

Exercise 9.1

Question 1:

Identify the terms, their coefficients for each of the following expressions:

(i) $5xyz^2 - 3zy$

(ii) $1 + x + x^2$

(iii) $4x^2y^2 - 4x^2y^2z^2 + z^2$

(iv) $3 - pq + qr - rp$

(v) $\frac{x}{2} + \frac{y}{2} - xy$

(vi) $0.3a - 0.6ab + 0.5b$

Answer 1:

(i) Terms: $5xyz^2$ and $-3zy$

Coefficient in $5xyz^2$ is 5 and in $-3zy$ is -3 .

(ii) Terms: $1, x$ and x^2 .

Coefficient of x and coefficient of x^2 is 1.

(iii) Terms: $4x^2y^2, -4x^2y^2z^2$ and z^2 .

Coefficient in $4x^2y^2$ is 4, coefficient of $-4x^2y^2z^2$ is -4 and coefficient of z^2 is 1.

(iv) Terms: $3, -pq, qr$ and $-rp$

Coefficient of $-pq$ is -1 , coefficient of qr is 1 and coefficient of $-rp$ is -1 .

(v) Terms: $\frac{x}{2}, \frac{y}{2}$ and $-xy$

Coefficient of $\frac{x}{2}$ is $\frac{1}{2}$, coefficient of $\frac{y}{2}$ is $\frac{1}{2}$ and coefficient of $-xy$ is -1 .

(vi) Terms: $0.3a, -0.6ab$ and $0.5b$

Coefficient of $0.3a$ is 0.3, coefficient of $-0.6ab$ is -0.6 and coefficient of $0.5b$ is 0.5.

Question 2:

Classify the following polynomials as monomials, binomials, trinomials. Which polynomials do not fit in any of these three categories:

$x + y, 1000, x + x^2 + x^3 + x^4, 7 + y + 5x, 2y - 3y^2, 2y - 3y^2 + 4y^3, 5x - 4y + 3xy,$
 $4z - 15^2, \quad , pqr, p^2q + pq^2, 2p + 2q$

Answer 2:

- (i) Since $x + y$ contains two terms. Therefore it is binomial.
- (ii) Since 1000 contains one terms. Therefore it is monomial.
- (iii) Since $x + x^2 + x^3 + x^4$ contains four terms. Therefore it is a polynomial and it does not fit in above three categories.
- (iv) Since $7 + y + 5x$ contains three terms. Therefore it is trinomial.
- (v) Since $2y - 3y^2$ contains two terms. Therefore it is binomial.
- (vi) Since $2y - 3y^2 + 4y^3$ contains three terms. Therefore it is trinomial.
- (vii) Since $5x - 4y + 3xy$ contains three terms. Therefore it is trinomial.
- (viii) Since $4x - 15z^2$ contains two terms. Therefore it is binomial.
- (ix) Since $ab + bc + cd + da$ contains four terms. Therefore it is a polynomial and it does not fit in above three categories.
- (x) Since pqr contains one terms. Therefore it is monomial.
- (xi) Since $p^2q + pq^2$ contains two terms. Therefore it is binomial.
- (xii) Since $2p + 2q$ contains two terms. Therefore it is binomial.

Question 3:

Add the following:

- (i) $ab - bc, bc - ca, ca - ab$
- (ii) $a - b + ab, b - c + bc, c - a + ac$
- (iii) $2p^2q^2 - 3pq + 4, 5 + 7pq - 3p^2q^2$
- (iv) $l^2 + m^2, m^2 + n^2, n^2 + l^2 + 2lm + 2mn + 2nl$

Answer 3:

(i) $ab - bc, bc - ca, ca - ab$

$$\begin{array}{r} ab - bc \\ + bc - ca \\ - ab + ca \\ \hline 0 + 0 + 0 \end{array}$$

Hence the sum is 0.

(ii) $a - b + ab, b - c + bc, c - a + ac$

$$\begin{array}{r} a - b - ab \\ + b - c + bc \\ - a + c + ac \\ \hline 0 + 0 + ab + 0 + bc + ac \end{array}$$

Hence the sum is $ab + bc + ac$.

$$(iii) 2p^2q^2 - 3pq + 4, 5 + 7pq - 3p^2q^2 \quad (iv) l^2 + m^2, m^2 + n^2, n^2 + l^2, 2lm + 2mn + 2nl$$

$$\begin{array}{r} 2p^2q^2 - 3pq + 4 \\ -3p^2q^2 + 7pq + 5 \end{array}$$

$$\boxed{-p^2q^2 + 4pq + 9}$$

$$\begin{array}{r} l^2 + m^2 \\ + \quad m^2 + n^2 \\ + l^2 \quad + n^2 \\ + \quad 2lm + 2mn + 2nl \\ \hline 2l^2 + 2m^2 + 2n^2 + 2lm + 2mn + 2nl \end{array}$$

Hence the sum is $-p^2q^2 + 4pq + 9$. Hence the sum is $2(l^2 + m^2 + n^2 + lm + mn + nl)$

Question 4:

(a) Subtract $4a - 7ab + 3b + 12$ from $12a - 9ab + 5b - 3$.

(b) Subtract $3xy + 5yz - 7zx$ from $5xy - 2yz - 2zx + 10xyz$.

(c) Subtract $4p^2q - 3pq + 5pq^2 - 8p + 7q - 10$ from $18 - 3p - 11q + 5pq - 2pq^2 + 5p^2q$.

Answer 4:

(a)

$$\begin{array}{r} 12a - 9ab + 5b - 3 \\ 4a - 7ab + 3b + 12 \\ (-) \quad (+) \quad (-) \quad (-) \\ \hline 8a - 2ab + 2b - 15 \end{array}$$

(b)

$$\begin{array}{r} 5xy - 2yz - 2zx + 10xyz \\ 3xy + 5yz - 7zx \\ (-) \quad (-) \quad (+) \\ \hline 2xy - 7yz + 5zx + 10xyz \end{array}$$

(c)

$$\begin{array}{r} 5p^2q - 2pq^2 + 5pq - 11q - 3p + 18 \\ 4p^2q + 5pq^2 - 3pq + 7q - 8p - 10 \\ (-) \quad (-) \quad (+) \quad (-) \quad (+) \quad (+) \\ \hline p^2q - 7pq^2 + 8pq - 18q + 5p + 28 \end{array}$$

Exercise 9.2

Question 1:

Find the product of the following pairs of monomials:

(i) $4, 7p$

(ii) $-4p, 7p$

(iii) $-4p, 7pq$

(iv) $4p^3, -3p$

(v) $4p, 0$

Answer 1:

(i) $4 \times 7p = 4 \times 7 \times p = 28p$

(ii) $-4p \times 7p = (-4 \times 7) \times (p \times p) = -28p^2$

(iii) $-4p \times 7pq = (-4 \times 7)(p \times pq) = -28p^2q$

(iv) $4p^3 \times -3p = (4 \times -3)(p^3 \times p) = -12p^4$

(v) $4p \times 0 = (4 \times 0)(p) = 0$

Question 2:

Find the areas of rectangles with the following pairs of monomials as their lengths and breadths respectively:

$(p, q); (10m, 5n); (20x^2, 5y^2); (4x, 3x^2); (3mn, 4np)$

Answer 2:

(i) Area of rectangle = length x breadth
 $= p \times q = pq$ sq. units

(ii) Area of rectangle = length x breadth
 $= 10m \times 5n = (10 \times 5)(m \times n) = 50mn$ sq. units

(iii) Area of rectangle = length x breadth
 $= 20x^2 \times 5y^2 = (20 \times 5)(x^2 \times y^2) = 100x^2y^2$ sq. units

(iv) Area of rectangle = length x breadth
 $= 4x \times 3x^2 = (4 \times 3)(x \times x^2) = 12x^3$ sq. units

(v) Area of rectangle = length x breadth
 $= 3mn \times 4np = (3 \times 4)(mn \times np) = 12mn^2p$ sq. units



Question 3:

Complete the table of products:

First monomial → Second monomial ↓	$2x$	$-5y$	$3x^2$	$-4xy$	$7x^2y$	$-9x^2y^2$
$2x$	$4x^2$	.....	.....	.....	.....	.....
$-5y$			$-15x^2y$	.....	.....	.....
$3x^2$						
$-4xy$						
$7x^2y$						
$-9x^2y^2$						

Answer 3:

First monomial → Second monomial ↓	$2x$	$-5y$	$3x^2$	$-4xy$	$7x^2y$	$-9x^2y^2$
$2x$	$4x^2$	$-10xy$	$6x^3$	$-8x^2y$	$14x^3y$	$-18x^3y^2$
$-5y$	$-10xy$	$25y^2$	$-15x^2y$	$20xy^2$	$-35x^2y^2$	$45x^2y^3$
$3x^2$	$6x^3$	$-15x^2y$	$9x^4$	$-12x^3y$	$21x^4y$	$-27x^4y^2$
$-4xy$	$8x^2y$	$20xy^2$	$-12x^3y$	$16x^2y^2$	$-28x^3y^2$	$36x^3y^3$
$7x^2y$	$14x^3y$	$-35x^2y^2$	$21x^4y$	$-28x^3y^2$	$49x^4y^2$	$-63x^4y^3$
$-9x^2y^2$	$-18x^3y^2$	$45x^2y^3$	$-27x^4y^2$	$36x^3y^3$	$-63x^4y^3$	$81x^4y^4$

Question 4:

Obtain the volume of rectangular boxes with the following length, breadth and height respectively:

(i) $5a, 3a^2, 7a^4$

(ii) $2p, 4q, 8r$

(iii) $xy, 2x^2y, 2xy^2$

(iv) $a, 2b, 3c$

Answer 4:

- (i) Volume of rectangular box = length x breadth x height
 $= 5a \times 3a^2 \times 7a^4 = (5 \times 3 \times 7)(a \times a^2 \times a^4)$
 $= 105a^7$ cubic units
- (ii) Volume of rectangular box = length x breadth x height
 $= 2p \times 4q \times 8r = (2 \times 4 \times 8)(p \times q \times r)$
 $= 64pqr$ cubic units
- (iii) Volume of rectangular box = length x breadth x height
 $= xy \times 2x^2y \times 2xy^2 = (1 \times 2 \times 2)(x \times x^2 \times x \times y \times y \times y^2)$
 $= 4x^4y^4$ cubic units
- (iv) Volume of rectangular box = length x breadth x height
 $= a \times 2b \times 3c = (1 \times 2 \times 3)(a \times b \times c) = 6abc$ cubic units

Question 5:

Obtain the product of:

- | | |
|----------------------------|------------------------|
| (i) xy, yz, zx | (ii) $a, -a^2, a^3$ |
| (iii) $2, 4y, 8y^2, 16y^3$ | (iv) $a, 2b, 3c, 6abc$ |
| (v) $m, -mn, mnp$ | |

Answer 5:

- (i) $xy \times yz \times zx = x \times x \times y \times y \times z \times z = x^2y^2z^2$
- (ii) $a \times (-a^2) \times a^3 = (-1)(a \times a^2 \times a^3) = -a^6$
- (iii) $2 \times 4y \times 8y^2 \times 16y^3 = (2 \times 4 \times 8 \times 16)(y \times y^2 \times y^3) = 1024y^6$
- (iv) $a \times 2b \times 3c \times 6abc = (1 \times 2 \times 3 \times 6)(a \times b \times c \times abc) = 36a^2b^2c^2$
- (v) $m \times -mn \times mnp = (1)(m \times m \times m \times n \times n \times p) = -m^3n^2p$

Exercise 9.3

Question 1:

Carry out the multiplication of the expressions in each of the following pairs:

(i) $4p, q + r$

(ii) $ab, a - b$

(iii) $a + b, 7a^2b^2$

(iv) $a^2 - 9, 4a$

(v) $pq + qr + rp, 0$

Answer 1:

(i) $4p \times (q + r) = 4p \times q + 4p \times r$
 $= 4pq + 4pr$

(ii) $ab \times (a - b) = ab \times a - ab \times b$
 $= a^2b - ab^2$

(iii) $(a + b) \times 7a^2b^2 = a \times 7a^2b^2 + b \times 7a^2b^2$
 $= 7a^3b^2 + 7a^2b^3$

(iv) $(a^2 - 9) \times 4a = a^2 \times 4a - 4a \times 9$
 $= 4a^3 - 36a$

(v) $(pq + qr + rp) \times 0 = pq \times 0 + qr \times 0 + rp \times 0$
 $= 0 + 0 + 0 = 0$

Question 2:

Complete the table:

	First expression	Second expression	Product
(i)	a	$b + c + d$	.....
(ii)	$x + y - 5$	$5xy$	.....
(iii)	p	$6p^2 - 7p + 5$	.....
(iv)	$4p^2q^2$	$p^2 - q^2$	.....
(v)	$a + b + c$	abc	.....

 Answer 2:

	First expression	Second expression	Product
(i)	a	$b+c+d$	$a(b+c+d)$ $= a \times b + a \times c + a \times d$ $= ab + ac + ad$
(ii)	$x+y-5$	$5xy$	$5xy(x+y-5)$ $= 5xy \times x + 5xy \times y - 5xy \times 5$ $= 5x^2y + 5xy^2 - 25xy$
(iii)	p	$6p^2-7p+5$	$p(6p^2-7p+5)$ $= p \times 6p^2 - p \times 7p + p \times 5$ $= 6p^3 - 7p^2 + 5p$
(iv)	$4p^2q^2$	p^2-q^2	$4p^2q^2(p^2-q^2)$ $= 4p^2q^2 \times p^2 - 4p^2q^2 \times q^2$ $= 4p^4q^2 - 4p^2q^4$
(v)	$a+b+c$	abc	$abc(a+b+c)$ $= abc \times a + abc \times b + abc \times c$ $= a^2bc + ab^2c + abc^2$

Question 3:

Find the product:

(i) $(a^2) \times (2a^{22}) \times (4a^{26})$

(ii) $\left(\frac{2}{3}xy\right) \times \left(\frac{-9}{10}x^2y^2\right)$

(iii) $\left(\frac{-10}{3}pq^3\right) \times \left(\frac{6}{5}p^3q\right)$

(iv) $x \times x^2 \times x^3 \times x^4$

 Answer 3:

$$(i) \quad (a^2) \times (2a^{22}) \times (4a^{26}) = (2 \times 4)(a^2 \times a^{22} \times a^{26}) \\ = 8 \times a^{2+22+26} = 8a^{50}$$

$$(ii) \quad \left(\frac{2}{3}xy\right) \times \left(\frac{-9}{10}x^2y^2\right) = \left(\frac{2}{3} \times \frac{-9}{10}\right)(x \times x^2 \times y \times y^2) \\ = \frac{-3}{5}x^3y^3$$

$$(iii) \quad \left(\frac{-10}{3}pq^3\right) \left(\frac{6}{5}p^3q\right) = \left(\frac{-10}{3} \times \frac{6}{5}\right)(p \times p^3 \times q^3 \times q) \\ = -4p^4q^4$$

$$(iv) \quad x \times x^2 \times x^3 \times x^4 = x^{1+2+3+4} = x^{10}$$

Question 4:

(a) Simplify: $3x(4x-5)+3$ and find values for (i) $x=3$ (ii) $x=\frac{1}{2}$.

(b) Simplify: $a(a^2+a+1)+5$ and find its value for (i) $a=0$ (ii) $a=1$ (iii) $a=-1$.

 Answer 4:

$$(a) \quad 3x(4x-5)+3 = 3x \times 4x - 3x \times 5 + 3 = 12x^2 - 15x + 3$$

$$(i) \quad \text{For } x=3, \quad 12x^2 - 15x + 3 = 12(3)^2 - 15 \times 3 + 3 \\ = 12 \times 9 - 45 + 3 = 108 - 45 + 3 = 66$$

$$(ii) \quad \text{For } x=\frac{1}{2}, \quad 12x^2 - 15x + 3 = 12\left(\frac{1}{2}\right)^2 - 15 \times \frac{1}{2} + 3 = 12 \times \frac{1}{4} - \frac{15}{2} + 3 \\ = 6 - \frac{15}{2} = \frac{12-15}{2} = \frac{-3}{2}$$

$$(b) \quad a(a^2+a+1)+5 = a \times a^2 + a \times a + a \times 1 + 5 = a^3 + a^2 + a + 5$$

$$(i) \quad \text{For } a=0, \quad a^3 + a^2 + a + 5 = (0)^3 + (0)^2 + (0) + 5 \\ = 0 + 0 + 0 + 5 = 5$$

$$(ii) \quad \text{For } a=1, \quad a^3 + a^2 + a + 5 = (1)^3 + (1)^2 + (1) + 5 \\ = 1 + 1 + 1 + 5 = 8$$

$$\begin{aligned} \text{(iii)} \quad \text{For } a = -1, \quad a^3 + a^2 + a + 5 &= (-1)^3 + (-1)^2 + (-1) + 5 \\ &= -1 + 1 - 1 + 5 = -2 + 6 = 4 \end{aligned}$$

Question 5:

- (a) Add: $p(p-q)$, $q(q-r)$ and $r(r-p)$.
 (b) Add: $2x(z-x-y)$ and $2y(z-y-zx)$.
 (c) Subtract: $3l(l-4m+5n)$ from $4l(10n-3m+2l)$.
 (d) Subtract: $3a(a+b+c) - 2b(a-b+c)$ from $4c(-a+b+c)$.

Answer 5:

- (a) $p(p-q) + q(q-r) + r(r-p) = p^2 - pq + q^2 - qr + r^2 - rp$
 $= p^2 + q^2 + r^2 - pq - qr - rp$
 (b) $2x(z-x-y) + 2y(z-y-zx) = 2xz - 2x^2 - 2xy + 2yz - 2y^2 - 2xy$
 $= 2xz - 2xy - 2xy + 2yz - 2x^2 - 2y^2$
 $= -2x^2 - 2y^2 - 4xy + 2yz + 2zx$
 (c) $4l(10n-3m+2l) - 3l(l-4m+5n) = 40ln - 12lm + 8l^2 - 3l^2 + 12lm - 15ln$
 $= 8l^2 - 3l^2 - 12lm + 12lm + 40ln - 15ln$
 $= 5l^2 + 25ln$
 (d) $4c(-a+b+c) - [3a(a+b+c) - 2b(a-b+c)]$
 $= -4ac + 4bc + 4c^2 - [3a^2 + 3ab + 3ac - 2ab + 2b^2 - 2bc]$
 $= -4ac + 4bc + 4c^2 - [3a^2 + 2b^2 + 3ab - 2bc + 3ac - 2ab]$
 $= -4ac + 4bc + 4c^2 - [3a^2 + 2b^2 + ab + 3ac - 2bc]$
 $= -4ac + 4bc + 4c^2 - 3a^2 - 2b^2 - ab - 3ac + 2bc$
 $= -3a^2 - 2b^2 + 4c^2 - ab + 4bc + 2bc - 4ac - 3ac$
 $= -3a^2 - 2b^2 + 4c^2 - ab + 6bc - 7ac$

Exercise 9.4

Question 1:

Multiply the binomials:

- (i) $(2x+5)$ and $(4x-3)$
- (ii) $(y-8)$ and $(3y-4)$
- (iii) $(2.5l-0.5m)$ and $(2.5l+0.5m)$
- (iv) $(a+3b)$ and $(x+5)$
- (v) $(2pq+3q^2)$ and $(3pq-2q^2)$
- (vi) $\left(\frac{3}{4}a^2+3b^2\right)$ and $4\left(a^2-\frac{2}{3}b^2\right)$

Answer 1:

- (i)
$$\begin{aligned}(2x+5) \times (4x-3) &= 2x(4x-3) + 5(4x-3) \\&= 2x \times 4x - 2x \times 3 + 5 \times 4x - 5 \times 3 \\&= 8x^2 - 6x + 20x - 15 \\&= 8x^2 + 14x - 15\end{aligned}$$
- (ii)
$$\begin{aligned}(y-8) \times (3y-4) &= y(3y-4) - 8(3y-4) \\&= y \times 3y - y \times 4 - 8 \times 3y - 8 \times -4 \\&= 3y^2 - 4y - 24y + 12 \\&= 3y^2 - 28y + 12\end{aligned}$$
- (iii)
$$\begin{aligned}(2.5l-0.5m) \times (2.5l+0.5m) &= 2.5l \times (2.5l+0.5m) - 0.5m \times (2.5l+0.5m) \\&= 2.5l \times 2.5l + 0.5l \times 0.5m - 0.5m \times 2.5l - 0.5m \times 0.5m \\&= 6.25l^2 + 1.25lm - 1.25lm - 0.25m^2 \\&= 6.25l^2 - 0.25m^2\end{aligned}$$
- (iv)
$$\begin{aligned}(a+3b) \times (x+5) &= a(x+5) + 3b(x+5) \\&= a \times x + a \times 5 + 3b \times x + 3b \times 5 \\&= ax + 5a + 3bx + 15b\end{aligned}$$
- (v)
$$\begin{aligned}(2pq+3q^2)(3pq-2q^2) &= 2pq \times (3pq-2q^2) + 3q^2(3pq-2q^2) \\&= 2pq \times 3pq - 2pq \times 2q^2 + 3q^2 \times 3pq - 3q^2 \times 2q^2 \\&= 6p^2q^2 - 4pq^3 + 9pq^3 - 6q^4 \\&= 6p^2q^2 + 5pq^3 - 6q^4\end{aligned}$$

$$\begin{aligned}
 \text{(vi)} \quad \left(\frac{3}{4}a^2 + 3b^2\right) \times 4\left(a^2 - \frac{2}{3}b^2\right) &= \left(\frac{3}{4}a^2 + 3b^2\right) \times \left(4a^2 - \frac{8}{3}b^2\right) \\
 &= \frac{3}{4}a^2 \times \left(4a^2 - \frac{8}{3}b^2\right) + 3b^2 \times \left(4a^2 - \frac{8}{3}b^2\right) \\
 &= \frac{3}{4}a^2 \times 4a^2 - \frac{3}{4}a^2 \times \frac{8}{3}b^2 + 3b^2 \times 4a^2 - 3b^2 \times \frac{8}{3}b^2 \\
 &= 3a^4 - 2a^2b^2 + 12a^2b^2 - 8b^4 \\
 &= 3a^4 + 10a^2b^2 - 8b^4
 \end{aligned}$$

Question 2:

Find the product:

$$\text{(i)} \quad (5 - 2x)(3 + x)$$

$$\text{(ii)} \quad (x + 7y)(7x - y)$$

$$\text{(iii)} \quad (a^2 + b)(a + b^2)$$

$$\text{(iv)} \quad (p^2 - q^2)(2p + q)$$

Answer 2:

$$\begin{aligned}
 \text{(i)} \quad (5 - 2x)(3 + x) &= 5 \times (3 + x) - 2x(3 + x) = 5 \times 3 + 5 \times x - 2x \times 3 - 2x \times x \\
 &= 15 + 5x - 6x - 2x^2 = 15 - x - 2x^2
 \end{aligned}$$

$$\begin{aligned}
 \text{(ii)} \quad (x + 7y)(7x - y) &= x(7x - y) + 7y \times (7x - y) \\
 &= x \times 7x - x \times y + 7y \times 7x - 7y \times y \\
 &= 7x^2 - xy + 49xy - 7y^2 \\
 &= 7x^2 + 48xy - 7y^2
 \end{aligned}$$

$$\begin{aligned}
 \text{(iii)} \quad (a^2 + b)(a + b^2) &= a^2 \times (a + b^2) + b \times (a + b^2) \\
 &= a^2 \times a + a^2 \times b^2 + b \times a + b \times b^2 \\
 &= a^3 + a^2b^2 + ab + b^3
 \end{aligned}$$

$$\begin{aligned}
 \text{(iv)} \quad (p^2 - q^2)(2p + q) &= p^2 \times (2p + q) - q^2(2p + q) \\
 &= p^2 \times 2p + p^2 \times q - q^2 \times 2p - q^2 \times q \\
 &= 2p^3 + p^2q - 2pq^2 - q^3
 \end{aligned}$$

Question 3:

Simplify:

(i) $(x^2 - 5)(x + 5) + 25$

(ii) $(a^2 + 5)(b^2 + 3) + 5$

(iii) $(t + s^2)(t^2 - s)$

(iv) $(a + b)(c - d) + (a - b)(c + d) + 2(ac + bd)$

(v) $(x + y)(2x + y) + (x + 2y)(x - y)$

(vi) $(x + y)(x^2 - xy + y^2)$

(vii) $(1.5x - 4y)(1.5x + 4y + 3) - 4.5x + 12y$

(viii) $(a + b + c)(a + b - c)$

Answer 3:

(i)
$$\begin{aligned}(x^2 - 5)(x + 5) + 25 &= x^2(x + 5) - 5(x + 5) + 25 \\&= x^2 \times x + x^2 \times 5 - 5 \times x - 5 \times 5 + 25 \\&= x^3 + 5x^2 - 5x - 25 + 25 \\&= x^3 + 5x^2 - 5x\end{aligned}$$

(ii)
$$\begin{aligned}(a^2 + 5)(b^3 + 3) + 5 &= a^2(b^3 + 3) + 5(b^3 + 3) + 5 \\&= a^2 \times b^3 + a^2 \times 3 + 5 \times b^3 + 5 \times 3 + 5 \\&= a^2b^3 + 3a^2 + 5b^3 + 15 + 5 \\&= a^2b^3 + 3a^2 + 5b^3 + 20\end{aligned}$$

(iii)
$$\begin{aligned}(t + s^2)(t^2 - s) &= t(t^2 - s) + s^2(t^2 - s) \\&= t \times t^2 - t \times s + s^2 \times t^2 - s^2 \times s \\&= t^3 - st + s^2t^2 - s^3\end{aligned}$$

(iv)
$$\begin{aligned}(a + b)(c - d) + (a - b)(c + d) + 2(ac + bd) \\&= a(c - d) + b(c - d) + a(c + d) - b(c + d) + 2ac + 2bd \\&= ac - ad + bc - bd + ac + ad - bc - bd + 2ac + 2bd \\&= ac + ac - ad + ad + bc - bc - bd - bd + 2ac + 2bd \\&= 2ac - 2bd + 2ac + 2bd \\&= 4ac\end{aligned}$$

$$\begin{aligned}
 \text{(v)} \quad (x+y)(2x+y) + (x+2y)(x-y) &= x(2x+y) + y(2x+y) + x(x-y) + 2y(x-y) \\
 &= 2x^2 + xy + 2xy + y^2 + x^2 - xy + 2xy - 2y^2 \\
 &= 2x^2 + x^2 + xy + 2xy - xy + 2xy + y^2 - 2y^2 \\
 &= 3x^2 + 4xy - y^2
 \end{aligned}$$

$$\begin{aligned}
 \text{(vi)} \quad (x+y)(x^2 - xy + y^2) &= x(x^2 - xy + y^2) + y(x^2 - xy + y^2) \\
 &= x^3 - x^2y + xy^2 + x^2y - xy^2 + y^3 \\
 &= x^3 - x^2y + x^2y + xy^2 - xy^2 + y^3 \\
 &= x^3 + y^3
 \end{aligned}$$

$$\begin{aligned}
 \text{(vii)} \quad (1.5x - 4y)(1.5x + 4y + 3) - 4.5x + 12y \\
 &= 1.5x(1.5x + 4y + 3) - 4y(1.5x + 4y + 3) - 4.5x + 12y \\
 &= 2.25x^2 + 6.0xy + 4.5x - 6.0xy - 16y^2 - 12y - 4.5x + 12y \\
 &= 2.25x^2 + 6.0xy - 6.0xy + 4.5x - 4.5x - 16y^2 - 12y + 12y \\
 &= 2.25x^2 - 16y^2
 \end{aligned}$$

$$\begin{aligned}
 \text{(viii)} \quad (a+b+c)(a+b-c) &= a(a+b-c) + b(a+b-c) + c(a+b-c) \\
 &= a^2 + ab - ac + ab + b^2 - bc + ac + bc - c^2 \\
 &= a^2 + ab + ab - ac + ac - bc + bc + b^2 - c^2 \\
 &= a^2 + b^2 - c^2 + 2ab
 \end{aligned}$$

Exercise 9.5

Question 1:

Use a suitable identity to get each of the following products:

(i) $(x+3)(x+3)$

(ii) $(2y+5)(2y+5)$

(iii) $(2a-7)(2a-7)$

(iv) $\left(3a - \frac{1}{2}\right)\left(3a - \frac{1}{2}\right)$

(v) $(1.1m-0.4)(1.1m+0.4)$

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

(vii) $(6x-7)(6x+7)$

(viii) $(-a+c)(-a+c)$

(ix) $\left(\frac{x}{2} + \frac{3y}{4}\right)\left(\frac{x}{2} + \frac{3y}{4}\right)$

(x) $(7a-9b)(7a-9b)$

Answer 1:

(i) $(x+3)(x+3) = (x+3)^2$

$$= (x)^2 + 2 \times x \times 3 + (3)^2 \quad [\text{Using identity } (a+b)^2 = a^2 + 2ab + b^2]$$

$$= x^2 + 6x + 9$$

(ii) $(2y+5)(2y+5) = (2y+5)^2$

$$= (2y)^2 + 2 \times 2y \times 5 + (5)^2 \quad [\text{Using identity } (a+b)^2 = a^2 + 2ab + b^2]$$

$$= 4y^2 + 20y + 25$$

(iii) $(2a-7)(2a-7) = (2a-7)^2$

$$= (2a)^2 - 2 \times 2a \times 7 + (7)^2 \quad [\text{Using identity } (a-b)^2 = a^2 - 2ab + b^2]$$

$$= 4a^2 - 28a + 49$$

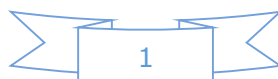
(iv) $\left(3a - \frac{1}{2}\right)\left(3a - \frac{1}{2}\right) = \left(3a - \frac{1}{2}\right)^2$

$$= (3a)^2 - 2 \times 3a \times \frac{1}{2} + \left(\frac{1}{2}\right)^2 \quad [\text{Using identity } (a-b)^2 = a^2 - 2ab + b^2]$$

$$= 9a^2 - 3a + \frac{1}{4}$$

(v) $(1.1m-0.4)(1.1m+0.4) = (1.1m)^2 - (0.4)^2$

$$\text{Using identity } (a-b)(a+b) = a^2 - b^2]$$



$$= 1.21m^2 - 0.16$$

$$\begin{aligned} \text{(vi)} \quad (a^2 + b^2)(-a^2 + b^2) &= (b^2 + a^2)(b^2 - a^2) \\ &= (b^2)^2 - (a^2)^2 \\ &\quad \text{[Using identity } (a-b)(a+b) = a^2 - b^2 \text{]} \\ &= b^4 - a^4 \end{aligned}$$

$$\begin{aligned} \text{(vii)} \quad (6x-7)(6x+7) &= (6x)^2 - (7)^2 && \text{[Using identity } (a-b)(a+b) = a^2 - b^2 \text{]} \\ &= 36x^2 - 49 \end{aligned}$$

$$\begin{aligned} \text{(viii)} \quad (-a+c)(-a+c) &= (c-a)(c-a) = (c-a)^2 \\ &= (c)^2 - 2 \times c \times a + (a)^2 \\ &\quad \text{[Using identity } (a-b)^2 = a^2 - 2ab + b^2 \text{]} \\ &= c^2 - 2ca + a^2 \end{aligned}$$

$$\begin{aligned} \text{(ix)} \quad \left(\frac{x}{2} + \frac{3y}{4}\right)\left(\frac{x}{2} + \frac{3y}{4}\right) &= \left(\frac{x}{2} + \frac{3y}{4}\right)^2 \\ &= \left(\frac{x}{2}\right)^2 + 2 \times \frac{x}{2} \times \frac{3y}{4} + \left(\frac{3y}{4}\right)^2 \\ &\quad \text{[Using identity } (a+b)^2 = a^2 + 2ab + b^2 \text{]} \\ &= \frac{x^2}{4} + \frac{3}{4}xy + \frac{9}{16}y^2 \end{aligned}$$

$$\begin{aligned} \text{(x)} \quad (7a-9b)(7a-9b) &= (7a-9b)^2 \\ &= (7a)^2 - 2 \times 7a \times 9b + (9b)^2 \\ &\quad \text{[Using identity } (a-b)^2 = a^2 - 2ab + b^2 \text{]} \\ &= 49a^2 - 126ab + 81b^2 \end{aligned}$$

Question 2:

Use the identity $(x+a)(x+b) = x^2 + (a+b)x + ab$ to find the following products:

(i) $(x+3)(x+7)$

(ii) $(4x+5)(4x+1)$

(iii) $(4x-5)(4x-1)$

(iv) $(4x+5)(4x-1)$

(v) $(2x+5y)(2x+3y)$

(vi) $(2a^2+9)(2a^2+5)$

(vii) $(xyz-4)(xyz-2)$

Answer 2:

(i) $(x+3)(x+7) = (x)^2 + (3+7)x + 3 \times 7$

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

$$= x^2 + 10x + 21$$

(ii) $(4x+5)(4x+1) = (4x)^2 + (5+1)4x + 5 \times 1$

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

$$= 16x^2 + 6 \times 4x + 5 = 16x^2 + 24x + 5$$

(iii) $(4x-5)(4x-1) = (4x)^2 + (-5-1)4x + (-5) \times (-1)$

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

$$= 16x^2 + (-6) \times 4x + 5 = 16x^2 - 24x + 5$$

(iv) $(4x+5)(4x-1) = (4x)^2 + \{5 \times (-1)\} \times 4x + 5 \times (-1)$

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

$$= 16x^2 + (5-1) \times 4x - 5$$

$$= 16x^2 + 4 \times 4x - 5$$

$$= 16x^2 + 16x - 5$$

(v) $(2x+5y)(2x+3y) = (2x)^2 + (5y+3y) \times 2x + 5y \times 3y$

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

$$= 4x^2 + 8y \times 2x + 15y^2$$

$$= 4x^2 + 16xy + 15y^2$$



$$\begin{aligned}
 \text{(vi)} \quad (2a^2 + 9)(2a^2 + 5) &= (2a^2)^2 + (9+5) \times 2a^2 + 9 \times 5 \\
 &\quad \text{[Using identity } (x+a)(x+b) = x^2 + (a+b)x + ab \text{]} \\
 &= 4a^4 + 14 \times 2a^2 + 45 \\
 &= 4a^4 + 28a^2 + 45 \\
 \text{(vii)} \quad (xyz - 4)(xyz - 2) &= (xyz)^2 + (-4-2) \times xyz + (-4) \times (-2) \\
 &\quad \text{[Using identity } (x+a)(x+b) = x^2 + (a+b)x + ab \text{]} \\
 &= x^2y^2z^2 - 6xyz + 8
 \end{aligned}$$

Question 3:

Find the following squares by using identities:

$$\begin{array}{lll}
 \text{(i)} & (b-7)^2 & \text{(ii)} \quad (xy+3z)^2 \quad \text{(iii)} \quad (6x^2-5y)^2 \\
 \text{(iv)} & \left(\frac{2}{3}m + \frac{3}{2}n\right)^2 & \text{(v)} \quad (0.4p - 0.5q)^2 \quad \text{(vi)} \quad (2xy+5y)^2
 \end{array}$$

Answer 3:

$$\begin{aligned}
 \text{(i)} \quad (b-7)^2 &= (b)^2 - 2 \times b \times 7 + (7)^2 \quad \text{[Using identity } (a-b)^2 = a^2 - 2ab + b^2 \text{]} \\
 &= b^2 - 14b + 49 \\
 \text{(ii)} \quad (xy+3z)^2 &= (xy)^2 + 2 \times xy \times 3z + (3z)^2 \quad \text{[Using identity } (a+b)^2 = a^2 + 2ab + b^2 \text{]} \\
 &= x^2y^2 + 6xyz + 9z^2 \\
 \text{(iii)} \quad (6x^2-5y)^2 &= (6x^2)^2 - 2 \times 6x^2 \times 5y + (5y)^2 \\
 &\quad \text{[Using identity } (a-b)^2 = a^2 - 2ab + b^2 \text{]} \\
 &= 36x^4 - 60x^2y + 25y^2 \\
 \text{(iv)} \quad \left(\frac{2}{3}m + \frac{3}{2}n\right)^2 &= \left(\frac{2}{3}m\right)^2 + 2 \times \frac{2}{3}m \times \frac{3}{2}n + \left(\frac{3}{2}n\right)^2 \\
 &\quad \text{[Using identity } (a+b)^2 = a^2 + 2ab + b^2 \text{]}
 \end{aligned}$$

$$= \frac{4}{9}m^2 + 2mn + \frac{9}{4}n^2$$

$$\begin{aligned} \text{(v)} \quad (0.4p - 0.5q)^2 &= (0.4p)^2 - 2 \times 0.4p \times 0.5q + (0.5q)^2 \\ &\quad \text{[Using identity } (a-b)^2 = a^2 - 2ab + b^2 \text{]} \\ &= 0.16p^2 - 0.40pq + 0.25q^2 \end{aligned}$$

$$\begin{aligned} \text{(vi)} \quad (2xy + 5y)^2 &= (2xy)^2 + 2 \times 2xy \times 5y + (5y)^2 \\ &\quad \text{[Using identity } (a+b)^2 = a^2 + 2ab + b^2 \text{]} \\ &= 4x^2y^2 + 20xy^2 + 25y^2 \end{aligned}$$

Question 4:

Simplify:

- (i) $(a^2 - b^2)^2$
- (ii) $(2x + 5)^2 - (2x - 5)^2$
- (iii) $(7m - 8n)^2 + (7m + 8n)^2$
- (iv) $(4m + 5n)^2 + (5m + 4n)^2$
- (v) $(2.5p - 1.5q)^2 - (1.5p - 2.5q)^2$
- (vi) $(ab + bc)^2 - 2ab^2c$
- (vii) $(m^2 - n^2m)^2 + 2m^3n^2$



Answer 4:

$$\begin{aligned} \text{(i)} \quad (a^2 - b^2)^2 &= (a^2)^2 - 2 \times a^2 \times b^2 + (b^2)^2 \quad \text{[Using identity } (a-b)^2 = a^2 - 2ab + b^2 \text{]} \\ &= a^4 - 2a^2b^2 + b^4 \end{aligned}$$

$$\begin{aligned} \text{(ii)} \quad (2x + 5)^2 - (2x - 5)^2 &= (2x)^2 + 2 \times 2x \times 5 + (5)^2 - [(2x)^2 - 2 \times 2x \times 5 + (5)^2] \\ &\quad \text{[Using identities } (a+b)^2 = a^2 + 2ab + b^2 \text{ and } (a-b)^2 = a^2 - 2ab + b^2 \text{]} \\ &= 4x^2 + 20x + 25 - [4x^2 - 20x + 25] \end{aligned}$$



$$= 4x^2 + 20x + 25 - 4x^2 + 20x - 25$$

$$= 40x$$

(iii)

$$(7m-8n)^2 + (7m+8n)^2 = (7m)^2 - 2 \times 7m \times 8n + (8n)^2 + [(7m)^2 + 2 \times 7m \times 8n + (8n)^2]$$

$$[\text{Using identities } (a+b)^2 = a^2 + 2ab + b^2 \text{ and } (a-b)^2 = a^2 - 2ab + b^2]$$

$$= 49m^2 - 112mn + 64n^2 + [49m^2 + 112mn + 64n^2]$$

$$= 49m^2 - 112mn + 64n^2 + 49m^2 + 112mn + 64n^2$$

$$= 98m^2 + 128n^2$$

(iv) $(4m+5n)^2 + (5m+4n)^2 = (4m)^2 + 2 \times 4m \times 5n + (5n)^2 + (5m)^2 + 2 \times 5m \times 4n + (4n)^2$

$$[\text{Using identity } (a+b)^2 = a^2 + 2ab + b^2]$$

$$= 16m^2 + 40mn + 25n^2 + 25m^2 + 40mn + 16n^2$$

$$= 16m^2 + 25m^2 + 40mn + 40mn + 25n^2 + 16n^2$$

$$= 41m^2 + 80mn + 41n^2$$

(v) $(2.5p-1.5q)^2 - (1.5p-2.5q)^2$

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

$$[\text{Using identity } (a-b)^2 = a^2 - 2ab + b^2]$$

$$= 6.25p^2 - 7.50pq + 2.25q^2 - [2.25p^2 - 7.50pq + 6.25q^2]$$

$$= 6.25p^2 - 7.50pq + 2.25q^2 - 2.25p^2 + 7.50pq - 6.25q^2$$

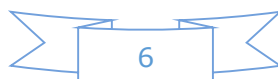
$$= 4p^2 - 4q^2$$

(vi) $(ab+bc)^2 - 2ab^2c = (ab)^2 + 2 \times ab \times bc + (bc)^2 - 2ab^2c$

$$[\text{Using identity } (a+b)^2 = a^2 + 2ab + b^2]$$

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

$$= a^2b^2 + b^2c^2$$



$$\begin{aligned}
 \text{(vii)} \quad (m^2 - n^2m)^2 + 2m^3n^2 &= (m^2)^2 - 2 \times m^2 \times n^2m + (n^2m)^2 + 2m^3n^2 \\
 &\quad \text{[Using identity } (a-b)^2 = a^2 - 2ab + b^2 \text{]} \\
 &= m^4 - 2m^3n^2 + n^4m^2 + 2m^3n^2 \\
 &= m^4 + n^4m^2
 \end{aligned}$$

Question 5:

Show that:

- (i) $(3x+7)^2 - 84x = (3x-7)^2$
- (ii) $(9p-5q)^2 + 180pq = (9p+5q)^2$
- (iii) $\left(\frac{4}{3}m - \frac{3}{4}n\right)^2 + 2mn = \frac{16}{9}m^2 + \frac{9}{16}n^2$
- (iv) $(4pq+3q)^2 - (4pq-3q)^2 = 48pq^2$
- (v) $(a-b)(a+b) + (b-c)(b+c) + (c-a)(c+a) = 0$

Answer 5:

$$\begin{aligned}
 \text{(i)} \quad \text{L.H.S.} &= (3x+7)^2 - 84x = (3x)^2 + 2 \times 3x \times 7 + (7)^2 - 84x \\
 &\quad \text{[Using identity } (a+b)^2 = a^2 + 2ab + b^2 \text{]} \\
 &= 9x^2 + 42x + 49 - 84x \\
 &= 9x^2 - 42x + 49 \\
 &= (3x-7)^2 \quad [\because (a-b)^2 = a^2 - 2ab + b^2] \\
 &= \text{R.H.S.}
 \end{aligned}$$

$$\begin{aligned}
 \text{(ii)} \quad \text{L.H.S.} &= (9p-5q)^2 + 180pq = (9p)^2 - 2 \times 9p \times 5q + (5q)^2 + 180pq \\
 &\quad \text{[Using identity } (a-b)^2 = a^2 - 2ab + b^2 \text{]} \\
 &= 81p^2 - 90pq + 25q^2 + 180pq \\
 &= 81p^2 + 90pq + 25q^2 \\
 &= (9p+5q)^2 \quad [\because (a+b)^2 = a^2 + 2ab + b^2]
 \end{aligned}$$

$$\begin{aligned}
 \text{(iii)} \quad \text{L.H.S.} &= \left(\frac{4}{3}m - \frac{3}{4}n\right)^2 + 2mn = \left(\frac{4}{3}m\right)^2 - 2 \times \frac{4}{3}m \times \frac{3}{4}n + \left(\frac{3}{4}n\right)^2 + 2mn \\
 &\quad \text{[Using identity } (a-b)^2 = a^2 - 2ab + b^2 \text{]} \\
 &= \frac{16}{9}m^2 - 2mn + \frac{9}{16}n^2 + 2mn \\
 &= \frac{16}{9}m^2 + \frac{9}{16}n^2 \\
 &= \text{R.H.S.}
 \end{aligned}$$

$$\begin{aligned}
 \text{(iv)} \quad \text{L.H.S.} &= (4pq + 3q)^2 - (4pq - 3q)^2 \\
 &= (4pq)^2 + 2 \times 4pq \times 3q + (3q)^2 - [(4pq)^2 - 2 \times 4pq \times 3q + (3q)^2] \\
 &\quad \text{[Using identities } (a+b)^2 = a^2 + 2ab + b^2 \text{ and } (a-b)^2 = a^2 - 2ab + b^2 \text{]} \\
 &= 16p^2q^2 + 24pq^2 + 9q^2 - [16p^2q^2 - 24pq^2 + 9q^2] \\
 &= 16p^2q^2 + 24pq^2 + 9q^2 - 16p^2q^2 + 24pq^2 - 9q^2 \\
 &= 48pq^2 \\
 &= \text{R.H.S.}
 \end{aligned}$$

$$\begin{aligned}
 \text{(v)} \quad \text{L.H.S.} &= (a-b)(a+b) + (b-c)(b+c) + (c-a)(c+a) \\
 &= a^2 - b^2 + b^2 - c^2 + c^2 - a^2 \quad \text{[Using identity } (a-b)(a+b) = a^2 - b^2 \text{]} \\
 &= 0 \\
 &= \text{R.H.S.}
 \end{aligned}$$

Question 6:

Using identities, evaluate:

- | | | |
|----------------------|----------------|------------------------|
| (i) 71^2 | (ii) 99^2 | (iii) 102^2 |
| (iv) 998^2 | (v) 5.2^2 | (vi) 297×303 |
| (vii) 78×82 | (viii) 8.9^2 | (ix) 1.05×9.5 |

 Answer 6:

$$\begin{aligned} \text{(i)} \quad 71^2 &= (70+1)^2 = (70)^2 + 2 \times 70 \times 1 + (1)^2 \\ &= 4900 + 140 + 1 = 5041 \end{aligned}$$

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

$$\begin{aligned} \text{(ii)} \quad 99^2 &= (100-1)^2 = (100)^2 - 2 \times 100 \times 1 + (1)^2 \\ &= 10000 - 200 + 1 = 9801 \end{aligned}$$

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

$$\begin{aligned} \text{(iii)} \quad 102^2 &= (100+2)^2 = (100)^2 + 2 \times 100 \times 2 + (2)^2 \\ &= 10000 + 400 + 4 = 10404 \end{aligned}$$

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

$$\begin{aligned} \text{(iv)} \quad 998^2 &= (1000-2)^2 = (1000)^2 - 2 \times 1000 \times 2 + (2)^2 \\ &= 1000000 - 4000 + 4 = 996004 \end{aligned}$$

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

$$\begin{aligned} \text{(v)} \quad 5.2^2 &= (5+0.2)^2 = (5)^2 + 2 \times 5 \times 0.2 + (0.2)^2 \\ &= 25 + 2.0 + 0.04 = 27.04 \end{aligned}$$

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

$$\begin{aligned} \text{(vi)} \quad 297 \times 303 &= (300-3) \times (300+3) = (300)^2 - (3)^2 \\ &= 90000 - 9 = 89991 \end{aligned}$$

[Using identity $(a-b)(a+b) = a^2 - b^2$]

$$\begin{aligned} \text{(vii)} \quad 78 \times 82 &= (80-2) \times (80+2) = (80)^2 - (2)^2 \\ &= 6400 - 4 = 6396 \end{aligned}$$

[Using identity $(a-b)(a+b) = a^2 - b^2$]

$$\begin{aligned} \text{(viii)} \quad 8.9^2 &= (8+0.9)^2 = (8)^2 + 2 \times 8 \times 0.9 + (0.9)^2 \\ &= 64 + 14.4 + 0.81 = 79.21 \end{aligned}$$

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

$$= 64 + 14.4 + 0.81 = 79.21$$

$$(ix) \quad 1.05 \times 9.5 = (10 + 0.5) \times (10 - 0.5) = (10)^2 - (0.5)^2$$

$$[\text{Using identity } (a-b)(a+b) = a^2 - b^2]$$

Question 7:

Using $a^2 - b^2 = (a+b)(a-b)$, find

$$(i) \quad 51^2 - 49^2$$

$$(ii) \quad (1.02)^2 - (0.98)^2$$

$$(iii) \quad 153^2 - 147^2$$

$$(iv) \quad 12.1^2 - 7.9^2$$

Answer 7:

$$(i) \quad 51^2 - 49^2 = (51+49)(51-49)$$

$$[\text{Using identity } (a-b)(a+b) = a^2 - b^2]$$

$$= 100 \times 2 = 200$$

$$(ii) \quad (1.02)^2 - (0.98)^2 = (1.02+0.98)(1.02-0.98)$$

$$[\text{Using identity } (a-b)(a+b) = a^2 - b^2]$$

$$= 2.00 \times 0.04 = 0.08$$

$$(iii) \quad 153^2 - 147^2 = (153+147)(153-147)$$

$$[\text{Using identity } (a-b)(a+b) = a^2 - b^2]$$

$$= 300 \times 6 = 1800$$

$$(iv) \quad 12.1^2 - 7.9^2 = (12.1+7.9)(12.1-7.9)$$

$$[\text{Using identity } (a-b)(a+b) = a^2 - b^2]$$

$$= 20.0 \times 4.2 = 84.0 = 84$$

Question 8:

Using $(x+a)(x+b) = x^2 + (a+b)x + ab$, find

- (i) 103×104
- (ii) 5.1×5.2
- (iii) 103×98
- (iv) 9.7×9.8



Answer 8:

$$(i) \quad 103 \times 104 = (100 + 3) \times (100 + 4) = (100)^2 + (3+4) \times 100 + 3 \times 4$$

$$[\text{Using identity } (x+a)(x+b) = x^2 + (a+b)x + ab]$$

$$\begin{aligned} &= 10000 + 7 \times 100 + 12 \\ &= 10000 + 700 + 12 = 10712 \end{aligned}$$

$$(ii) \quad 5.1 \times 5.2 = (5 + 0.1) \times (5 + 0.2) = (5)^2 + (0.1+0.2) \times 5 + 0.1 \times 0.2$$

$$[\text{Using identity } (x+a)(x+b) = x^2 + (a+b)x + ab]$$

$$\begin{aligned} &= 25 + 0.3 \times 5 + 0.02 \\ &= 25 + 1.5 + 0.02 = 26.52 \end{aligned}$$

$$(iii) \quad 103 \times 98 = (100 + 3) \times (100 - 2) = (100)^2 + (3-2) \times 100 + 3 \times (-2)$$

$$[\text{Using identity } (x+a)(x+b) = x^2 + (a+b)x + ab]$$

$$\begin{aligned} &= 10000 + (3 - 2) \times 100 - 6 \\ &= 10000 + 100 - 6 = 10094 \end{aligned}$$

$$(iv) \quad 9.7 \times 9.8 = (10 - 0.3) \times (10 - 0.2)$$

$$= (10)^2 + \{(-0.3) + (-0.2)\} \times 10 + (-0.3) \times (-0.2)$$

$$[\text{Using identity } (x+a)(x+b) = x^2 + (a+b)x + ab]$$

$$\begin{aligned} &= 100 + \{-0.3 - 0.2\} \times 10 + 0.06 \\ &= 100 - 0.5 \times 10 + 0.06 \\ &= 100 - 5 + 0.06 = 95.06 \end{aligned}$$