MS121 Discrete Mathematics, Tutorial 3

1. Let $U = \{n \in \mathbb{Z} \mid 1 \leq n \leq 12\}$ be the universal set for this question and set $A = \{n \in \mathbb{Z} \mid n \text{ is a divisor of } 12\}$, $B = \{n \in \mathbb{Z} \mid n \text{ is a prime number}\}$ and $C = \{n \in \mathbb{Z} \mid n \text{ is odd}\}$
a) Describe in words each of the following sets:

$$A \cap B, \quad A \cap B \cap C, \quad B \cap \sim C, \quad A - C.$$

b) List the elements of each of the following sets:

$$A \cup B, \quad \sim (A \cup C), \quad \sim (A \cap B), \quad B \triangle C.$$

2. Each of the 100 students in the first year of a Computer Science Department study at least one of the subsidiary subjects : mathematics, electronics and accounting. Given that 65 study mathematics, 45 study electronics, 42 study accounting, 20 study mathematics and electronics, 25 study mathematics and accounting, and 15 study electronics and accounting, find the number who study:
(a) all three subsidiary subjects;
(b) mathematics and electronics but not accounting;
(c) only electronics as a subsidiary subject.
Draw a Venn diagram to illustrate the cardinality of each component subset.

3. Consider the set $A = \{1, 2, 3, 4, 5, 6, \ldots, 100\}$ where $|A| = 100$.
(a) How many elements in A are divisible by 3?
(b) How many elements in A are divisible by 5?
(c) How many elements in A are divisible by 15?
(d) How many elements in A are divisible by either 3, 5 or both?
(e) How many elements in A are neither divisible by 3 nor 5?
(f) How many elements in A are divisible by exactly one of 3 or 5?
(No need to enumerate sets!)

4. How many positive integers less than or equal to 2001 are multiples of 3 or 4 ?