3) i) $A = \{x : x \in Z \text{ and } x < 10\}$

$= \{\ldots, -4, -3, -2, -1, 0, 1, 2, 3, 4, 5, 6, 7, 8, 9\}$

= It is an infinite set.

ii) $B = \{x : x \in W \text{ and } 5x - 3 \leq 20\}$

$5x - 3 \leq 20$

$5x - 3 + 3 \leq 20 + 3$ (Adding 3 to both sides)

$5x \leq 20 + 3$

$5x \leq 23$

$x \leq \frac{23}{5}$ Dividing

3) iii) $P = \{y : y = 3x - 2, x \in N \text{ and } x > 5\}$

$x \in N$ and $x > 5 = 6, 7, 8, 9 \ldots\ldots$

$\therefore$ When $x = 6$

$y = 3 \times 6 - 2$

$= 18 - 2$

$= 16$

$\therefore$ When $x = 7$

$y = 3 \times 7 - 2$

$= 21 - 2$

$= 19$

$\therefore$ When $x = 8$

$y = 3 \times 8 - 2$

$= 24 - 2$

$= 22$

$\therefore$ When $x = 9$

$y = 3 \times 9 - 2$

$= 27 - 2$

$= 25$

$P = \{16, 19, 22, 25 \ldots\}$

So it is a infinite set.

iv) $u = \frac{3}{n}$

When $n = 7$, $= \frac{3}{7}$ When $n = 12 = \frac{3}{12}$

When $n = 8$, $\frac{3}{8}$ When $n = 13 = \frac{3}{13}$

When $n = 9 = \frac{3}{9}$ When $n = 14 = \frac{3}{14}$

When $n = 10 = \frac{3}{10}$ When $n = 15 = \frac{3}{15}$

When $n = 11 = \frac{3}{11}$

$\therefore M = \{\frac{3}{7}, \frac{3}{8}, \frac{3}{9}, \frac{3}{10}, \frac{3}{11}, \frac{3}{12}, \frac{3}{13}, \frac{3}{14}, \frac{3}{15}\}$

So it is a finite set.

4) i) Yes, it is a singleton set.

ii) $A = \{x : 7x - 3 = 11\}$

$= 7x - 3 = 11$

$\Rightarrow 7x = 11 + 3$

$\Rightarrow 7x = 14$

$\Rightarrow x = \frac{14}{7} 2$

$\Rightarrow x = 2$

$A = \{2\}$

$\therefore$ So, it is a singleton set

iii) $B = \{y : 2y+1 > 3 \text{ and } y \in W\}$

$y \in W$ and $2y+1 > 3$

$2y+1 > 3$

$\Rightarrow 2y > 3-1$

$\Rightarrow 2y > 0$

$\Rightarrow y = 2/2$

$\Rightarrow y = 1$

$\therefore B = \{0\}$

$\therefore$ Yes it is a singleton set.

5) i) The set of points of intersection of two parallel lines is an empty set because two parallel lines do not intersect anywhere.

ii) $A = \{x : x \in N \text{ and } 5 < x \leq 6\}$

$5 < x \leq 6$

$x = 6$

$A = \{6\}$

$\therefore$ Yet A is not an empty set

iii) $B = \{x : x^2 + 4 = 0, x \in N\}$

$x^2 + 4 = 0$

$\Rightarrow x^2 = -4$

$\Rightarrow x = \sqrt{-4}$ (not a natural no.)

But $x = N$

$\therefore$ So, $B = \{\}$ is an empty set

iv) C = {even numbers between 6 and 10}

6, (8), 9, 10

$\Rightarrow C = \{8\}$

$\therefore$ Hence it is not an empty set.

v) D = {prime number between 7 and 11}

7, 8, 9, 10, 11

No prime numbers

So, $D = \{\}$

$\therefore$ Hence it is an empty set

6) i) $A = \{4, 5, 6\}$

$B = \{x : x^2 - 5x - 6 = 0\}$

$x^2 - 5x - 6 = 0$

$\Rightarrow x^2 - 6x + x - 6 = 0$

$\Rightarrow x(x-6) + 1(x-6) = 0$

$\Rightarrow (x-6)(x+1) = 0$

Either

$x - 6 = 0$ or $x + 1 = 0$

$\Rightarrow x = 6$ $\Rightarrow x = -1$

$B = \{6, -1\}$

$\therefore$ So, Yes it is a joint set because these sets have element 6 in common

ii) A = {b, c, d, e}
B = {x : x is a letter in the 'MASTER'}
B = {m, a, s, t, e, r}

No, set A and set B are joint set because these sets have element e in common

7) i) $A = \{x : x \in N \text{ and } 11 \leq 2x - 1\}$

$11 \geq 2x - 1$

$\Rightarrow 11 + 1 \geq 2x - 1 + 1$

$\Rightarrow 12 \geq 2x$

$\Rightarrow \frac{12}{2} \geq x$

$\Rightarrow 6 \geq x$

$A = \{1, 2, 3, 4, 5, 6\}$

$n(A) = 6$

$B = \{y : y \in W \text{ and } 3 \leq y < 9\}$

$B = \{3, 4, 5, 6, 7, 8, 9\}$

$\therefore n(B) = 7$

So A and B set are not equivalent.

ii) Set of integers and set of natural number are equivalent because these have infinite of elements.

iii) Set of whole number and set of multiples of 3 are equivalent Because both these sets have infinite number of elements.

iv) $P = \{5, 6, 7, 8\}$

$M = \{x : x \in W \text{ and } x \leq 4\}$

$\Rightarrow n(P) = 4$

$\Rightarrow M = \{x : x \in W \text{ and } x \leq 4\}$

$x \in W \text{ and } x \leq 4 = \{0, 1, 2, 3, 4\}$

$n(M) = 5$

Cardinal no. of $P = 4$

Cardinal no of $M = 5$

So these will are not equivalent.

8) i) $A = \{2, 4, 6, 8\}$

$B = \{2n : n \in N \text{ and } n < 5\}$

$n \in N \text{ and } n < 5 = 1, 2, 3, 4$

When $n = 1 = 2 \times 1 = 2$

When $n = 2 = 2 \times 2 = 4$

When $n = 3 = 2 \times 3 = 6$

When $n = 4 = 2 \times 4 = 8$

$B = \{2, 4, 6, 8\}$

$\therefore$ No elements of set A and B are same.

ii) $M = \{x : x \in W \text{ and } x + 3 < 8\}$

$x + 3 < 8$

$x < 8 - 3$

$x = 5$

$\therefore M = \{0, 1, 2, 3, 4\}$

$N = \{y : y = 2n - 1, n \in N \text{ and } n < 5\}$

$n \in N \text{ and } n < 5 = 1, 2, 3, 4$

When $n = 1 = 2 \times 1 - 1 = 1$

When $n = 2 = 2 \times 2 - 1 = 3$

When $n = 3 = 2 \times 3 - 1 = 5$

When $n = 4 = 2 \times 4 - 1 = 7$

$\therefore N = \{1, 3, 5, 7\}$

$\therefore$ No set M and N are not same.

iii) $E = \{x : x^2 + 8x - 9 = 0\}$ and $F = \{1, -9\}$

$E = \{x : x^2 + 8x - 9 = 0\}$

$= x^2 + 8x - 9 = 0$

$\Rightarrow x^2 + 8x = 0 + 9$

$\Rightarrow x^2 + 8x = 9$

$\Rightarrow x^2 + x = 9 - 8$

$\Rightarrow x^2 + x = 1$

$\Rightarrow$

$x^2 + 8x - 9 = 0$

$\Rightarrow x^2 + 9x - x - 9 = 0$

$\Rightarrow x(x+9) - 1(x+9) = 0$

$\Rightarrow (x+9)(x-1) = 0$

Either

$x + 9 = 0$ or $x - 1 = 0$

$\Rightarrow x = -9$ $\Rightarrow x = 1$

$F = \{1, -9\}$

$\therefore$ No set E and F are same

iv) $A = \{x : x \in N, x < 3\}$

$x \in N$ and $x < 3 = 1, 2$

$B = \{y : y^2 - 3y + 2 = 0\}$

$y^2 - 3y + 2 = 0$

$\Rightarrow y^2 - 2y - y + 2 = 0$

$\Rightarrow y(y-2) - 1(y-2) = 0$

$\Rightarrow (y-2)(y-1) = 0$

Either $y-2=0$ or $y+1=0$

$y=02$ $y=01$

$B=\{2,-1\}$

9) i) The set of multiple of 8

$=\{8,16,24,32\ldots\}$

= It is infinite set.

ii) The set of integer less that 10

$=\{9,8,7,6,5,4,3,2,1,0,-1,-2\ldots\}$

= It is infinite set

iii) The set of whole number less than 12

$=\{11,10,9,8,7,6,5,4,3,2,1,0\}$

= It is infinite set

iv) $\{x: x=3n-2, n\in W, n\leq 8\}$

$n\in W, n\leq 8 = 1,2,3,4,5,6,7,8$

When $n=1$, $3\times1-2=1$

When $n=2$, $3\times2-2=4$

When $n=3$, $3\times3-2=7$

When $n=4$, $3\times4-2=10$

When $n=5$, $3\times5-2=13$

When $n=6$, $3\times6-2=16$

When $n=7$, $3\times7-2=19$

When $n=8$, $3\times8-2=22$

$\therefore \{1,4,7,10,13,16,19,22\}$ It is a finite set