Sets, Relations and Functions

Practice Questions

Notations:

N ⇒ the set of natural numbers
W ⇒ the set of whole numbers
Z ⇒ the set of integers
$\mathfrak{R}$ ⇒ the set of real numbers

1. Convert/Express the following into Roster form:
   a. { (x, y) | {x, y} ⊂ {-1, 0, 1, 2} }
   b. { P | P ⊂ {-1, 0, 1, 2} }
   c. **A** ∩ **B**, where,
      A = { x | x is a prime number } and
      B = { x | x = 2n, where n ⊂ **N** }

2. If n(A) = 5, n(B) = 7, n(C) = 3 and n((A X C) ∪ (B X C)) = 30, find the n(A ∩ B).
   Hint: How are A ∪ B and A ∩ B related?
3. The number of all possible subsets of a set A which contains finite elements is 131072. If I add one more element *x* to the set A, what will be the number of all possible subsets of the new set A?
   Hint: The new subsets either will have the element *x*, or won't have it.
4. If **A** = { n | n ∈ **N**, and n < 6 }, and **R** is any relation defined as **R**: **A** → **A**, find the number of different types of relations **R** possible.
5. For each of the following relation R: **Z** → **Z**, find the type of relation
   a. R = { (x, y) | (x - y) is divisible by 3}
   b. R = { (p, q) | p, q being lines such that p ⊥ q}
   c. R = { (x, y) | y = $-\sqrt{25 - x^2}$ }
   d. R = { (x, y) | x = $-\sqrt{25 - y^2}$ }
6. Which of the relations in question 5 is/are equivalence relation(s)?
7. Which of the relations in question 5 is/are functions(s)? Which of the function(s) is/are invertible?
8. The below area is formed by overlapping two squares of size 5 and 7 units respectively, as shown below. The overall area of the space occupied is 59 square-units. Calculate the overlap area in square-units.