

NCERT SOLUTIONS OF Algebraic Exercise 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) $(3a - 1/2)(3a - 1/2)$

(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) $[(x/2) + (3y/4)][(x/2) + (3y/4)]$

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

Answer:

We will be using below identities in these question

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

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

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

- i) This question can be solved using the first identify

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

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

- ii) This question can be solved using the first identify
- $$(2y + 5)(2y + 5)$$
- $$= 4y^2 + 20y + 25$$

- iii) This question can be solved using the second identify
- $$(2a - 7)(2a - 7)$$

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

- iv) This question can be solved using the second identify
- $$(3a - 1/2)(3a - 1/2) = 9a^2 - 3a + 1/4$$

- v) This question can be solved using the third identity
- $$(1.1m - 0.4)(1.1m + 0.4)$$

$$= 1.21m^2 - 0.16$$

- vi) This question can be solved using the third identity
- $$(a^2 + b^2)(-a^2 + b^2)$$
- $$= (b^2 + a^2)(b^2 - a^2)$$
- $$= a^4 - b^4$$

- vii) This question can be solved using the third identity
- $$(6x - 7)(6x + 7)$$
- $$= 36x^2 - 49$$

- viii) This question can be solved using the third identity
- $$= c^2 - a^2$$

- ix) This question can be solved using the first identity
- $$\left[\left(\frac{x}{2} \right) + \left(\frac{3y}{4} \right) \right] \left[\left(\frac{x}{2} \right) + \left(\frac{3y}{4} \right) \right]$$
- $$= \left(\frac{x^2}{4} \right) + \left(\frac{9y^2}{16} \right) + \left(\frac{3xy}{4} \right)$$

- x) This question can be solved using second identity
- $$= 49a^2 - 126ab + 81b^2$$

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:

$$\begin{aligned} i) \quad & x^2 + (3+7)x + 21 \\ & = x^2 + 10x + 21 \end{aligned}$$

$$\begin{aligned} ii) \quad & (4x + 5)(4x + 1) \\ & = 16x^2 + (5 + 1)4x + 5 \\ & = 16x^2 + 24x + 5 \end{aligned}$$

$$\begin{aligned} iii) \quad & (4x - 5)(4x - 1) \\ & = 16x^2 + (-5-1)4x + 5 \\ & = 16x^2 - 20x + 5 \end{aligned}$$

$$\begin{aligned} iv) \quad & (4x + 5)(4x - 1) \\ & = 16x^2 + (5-1)4x - 5 \\ & = 16x^2 + 16x - 5 \end{aligned}$$

$$\begin{aligned} v) \quad & (2x + 5y)(2x + 3y) \\ & = 4x^2 + (5y + 3y)4x + 15y^2 \\ & = 4x^2 + 32xy + 15y^2 \end{aligned}$$

$$\text{vi) } (2a^2 + 9)(2a^2 + 5)$$

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

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

$$\text{vii) } (xyz - 4)(xyz - 2)$$

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

$$= x^2y^2z^2 - 6xyz - 8$$

Question 3

Find the following squares by using the identities.

$$\text{(i) } (b - 7)^2$$

$$\text{(ii) } (xy + 3z)^2$$

$$\text{(iii) } (6x^2 - 5y)^2$$

$$\text{iv) } [(2m/3) + (3n/2)]^2$$

$$\text{(v) } (0.4p - 0.5q)^2$$

$$\text{(vi) } (2xy + 5y)^2$$

Answer:

$$\text{i) } b^2 - 14b + 49$$

$$\text{ii) } x^2y^2 + 6xyz + 9z^2$$

$$\text{iii) } 36x^4 - 60x^2y + 25y^2$$

$$\text{iv) } (4m^2/9) + (9n^2/4) + 2mn$$

$$\text{v) } 0.16p^2 - 0.4pq + 0.25q^2$$

$$\text{vi) } 4x^2y^2 + 20xy^2 + 25y^2$$

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:

i) $a^4 - b^4$

ii) $(2x + 5)^2 - (2x - 5)^2$

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

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

$$= 40$$

iii) $(7m - 8n)^2 + (7m + 8n)^2$

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

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

iv) $(4m + 5n)^2 + (5m + 4n)^2$

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

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

$$\begin{aligned} \text{v)} \quad & (2.5p - 1.5q)^2 - (1.5p - 2.5q)^2 \\ &= 6.25p^2 - 7.5pq + 2.25q^2 - 2.25p^2 + 7.5pq - 6.25q^2 \\ &= 4p^2 - 4q^2 \end{aligned}$$

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

$$\begin{aligned} \text{vii)} \quad & (m^2 - n^2m)^2 + 2m^3n^2 \\ &= m^4 - 2m^3n^2 + m^2n^4 + 2m^3n^2 \\ &= m^4 + m^2n^4 \end{aligned}$$

Question 5

Show that.

$$\text{(i)} \quad (3x + 7)^2 - 84x = (3x - 7)^2$$

$$\text{(ii)} \quad (9p - 5q)^2 + 180pq = (9p + 5q)^2$$

$$\text{(iv)} \quad (4pq + 3q)^2 - (4pq - 3q)^2 = 48pq^2$$

$$\text{v)} \quad (a - b)(a + b) + (b - c)(b + c) + (c - a)(c + a) = 0$$

Answer:

$$\begin{aligned} \text{i)} \quad & \text{LHS} = 9x^2 + 42x + 49 - 84x \\ &= 9x^2 - 42x + 49 \end{aligned}$$

$$\text{RHS} = 9x^2 - 42x + 49$$

$$\text{LHS} = \text{RHS}$$

$$\text{ii) LHS} = 91p^2 - 90pq + 25q^2 + 180pq$$

$$= 91p^2 + 90pq + 25q^2$$

$$\text{RHS} = 91p^2 + 90pq + 25q^2$$

$$\text{iv) LHS} = 16p^2q^2 + 24pq^2 + 9q^2 - 16p^2q^2 + 24pq^2 - 9q^2$$

$$= 48pq^2$$

$$\text{v) LHS} = a^2 - b^2 + b^2 - c^2 + c^2 - a^2$$

$$= 0$$

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) 10.5×9.5

Answer:

i) $71^2 = (70+1)^2$

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

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

$$= 4900 + 140 + 1 = 5041$$

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) $5.2^2 = (5 + 0.2)^2$

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

$$= 25 + 2 + 0.4$$

$$= 27.4$$

vi) $= (300 - 3)(300 + 3)$

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

$$= 300^2 - 3^2$$

$$= 90000 - 9$$

$$= 89991$$

$$\text{vii) } = (80 - 2)(80 + 2)$$

$$= 80^2 - 2^2$$

$$= 6400 - 4$$

$$= 6396$$

$$\text{viii) } 8.9^2 = (9 - 0.1)^2$$

$$= 9^2 - 1.8 + 0.1^2$$

$$= 81 - 1.8 + 0.01$$

$$= 79.21$$

$$\text{ix) } = (10 + 0.5)(10 - 0.5)$$

$$= 10^2 - 0.5^2$$

$$= 100 - 0.25$$

$$= 99.75$$

Question 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) $12.1^2 - 7.9^2$

Answer:

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$$\text{i) } = (51 + 49)(51 - 49)$$

$$= 100 \times 2$$

$$= 200$$

$$\text{ii) } = (1.02 + 0.98)(1.02 - 0.98)$$

$$= 2 \times 0.04$$

$$= 0.08$$

$$\text{iii) } = (153 + 147)(153 - 147)$$

$$= 300 \times 6$$

$$= 1800$$

$$\text{iv) } = (12.1 + 7.9)(12.1 - 7.9)$$

$$= 20 \times 4.2$$

$$= 84$$

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:

$$\text{i) } = (100 + 3)(100 + 4)$$

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

$$= 10000 + 1200 + 12$$

$$= 11212$$

$$\text{ii) } = (5 + 0.1)(5 + 0.2)$$

$$= 5^2 + (0.1+0.2)5 + 0.02$$

$$= 25 + 1.5 + 0.02$$

$$= 26.52$$

$$\text{iii) } = (100 + 3)(100 - 2)$$

$$= 100^2 + (3-2)100 - 6$$

$$= 10000 + 100 - 6$$

$$= 10094$$

$$\text{iv) } = (9 + 0.7)(9 + 0.8)$$

$$= 9^2 + (0.7 + 0.8)9 + 0.63$$

$$= 81 + 13.5 + 0.63$$

$$= 95.13$$