Mathematics for Computing
Set Theory

1 Set Theory

DRAFT

1.1 Important Operations in Set Theory

- Union ($\cup$) - also known as the OR operator. A union signifies a bringing together. The union of the sets A and B consists of the elements that are in either A or B.
- Intersection ($\cap$) - also known as the AND operator. An intersection is where two things meet. The intersection of the sets A and B consists of the elements that in both A and B.
- Complement (^{c}) - The complement of the set A consists of all of the elements in the universal set that are not elements of A.

2.a Describe the following set by the listing method

$$\{2r + 1 : r \in Z^+ and r \leq 5\}$$

2.b Let A,B be subsets of the universal set U.

3.a Let n be an element of the set $\{10, 11, 12, 13, 14, 15, 16, 17, 18, 19\}$, and p and q be the propositions: p : n is even, $q : n > 15$. Draw up truth tables for the following statements and find the values of n for which they are true: (i) $p \vee \neg q$ (ii) $\neg p \wedge q$

1.2 Universal Set and the Empty Set

- The first is the ***universal set***, typically denoted U. This set is all of the elements that we may choose from. This set may be different from one setting to the next.

- For example one universal set may be the set of all real numbers, denoted $\mathbb{R}$, whereas for another problem the universal set may be the whole numbers $\{0, 1, 2, \ldots\}$.
- The other set that requires consideration is called the ***empty set***. The empty set is the unique set is the set with no elements. We write this as $\{\}$ and denote this set by $\emptyset$.

2 Number Sets

The font that the symbols are written in (i.e. $\mathbb{N}$, $\mathbb{R}$) is known as ***blackboard font***.

- $\mathbb{N}$ Natural Numbers $(0, 1, 2, 3)$ (Not used in the CIS102 Syllabus)
- $\mathbb{Z}$ Integers $(-3, -2, -1, 0, 1, 2, 3, \ldots)$
  - $\mathbb{Z}^+$ Positive Integers
  - $\mathbb{Z}^-$ Negative Integers
- $\mathbb{Q}$ Rational Numbers
- $\mathbb{R}$ Real Numbers

(a)

(b)

(c)