EXERCISE 9.1

Q1. Identify the terms, their coefficients for each of the following expressions. (i) 5xyz² – 3zy (ii) 1 + x + x²(iii) 4x²y² – 4x²y²z² + z² (iv) 3 – pq + qr – p (v) (x/2) + (y/2) – xy (vi) 0.3a – 0.6ab + 0.5b Solution :

Sl. No.	Expression	Term	Coefficient
i)	$5xyz^2 – 3zy$	Term: $5xyz^2$ Term: $-3zy$	5 -3
ii)	$1 + x + x^2$	Term: 1 Term: x Term: x^2	1 1 1
iii)	$4x^2y^2 – 4x^2y^2z^2 + z^2$	Term: $4x^2y^2$ Term: $-4 x^2y^2z^2$ Term $: z^2$	4 -4 1
iv)	$3 – pq + qr – p$	Term : 3 -pq qr -p	3 -1 1 -1
v)	$(x/2) + (y/2) – xy$	Term : x/2 Y/2 -xy	½ 1/2 -1
vi)	$0.3a – 0.6ab + 0.5b$	Term : 0.3a -0.6ab 0.5b	0.3 -0.6 0.5

2. Classify the following polynomials as monomials, binomials, trinomials. Which polynomials do not fit in any of these three categories? $x + y$, 1000, $x + x^2 + x^3 + x^4$, $7 + y + 5x$, $2y - 3y^2$, $2y - 3y^2 + 4y^3$, $5x - 4y + 3xy$, $4z - 15z^2$, $ab + bc + cd + da$, pqr, $p^2q + pq^2$, $2p + 2q$

Solution:

Let us first define the classifications of these 3 polynomials:

Monomials contain only one term.

Binomials contain only two terms.

Trinomials contain only three terms.

$x + y$		
	two terms	Binomial

1000	one term	Monomial
$x + x^2 + x^3 + x^4$	four terms	Polynomial, and it does not fit in the listed three categories
$2y - 3y^2$	two terms	Binomial
$2y - 3y^2 + 4y^3$	three terms	Trinomial
$5x - 4y + 3xy$	three terms	Trinomial
$4z - 15z^2$	two terms	Binomial
$ab + bc + cd + da$	four terms	Polynomial, and it does not fit in the listed three categories
pqr	one term	Monomial
$p^2q + pq^2$	two terms	Binomial
$2p + 2q$	two terms	Binomial
$7 + y + 5x$	three terms	Trinomial

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) $l^2 + m^2, m^2 + n^2, n^2 + l^2, 2lm + 2mn + 2nl$

Solution:

i) (ab – bc) + (bc – ca) + (ca-ab)

= ab – bc + bc – ca + ca – ab =

ab – ab – bc + bc – ca + ca

= 0 **ii)** (a – b + ab) + (b – c + bc) + (c – a

+ ac)

= a – b + ab + b – c + bc + c – a + ac

= a – a +b – b +c – c + ab + bc + ca

= 0 + 0 + 0 + ab + bc + ca = ab + bc

+ ca **iii)** $2p^2q^2 – 3pq + 4, 5 + 7pq –$

$3p^2q^2$

= $(2p^2q^2 – 3pq + 4) + (5 + 7pq – 3p^2q^2)$

= $2p^2q^2 – 3p^2q^2 – 3pq + 7pq + 4 + 5$

= $– p^2q^2 + 4pq + 9$ **iv)**$(l^2 + m^2) + (m^2 + n^2) + (n^2 + l^2) +$

(2lm + 2mn + 2nl)

= $l^2 + l^2 + m^2 + m^2 + n^2 + n^2 + 2lm + 2mn + 2nl$

= $2l^2 + 2m^2 + 2n^2 + 2lm + 2mn + 2nl$

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** *$18 – 3p – 11q + 5pq – 2pq^2 + 5p^2q$*

Solution:

(a) (12a – 9ab + 5b – 3) – (4a – 7ab + 3b + 12)

= 12a – 9ab + 5b – 3 – 4a + 7ab – 3b – 12

= 12a – 4a -9ab + 7ab +5b – 3b -3 -12

= 8a – 2ab + 2b – 15

b) $(5xy – 2yz – 2zx + 10xyz) – (3xy + 5yz – 7zx) = 5xy –$

$2yz – 2zx + 10xyz – 3xy – 5yz + 7zx$

$= 5xy – 3xy – 2yz – 5yz – 2zx + 7zx + 10xyz$

$= 2xy – 7yz + 5zx + 10xyz$

c) $(18 – 3p – 11q + 5pq – 2pq^2 + 5p^2q) – (4p^2q – 3pq +$

$5pq^2 – 8p + 7q – 10) = 18 – 3p – 11q + 5pq – 2pq^2 + 5p^2q – 4p^2q$

$+ 3pq – 5pq^2 + 8p – 7q + 10$

$= 18 + 10 - 3p + 8p - 11q – 7q + 5 pq + 3pq - 2pq^2 – 5pq^2 + 5 p^2 q – 4p^2 q$

$= 28 + 5p – 18q + 8pq – 7pq^2 + p^2q$

EXERCISE 9.2

1. Find the product of the following pairs of monomials.

(i) 4, 7p

(ii) $– 4p, 7p$

(iii) $-4p, 7pq$

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

(v) $4p, 0$

Solution:

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

(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) $4p \times 0 = 0$

2. Find the areas of rectangles with the following pairs of monomials as their lengths and breadths, respectively.

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

Solution:

Area of rectangle = Length x breadth. So, it is multiplication of two monomials.

The results can be written in square units.

(i) $p \times q = pq$

(ii) $10m \times 5n = 50mn$

(iii) $20x^2 \times 5y^2 = 100x^2y^2$

(iv) $4x \times 3x^2 = 12x^3$

(v) $3mn \times 4np = 12mn^2p$

3. Complete the following table of products:

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

Solution:

First monomial	2x	-5y	3x²	-4xY	7x²Y	-9x²y²
Second monomial						
2x	$4x^2$	$-10xy$	$6x^3$	$-8x^2y$	$14x^3y$	$-18x^3y^2$
-5y	$-10xy$	$25y^2$	$-15x^2y$	$20xy^2$	$-35x^2y^2$	$45x^2y^3$
3x²	$6x^3$	$-15x^2y$	$9x^4$	$-12x^3y$	$21x^4y$	$-27x^4y^2$
-4xy	$-8x^2y$	$20xy^2$	$-12x^3y$	$16x^2y^2$	$-28x^3y^2$	$36x^3y^3$
7x²y	$14x^3y$	$-35x^2y^2$	$21x^4y$	$-28x^3y^2$	$49x^4y^2$	$-63x^4y^3$
-9x²y²	$-18x^3y^2$	$45x^2y^3$	$-27 x^4y^2$	$36x^3y^3$	$-63x^4y^3$	$81x^4y^4$

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

(i) *5a, 3a², 7a⁴*

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

(iii) *xy, 2x²y, 2xy²*

(iv) *a, 2b, 3c* **Solution:**

Volume of rectangle = length x breadth x height. To evaluate volume of rectangular boxes, multiply all the monomials.

(i) 5a x 3a² x 7a⁴ = (5 × 3 × 7) (a × a² × a⁴) = 105a⁷

(ii) 2p x 4q x 8r = (2 × 4 × 8) (p × q × r) = 64pqr

(iii) y × 2x²y × 2xy² =(1 × 2 × 2)(x × x² × x × y × y × y²) = 4x⁴y⁴

(iv) a x 2b x 3c = (1 × 2 × 3) (a × b × c) = 6abc

5. Obtain the product of

(i) **xy, yz, zx**

(ii) **a, – a², a³**

(iii) **2, 4y, 8y² , 16y³**

(iv) **a, 2b, 3c, 6abc**

(v) **m, – mn, mnp Solution:**

(i) xy × yz × zx = $x^2 y^2 z^2$

(ii) $a \times -a^2 \times a^3 = -a^6$

(iii) $2 \times 4y \times 8y^2 \times 16y^3 = 1024\,y^6$

(iv) $a \times 2b \times 3c \times 6abc = 36a^2\,b^2\,c^2$

(v) $m \times -mn \times mnp = -m^3\,n^2\,p$

EXERCISE 9.3

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) $pq + qr + rp, 0$

Solution:

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

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

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

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

(v) $(pq + qr + rp) \times 0 = 0$ (Anything multiplied by zero is zero) **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	—

Solution:

	First expression	Second expression	Product
(i)	a	b + c + d	a(b+c+d) = a×b + a×c + a×d = ab + ac + ad
(ii)	x + y – 5	5xy	5 xy (x + y – 5)

			$= 5\ xy \times x + 5\ xy \times y - 5\ xy \times 5$ $= 5\ x^2y + 5\ xy^2 - 25xy$
(iii)	p	$6p^2 - 7p + 5$	$p\ (6\ p^2 - 7\ p + 5)$ $= p \times 6\ p^2 - p \times 7\ p + p \times 5$ $= 6\ p^3 - 7\ p^2 + 5\ p$
(iv)	$4\ p^2 q^2$	$p^2 - q^2$	$4p^2\ q^2 * (p^2 - q^2)$ $= 4\ p^4\ q^2 - 4p^2\ q^4$
(v)	$a + b + c$	abc	$abc(a + b + c)$ $= abc \times a + abc \times b + abc \times c$ $= a^2bc + ab^2c + abc^2$

3. Find the product.

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

ii) $(2/3\ xy) \times (-9/10\ x^2y^2)$

(iii) $(-10/3\ pq^3/) \times (6/5\ p^3q)$

(iv) $(x) \times (x^2) \times (x^3) \times (x^4)$ **Solution:**

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

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

$= 8 \times a_{2+22+26}$

$= 8a^{50}$ ii) $(2xy/3) \times ($-

$9x^2y^2/10)$

$= (2/3 \times -9/10)\ (x \times x^2 \times y \times y^2)$

$= (-3/5\ x^3y^3)$ iii) $(-10pq^3/3)$

$\times (6p^3q/5)$

$= (-10/3 \times 6/5)\ (p \times p^3 \times q^3 \times q)$

$= (-4p^4q^4)$ iv) $(x) \times (x^2) \times (x^3) \times$

(x^4)

$= x_{1+2+3+4}$

$= x^{10}$

4. (a) Simplify 3x (4x – 5) + 3 and find its values for (i) x = 3 (ii) x =1/2 (b)

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

Solution:

a) 3x (4x – 5) + 3

=3x (4x) – 3x(5) +3

=12x² – 15x + 3

(i) Putting x=3 in the equation we gets 12x² – 15x + 3 =12(3²) – 15 (3) +3

= 108 – 45 + 3

= 66

(ii) Putting x=1/2 in the equation we get

12x² – 15x + 3 = 12 (1/2)² – 15 (1/2) + 3

= 12 (1/4) – 15/2 +3

= 3 – 15/2 + 3

= 6- 15/2

= (12- 15) /2

= -3/2

b) a(a²+a +1)+5

= a x a² + a x a + a x 1 + 5 =a³+a²+a+ 5

(i)   putting a=0 in the equation we get 0³+0²+0+5=5

(ii) putting a=1 in the equation we get 1³+ 1²+ 1+5 = 1 + 1 + 1+5 = 8

(iii) Putting a = -1 in the equation we get (-1)³+(-1)²+ (-1)+5 = -1 + 1 – 1+5 = 4

5. (a) Add: $p\ (p – q), q\ (q – r)$ and $r\ (r – p)$

(b) Add: $2x\ (z – x – y)$ and $2y\ (z – y – x)$

(c) Subtract: $3l\ (l – 4m + 5n)$ from $4l\ (10n – 3m + 2l)$ (d) Subtract: $3a\ (a + b + c) – 2$

   $b\ (a – b + c)$ from $4c\ (-a + b + c)$

Solution:

a) $p (p – q) + q (q – r) + r (r – p)$

$= (p^2 – pq) + (q^2 – qr) + (r^2 – pr)$

$= p^2 + q^2 + r^2 – pq – qr – pr$

b) $2x (z – x – y) + 2y (z – y – x)$

$= (2xz – 2x^2 – 2xy) + (2yz – 2y^2 – 2xy)$

$= 2xz – 4xy + 2yz – 2x^2 – 2y^2$

c) $4l (10 n – 3 m + 2 l) – 3l (l – 4 m + 5 n) = (40ln – 12lm + 8l^2) – (3l^2 – 12lm + 15ln)$

$= 40ln – 12lm + 8l^2 – 3l^2 +12lm -15 ln$

$= 25 ln + 5l^2$

d) $4c (– a + b + c) – (3a (a + b + c) – 2 b (a – b + c))$

$= (-4ac + 4bc + 4c^2) – (3a^2 + 3ab + 3ac – (2ab – 2b^2 + 2bc))$

$=-4ac + 4bc + 4c^2 – (3a^2 + 3ab + 3ac – 2ab + 2b^2 – 2bc)$

$= -4ac + 4bc + 4c^2 – 3a^2 – 3ab – 3ac +2ab – 2b^2 + 2bc$

$= -7ac + 6bc + 4c^2 – 3a^2 – ab – 2b^2$

EXERCISE 9.4 PAGE NO: 148

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) $(3/4\ a^2 + 3b^2)$ and $4(\ a^2 – 2/3\ b^2)$

Solution :

(i) *(2x + 5)(4x – 3)*

$= 2x$ x $4x – 2x$ x $3 + 5$ x $4x – 5$ x 3

$= 8x^2 – 6x + 20x\ -15$

$= 8x^2 + 14x\ -15$ ii) (

$y – 8)(3y – 4)$

$= y$ x $3y – 4y – 8$ x $3y + 32$

$= 3y^2 – 4y – 24y + 32$

$= 3y^2 – 28y + 32$

(iii) (2.5l – 0.5m)(2.5l + 0.5m)

$= 2.5l$ x $2.5\ l + 2.5l$ x $0.5m – 0.5m$ x $2.5l – 0.5m$ x $0.5m$

$= 6.25l^2 + 1.25\ lm – 1.25\ lm – 0.25\ m^2$

$= 6.25l^2 – 0.25\ m^2$ *iv)*

$(a + 3b) (x + 5)$

$= ax + 5a + 3bx + 15b$

v) *(2pq + 3q^2) (3pq – 2q^2)*

$= 2pq$ x $3pq – 2pq$ x $2q^2 + 3q^2$ x $3pq – 3q^2$ x $2q^2$

$= 6p^2q^2 – 4pq^3 + 9pq^3 – 6q^4$

$= 6p^2q^2 + 5pq^3 – 6q^4$

(vi) $(3/4\ a^2 + 3b^2)$ and $4(\ a^2 – 2/3\ b^2)$

$=(3/4\ a^2 + 3b^2)$ x $4(\ a^2 – 2/3\ b^2)$

$=(3/4\ a^2 + 3b^2)$ x $(4a^2 – 8/3\ b^2)$

$= 3/4\ a^2 \times (4a^2 – 8/3\ b^2) + 3b^2 \times (4a^2 – 8/3\ b^2)$

$= 3/4\ a^2 \times 4a^2 - 3/4\ a^2 \times 8/3\ b^2 + 3b^2 \times 4a^2 – 3b^2 \times 8/3\ b^2$

$= 3a^4 – 2a^2\ b^2 + 12\ a^2\ b^2 – 8b^4$

$= 3a^4 + 10a^2\ b^2 – 8b^4$

2. Find the product.

(i) $(5 – 2x)\ (3 + x)$

(ii) $(x + 7y)\ (7x – y)$

(iii) $(a^2 + b)\ (a + b^2)$ (iv) $(p^2 – q^2)\ (2p + q)$ **Solution:**

(i) $(5 – 2x)\ (3 + x)$

$= 5\ (3 + x) – 2x\ (3 + x)$

$= 15 + 5x – 6x – 2x^2$

$= 15 – x - 2\ x^2$

(ii) $(x + 7y)\ (7x – y)$

$= x(7x-y) + 7y\ (7x-y)$

$= 7x^2 – xy + 49xy – 7y^2$

$= 7x^2 – 7y^2 + 48xy$ iii)

$(a^2 + b)\ (a + b^2)$

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

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

$a^3 + b^3 + a^2b^2 + ab$ iv)

$(p^2 – q^2)\ (2p + q) = p^2$

$(2p + q) – q^2(2p + q)$

$= 2p^3 + p^2q – 2pq^2 – q^3 =$

$2p^3 – q^3 + p^2q – 2pq^2$

3. Simplify.

(i) $(x^2 – 5)\ (x + 5) + 25$

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

(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) $(a + b + c)(a + b – c)$ **Solution:**

i) $(x^2– 5) (x + 5) + 25$

$= x^3 + 5x^2 – 5x – 25 + 25$

$= x^3 + 5x^2 – 5x$ ii) $(a^2+ 5)$

$(b^3+ 3) + 5$

$= a^2b^3 + 3a^2 + 5b^3 + 15 + 5 =$

$a^2b^3 + 5b^3 + 3a^2 + 20$

iii) $(t + s^2)(t^2 – s)$

$= t (t^2 – s) + s^2(t^2 – s)$

$= t^3 – st + s^2t^2 – s^3 = t^3 – s^3 – st + s^2t^2$ iv) $(a + b) (c$

$– d) + (a – b) (c + d) + 2 (ac + bd) = (a + b) (c$

$– d) + (a – b) (c + d) + 2 (ac + bd)$

$=(ac – ad + bc – bd) + (ac + ad – bc – bd) + (2ac + 2bd)$

$= ac – ad + bc – bd + ac + ad – bc – bd + 2ac + 2bd$

$= 4ac$

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

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

$= 3x^2 + 4xy – y^2$ vi) $(x$

$+ y)(x^2– xy + y^2)$

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

$= x^3 + y^3$ vii) $(1.5x – 4y)(1.5x + 4y + 3) –$

$4.5x + 12y$

$= 2.25x^2 + 6xy + 4.5x – 6xy – 16y^2 – 12y – 4.5x + 12y = 2.25x^2 – 16y^2$ viii)

$(a + b + c)(a + b – c)$

$= a^2 + ab – ac + ab + b^2 – bc + ac + bc – c^2$

$= a^2 + b^2 – c^2 + 2ab$

EXERCISE 9.5

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) $(3a – 1/2)(3a – 1/2)$

(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) $(1/2x + 3/4y) (1/2x + 3/4y)$

(x) $(7a – 9b) (7a – 9b)$

Solution:

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

$= x^2 + 6x + 9$

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

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

$4y^2 + 20y + 25$

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

$(2a – 7) (2a – 7) = (2a – 7)^2 =$

$4a^2 – 28a + 49$

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

$– 1/2)(3a – 1/2) = (3a – 1/2)^2$

$= 9a^2 -3a+(1/4)$

Using $(a-b)^2 = a^2 + b^2 – 2ab$

v) $(1.1m – 0.4) (1.1m + 0.4)$

$= 1.21m^2 – 0.16$

Using $(a – b)(a + b) = a^2 – b^2$ vi)

$(a^2+ b^2) (– a^2+ b^2)$

$= (b^2 + a^2) (b^2 – a^2)$

$= -a^4 + b^4$

Using $(a – b)(a + b) = a^2 – b^2$ vii)

$(6x – 7) (6x + 7)$

$=36x^2 – 49$

Using $(a – b)(a + b) = a^2 – b^2$ viii)

$(– a + c) (– a + c) = (– a + c)^2$

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

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

ix) $\left(\frac{1}{2}x + \frac{3}{4}y\right)\left(\frac{1}{2}x + \frac{3}{4}y\right) = \left(\frac{1}{2}x + \frac{3}{4}y\right)^2$

$= (x^2/4) + (9y^2/16) + (3xy/4)$

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

x) $(7a - 9b)(7a - 9b) = (7a - 9b)^2$

$= 49a^2 - 126ab + 81b^2$

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

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)$(xyz - 4)(xyz - 2)$ **Solution:**

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

$= x^2 + (3+7)x + 21$

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

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

$= 16x^2 + 4x + 20x + 5$

$= 16x^2 + 24x + 5$ iii)

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

$= 16x^2 – 4x – 20x + 5$

$= 16x^2 – 24x + 5$ iv)

$(4x + 5) (4x – 1)$

$= 16x^2 + (5-1)4x – 5$

$= 16x^2 +16x – 5$

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

$= 4x^2 + (5y + 3y)2x + 15y^2$

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

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

$= 4a^4 + (9+5)2a^2 + 45$

$= 4a^4 + 28a^2 + 45$ vii)

$(xyz – 4) (xyz – 2)$

$= x^2y^2z^2 + (-4 -2)xyz + 8$

$= x^2y^2z^2 – 6xyz + 8$

3. Find the following squares by using the identities.

(i) $(b – 7)^2$

(ii) $(xy + 3z)^2$

(iii) $(6x^2 – 5y)^2$

(iv) $[(2m/3) + (3n/2)]^2$

(v) $(0.4p – 0.5q)^2$

(vi) $(2xy + 5y)^2$ **Solution:**

Using identities:

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

(i) $(b – 7)^2 = b^2 – 14b + 49$

(ii) $(xy + 3z)^2 = x^2y^2 + 6xyz + 9z^2$

(iii) $(6x^2 – 5y)^2 = 36x^4 – 60x^2y + 25y^2$

(iv) $[(2m/3\}) + (3n/2)]^2 = (4m^2/9) +(9n^2/4) + 2mn$

(v) $(0.4p - 0.5q)^2 = 0.16p^2 - 0.4pq + 0.25q^2$

(vi) $(2xy + 5y)^2 = 4x^2y^2 + 20xy^2 + 25y^2$

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) $(m^2 - n^2m)^2 + 2m^3n^2$ **Solution:**

i) $(a^2 - b^2)^2 = a^4 + b^4 - 2a^2b^2$

ii) $(2x + 5)^2 - (2x - 5)^2$
$= 4x^2 + 20x + 25 - (4x^2 - 20x + 25) = 4x^2 + 20x + 25 - 4x^2 + 20x - 25 = 40x$

iii) $(7m - 8n)^2 + (7m + 8n)^2$
$= 49m^2 - 112mn + 64n^2 + 49m^2 + 112mn + 64n^2$
$= 98m^2 + 128n^2$

iv) $(4m + 5n)^2 + (5m + 4n)^2 = 16m^2 + 40mn + 25n^2 + 25m^2 + 40mn + 16n^2$
$= 41m^2 + 80mn + 41n^2$

v) $(2.5p - 1.5q)^2 - (1.5p - 2.5q)^2$
$= 6.25p^2 - 7.5pq + 2.25q^2 - 2.25p^2 + 7.5pq - 6.25q^2$
$= 4p^2 - 4q^2$ vi) $(ab + bc)^2 - 2ab^2c = a^2b^2 + 2ab^2c + b^2c^2 - 2ab^2c$

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

vii) $(m^2 - n^2m)^2 + 2m^3n^2 = m^4 - 2m^3n^2 + m^2n^4 + 2m^3n^2 = m^4 + m^2n^4$

5. Show that.

(i) $(3x + 7)^2 - 84x = (3x - 7)^2$

(ii) $(9p - 5q)^2 + 180pq = (9p + 5q)^2$

(iii) $(4/3m - 3/4n)^2 + 2mn = 16/9\ m^2 + 9/16\ n^2$

(iv) $(4pq + 3q)^2 - (4pq - 3q)^2 = 48pq^2$

(v) $(a - b)(a + b) + (b - c)(b + c) + (c - a)(c + a) = 0$

Solution:

i) LHS $= (3x + 7)^2 - 84x$

$= 9x^2 + 42x + 49 - 84x$
$= 9x^2 - 42x + 49 =$
RHS

LHS = RHS

ii)   LHS $= (9p - 5q)^2 + 180pq = 81p^2 - 90pq + 25q^2 + 180pq$
$= 81p^2 + 90pq + 25q^2$
RHS $= (9p + 5q)^2$
$= 81p^2 + 90pq + 25q^2$
LHS = RHS

(iii) $LHS = \left(\frac{4}{3}m - \frac{3}{4}n\right)^2 + 2mn$

$= \frac{16}{9}m^2 + \frac{9}{16}n^2 - 2mn + 2mn$
$= \frac{16}{9}m^2 + \frac{9}{16}n^2$
$=$ RHS

LHS = RHS

iv) LHS $= (4pq + 3q)^2 - (4pq - 3q)^2$

$= 16p^2q^2 + 24pq^2 + 9q^2 - 16p^2q^2 + 24pq^2 - 9q^2$

$= 48pq^2$

$=$ RHS

LHS = RHS

v) LHS $= (a - b)(a + b) + (b - c)(b + c) + (c - a)(c + a)$

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

$= 0$

$=$ RHS

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) 10.5×9.5

Solution:

i) 71^2

$= (70+1)^2$

$= 70^2 + 140 + 1^2$

$= 4900 + 140 + 1 =$

5041

ii) 99^2

$= (100 - 1)^2$

$= 100^2 - 200 + 1^2$

$= 10000 - 200 + 1 =$

9801

iii) 102^2

$= (100 + 2)^2$

$= 100^2 + 400 + 2^2 = 10000$

$+ 400 + 4 = 10404$ iv) 998^2

$= (1000 - 2)^2$

$= 1000^2 - 4000 + 2^2$

$= 1000000 - 4000 + 4 =$

996004

v) 5.2^2

$= (5 + 0.2)^2$

$= 5^2 + 2 + 0.2^2$

$= 25 + 2 + 0.04 = 27.04$

vi) 297 x 303

$= (300 – 3)(300 + 3)$

$= 300^2 – 3^2$

$= 90000 – 9$

$= 89991$ vii)

78 x 82

$= (80 – 2)(80 + 2)$

$= 80^2 – 2^2$

$= 6400 – 4 =$

6396

viii) 8.9^2

$= (9 – 0.1)^2$

$= 9^2 – 1.8 + 0.1^2$

$= 81 – 1.8 + 0.01$

$= 79.21$ ix) 10.5

x 9.5

$= (10 + 0.5)(10 – 0.5)$

$= 10^2 – 0.5^2$

$= 100 – 0.25$

$= 99.75$

7. Using $a^2 – b^2 = (a + b)(a – b)$, find

(i) $51^2 – 49^2$

(ii) $(1.02)^2 – (0.98)^2$

(iii) $153^2 – 147^2$

(iv) $12.1^2 – 7.9^2$ **Solution:**

i) $51^2 – 49^2$

$= (51 + 49)(51 – 49) = 100 \times 2 = 200$ ii)

$(1.02)^2 – (0.98)^2$

$= (1.02 + 0.98)(1.02 – 0.98) = 2 \times 0.04 = 0.08$ iii)

$153^2 – 147^2$

$= (153 + 147)(153 – 147) = 300 \times 6 = 1800$ iv)

$12.1^2 – 7.9^2$

$= (12.1 + 7.9)(12.1 – 7.9) = 20 \times 4.2 = 84$

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

(i)   103 x 104

(ii) 5.1 x 5.2

(iii) 103 x 98

(iv) 9.7 x 9.8

Solution:

i) 103 x 104

$= (100 + 3)(100 + 4)$

$= 100^2 + (3 + 4)100 + 12$

$= 10000 + 700 + 12 =$

10712

ii) 5.1 x 5.2

$= (5 + 0.1)(5 + 0.2)$

$= 5^2 + (0.1 + 0.2)5 + 0.1 \times 0.2$

= 25 + 1.5 + 0.02

= 26.52 iii) 103

x 98

= (100 + 3)(100 − 2)

= 100^2 + (3-2)100 − 6

= 10000 + 100 − 6 =

10094

iv) 9.7 x 9.8

= (9 + 0.7)(9 + 0.8)

= 9^2 + (0.7 + 0.8)9 + 0.56

= 81 + 13.5 + 0.56

= 95.06