Ex 1

Let S be the set of integers

$x R y$ means $x-y$ is a multiple of 3

$Z = 7$

Reflexive $x \sim x$ $\quad x R x$

$x - x = 0$ set up condition

$= 0 \cdot 3$ ← show it works

Symmetric: If $x R y$

$-1 \cdot (x - y = 3 \cdot n)(-1)$ $\quad$ n is an integer

$y - x = -3 \cdot n$

$y - x = 3(-n)$

So $y R x$

Transitive: If $x R y$ and $y R z$

$x - y = 3n$ $\quad y - z = 3m$

$x = y + 3n$ $\quad y = x - 3n$ $\quad y = 3m + z$ $\quad z = y - 3m$

$x - z = y + 3n - (y - 3m) = 3n + 3m = 3(n+m)$:)

OR

$x - 3n = 3m + z$

$x - z - 3n = 3m$

$x - z = 3m + 3n$

$3(m+n)$

so $x R z$

Ex 1. $7 R \underline{x}$ $\boxed{7 - x \text{ is a multiple of } 3}$

$$\begin{array}{ll}
\downarrow & \\
4 & 7-4 = 1\cdot 3 \\
1 & 7-1 = 2\cdot 3 \\
-2 & 7- -2 = 3\cdot 3 \\
-5 & 7- -5 = 4\cdot 3 \\
7 & 7-7 = 0\cdot 3 \\
10 & 7-10 = -1\cdot 3
\end{array}$$

$$7 - x = 3 \cdot n$$

$$x = 7 - 3n$$

$$[7] = \{ x \mid x = 7 - 3n \text{ for some integer } n \}$$

S = ordered pairs of real numbers $\qquad z = (5,4)$

$(x_1, x_2) R (y_1, y_2)$ means $\quad x_1 - y_2 = y_1 - x_2$

$(a, b) R (c, d)$ means $\quad a - d = c - b$

means

$a + b = c + d$

Reflexive: If $(x, y) \in S$ $\leftarrow$

then $x + y = x + y$

$(x, y) R (x, y)$

Symmetric: If $(x, y) R (n, m)$

$x + y = n + m$

so $\quad n + m = x + y$

so $\quad (n, m) R (x, y)$

Transitive: If $(x, y) R (a, b)$ and $(a, b) R (n, m)$

$x + y = a + b \qquad a + b = n + m$

So $\quad x + y = n + m$

thus $\quad (x, y) R (n, m)$

$(5,4) \sim (a,b)$ mean $5-b = a-4$

$5+4 = a+b$

$(a,b) = (8,1)$

$(1,8)$

$(5,4)$

$(2,7)$

$(10,-1)$

$(6,3)$

$[(5,4)] = \{(8,1), (1,8), (6,3) \dots\}$

$\{(x,y) \mid x+y = 9\}$