Exercise 12.2

Question 1:

Simplify combining like terms:

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

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

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

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

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

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

Answer 1:

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

$= 28b-20b-32 = 8b-32$

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

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

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

$= p-p+p+q-q-q = p-q$

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

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

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

$= a-0-(-ab)$

$= a+ab$

(v)

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

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

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

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

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

$= 4y^2-3y-0 = 4y^2-3y$

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

Answer 2:

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

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

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

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

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

$= 0 - 5tz + 0 = -5tz$

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

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

$= (-7 + 12 + 9 - 2)mn + 7 - 11$

$= 12mn - 4$

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

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

$= a + b + 3$

(v)

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

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

$= 7x + 0y + 0xy + 5 = 7x + 5$

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

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

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

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

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

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

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

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

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

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

$= (3-10+7)p^2q^2+(-4+9)pq+20$

$= 0p^2q^2+5pq+20 = 5pq+20$

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

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

$= 0+0+0=0$

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

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

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

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

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

Question 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 $4m^2-3mn+8$

(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 $5p^2+3q^2-pq$

Answer 3:

(i) $y^2-(-5y^2) = y^2+5y^2$
$= 6y^2$

(ii) $-12xy-(6xy) = -12xy-6xy$
$= -18xy$

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

(iv) $b(5-a)-a(b-5)$
$= 5b-ab-ab+5a$
$= 5b-2ab+5a$
$= 5a+5b-2ab$

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

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

(vii) $3ab-2a^2-2b^2-(5a^2-7ab+5b^2)$
$= 3ab-2a^2-2b^2-5a^2+7ab-5b^2$
$= 3ab+7ab-2a^2-5a^2-2b^2-5b^2$
$= 10ab-7a^2-7b^2$
$= -7a^2-7b^2+10ab$

(viii) $5p^2+3q^2-pq-(4pq-5q^2-3p^2)$
$= 5p^2+3q^2-pq-4pq+5q^2+3p^2$
$= 5p^2+3p^2+3q^2+5q^2-pq-4pq$
$= 8p^2+8q^2-5pq$

Question 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 $-3a+7b+16$?

Answer 4:

(a) Let p should be added.

Then according to question,

$x^2+xy+y^2+p=2x^2+3xy$

$\Rightarrow \quad p=2x^2+3xy-\left(x^2+xy+y^2\right)$

$\Rightarrow \quad p=2x^2+3xy-x^2-xy-y^2$

$\Rightarrow \quad p=2x^2-x^2-y^2+3xy-xy$

$\Rightarrow \quad p=x^2-y^2+2xy$

Hence, x^2-y^2+2xy should be added.

(b) Let q should be subtracted.

Then according to question,

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

$\Rightarrow \quad -q=-3a+7b+16-\left(2a+8b+10\right)$

$\Rightarrow \quad -q=-3a+7b+16-2a-8b-10$

$\Rightarrow \quad -q=-3a-2a+7b-8b+16-10$

$\Rightarrow \quad -q=-5a-b+6$

$\Rightarrow \quad q=-\left(-5a-b+6\right)$

$\Rightarrow \quad q=5a+b-6$

Question 5:

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

Answer 5:

Let q should be subtracted.

Then according to question,

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

$\Rightarrow \quad q=3x^2-4y^2+5xy+20-\left(-x^2-y^2+6xy+20\right)$

$\Rightarrow \quad q=3x^2-4y^2+5xy+20+x^2+y^2-6xy-20$

$\Rightarrow \quad q=3x^2+x^2-4y^2+y^2+5xy-6xy+20-20$

$\Rightarrow \quad q=4x^2-3y^2-xy+0$

Hence, $4x^2-3y^2-xy$ should be subtracted.

Question 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 $-x^2 + 2x + 5$.

Answer 6:

(a) According to question,

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

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

$$= (3 - 3)x - (1 + 1 - 1)y + 11 + 11 - 11$$

$$= 0x - y + 11 = -y + 11$$

(b) According to question,

$$\left[(4 + 3x) + (5 - 4x + 2x^2)\right] - \left[(3x^2 - 5x) + (-x^2 + 2x + 5)\right]$$

$$= \left[4 + 3x + 5 - 4x + 2x^2\right] - \left[3x^2 - 5x - x^2 + 2x + 5\right]$$

$$= \left[2x^2 + 3x - 4x + 5 + 4\right] - \left[3x^2 - x^2 + 2x - 5x + 5\right]$$

$$= \left[2x^2 - x + 9\right] - \left[2x^2 - 3x + 5\right]$$

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

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

$$= 2x + 4$$