

NCERT Solutions for Class 8 Maths Chapter 9 - Algebraic Expressions and Identities

Chapter 9 - Algebraic Expressions and Identities Exercise Ex. 9.1

Solution 1

The terms and the respective coefficients of the given expressions are as follows.

-	Terms	Coefficients
(i)	$5xyz^2$	5
	$- 3zy$	$- 3$
(ii)	1	1
	x	1
	x^2	1
(iii)	$4x^2y^2$	4
	$- 4x^2y^2z^2$	$- 4$
	z^2	1
(iv)	3	3
	$- pq$	-1
	qr	1
	$- rp$	-1
(v)	$\frac{x}{2}$	$\frac{1}{2}$
	$\frac{y}{2}$	$\frac{1}{2}$
	$- xy$	$- 1$
(vi)	$0.3a$	0.3
	$- 0.6ab$	$- 0.6$
	$0.5b$	0.5

The given expressions are classified as

Monomials: $1000, pqr$

Binomials: $x + y, 2y - 3y^2, 4z - 15z^2, p^2q + pq^2, 2p + 2q$

Trinomials: $7 + y + 5x, 2y - 3y^2 + 4y^3, 5x - 4y + 3xy$

Polynomials that do not fit in any of these categories are

$x + x^2 + x^3 + x^4, ab + bc + cd + da$

Solution 3

The given expressions written in separate rows, with like terms one below the other and then the addition of these expressions are as follows.

(i)

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

Thus, the sum of the given expressions is 0.

(ii)

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

Thus, the sum of the given expressions is $ab + bc + ac$.

(iii)

$$\begin{array}{r}
 2p^2q^2 - 3pq + 4 \\
 + \quad -3p^2q^2 + 7pq + 5 \\
 \hline
 -p^2q^2 + 4pq + 9
 \end{array}$$

Thus, the sum of the given expressions is $-p^2q^2 + 4pq + 9$.

(iv)

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

Thus, the sum of the given expressions is $2(l^2 + m^2 + n^2 + lm + mn + nl)$.

The given expressions in separate rows, with like terms one below the other and then the subtraction of these expressions is as follows.

(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)

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

Chapter 9 - Algebraic Expressions and Identities Exercise Ex. 9.2

Solution 1

The product will be as follows.

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

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

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

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

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

Solution 2

We know that,

$$\text{Area of rectangle} = \text{Length} \times \text{Breadth}$$

$$\text{Area of 1}^{\text{st}} \text{ rectangle} = p \times q = pq$$

$$\text{Area of 2}^{\text{nd}} \text{ rectangle} = 10m \times 5n = 10 \times 5 \times m \times n = 50 mn$$

$$\text{Area of 3}^{\text{rd}} \text{ rectangle} = 20x^2 \times 5y^2 = 20 \times 5 \times x^2 \times y^2 = 100 x^2y^2$$

$$\text{Area of 4}^{\text{th}} \text{ rectangle} = 4x \times 3x^2 = 4 \times 3 \times x \times x^2 = 12x^3$$

$$\text{Area of 5}^{\text{th}} \text{ rectangle} = 3mn \times 4np = 3 \times 4 \times m \times n \times n \times p = 12mn^2p$$

Solution 3

The table can be completed as follows.

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

Solution 4

We know that,

$$\text{Volume} = \text{Length} \times \text{Breadth} \times \text{Height}$$

$$(i) \text{ Volume} = 5a \times 3a^2 \times 7a^4 = 5 \times 3 \times 7 \times a \times a^2 \times a^4 = 105 a^7$$

$$(ii) \text{ Volume} = 2p \times 4q \times 8r = 2 \times 4 \times 8 \times p \times q \times r = 64pqr$$

$$(iii) \text{ Volume} = xy \times 2x^2y \times 2xy^2 = 2 \times 2 \times xy \times x^2y \times xy^2 = 4x^4y^4$$

$$(iv) \text{ Volume} = a \times 2b \times 3c = 2 \times 3 \times a \times b \times c = 6abc$$

Solution 5

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

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

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

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

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

Chapter 9 - Algebraic Expressions and Identities Exercise Ex. 9.3

Solution 1

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

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

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

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

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

Solution 2

The table can be completed as follows.

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

Solution 3

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

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

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

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

Solution 4

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

$$(i) \text{ For } x = 3, 12x^2 - 15x + 3 = 12(3)^2 - 15(3) + 3$$

$$= 108 - 45 + 3$$

$$= 66$$

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

$$= 12 \times \frac{1}{4} - \frac{15}{2} + 3$$

$$= 3 - \frac{15}{2} + 3 = 6 - \frac{15}{2}$$

$$= \frac{12-15}{2} = \frac{-3}{2}$$

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

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

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

$$= 1 + 1 + 1 + 5 = 8$$

$$(iii) \text{ For } a = -1, a^3 + a^2 + a + 5 = (-1)^3 + (-1)^2 + (-1) + 5$$

$$= -1 + 1 - 1 + 5 = 4$$

Solution 5

$$(a) \text{ First expression} = p(p - q) = p^2 - pq$$

$$\text{Second expression} = q(q - r) = q^2 - qr$$

$$\text{Third expression} = r(r - p) = r^2 - pr$$

Adding the three expressions, we obtain

$$\begin{array}{r} p^2 - pq \\ + \quad \quad \quad q^2 - qr \\ + \quad \quad \quad r^2 - pr \\ \hline p^2 - pq + q^2 - qr + r^2 - pr \end{array}$$

Therefore, the sum of the given expressions is $p^2 + q^2 + r^2 - pq - qr - rp$.

$$(b) \text{ First expression} = 2x(z - x - y) = 2xz - 2x^2 - 2xy$$

$$\text{Second expression} = 2y(z - y - x) = 2yz - 2y^2 - 2yx$$

Adding the two expressions, we obtain

$$\begin{array}{r} 2xz - 2x^2 - 2xy \\ + \quad \quad \quad - 2yx + 2yz - 2y^2 \\ \hline 2xz - 2x^2 - 4xy + 2yz - 2y^2 \end{array}$$

Therefore, the sum of the given expressions is $-2x^2 - 2y^2 - 4xy + 2yz + 2zx$.

$$(c) 3l(l - 4m + 5n) = 3l^2 - 12lm + 15ln$$

$$4l(10n - 3m + 2l) = 40ln - 12lm + 8l^2$$

Subtracting these expressions, we obtain

$$\begin{array}{r} 40ln - 12lm + 8l^2 \\ 15ln - 12lm + 3l^2 \\ (-) \quad (+) \quad (-) \\ \hline +25ln \quad \quad +5l^2 \end{array}$$

Therefore, the result is $5l^2 + 25ln$.

$$(d) 3a(a + b + c) - 2b(a - b + c) = 3a^2 + 3ab + 3ac - 2ba + 2b^2 - 2bc$$

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

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

Subtracting these expressions, we obtain

$$\begin{array}{r} -4ac + 4bc + 4c^2 \\ 3ac - 2bc \quad \quad + 3a^2 + 2b^2 + ab \\ (-) \quad (+) \quad \quad (-) \quad (-) \quad (-) \\ \hline -7ac + 6bc + 4c^2 - 3a^2 - 2b^2 - ab \end{array}$$

Therefore, the result is $-3a^2 - 2b^2 + 4c^2 - ab + 6bc - 7ac$.

$$(i) (2x + 5) \times (4x - 3) = 2x \times (4x - 3) + 5 \times (4x - 3)$$

$$= 8x^2 - 6x + 20x - 15$$

$$= 8x^2 + 14x - 15 \text{ (By adding like terms)}$$

$$(ii) (y - 8) \times (3y - 4) = y \times (3y - 4) - 8 \times (3y - 4)$$

$$= 3y^2 - 4y - 24y + 32$$

$$= 3y^2 - 28y + 32 \text{ (By adding like terms)}$$

$$(iii) (2.5l - 0.5m) \times (2.5l + 0.5m) = 2.5l \times (2.5l + 0.5m) - 0.5m (2.5l + 0.5m)$$

$$= 6.25l^2 + 1.25lm - 1.25lm - 0.25m^2$$

$$= 6.25l^2 - 0.25m^2$$

$$(iv) (a + 3b) \times (x + 5) = a \times (x + 5) + 3b \times (x + 5)$$

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

$$(v) (2pq + 3q^2) \times (3pq - 2q^2) = 2pq \times (3pq - 2q^2) + 3q^2 \times (3pq - 2q^2)$$

$$= 6p^2q^2 - 4pq^3 + 9pq^3 - 6q^4$$

$$= 6p^2q^2 + 5pq^3 - 6q^4$$

$$(vi) \left(\frac{3}{4}a^2 + 3b^2 \right) \times \left[4 \left(a^2 - \frac{2}{3}b^2 \right) \right] = \left(\frac{3}{4}a^2 + 3b^2 \right) \times \left(4a^2 - \frac{8}{3}b^2 \right)$$

$$= \frac{3}{4}a^2 \times \left(4a^2 - \frac{8}{3}b^2 \right) + 3b^2 \times \left(4a^2 - \frac{8}{3}b^2 \right)$$

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

$$= 3a^4 + 10a^2b^2 - 8b^4$$

$$(i) (5 - 2x) (3 + x) = 5 (3 + x) - 2x (3 + x)$$

$$= 15 + 5x - 6x - 2x^2$$

$$= 15 - x - 2x^2$$

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

$$= 7x^2 - xy + 49xy - 7y^2$$

$$= 7x^2 + 48xy - 7y^2$$

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

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

$$(iv) (p^2 - q^2) (2p + q) = p^2 (2p + q) - q^2 (2p + q)$$

$$= 2p^3 + p^2q - 2pq^2 - q^3$$

Solution 3

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

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

$$= x^3 + 5x^2 - 5x - 25 + 25$$

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

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

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

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

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

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

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

$$= t^3 - st + s^2t^2 - s^3$$

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

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

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

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

$$= 4ac$$

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

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

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

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

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

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

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

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

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

$$= x^3 + y^3$$

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

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

$$= 2.25x^2 + 6xy + 4.5x - 6xy - 16y^2 - 12y - 4.5x + 12y$$

$$= 2.25x^2 + (6xy - 6xy) + (4.5x - 4.5x) - 16y^2 + (12y - 12y)$$

$$= 2.25x^2 - 16y^2$$

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

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

$$= a^2 + ab - ac + ab + b^2 - bc + ca + bc - c^2$$

$$= a^2 + b^2 - c^2 + (ab + ab) + (bc - bc) + (ca - ca)$$

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

The products will be as follows.

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

$$= (x)^2 + 2(x) (3) + (3)^2 [(a + b)^2 = a^2 + 2ab + b^2]$$

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

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

$$= (2y)^2 + 2(2y) (5) + (5)^2 [(a + b)^2 = a^2 + 2ab + b^2]$$

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

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

$$= (2a)^2 - 2(2a) (7) + (7)^2 [(a - b)^2 = a^2 - 2ab + b^2]$$

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

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

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

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

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

$$= (1.1m)^2 - (0.4)^2 [(a + b)(a - b) = a^2 - b^2]$$

$$= 1.21m^2 - 0.16$$

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

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

$$= b^4 - a^4$$

$$(vii) (6x - 7)(6x + 7) = (6x)^2 - (7)^2 [(a + b)(a - b) = a^2 - b^2]$$

$$= 36x^2 - 49$$

$$(viii) (-a + c)(-a + c) = (-a + c)^2$$

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

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

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

$$= \left(\frac{x}{2}\right)^2 + 2\left(\frac{x}{2}\right)\left(\frac{3y}{4}\right) + \left(\frac{3y}{4}\right)^2 [(a + b)^2 = a^2 + 2ab + b^2]$$

$$= \frac{x^2}{4} + \frac{3xy}{4} + \frac{9y^2}{16}$$

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

$$= (7a)^2 - 2(7a)(9b) + (9b)^2 [(a - b)^2 = a^2 - 2ab + b^2]$$

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

The products will be as follows.

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

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

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

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

$$(iii) (4x - 5) (4x - 1) = (4x)^2 + [(-5) + (-1)] (4x) + (-5) (-1)$$

$$= 16x^2 - 24x + 5$$

$$(iv) (4x + 5) (4x - 1) = (4x)^2 + [(5) + (-1)] (4x) + (5) (-1)$$

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

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

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

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

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

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

$$= (xyz)^2 + [(-4) + (-2)] (xyz) + (-4) (-2)$$

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

$$(i) (b - 7)^2 = (b)^2 - 2(b)(7) + (7)^2 [(a - b)^2 = a^2 - 2ab + b^2]$$

$$= b^2 - 14b + 49$$

$$(ii) (xy + 3z)^2 = (xy)^2 + 2(xy)(3z) + (3z)^2 [(a + b)^2 = a^2 + 2ab + b^2]$$

$$= x^2y^2 + 6xyz + 9z^2$$

$$(iii) (6x^2 - 5y)^2 = (6x^2)^2 - 2(6x^2)(5y) + (5y)^2 [(a - b)^2 = a^2 - 2ab + b^2]$$

$$= 36x^4 - 60x^2y + 25y^2$$

$$(iv) \left(\frac{2}{3}m + \frac{3}{2}n\right)^2 = \left(\frac{2}{3}m\right)^2 + 2\left(\frac{2}{3}m\right)\left(\frac{3}{2}n\right) + \left(\frac{3}{2}n\right)^2 [(a + b)^2 = a^2 + 2ab + b^2]$$

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

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

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

$$= 0.16p^2 - 0.4pq + 0.25q^2$$

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

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

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

Solution 4

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

$$= a^4 - 2a^2b^2 + b^4$$

$$(ii) (2x + 5)^2 - (2x - 5)^2 = (2x)^2 + 2(2x)(5) + (5)^2 - [(2x)^2 - 2(2x)(5) + (5)^2]$$

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

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

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

$$= 4x^2 + 20x + 25 - 4x^2 + 20x - 25 = 40x$$

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

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

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

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

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

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

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

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

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

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

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

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

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

$$= 6.25p^2 - 7.5pq + 2.25q^2 - [2.25p^2 - 7.5pq + 6.25q^2]$$

$$= 6.25p^2 - 7.5pq + 2.25q^2 - 2.25p^2 + 7.5pq - 6.25q^2]$$

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

$$(vi) (ab + bc)^2 - 2ab^2c$$

$$= (ab)^2 + 2(ab)(bc) + (bc)^2 - 2ab^2c [(a + b)^2 = a^2 + 2ab + b^2]$$

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

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

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

$$= (m^2)^2 - 2(m^2)(n^2m) + (n^2m)^2 + 2m^3n^2 [(a - b)^2 = a^2 - 2ab + b^2]$$

$$= m^4 - 2m^3n^2 + n^4m^2 + 2m^3n^2$$

$$= m^4 + n^4m^2$$

$$(i) \text{ L.H.S} = (3x + 7)^2 - 84x$$

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

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

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

$$\text{R.H.S} = (3x - 7)^2 = (3x)^2 - 2(3x)(7) + (7)^2$$

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

$$\text{L.H.S} = \text{R.H.S}$$

$$(ii) \text{ L.H.S} = (9p - 5q)^2 + 180pq$$

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

$$= 81p^2 - 90pq + 25q^2 + 180pq$$

$$= 81p^2 + 90pq + 25q^2$$

$$\text{R.H.S} = (9p + 5q)^2$$

$$= (9p)^2 + 2(9p)(5q) + (5q)^2$$

$$= 81p^2 + 90pq + 25q^2$$

$$\text{L.H.S} = \text{R.H.S}$$

$$\begin{aligned}
\text{(iii) L.H.S} &= \left(\frac{4}{3}m - \frac{3}{4}n \right)^2 + 2mn \\
&= \left(\frac{4}{3}m \right)^2 - 2 \left(\frac{4}{3}m \right) \left(\frac{3}{4}n \right) + \left(\frac{3}{4}n \right)^2 + 2mn \\
&= \frac{16}{9}m^2 - 2mn + \frac{9}{16}n^2 + 2mn \\
&= \frac{16}{9}m^2 + \frac{9}{16}n^2 = \text{R.H.S.}
\end{aligned}$$

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

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

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

$$= (70)^2 + 2(70)(1) + (1)^2 [(a + b)^2 = a^2 + 2ab + b^2]$$

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

$$(ii) 99^2 = (100 - 1)^2$$

$$= (100)^2 - 2(100)(1) + (1)^2 [(a - b)^2 = a^2 - 2ab + b^2]$$

$$= 10000 - 200 + 1 = 9801$$

$$(iii) 102^2 = (100 + 2)^2$$

$$= (100)^2 + 2(100)(2) + (2)^2 [(a + b)^2 = a^2 + 2ab + b^2]$$

$$= 10000 + 400 + 4 = 10404$$

$$(iv) 998^2 = (1000 - 2)^2$$

$$= (1000)^2 - 2(1000)(2) + (2)^2 [(a - b)^2 = a^2 - 2ab + b^2]$$

$$= 1000000 - 4000 + 4 = 996004$$

$$(v) (5.2)^2 = (5.0 + 0.2)^2$$

$$= (5.0)^2 + 2(5.0)(0.2) + (0.2)^2 [(a + b)^2 = a^2 + 2ab + b^2]$$

$$= 25 + 2 + 0.04 = 27.04$$

$$(vi) 297 \times 303 = (300 - 3) \times (300 + 3)$$

$$= (300)^2 - (3)^2 [(a + b) (a - b) = a^2 - b^2]$$

$$= 90000 - 9 = 89991$$

$$(vii) 78 \times 82 = (80 - 2) (80 + 2)$$

$$= (80)^2 - (2)^2 [(a + b) (a - b) = a^2 - b^2]$$

$$= 6400 - 4 = 6396$$

$$(viii) 8.9^2 = (9.0 - 0.1)^2$$

$$= (9.0)^2 - 2(9.0) (0.1) + (0.1)^2 [(a - b)^2 = a^2 - 2ab + b^2]$$

$$= 81 - 1.8 + 0.01 = 79.21$$

$$(ix) 1.05 \times 9.5 = 1.05 \times 0.95 \times 10$$

$$= (1 + 0.05) (1 - 0.05) \times 10$$

$$= [(1)^2 - (0.05)^2] \times 10$$

$$= [1 - 0.0025] \times 10 [(a + b) (a - b) = a^2 - b^2]$$

$$= 0.9975 \times 10 = 9.975$$

Solution 7

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

$$= (100) (2) = 200$$

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

$$= (2) (0.04) = 0.08$$

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

$$= (300) (6) = 1800$$

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

$$= (20.0) (4.2) = 84$$

Solution 8

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

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

$$= 10000 + 700 + 12 = 10712$$

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

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

$$= 25 + 1.5 + 0.02 = 26.52$$

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

$$= (100)^2 + [3 + (-2)] (100) + (3) (-2)$$

$$= 10000 + 100 - 6$$

$$= 10094$$

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

$$= (10)^2 + [(-0.3) + (-0.2)] (10) + (-0.3) (-0.2)$$

$$= 100 + (-0.5)10 + 0.06 = 100.06 - 5 = 95.06$$