1. Find the decimal representation of the binary number 101100112.

2. Find the binary representation of the decimal number 20310.

3. Represent the number −44 as a two’s complement 32-bit binary number.

4. Given the machine 32-bit word
   
   $\begin{align*}
   1111 & 1111 1111 1111 1101 1011 1101 \end{align*}$

   find the decimal number represented by this word assuming that it is
   
   (a) a two’s complement integer;
   (b) an unsigned integer.

5. Given the 32-bit word
   
   $\begin{align*}
   1100 & 0001 0101 1101 0000 0000 0000 0000 \end{align*}$

   find the decimal number represented by this word assuming that it is
   
   – a single precision IEEE 754 floating-point number;
   – a two’s complement integer (you can give the number as a sum of powers of 2).


7. Describe each of the following sets in terms of a property of its elements (that is, using the ‘description by properties’ notation):
   
   (a) the set of dates in the month of July;
   (b) \{1, 4, 9, 16, 25, 36, 49\}.

8. Let
   
   $A = \{1, 2, 3\}, \quad B = \{1, 3, 5\}, \quad C = \{3, \{3, 5\}, 5, 6\}$.

   Describe each of the following sets by listing its elements.
   
   (a) \(A \cup B\) \(\cap\) \(C\).
   (b) \(\text{Pow}(B) \cap C\).
   (c) \(B - C\) \(\cup\) \((C - A)\).

9. For each of the following relations from \(A = \{a, b, c, d\}\) to \(B = \{1, 2, 3, 4, 5\}\), determine whether or not it is an \(A \to B\) function.
   
   (a) \{(a, 1), (b, 2), (c, 3)\}.
   (b) \{(a, 1), (b, 2), (c, 3), (d, 4), (d, 5)\}.
   (c) \{(a, 1), (b, 2), (c, 3), (d, 5)\}.
   (d) \{(a, 1), (b, 2), (c, 2), (d, 1)\}.
   (e) \{(a, 5), (b, 5), (c, 5), (d, 5)\}.

10. Which of the following relations are functions?
    
    (a) \(\{(x, y) \in \mathbb{N} \times \mathbb{Q} \mid y = \sqrt{x}\}\)
    (b) \(\{(x, y) \in \mathbb{Q} \times \mathbb{Q}^+ \mid y = 1/x\}\)
    (c) \(\{(x, y) \in \mathbb{R} \times \mathbb{R} \mid y^2 = x\}\)

11. Consider the set \(A = \{x \in \mathbb{N} \mid 1 \leq x \leq 8\}\) and the relation
    
    \[ R = (\{1, 2\} \times \{2, 3\}) \cup \{(x, y) \mid 1 \leq x, y \leq 8, \ x - y = 2\} \]
    
    on \(A\).

   Represent the relation \(R\) as a directed graph. Is \(R\) a function?