Board – CBSE	Class – 7th	Topic – Algebraic Expressions 12.2

Q.1 Simplify combining like terms:

(i) $21b - 32 + 7b - 20b$

(ii) $-z^2 + 13z^2 - 5z + 7z^3 - 15z$

(iii) $p - (p - q) - q - (q - p)$

(iv) $3a - 2b - ab - (a - b + ab) + 3ab + b - a$

(v) $5x^2y - 5x^2 + 3y\,x^2 - 3y^2 + x^2 - y^2 + 8xy^2 - 3y^2$

(vi) $(3\,y2 + 5y - 4) - (8y - y2 - 4)$

Sol: (i) $21b - 32 + 7b - 20b = 21b + 7b - 20b - 32$

$= b\,(21 + 7 - 20) - 32$

$= 8b - 32$

(ii) $-z^2 + 13z^2 - 5z + 7z^3 - 15z = 7z^3 - z^2 + 13z^2 - 5z - 15z$

$= 7z^3 + z^2\,(-1 + 13) + z\,(-5 - 15)$

$= 7z^3 + 12z^2 - 20z$

(iii) $p - (p - q) - q - (q - p) = p - p + q - q - q + p$

$= p - q$

(iv) $3a - 2b - ab - (a - b + ab) + 3ba + b - a$

$= 3a - 2b - ab - a + b - ab + 3ab + b - a$

$= 3a - a - a - 2b + b + b - ab - ab + 3ab$

$= a\,(3 - 1 - 1) + b\,(-2 + 1 + 1) + ab\,(-1 - 1 + 3)$

$= a + ab$

(v) $5x^2y - 5x^2 + 3yx^2 - 3y^2 + x^2 - y^2 + 8xy^2 - 3y^2$

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

$= x^2y\,(5 + 3) + x^2\,(-5 + 1) + y^2(-3 - 1 - 3) + 8xy^2$

$= 8x^2y - 4x^2 - 7y^2 + 8xy^2$

(vi) $(3y^2 + 5y - 4) - (8y - y^2 - 4)$

$= 3y^2 + 5y - 4 - 8y + y^2 + 4$

$= 3y^2 + y^2 + 5y - 8y - 4 + 4$

$= y^2 (3 + 1) + y (5 - 8) + 4 (1 - 1)$

$= 4y^2 - 3y$

Q.2 Add:

(i) $3mn, -5mn, 8mn, -4mn$

(ii) $t - 8tz, 3tz - z, z - t$

(iii) $-7mn + 5, 12mn + 2, 9mn - 8, -2mn - 3$

(iv) $a + b - 3, b - a + 3, a - b + 3$

(v) $14x + 10y - 12xy - 13, 18 - 7x - 10y + 8xy, 4xy$

(vi) $5m - 7n, 3n - 4m + 2, 2m - 3mn - 5$

(vii) $4x^2y, -3xy^2, -5xy^2, 5x^2y$

(viii) $3p^2q^2 - 4pq + 5, -10p^2q^2, 15 + 9pq + 7p^2q^2$

(ix) $ab - 4a, 4b - ab, 4a - 4b$

(x) $x^2 - y^2 - 1, y^2 - 1 - x^2, 1 - x^2 - y^2$

Sol: (i) $3mn + (-5mn) + 8mn + (-4mn) = mn (3 - 5 + 8 - 4) = 2mn$

(ii) $(t - 8tz) + (3tz - z) + (z - t)$

$= t - 8tz + 3tz - z + z - t$

$= t - t - 8tz + 3tz - z + z$

$= t (1 - 1) + tz (-8 + 3) + z (-1 + 1)$

$= -5tz$

(iii) $(-7mn + 5) + (12mn + 2) + (9mn - 8) + (-2mn - 3)$

$= -7mn + 5 + 12mn + 2 + 9mn - 8 - 2mn - 3$

$= -7mn + 12mn + 9mn - 2mn + 5 + 2 - 8 - 3$

$= mn (-7 + 12 + 9 - 2) + (5 + 2 - 8 - 3)$

$= 12mn - 4$

(iv) $(a + b - 3) + (b - a + 3) + (a - b + 3)$

$= a + b - 3 + b - a + 3 + a - b + 3$

$= a - a + a + b + b - b - 3 + 3 + 3$

$= a(1 - 1 + 1) + b(1 + 1 - 1) + 3(-1 + 1 + 1)$

$= a + b + 3$

(v) $(14x + 10y - 12xy - 13) + (18 - 7x - 10y + 8yx) + 4xy$

$= 14x + 10y - 12xy - 13 + 18 - 7x - 10y + 8yx + 4xy$

$= 14x - 7x + 10y - 10y - 12xy + 8yx + 4xy - 13 + 18$

$= x(14 - 7) + y(10 - 10) + xy(-12 + 8 + 4) - 13 + 18$

$= 7x + 5$

(vi) $(5m - 7n) + (3n - 4m + 2) + (2m - 3mn - 5)$

$= 5m - 7n + 3n - 4m + 2 + 2m - 3mn - 5$

$= 5m - 4m + 2m - 7n + 3n - 3mn + 2 - 5$

$= m(5 - 4 + 2) + n(-7 + 3) - 3mn + 2 - 5$

$= 3m - 4n - 3mn - 3$

(vii) $4x^2y - 3xy^2 - 5xy^2 + 5x^2y = 4x^2y + 5x^2y - 3xy^2 - 5xy^2$

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

$= 9x^2y - 8xy^2$

(viii) $(3p^2q^2 - 4pq + 5) + (-10p^2q^2) + (15 + 9pq + 7p^2q^2)$

$= 3p^2q^2 - 4pq + 5 - 10p^2q^2 + 15 + 9pq + 7p^2q^2$

$= 3p^2q^2 - 10p^2q^2 + 7p^2q^2 - 4pq + 9pq + 5 + 15$

$= p^2q^2(3 - 10 + 7) + pq(-4 + 9) + 5 + 15$

$= 5pq + 20$

(ix) $(ab - 4a) + (4b - ab) + (4a - 4b)$

$= ab - 4a + 4b - ab + 4a - 4b$

$= ab - ab - 4a + 4a + 4b - 4b$

$= ab(1 - 1) + a(-4 + 4) + b(4 - 4)$

$= 0$

(x) $(x^2 - y^2 - 1) + (y^2 - 1 - x^2) + (1 - x^2 - y^2)$

$= x^2 - y^2 - 1 + y^2 - 1 - x^2 + 1 - x^2 - y^2$

$= x^2 - x^2 - x^2 - y^2 + y^2 - y^2 - 1 - 1 + 1$

$= x^2(1 - 1 - 1) + y^2 (-1 + 1 - 1) + (- 1 - 1 + 1)$

$= - x^2 - y^2 - 1$

Q.3 Subtract:

(i) $- 5y^2$ from y^2

(ii) 6xy from $- 12xy$

(iii) $(a - b)$ from $(a + b)$

(iv) $a (b - 5)$ from $b (5 - a)$

(v) $- m^2 + 5mn$ from $4m2 - 3mn + 8$

(vi) $- x^2 + 10x - 5$ from $5x - 10$

(vii) $5a^2 - 7ab + 5b^2$ from $3ab - 2a^2 - 2b^2$

(viii) $4pq - 5q^2 - 3p^2$ from $5p^2 + 3q^2 - pq$

Sol: (i) $y^2 - (-5y^2)$

$= y^2 + 5y^2$

$= 6y^2$

(ii) $- 12xy - (6xy)$

$= -18xy$

(iii) $(a + b) - (a - b)$

$= a + b - a + b$

$= 2b$

(iv) $b (5 - a) - a (b - 5)$

$= 5b - ab - ab + 5a$

$= 5a + 5b - 2ab$

(v) $(4m^2 - 3mn + 8) - (- m^2 + 5mn)$

$= 4m^2 - 3mn + 8 + m^2 - 5 mn$

$= 4m^2 + m^2 - 3mn - 5 mn + 8$

$= 5m^2 - 8mn + 8$

(vi) $(5x - 10) - (-x^2 + 10x - 5)$

$= 5x - 10 + x^2 - 10x + 5$

$= x^2 + 5x - 10x - 10 + 5$

$= x^2 - 5x - 5$

(vii) $(3ab - 2a^2 - 2b^2) - (5a^2 - 7ab + 5b^2)$

$= 3ab - 2a^2 - 2b^2 - 5a^2 + 7ab - 5\,b^2$

$= 3ab + 7ab - 2a^2 - 5a^2 - 2b^2 - 5\,b^2$

$= 10ab - 7a^2 - 7b^2$

(viii) $4pq - 5q^2 - 3p^2$ from $5p^2 + 3q^2 - pq$

$= (5p^2 + 3q^2 - pq) - (4pq - 5q^2 - 3p^2)$

$= 5p^2 + 3q^2 - pq - 4pq + 5q^2 + 3p^2$

$= 5p^2 + 3p^2 + 3q^2 + 5q^2 - pq - 4pq$

$= 8p^2 + 8q^2 - 5pq$

Q.4 (a) What should be added to $x^2 + xy + y^2$ to obtain $2x^2 + 3xy$?

(b) What should be subtracted from $2a + 8b + 10$ to get $-3a + 7b + 16$?

Sol: (a) Let a be the required term.

$a + (x^2 + y^2 + xy) = 2x^2 + 3xy$

$a = 2x^2 + 3xy - (x^2 + y^2 + xy)$

$a = 2x^2 + 3xy - x^2 - y^2 - xy$

$a = 2x^2 - x^2 - y^2 + 3xy - xy$

$= x^2 - y^2 + 2xy$

(b) Let p be the required term.

$(2a + 8b + 10) - p = -3a + 7b + 16$

$p = 2a + 8b + 10 - (-3a + 7b + 16)$

$= 2a + 8b + 10 + 3a - 7b - 16$

$= 2a + 3a + 8b - 7b + 10 - 16$

$= 5a + b - 6$

Q.5 What should be taken away from $3x^2 - 4y^2 + 5xy + 20$ to obtain $-x^2 - y^2 + 6xy + 20$?

Sol: Let p be the required term.

$(3x^2 - 4y^2 + 5xy + 20) - p = -x^2 - y^2 + 6xy + 20$

$p = (3x^2 - 4y^2 + 5xy + 20) - (-x^2 - y^2 + 6xy + 20)$

$= 3x^2 - 4y^2 + 5xy + 20 + x^2 + y^2 - 6xy - 20$

$= 3x^2 + x^2 - 4y^2 + y^2 + 5xy - 6xy + 20 - 20$

$= 4x^2 - 3y^2 - xy$

Q.6 (a) From the sum of $3x - y + 11$ and $-y - 11$, subtract $3x - y - 11$.

(b) From the sum of $4 + 3x$ and $5 - 4x + 2x^2$, subtract the sum of $3x^2 - 5x$ and $-x^2 + 2x + 5$.

Sol: (a) $(3x - y + 11) + (-y - 11)$

$= 3x - y + 11 - y - 11$

$= 3x - y - y + 11 - 11$

$= 3x - 2y$

$(3x - 2y) - (3x - y - 11)$

$= 3x - 2y - 3x + y + 11$

$= 3x - 3x - 2y + y + 11$

$= -y + 11$

(b) $(4 + 3x) + (5 - 4x + 2x^2) = 4 + 3x + 5 - 4x + 2x^2$

$= 3x - 4x + 2x^2 + 4 + 5$

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

$(3x^2 - 5x) + (-x^2 + 2x + 5) = 3x^2 - 5x - x^2 + 2x + 5$

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

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

$(-x + 2x^2 + 9) - (2x^2 - 3x + 5)$

$= -x + 2x^2 + 9 - 2x^2 + 3x - 5$

$= -x + 3x + 2x^2 - 2x^2 + 9 - 5$

$= 2x + 4$