1. Show the following sets on the real number line.
   (a) \{x \mid 2 \leq x \leq 8\}  \hspace{1cm} (b) \{x \mid x > 7\}  \hspace{1cm} (c) \{x \mid -2 < x \leq 6\} \setminus \{4\}
   (d) \{2, 7\} \cap \{4, 8\}  \hspace{1cm} (e) (-\infty, 4) \cap [-2, 5)  \hspace{1cm} (f) \{x \mid x < -6\}

2. Write the following using interval notation.
   (a) \{x \mid -2 \leq x \leq 7\}  \hspace{1cm} (b) \{x \mid x > 9\}
   (c) \{x \mid 0 < x \leq 5\}  \hspace{1cm} (d) \{x \mid x \leq 0\}
   (e) \{x \mid x < 8\} \cap \{x \mid x > -4\}  \hspace{1cm} (f) \{x \mid x < -1\} \cup \{x \mid x > 2\}

3. Simplify the following.
   (a) \(3\sqrt{5} + \sqrt{20}\)  \hspace{1cm} (b) \(2\sqrt{3} - \sqrt{27}\)  \hspace{1cm} (c) \(\sqrt{2} + \sqrt{3} + \sqrt{8} - \sqrt{18}\)

4. Simplify the following.
   (a) \((\sqrt{5} + 1)(\sqrt{5} - 1)\)  \hspace{1cm} (b) \((2\sqrt{3} - \sqrt{2})(\sqrt{2} + \sqrt{3})\)
   (c) \((3\sqrt{2} - \sqrt{6})(\sqrt{3} + 3)\)  \hspace{1cm} (d) \((2 + 3\sqrt{3})^2\)

5. Rationalise the denominator in each of the following.
   (a) \(\frac{1}{2 + \sqrt{3}}\)  \hspace{1cm} (b) \(\frac{3}{\sqrt{7} - 2}\)  \hspace{1cm} (c) \(\frac{\sqrt{3}}{\sqrt{5} - 2}\)
   (d) \(\frac{2\sqrt{5} + 1}{\sqrt{3} - 2}\)  \hspace{1cm} (e) \(\frac{\sqrt{2} + \sqrt{3}}{\sqrt{3} - \sqrt{5}}\)  \hspace{1cm} (f) \(\frac{2\sqrt{3}}{2\sqrt{5} - 3\sqrt{2}}\)
6. (a) If \( x = \sqrt{5} + \sqrt{3} \), find the value of
   i. \( x + \frac{1}{x} \)    
   ii. \( x^2 + \frac{1}{x^2} \)

(b) If \( x = 4 + \sqrt{3} \), find the value of
   i. \( x - \frac{1}{x} \)    
   ii. \( x^2 + \frac{1}{x^2} \)

7. Find the value of \( x \) if
(a) \( \{ x \mid |x| = 3 \} \)    
(b) \( \{ x \mid |x| = 10 \} \)    
(c) \( \{ x \mid |x| = -2 \} \)
(d) \( \{ x \mid |x + 1| = 3 \} \)    
(e) \( \{ x \mid |x + 2| = 10 \} \)    
(f) \( \{ x \mid |x - 2| = 2 \} \)

8. Represent each of the following on the real number line.
(a) \( \{ x : |x| \leq 5 \} \)    
(b) \( \{ x : |x| > 2 \} \)
(c) \( \{ x : 2 \leq |x| < 5 \} \)    
(d) \( \{ x : 2 \geq |x| \} \)

9. Write the following using interval notation.
(a) \( \{ x \mid x - 1 > 0 \} \)    
(b) \( \left\{ x \mid \frac{1}{2} x > 2 \right\} \)    
(c) \( \{ x : x > 4 \} \cap \{ x : 2 x < 12 \} \)