EXERCISE SET 4.1

1. Using the identity $(a+b)^2 = a^2 + 2ab + b^2$, expand the following :

(i) $(7x + 4y)^2$

Using $(a+b)^2 = a^2 + 2ab + b^2$

where $a = 7x$, $b = 4y$

$$(7x + 4y)^2 = (7x)^2 + 2 \times 7x \times 4y + (4y)^2$$

$$= 49x^2 + 56xy + 16y^2$$

(ii) $\left(\frac{7}{5}x + \frac{3}{2}y\right)^2$

Using $(a+b)^2 = a^2 + b^2 + 2ab$

Here $a = \frac{7}{5}x$, $b = \frac{3}{2}y$

$$\left(\frac{7}{5}x + \frac{3}{2}y\right)^2 = \left(\frac{7}{5}x\right)^2 + 2 \times \left(\frac{7}{5}x\right) \times \left(\frac{3}{2}y\right) + \left(\frac{3}{2}y\right)^2$$

$$\left(\frac{7}{5}x + \frac{3}{2}y\right)^2 = \frac{49}{25}x^2 + 2 \times \frac{7}{5}x \times \frac{3}{2}y + \frac{9}{4}y^2$$

$$\left(\frac{7}{5}x + \frac{3}{2}y\right)^2 = \frac{49}{25}x^2 + \frac{21}{5}xy + \frac{9}{4}y^2$$

(iii) $(2.5p + 1.5q)^2$

Using $(a + b)^2 = a^2 + 2ab + b^2$

Here $a = 2.5p \qquad b = 1.5q$

$$(2.5p + 1.5q)^2 = (2.5p)^2 + 2 \times 2.5p \times 1.5q + (1.5q)^2$$

$$= 6.25p^2 + 7.5pq + 2.25q^2$$

(iv) $\left(\frac{3}{4}s + 8t\right)^2$ Using $(a+b)^2 = a^2 + 2ab + b^2$

Here $a = \frac{3}{4}s$ $b = 8t$

$$\left(\frac{3}{4}s + 8t\right)^2 = \left(\frac{3}{4}s\right)^2 + 2 \times \left(\frac{3}{4}s\right) \times (8t) + (8t)^2$$

$$= \frac{9}{16}s^2 + \left(2 \times \frac{3}{4} \times 8\right)st + 64t^2$$

$$\left(\frac{3}{4}s + 8t\right)^2 = \frac{9}{16}s^2 + 12st + 64t^2$$

(v) $\left(x+\frac{1}{2y}\right)^2$

Using $(a+b)^2 = a^2 + b^2 + 2ab$

Here $a = x$, $b = \frac{1}{2y}$

$$\left(x+\frac{1}{2y}\right)^2 = x^2 + 2 \times x \times \frac{1}{2y} + \left(\frac{1}{2y}\right)^2$$

$$= x^2 + \frac{x}{y} + \frac{1}{(2y)^2}$$

$$= x^2 + \frac{x}{y} + \frac{1}{4y^2}$$

(vi) $\left(\frac{1}{x}+\frac{1}{y}\right)^2$ Here $a = \frac{1}{x}$, $b = \frac{1}{y}$

$$(a+b)^2 = a^2 + 2ab + b^2$$

$$\left(\frac{1}{x}+\frac{1}{y}\right)^2 = \left(\frac{1}{x}\right)^2 + 2\times\left(\frac{1}{x}\right)\times\left(\frac{1}{y}\right) + \left(\frac{1}{y}\right)^2$$

$$= \frac{1}{x^2} + \frac{2}{xy} + \frac{1}{y^2}$$

2. Using the same identity, find the values of the following:

(i) $(64)^2$ $\quad 64 = 60 + 4$ $\quad$ using $(a+b)^2 = a^2 + 2ab + b^2$

Here $a = 60$, $b = 4$

$(60+4)^2 \Rightarrow$

$(60)^2 + 2 \times 60 \times 4 + (4)^2$

$= 3600 + 480 + 16$

$= 4096$

(ii) $(105)^2$ $\quad 105 = 100 + 5$ $\quad$ Here $a = 100,\ b = 5$

$$(a+b)^2 = a^2 + 2ab + b^2$$

$$(100+5)^2 = (100)^2 + 2 \times 100 \times 5 + (5)^2$$

$$= 10000 + 1000 + 25$$

$$= 11025$$

(iii) $(205)^2$ $\quad 205 = 200 + 5$

Here $\quad a = 200, \quad b = 5$

Using $(a+b)^2 = a^2 + 2ab + b^2$

$$(205)^2 = (200+5)^2$$

$$= (200)^2 + 2 \times 200 \times 5 + (5)^2$$

$$= 40000 + 2000 + 25$$

$$= \underline{\underline{42025}}$$