Sets Ex 1.4 Q1

(i) False, $\because$ the two sets A and B need not be comparable.

(ii) False, $\because$ $\{1\}$ is a finite subset of the infinite set N of natural numbers.

(iii) True, $\because$ the order (or cardinal number) of any subset of a set is less than or equal to the order of the set.
(order (or cardinal number) of a set is the number of elements in the set).

(iv) False, $\because$ the empty set ϕ has no proper subset.

(v) False, $\because$ $\{a,b,a,b,...\} = \{a,b\}$ (repetition is not allowed)

$\therefore$ $\{a,b,a,b,...\}$ is a finite set.

(vi) True, $\because$ equivalent sets have the same cardinal number.

(vii) False,
One knows that if the cardinal number of a set A is n, then the power set of A denoted by $P(A)$ which is the set of all subsets of A, has the cardinal number 2^n.

If the cardinal number of A is infinite, then the cardinal number of $P(A)$ is also infinite.
Hence, the above statement is true provided the set is infinite.

Sets Ex 1.4 Q2

(i) True, $\because$ 1 is an element of the set $\{1,2,3\}$.

(ii) False, $\because$ a is an element and not a subset of the set $\{b,c,a\}$.

(iii) False, $\because$ $\{a\}$ is a subset of the set $\{a,b,c\}$ and not an element.

(iv) True, $\because$ repetition is not allowed in a set.

(v) False, $\because$ the set $\{x : x + 8 = 8\}$ is the single ton set $\{0\}$ which is not the null set ϕ.

Sets Ex 1.4 Q3

We have,

$$A = \{x : x \text{ satisfies } x^2 - 8x + 12 = 0\}$$
$$= \{x : x^2 - 6x - 2x + 12 = 0\}$$
$$= \{x : x(x-6) - 2(x-6) = 0\}$$
$$= \{x : (x-6)(x-2) = 0\}$$
$$= \{x : x = 6, 2\}$$
$$= \{6, 2\}$$

$$B = \{2, 4, 6\}$$
$$C = \{2, 4, 6, 8, \ldots\}$$
$$D = \{6\}$$

We know that if E and F are two sets, then E is a subset of F. i.e., $E \subseteq F$ if $x \in E \Rightarrow x \in F$. E is called a proper subset of F if E is strictly contained in F and is denoted by $E \subset F$.

Clearly,

$D \subset A \{\because 6 \in D \text{ and } 6 \in A\}$

$A \subset B \{\because 2, 6 \in A \text{ and they also belong to } B\}$

Similarly, $B \subset C$

Hence, $D \subset A \subset B \subset C$.

********** END **********