CHAPTER 6

ALGEBRAIC EXPRESSIONS

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 , 7 p = 4 × 7 × p = 28p

(ii) – 4p × 7p = (-4 × 7) × (p × p)= $-28p^2$

(iii) – 4p × 7pq =(-4 × 7) (p × pq) = $-28p^2q$

(iv) $4p^3$ × – 3p = (4 × -3) (p^3 × p) = $-12p^4$ (v) 4p × 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 / 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	$-8x^2y$	$20xy^2$	$-12x^3y$	$16x^2y^2$	$-28x^3y^2$	$36x^3y^3$
$7x^2y$	$14x^3y$	$-35x^2y^2$	$21x^4y$	$-28x^3y^2$	$49x^4y^2$	$-63x^4y^3$
$-9x^2y^2$	$-18x^3y^2$	$45x^2y^3$	$-27\,x^4y^2$	$36x^3y^3$	$-63x^4y^3$	$81x^4y^4$

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

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

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

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

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

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

(i) $5a \times 3a^2 \times 7a^4 = (5 \times 3 \times 7)\,(a \times a^2 \times a^4) = 105a^7$

(ii) $2p \times 4q \times 8r = (2 \times 4 \times 8)\,(p \times q \times r) = 64pqr$

(iii) $y \times 2x^2y \times 2xy^2 = (1 \times 2 \times 2)(x \times x^2 \times x \times y \times y \times y^2) = 4x^4y^4$

(iv) $a \times 2b \times 3c = (1 \times 2 \times 3)\,(a \times b \times c) = 6abc$

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 Solution:

(i) $xy \times yz \times zx = x^2 y^2 z^2$

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

EXTRA 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

Solution:

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

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

(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 x x + 5 xy x y – 5 xy x 5 = 5 x^2y + 5 xy^2 – 25xy
(iii)	p	$6p^2$ – 7p + 5	p (6 p^2-7 p +5) = p× 6 p^2 – p× 7 p + p×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 × a + abc × b + abc × c = a^2bc + ab^2c + abc^2

3. Find the product.

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

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) x (x^2) x (x^3) x

(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

$=12x^2 – 15x + 3$

(i) Putting x=3 in the equation we gets $12x^2 – 15x + 3 =12(3^2) – 15\ (3) +3$

= 108 – 45 + 3

= 66

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

$12x^2 - 15x + 3 = 12\ (1/2)^2 - 15\ (1/2) + 3$

$= 12\ (1/4) - 15/2 + 3$

$= 3 - 15/2 + 3$

$= 6 - 15/2$

$= (12 - 15\ ) /2$

$= -3/2$

b) $a(a^2 + a + 1) + 5$

$= a \times a^2 + a \times a + a \times 1 + 5 = a^3 + a^2 + a + 5$

(i) putting a=0 in the equation we get $0^3 + 0^2 + 0 + 5 = 5$

(ii) putting a=1 in the equation we get $1^3 + 1^2 + 1 + 5 = 1 + 1 + 1 + 5 = 8$

(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 – 4 m + 5 n)*** **from** ***4l (10 n – 3 m + 2 l)*** **(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) $4c\ (-a + b + c\ ) - (3a\ (a + b + c\ ) - 2\ b\ (a - b + c))$

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

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

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

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

6. 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 x ($4a^2$ – 8/3 b^2) + $3b^2$ x ($4a^2$ – 8/3 b^2)

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

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

= $3a^4$ + $10a^2$ b^2 – $8b^4$

7. 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)

$(p^2– q^2) (2p + q) = p^2$

$(2p + q) – q^2 (2p + q)$

$=2p^3 + p^2q – 2pq^2 – q^3 =$

$2p^3 – q^3 + p^2q – 2pq^2$

8. 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

9. 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 $(a-b)^2 = a^2 + b^2 - 2ab$

10. 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)

$(xyz – 4) (xyz – 2)$

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

$= x^2y^2z^2 – 6xyz + 8$

11. 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) $(2xy + 5y)^2 = 4x^2y^2 + 20xy^2 + 25y^2$

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

13. 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

14. Using identities, evaluate.

(i) 71^2

(ii) 99^2

(iii) 102^2

(iv) 998^2

(v) 5.2^2

(vi) 297 x 303

(vii) 78 x 82

(viii) 8.9^2

(ix) 10.5 x 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

$= (10 + 0.5)(10 – 0.5)$

$= 10^2 – 0.5^2$

$= 100 – 0.25$

$= 99.75$

15. 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)

$12.1^2 - 7.9^2$

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