1. List all factors of 24.

2. Find all prime numbers from the list (could be more than one): 203, 79, 91, 20 001, 103

3. Suppose $A = \{2,\ 3,\ 4,\ 5,\ 7,\ 8\}$, and $B = \{1,\ 2,\ 4,\ 6,\ 8,\ 10\}$. Draw a Venn-diagram depicting A and B.

4. Suppose that $P = \{2, 3, 5, 7\}$ and $Q = \{3, 7\}$. Label each of the following statements as true or false.

   a) $6 \in P$ c) $P \subseteq Q$ e) $P \subseteq \mathbb{N}$ g) $\varnothing \subseteq Q$

   b) $2 \notin Q$ d) $Q \subseteq P$ f) $Q \subseteq Q$ h) $\mathbb{Z} \subseteq \mathbb{N}$

5. Suppose that $U = \{0,\ 1,\ 2,\ 3,\ \ldots,\ 19,\ 20\}$. Find each of the following sets.

   a) $A = \{x \in U : x \text{ is divisible by } 3\}$ f) $F = \{x \in U : x < 4 \text{ or } x < 8\}$

   b) $B = \{x \in U : x \text{ is divisible by } 5 \text{ or } x < 8\}$ g) $G = \{x \in U : x < 4 \text{ and } x < 8\}$

   c) $C = \{x \in U : x \text{ is divisible by } 5 \text{ and } x < 8\}$ h) $H = \{x \in U : x \text{ is divisible by } 4\}$

   d) $D = \{x \in U : x < 12 \text{ or } x \geq 7\}$ i) $I = \{x \in U : x \text{ is divisible by } 3 \text{ or } x \text{ is divisible by } 4\}$

   e) $E = \{x \in U : x < 12 \text{ and } x \geq 7\}$ j) $J = \{x \in U : x \text{ is divisible by } 3 \text{ and } x \text{ is divisible by } 4\}$

6. Recall the following definitions. A **rectangle** is a four-sided polygon with four right angles. A **square** is a rectangle with four equal sides. Let R be the set of all rectangles and S the set of all squares.

   a) Label each of the following statements as true or false.

          i) Every square is a rectangle.   iii) $R \subseteq S$

          ii) Every rectangle is a square.   iv) $S \subseteq R$

   b) Describe x if we know that $x \in R$ and $x \notin S$.

7. Perform the indicated operations. Show all steps.

   a) $12 - 3(8 - 5)$ e) $18 - 3(7 - 2(14 - 3(5 - 1)))$ i) $\dfrac{32 - 7 + 3}{10 - 6 + 3}$

   b) $\dfrac{18 - 3^2 + 1}{2^3 - 3^1}$ f) $\left(4^2 - 3\left(2 \cdot 7 - 3^2\right) + 2\right)^2$

   c) $24 \div 4 \cdot 2$ g) $\dfrac{12 - 2\left(3^2 - 5\right)}{3^3 - 5^2}$ j) $\left(3^3 - \left(\left(13 - 3^2\right)^2 - 11\right)^2\right)^2$

   d) $8 - (12 - (10 - (4 - 1)))$ h) $\dfrac{10 - 2\left(3^2 - 7\right)}{12 - 5(7 - (8 - 3))}$ k) $\dfrac{5^2 - 3^2}{(5 - 3)^2}$

Answers

1. 1, 2, 3, 4, 6, 8, 12, 24

2. 79 and 103

3.
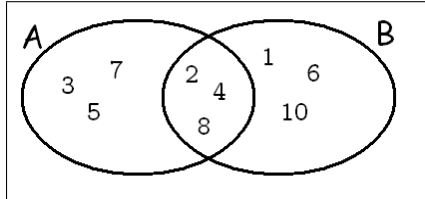
4. a) false   b) true   c) false   d) true   e) true   f) true   g) true   h) false

5. a) $\{0, 3, 6, 9, 12, 15, 18\}$ b) $\{0, 1, 2, 3, 4, 5, 6, 7, 10, 15, 20\}$ c) $\{0, 5\}$ d) U or $\{0, 1, 2, 3, \ldots, 19, 20\}$

   e) $\{7, 8, 9, 10, 11\}$ f) $\{0, 1, 2, 3, 4, 5, 6, 7\}$ g) $\{0, 1, 2, 3\}$ h) $\{0, 4, 8, 12, 16, 20\}$

   i) $\{0, 3, 4, 6, 8, 9, 12, 15, 16, 18, 20\}$ j) $\{0, 12\}$

6. a) i) true   ii) false   iii) false   iv) true

   b) x is a rectangle that is NOT a square, i.e. a rectangle that has two sides with different lengths.

7. a) 3   b) 2   c) 12   d) 3   e) 9   f) 9   g) 2   h) 3   i) 4   j) 4   k) 4