## VIII Algebraic Expressions and its Identities.

1) Use suitable identities and simplify

(i) $(5x+4y)^2$

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

$= (5x)^2 + 2\times 5x \times 4y + (4y)^2 = 25x^2 + 40xy + 16y^2$

(ii) $(3p-2x)^2$

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

$= (3p)^2 - 2\times 3p \times 2x + (2x)^2$

$= 9p^2 - 12px + 4x^2$

(iii) $(l+5m)(l-5m)$

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

$(l)^2 - (5m)^2 = l^2 - 25m^2$

(iv) $(y-7)(y+12)$

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

$= y^2 + (-7+12)y + (-7)\times 12$

$= y^2 + 5y - 84$

(v) $102 \times 98$

$= (100+2)(100-2)$

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

$= (100)^2 - (2)^2 = 10000 - 4 = 9996$

(vi) $52^2 - 48^2$

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

$= (52+48)(52-48) = 100\times 4 = 400$

(vii) $(10.5)^2$

$= (10+0.5)^2$

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

$= (10)^2 + 2\times 10\times 0.5 + (0.5)^2$

$= 100 + 10 + 0.25 = 110.25$

## 2) Use Suitable identities and simplify

(i) $\left(\frac{1}{2}x+\frac{1}{5}y\right)^2$

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

$= \left(\frac{1}{2}x\right)^2 + 2\times\frac{1}{2}x\times\frac{1}{5}y + \left(\frac{1}{5}y\right)^2$

$= \frac{x^2}{4} + \frac{xy}{5} + \frac{y^2}{25}$

(ii) $\left(7p-\frac{1}{3}q\right)^2$

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

$= (7p)^2 - 2\times 7p\times\frac{1}{3}q + \left(\frac{1}{3}q\right)^2$

$= 49p^2 - \frac{14}{3}pq + \frac{q^2}{9}$

(iii) $\left(\frac{1}{3}a-5b\right)\left(\frac{1}{3}a+5b\right)$

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

$= \left(\frac{1}{3}a\right)^2 - (5b)^2 = \frac{a^2}{9} - 25b^2$

(iv) $\left(x^2-\frac{5}{7}\right)\left(x^2+\frac{14}{5}\right)$

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

$= (x^2)^2 + \left(-\frac{5}{7}+\frac{14}{5}\right)x^2 + \left(-\frac{5}{7}\right)\times\left(\frac{14}{5}\right)$

$= x^4 + \left(\frac{-25+98}{35}\right)x^2 - 2$

$= x^4 + \frac{73}{35}x^2 - 2$

(v) $100.5 \times 99.5$

$(100+0.5)(100-0.5)$

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

$= 100^2 - (0.5)^2 = 10000 - 0.25$

$= \underline{9999.75}$

3) Using suitable identities:

(i) Simplify: $\left(\frac{1}{4}a + \frac{3}{4}b\right)^2 - \left(\frac{1}{4}a - \frac{3}{4}b\right)^2$

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

$= \left(\frac{1}{4}a + \frac{3}{4}b + \frac{1}{4}a - \frac{3}{4}b\right)\left(\frac{1}{4}a + \frac{3}{4}b - \frac{1}{4}a + \frac{3}{4}b\right)$

$= \frac{2}{4}a \times \frac{6}{4}b = \underline{\frac{3}{4}ab}$

(ii) if $x + \frac{1}{x} = 4$, evaluate $x^2 + \frac{1}{x^2}$

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

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

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

$\Rightarrow (4)^2 = x^2 + \frac{1}{x^2} + 2$

$\therefore x^2 + \frac{1}{x^2} = 16 - 2 = \underline{14}$

(iii) if $x^2 + \frac{1}{x^2} = 34$, find the value of $x + \frac{1}{x}$

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

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

$= 34 + 2 = 36$

$\therefore x + \frac{1}{x} = \sqrt{36} = \underline{6}$