

## Algebraic Expressions and Identities: Exercise 9.3

**Q.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)  $pq + qr + rp, 0$

**Sol.** Multiplication of the expressions:

**(i) Given:**  $4p, q + r$

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

**(ii) Given:**  $ab, a - b$

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

**(iii) Given:**  $a + b, 7a^2b^2$

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

**(iv) Given:**  $a^2 - 9, 4a$

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

**(v) Given:**  $pq + qr + rp, 0$

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

**Q.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)	$a + b + c$	$abc$	...

**Sol.** The complete table:

	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)	$a + b + c$	$abc$	$a^2bc + ab^2c + abc^2$

**Q.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)  $x \times x^2 \times x^3 \times x^4$

**Sol.** Product of given expression:

$$\begin{aligned} \text{(i) Given: } (a^2) \times (2a^{22}) \times (4a^{26}) &= 2 \times 4 \times a^2 \times a^{22} \times a^{26} \\ &= 8 a^{50} \end{aligned}$$

$$\begin{aligned} \text{(ii) Given: } \left(\frac{2}{3}xy\right) \times \left(\frac{-9}{10}x^2y^2\right) &= \left(\frac{2}{3}\right) \times \left(\frac{-9}{10}\right) \times x \times y \times x^2 \times y^2 \\ &= \frac{-3}{5}x^3y^3 \end{aligned}$$

$$\begin{aligned} \text{(iii) Given: } \left(-\frac{10}{3}pq^3\right) \times \left(\frac{6}{5}p^3q\right) &= \left(\frac{-10}{3}\right) \times \left(\frac{6}{5}\right) \times pq^3 \times p^3q \\ &= -4p^4q^4 \end{aligned}$$

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

**Q.4 (a) Simplify  $3x(4x - 5) + 3$  and find its 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)  $a = -1$ .**

**Sol. (a) Given:**  $f(x) = 3x(4x - 5) + 3$

Now simplify the given expression,

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

(i) Now value of  $f(x)$  at  $x = 3$

$$\begin{aligned} 12x^2 - 15x + 3 &= 12(3)^2 - 15(3) + 3 \\ &= 108 - 45 + 3 \\ &= 66 \end{aligned}$$

(ii) Value of  $f(x)$  at  $x = \frac{1}{2}$

$$\begin{aligned} 12x^2 - 15x + 3 &= 12\left(\frac{1}{2}\right)^2 - 15\left(\frac{1}{2}\right) + 3 \\ &= 3 - \frac{15}{2} + 3 \\ &= 6 - \frac{15}{2} \\ &= \frac{12 - 15}{2} \\ &= \frac{-3}{2} \end{aligned}$$

**(b) Given:**  $f(a) = a(a^2 + a + 1) + 5$

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

(i)  $a = 0$

$$\begin{aligned} &= a^3 + a^2 + a + 5 \\ &= (0)^3 + (0)^2 + 0 + 5 \\ &= 5 \end{aligned}$$

(ii) Now value of  $f(a)$  at  $a = 1$

$$\begin{aligned} &= a^3 + a^2 + a + 5 \\ &= (1)^3 + (1)^2 + 1 + 5 \\ &= 1 + 1 + 1 + 5 \\ &= 8 \end{aligned}$$

(iii) Now value of  $f(a)$  at  $a = -1$

$$\begin{aligned} &= a^3 + a^2 + a + 5 \\ &= (-1)^3 + (-1)^2 + (-1) + 5 \\ &= -1 + 1 - 1 + 5 \\ &= 4 \end{aligned}$$

**Q.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:  $3a(a + b + c) - 2b(a - b + c)$  from  $4c(-a + b + c)$**

**Sol. (a) Given:**  $p(p - q)$ ,  $q(q - r)$  and  $r(r - p)$

Now adding,

$$\begin{aligned} p(p - q) + q(q - r) + r(r - p) &= p^2 - pq + q^2 - qr + r^2 - rp \\ &= p^2 + q^2 + r^2 - pq - qr - rp \end{aligned}$$

**(b) Given:**  $2x(z - x - y)$  and  $2y(z - y - x)$

Now adding,

$$\begin{aligned} 2x(z - x - y) + 2y(z - y - x) &= 2xz - 2x^2 - 2xy + 2yz - 2y^2 - 2xy \\ &= -2x^2 - 2y^2 - 4xy + 2yz + 2xz \end{aligned}$$

**(c) Given:**  $3l(l - 4m + 5n)$  from  $4l(10n - 3m + 2l)$

Now subtracting,

$$\begin{aligned} 4l(10n - 3m + 2l) - 3l(l - 4m + 5n) &= 40ln - 12lm + 8l^2 - 3l^2 + 12lm - 15ln \\ &= 40ln - 15ln - 12lm + 12lm + 8l^2 - 3l^2 \\ &= 25ln + 5l^2 \end{aligned}$$

**(d) Given:** Subtract:  $3a(a + b + c) - 2b(a - b + c)$  from  $4c(-a + b + c)$

$$\begin{aligned} 4c(-a + b + c) - 3a(a + b + c) - 2b(a - b + c) &= -4ac + 4bc + 4c^2 - [3a^2 + 3ab + 3ac - 2ab + 2b^2 - 2bc] \\ &= -4ac + 4bc + 4c^2 - 3a^2 - 3ab - 3ac + 2ab - 2b^2 + 2bc \\ &= -4ac - 3ac + 4bc + 2bc - 3ab + 2ab + 4c^2 - 3a^2 - 2b^2 \\ &= -3a^2 - 2b^2 + 4c^2 - ab + 6bc - 7ac \end{aligned}$$