Fundamental Concepts

1. Fill in

(i) $8x + 5x = \underline{13x}$
(ii) $8x - 5x = \underline{3x}$
(iii) $6xy^2 + 9xy^2 = \underline{15xy^2}$
(iv) $6xy^2 + -9xy^2 = \underline{-3xy^2}$
(v) The sum of $8a$, $6a$ and $5b = \underline{14a + 5b}$
(vi) The addition of 5, $7xy$, 6 and $3xy = \underline{11 + 10xy}$
(vii) $4a + 3b - 7a + 4b = \underline{7b - 3a}$
(viii) $-15x + 13x + 8 = \underline{8 - 2x}$
(ix) $6x^2y + 13xy^2 - 4x^2y + 2xy^2 = \underline{2x^2y + 15xy^2}$
(x) $16x^2 - 9x^2 =$ and $25xy^2 - 17xy^2 = \underline{8xy}$

2. Add:

(i) $-9x$, $3x$ and $4x$

Ans $-9x + 3x + 4x$
$= -9x + 7x$
$= -2x$

(ii) $23y^2$, $8y^2$ and $-12y^2$

Ans $23y^2 + 8y^2 - 12y^2$
$= 31y^2 - 12y^2$
$= 19y^2$

(iii) $18pq - 15pq$ and $3pq$

Ans $18pq - 15pq + 3pq$
$= 18pq + 3pq - 15pq = 21pq - 15pq = 6pq$

3 Simplify:

(i) $3m + 12m - 5m$

Ans $15m - 5m$

$= 10m$

(ii) $7n^2 - 9n^2 + 3n^2$

Ans $= 7n^2 + 3n^2 - 9n^2$

$= 10n^2 - 9n^2$

$= n^2$

(iii) $25zy - 8zy - 6zy$

Ans $25zy - 14zy$

$= 11zy.$

(iv) $-5ax^2 + 7ax^2 - 12ax^2$

Ans $-5ax^2 - 12ax^2 + 7ax^2$

$= -17ax^2 + 7ax^2 =$

$= -10x^2$

(v) $-16am + 4mx + 4am - 15mx + 5am$

Ans $= -16am + 4am + 5am + 4mx - 15mx$

$= -16am + 9am + 4mx - 15mx$

$= -7am - 11mx.$

4 Add:

(i) $a + b$ and $2a + 3b$

Ans $a + a + 2a + b + 3b$

$= 3a + 4b.$

(ii) $2x + y$ and $3x - 4y$

Ans $2x + 3x + y - 4y$

$= 5x - 3y$

(iii) $-3a + 2b$ and $3a + b$

Ans $-3a + 3a + 2b + b$

$= 0 + 3b$

$= 3b$

(iv) $4 + x$, $5 - 2x$ and $6x$

Ans $4 + x + 5 - 2x + 6x$

$= x - 2x + 6x + 4 + 5$

$= 7x - 2x + 9 = 5$

$= 5x + 9.$

5 Find the sum of

(i) $3x + 8y + 7z$, $6y + 4z - 2x$ and $3y - 4x + 6z$

Ans $3x - 2x - 4x + 8y + 6y + 3y + 7z + 4z + 6z$

$= 3x - 6x + 17y + 17z$

$= -3x + 17y + 17z$

(ii) $3a + 5b + 2c$, $2a + 3b - c$ and $a + b + c$.

Ans $3a + 2a + a + 5b + 3b + b + 2c - c + c$

$= 6a + 9b + 3c - c = 6a + 9b + 2c$

(iii) $4x^2 + 8xy - 2y^2$ and $8xy - 5y^2 + x^2$.

Ans $4x^2 + 8xy - 2y^2 + 8xy - 5y^2 + x^2$

$= 4x^2 + x^2 + 8xy + 8xy - 2y^2 - 5y^2$

$= 5x^2 + 16xy - 7y^2$

(iv) $9x^2 - 6x + 7, 5 - 4x$ and $6 - 3x^2$

$9x^2 - 6x + 7 + 5 - 4x + 6 - 3x^2$

$= 9x^2 - 3x^2 - 6x - 4x + 7 + 5 + 6$

$= 6x^2 + -10x + 18$

(v) $5x^2 - 2xy + 3y^2$ and $-2x^2 + 5xy + 9y^2$ and $3x^2 - xy - 4y^2$.

$= 5x^2 - 2xy + 3y^2 + -2x^2 + 5xy + 9y^2 + 3x^2 - xy - 4y^2$

$= 5x^2 - 2x^2 + 3x^2 - 2xy + 5xy - xy + 3y^2 + 9y^2 - 4y^2$

$= 8x^2 - 2x^2 + 5xy - 3xy + 12y^2 - 4y^2$

$= 6x^2 + 2xy + 8y^2$

(vi) $a^2 + b^2 + 2ab$, $2b^2 + c^2 + 2bc$ and $4c^2 - a^2 + 2ac$

$= a^2 + b^2 + 2ab + 2b^2 + c^2 + 2bc^2 + 4c^2 - a^2 + 2ac$

$= a^2 - a^2 + b^2 + 2b^2 + c^2 + 4c^2 + 2ab + 2bc + 2ac$

$= 3b^2 + 5c^2 + \cancel{b^2 + 2b^2 + c^2 + 4c^2 + 2ab + 2bc + 2ac} + 2ab + 2bc + 2ac$

(vii) $9ax - 6bx + 8$, $4ax + 8bx - 7$ and $-6ax - 4bx - 3$

$= 9ax - 6bx + 8 + 4ax + 8bx - 7 - 6ax - 4bx - 3$

$= 9ax - 4ax - 6ax - 6bx + 8bx - 4bx + 8 - 7 - 3$

$= 13ax - 6ax + 8bx - 10bx + 8 - 10$

$= 7ax - 2bx - 2$

(viii) $abc + 2ba + 3ac$, $4cca - 4ab + 2abc$ and $2ab - 3abc - 6ac$

$= abc + 2ab + 3ca + 4ca - 4ab + 2abc + 2ab - 3abc - 6ca$

$= abc + 2abc - 3abc + 2ab - 4ab + 2ab + 3ca + 4ca - 6ca$

$= 3abc - 3abc + 4ab - 4ab + 7ca - 6ca$

$= 0 + 0 + ca = ca.$

(ix) $4a^2 + 5b^2 - 6ab$, $3ab$, $6a^2 - 2b^2$ and $4b^2 - 5ab$.

$= 4a^2 + 5b^2 - 6ab + 3ab + 6a^2 - 2b^2 + 4b^2 - 5ab$

$= 4a^2 + 6a^2 + 5b^2 - 2b^2 + 4b^2 - 6ab + 3ab - 5ab.$

$= 10a^2 + 9b^2 - 2b^2 - 11ab + 3ab.$

$= 10^2 + 7b^2 - 8ab.$

(x) $x^2 + x - 2$, $2x - 3x^2 + 5$ and $2x^2 - 5x + 7$

$= x^2 + x + -2 + 2x - 3x^2 + 5 + 2x^2 - 5x + 7$

$= x^2 - 3x^2 + 2x^2 + x + 2x - 5x - 2 + 5 + 7$

$= 3x^2 - 3x^2 + 3x - 5x - 2 + 12$

$= 0 - 2x + 10$

$= -2x + 10$

(xi) $4x^3 + 2x^2 - x + 1$, $2x^3 - 5x^2 - 3x + 6$, $x^2 + 8$ and $5x^3 - 7x$.

$4x^3 + 2x^2 - x + 1 + 2x^3 - 5x^3 - 3x + 6 + x^2 + 8 + 5x^3 - 7x$

$4x^3 + 2x^3 + 5x^3 + 2x^2 - 5x^2 + x^2 - x - 3x - 7x + 1 + 6 + 8.$

$= 11x^3 + 3x^2 - 5x^2 - 11x + 15$

$= 11x^3 - 2x^2 - 11x + 15$

6 Find the sum of:

(i) x and $3y$.
Ans $x + 3y$.

(ii) $-2a$ and $+5$
Ans $-2a + 5$

(iii) $-4x^2$ and $+7x$
Ans $-4x^2 + 7x$

(iv) $+4a$ and $-7b$
Ans $4a - 7b$

(v) $x^3 + 3x^2y$ and $2y^2$
Ans $x^3 + 3x^2y + 2y^2$

(vi) 11 and $-dy$.
Ans $11 - dy$

7 The sides of a triangle are $2x + 3x + x$. $+5y$ and $7x - 2y$, Find its perimeter.

Ans sides of a triangle are $2x + 3y$, $x + 5y$, $7x - 2y$

∴ Perimeter = sum of all sides of the triang-le.

$= 2x + 3y + x + 5y + 7x - 2y$

$= 2x + x + 7x + 3y + 5y - 2y$

$= 10x + 8y - 2x = 10x + 6y$

8 The two adjacent sides of a rectangle are $6a + 9b$ and $8a - 4b$. Find its perim-eter.

Ans Sids of a rectangle are $6a + 9b$ and $8a - 4b$.

Let length $= 6a + 9b$

and breadth $= 8a - 4b$.

$\therefore$ Perimeter $= 2$ (length + Breadth)

$= 2(6a + 9b + 8a - 4b)$

$= 2(14a + 5b) = 28a + 10b$

a Substraction the second expression from the first.

(i) $2a + b, a + b$.

$= 2a + b - a - b = 2a - a + b - b$

$= a + 0 = a$.

(ii) $-2b + 2c, b + 3c$

$= -2b + 2c - b - 3c$

$= -2b - b + 2c - 3c$

$= -3b - c$

(iii) $5a + b, -6b + 2a$

$= 5a + b + 6b - 2a$

$= 5a - 2a + b + 6b$

$= 3a + 7b$

(iv) $a^3 + -1 + a, 3a - 2a^2$

$= a^3 - 1 + a - 3a + 2a^2$

$= a^3 + 2a^2 - 2a - 1$

(v) $p + 2, 1$

$= p + 2 - 1 = p + 1$.

(vi) $x + 2y + z, -x - y + 3z$

$= x + 2y + z + x + y + 3z$

$= x + x + 2y + y + z + 3z$

$= 2x + 3y + 4z$

(vii) $3a^2 - 8ab + 2b^2, 3a^2 - 4ab + 6b^2$

$= 3a^2 - 8ab + 2b^2 + 3a^2 + 4ab - 6b^2$

$= 3a^2 - 3a^2 - 2b^2 + 6b^2 - 8ab + 4ab$

$= 0 + 8b^2 - 4ab$

$= -4ab + 8b^2$

(viii) $4pq - 6p^2 - 2q^2, 9p^2$

$= 4pq - 6p^2 - 2q^2 - 9p^2$

$= 4pq - 15p^2 - 2q^2$

(ix) $10abc, 2a^2 + 2abc - 4b^2$

$= 10abc - 2a^2 - 2abc + 4b^2$

$= 10abc - 2abc - 2a^2 + 4b^2$

$= 8abc - 2a^2 + 4b^2$

(x) $a^2 + ab + c^2, a^2 + a^2$

$= a^2 + ab + c^2 - a^2 + a^2$

$= a^2 - a^2 + ab + c^2 + a^2$

$= ab + c^2 + a^2$

10 Subtract.

(i) $4x$ from $8 - x$

Ans $(8 - x) - 4x = 8 - 5x$

(ii) $-8c$ from $c + 3d$

Ans $(c+3d)-(-8c)$

$c+3d+8c = 9c+3d$.

(iii) $-5a-2b$ from $b+6c$.

Ans $(b+6c)-(-5a-2b)$

$= b+6c+5a+2b = 5a+3b+6c$

(iv) $4p+p^2$ from $3p^2-8p$

$(3p^2-8p)-(4p-p^2)$

$= 3p^2-8p+4p+p^2 = 2p^2-12p$

(v) $5a-3b+2c$ from $4a-b-2c$

$(4a-b-2c)-(5a-3b+2c)$

$= 4a-b-2c-5a+3b-2c$

$= 4a-5a-b+3b-2c-2c$

$= -a+2b-4c$