b) Find the following. Write your answers in interval notation.

   (i) \( A \cap B \)  

   (ii) \( A \cup C \)

3. Mathematicians often use the symbol \( \mathbb{Z} \) to denote the set of integers and the symbol \( \mathbb{Q} \) to denote the set of rational numbers.

   (a) Is the set \( \mathbb{Z} \) finite or infinite? What about the set \( \mathbb{Q} \)?

   (b) Find \( \mathbb{Z} \cap \{ -2, -\frac{1}{3}, 0, \sqrt{7}, 15 \} \).

   (c) Find \( \mathbb{Q} \cap \{ -2, -\frac{1}{3}, 0, \sqrt{7}, 15 \} \).

4. Let \( S = [-1, 2) \). List six numbers that are in \( S \).

II. Section 1.2.

1. Evaluate the following and put them in increasing order.

   (a) \(-2^4\)  

   (b) \((-2)^4\)  

   (c) \((-2)^{-3}\)
2. Simplify the following using properties of exponents. It’s OK to leave negative exponents in your answers.

(a) \(-(-3x^4)^2\)

(b) \((x^4y^2) \cdot (x^2y^{-1})^3\)

(c) \(\frac{x^8y^2}{x^4y^{-4}}\)

(d) \(\frac{(xy^2z^{-4})^3}{(x^{-2}y^4z^2)^{-2}}\)

3. Find the following (if they exist).

(a) \(\sqrt{25}\)

(b) \(\sqrt{-25}\)

(c) \(\sqrt[3]{-8}\)

(d) \(\sqrt{0}\)

(e) \(\sqrt{0}\)

4. Simplify the following:

(a) \(\sqrt{24}\)

(b) \(\sqrt{45}\)

(c) \(\sqrt{20} \cdot \sqrt{5}\)

5. Is \(\sqrt{9} + \sqrt{16} = \sqrt{25}\)?