## EXERCISE 11C

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**1. Multiply:**
**(i) 3x, $5x^2y$ and 2y**
**(ii) 5, 3a and $2ab^2$**
**(iii) 5x + 2y and 3xy**
**(iv) 6a – 5b and – 2a**
**(v) 4a + 5b and 4a – 5b**
**Solution:**

(i) 3x, $5x^2y$ and 2y
Product = $3x \times 5x^2y \times 2y$
We can write it as
$= 3 \times 5 \times 2 \times x \times x^2 \times y \times y$
So we get
$= 30x^3y^2$

(ii) 5, 3a and $2ab^2$
Product = $5 \times 3a \times 2ab^2$
We can write it as
$= 5 \times 3 \times 2 \times a \times ab^2$
So we get
$= 30a^2b^2$

(iii) 5x + 2y and 3xy
Product = 3xy (5x + 2y)
We can write it as
$= 3xy \times 5x + 3xy \times 2y$
So we get
$= 15x^2y + 6xy^2$

(iv) 6a – 5b and – 2a
Product = - 2a (6a – 5b)
We can write it as
$= -2a \times 6a + 2a \times 5b$
So we get
$= -12a^2 + 10ab$

(v) 4a + 5b and 4a – 5b
Product = (4a + 5b) (4a – 5b)
So we get
$= 16a^2 – 25b^2$

$$
\begin{array}{r}
4a + 5b \\
\times\ 4a - 5b \\
\hline
16a^2 + 20ab \\
\quad - 20ab - 25b^2 \\
\hline
16a^2 \qquad - 25b^2 \\
\hline
\end{array}
$$

**2. Copy and complete the following multiplications:**

(i) $3a + 2b$ × $x - 3xy$

(ii) $9x - 5y$ × $x - 3xy$

(iii) $3xy - 2x^2 - 6x$ × $x - 5x^2 y$

(iv) $a + b$ × $x\ a + b$

(v) $ax - b$ × $x\ 2ax + 2b^2$

**Solution:**

(i) $3a + 2b$ × $x - 3xy$

$-9axy - 6bxy$

(ii) $9x - 5y$ × $x - 3xy$

$-27x^2y + 15xy^2$

(iii) $3xy - 2x^2 - 6x$ × $x - 5x^2 y$

$-15x^3y^2 + 10x^4y + 30x^3y$

(iv) $a + b$ × $x\ a + b$

$a^2 + ab$

$ab + b^2$

$a^2 + 2ab + b^2$

(v) $ax - b$ × $x\ 2ax + 2b^2$

$2a^2x^2 - 2abx + 2b^2x - 2b^3$

**3. Evaluate:**
**(i) (c + 5) (c – 3)**
**(ii) (3c – 5d) (4c – 6d)**
**(iii) (1/2a + 1/2b) (1/2a – 1/2b)**
**(iv) ($a^2$ + 2ab + $b^2$) (a + b)**
**(v) (3x – 1) ($4x^3$ – $2x^2$ + 6x – 3)**
**Solution:**

(i) (c + 5) (c – 3)
It can be written as
= c (c – 3) + 5 (c – 3)
By further calculation
= $c^2$ – 3c + 5c – 15
= $c^2$ + 2c – 15

(ii) (3c – 5d) (4c – 6d)
It can be written as
= 3c (4c – 6d) – 5d (4c – 6d)
By further calculation
= $12c^2 – 18cd – 20cd + 30d^2$
= $12c^2 – 38d + 30d^2$

(iii) (1/2a + 1/2b) (1/2a – 1/2b)
It can be written as
= 1/2a (1/2a – 1/2b) + 1/2b (1/2a – 1/2b)
By further calculation
= $1/4a^2 – 1/4ab + 1/4ab – 1/4b^2$
= $1/4a^2 – 1/4b^2$

(iv) $(a^2 + 2ab + b^2) (a + b)$
It can be written as
= a $(a^2 + 2ab + b^2)$ + b $(a^2 + 2ab + b^2)$
By further calculation
= $a^3 + 2a^2b + ab^2 + a^2b + 2ab^2 + b^3$
= $a^3 + b^3 + 3a^2b + 3ab^2$

(v) $(3x – 1) (4x^3 – 2x^2 + 6x – 3)$
It can be written as
= 3x $(4x^3 – 2x^2 + 6x – 3)$ – 1 $(4x^3 – 2x^2 + 6x – 3)$
By further calculation
= $12x^4 – 6x^3 + 18x^2 – 9x – 4x^3 + 2x^2 – 6x + 3$
= $12x^4 – 6x^3 – 4x^3 + 18x^2 + 2x^2 – 9x – 6x + 3$
So we get
= $12x^4 – 10x^3 + 20x^2 – 15x + 3$

**4. Evaluate:**
**(i) (a + b) (a – b).**
**(ii) $(a^2 + b^2) (a + b) (a – b)$, using the result of (i).**
**(iii) $(a^4 + b^4) (a^2 + b^2) (a + b) (a – b)$, using the result of (ii).**
**Solution:**

(i) (a + b) (a – b).
It can be written as
= a (a – b) + b (a – b)
By further calculation
= $a^2 – ab + ab – b^2$
= $a^2 – b^2$

(ii) $(a^2 + b^2) (a + b) (a – b)$
Substituting the result of (i)
= $(a^2 + b^2) (a^2 – b^2)$
It can be written as
= $a^2 (a^2 – b^2) + b^2 (a^2 – b^2)$
So we get
= $a^4 – a^2b^2 + a^2b^2 – b^4$

$= a^4 – b^4$

(iii) $(a^4 + b^4) (a^2 + b^2) (a + b) (a – b)$
Substituting the result of (ii)
$= (a^4 + b^4) (a^4 – b^4)$
It can be written as
$= a^4 (a^4 – b^4) + b^4 (a^4 – b^4)$
By further calculation
$= a^8 – a^4b^4 + a^4b^4 – b^8$
$= a^8 – b^8$

**5. Evaluate:**
**(i) (3x – 2y) (4x + 3y)**
**(ii) (3x – 2y) (4x + 3y) (8x – 5y)**
**(iii) (a + 5) (3a – 2) (5a + 1)**
**(iv) (a + 1) ($a^2$ – a + 1) and (a – 1) ($a^2$ + a + 1); and then: (a + 1) ($a^2$ – a + 1) + (a – 1) ($a^2$ + a + 1)**
**(v) (5m – 2n) (5m + 2n) ($25m^2 + 4n^2$)**
**Solution:**

(i) (3x – 2y) (4x + 3y)
It can be written as
$= 3x (4x + 3y) – 2y (4x + 3y)$
By further calculation
$= 12x^2 + 9xy – 8xy – 6y^2$
So we get
$= 12x^2 + xy – 6y^2$

(ii) (3x – 2y) (4x + 3y) (8x – 5y)
Substituting result of (i)
$= (12x^2 + xy – 6y^2) (8x – 5y)$
It can be written as
$= 8x (12x^2 + xy – 6y^2) – 5y (12x^2 + xy – 6y^2)$
By further calculation
$= 96x^3 + 8x^2y – 48xy^2 – 60x^2y – 5xy^2 + 30y^3$
So we get
$= 96x^3 + 8x^2y – 60x^2y – 48xy^2 – 5xy^2 + 30y^3$
$= 96x^3 - 52\ x^2y – 53xy^2 + 30y^3$

(iii) (a + 5) (3a – 2) (5a + 1)
It can be written as
$= a (3a – 2) + 5 (3a – 2) (5a + 1)$
By further calculation
$= (3a^2 – 2a + 15a – 10) (5a + 1)$
So we get
$= (3a^2 + 13a – 10) (5a + 1)$
We can write it as
$= 5a (3a^2 + 13a – 10) + 1 (3a^2 + 13a – 10)$
By further calculation
$= 15a^3 + 65a^2 – 50a + 3a^2 + 13a – 10$
$= 15a^3 + 68a^2 – 37a - 10$

(iv) $(a + 1)(a^2 – a + 1)$ and $(a – 1)(a^2 + a + 1)$; and then: $(a + 1)(a^2 – a + 1) + (a – 1)(a^2 + a + 1)$
Consider
$(a + 1)(a^2 – a + 1)$
It can be written as
$= a(a^2 – a + 1) + 1(a^2 – a + 1)$
By further calculation
$= a^3 – a^2 + a + a^2 – a + 1$
So we get
$= a^3 + 1$

$(a – 1)(a^2 + a + 1)$
It can be written as
$= a(a^2 + a + 1) – 1(a^2 + a + 1)$
By further calculation
$= a^3 + a^2 + a – a^2 – a – 1$
So we get
$= a^3 – 1$

Here
$(a + 1)(a^2 – a + 1) + (a – 1)(a^2 + a + 1)$
$= a^3 + 1 + a^3 – 1$
$= 2a^3$

(v) $(5m – 2n)(5m + 2n)(25m^2 + 4n^2)$
It can be written as
$= [5m(5m + 2n) – 2n(5m + 2n)](25m^2 + 4n^2)$
By further calculation
$= (25m^2 + 10mn – 10mn – 4n^2)(25m^2 + 4n^2)$
So we get
$= (25m^2 - 4n^2)(25m^2 + 4n^2)$
We can write it as
$= 25m^2(25m^2 + 4n^2) – 4n^2(25m^2 + 4n^2)$
By multiplying the terms
$= 625m^4 + 100m^2n^2 – 100m^2n^2 – 16n^4$
$= 625m^4 - 16n^4$

**6. Multiply:**
**(i) $mn^4$, $m^3n$ and $5m^2n^3$**
**(ii) 2mnpq, 4mnpq and 5mnpq**
**(iii) $pq – pm$ and $p^2m$**
**(iv) $x^3 – 3y^3$ and $4x^2y^2$**
**(v) $a^3 – 4ab$ and $2a^2b$**
**Solution:**

(i) $mn^4$, $m^3n$ and $5m^2n^3$
It can be written as
$= 5m^2n^3 \times mn^4 \times m^3n$
By further calculation
$= 5m^{(2 + 1 + 3)}\, n^{(3 + 4 + 1)}$
$= 5m^6n^8$

(ii) 2mnpq, 4mnpq and 5mnpq
It can be written as
= 5mnpq × 2mnpq × 4mnpq
By further calculation
= $5 \times 2 \times 4\ m^{(1+1+1)}\ n^{(1+1+1)}\ p^{(1+1+1)}\ q^{(1+1+1)}$
= $40m^3n^3p^3q^3$

(iii) pq – pm and $p^2m$
It can be written as
= $p^2m \times (pq - pm)$
So we get
= $p^3qm - p^3m^2$

(iv) $x^3 - 3y^3$ and $4x^2y^2$
It can be written as
= $4x^2y^2 \times (x^3 - 3y^3)$
By further calculation
= $4x^5y^2 - 12x^2y^5$

(v) $a^3 - 4ab$ and $2a^2b$
It can be written as
= $2a^2b \times (a^3 - 4ab)$
By further calculation
= $2a^5b - 8a^3b^2$

**7. Multiply:**
**(i) (2x + 3y) (2x + 3y)**
**(ii) (2x – 3y) (2x + 3y)**
**(iii) (2x + 3y) (2x – 3y)**
**(iv) (2x – 3y) (2x – 3y)**
**(v) (-2x + 3y) (2x – 3y)**
**Solution:**

(i) (2x + 3y) (2x + 3y)
It can be written as
= 2x (2x + 3y) + 3y (2x + 3y)
By further calculation
= $4x^2 + 6xy + 6xy + 9y^2$
= $4x^2 + 12xy + 9y^2$

(ii) (2x – 3y) (2x + 3y)
It can be written as
= 2x (2x + 3y) – 3y (2x + 3y)
By further calculation
= $4x^2 + 6xy - 6xy - 9y^2$
= $4x^2 - 9y^2$

(iii) (2x + 3y) (2x – 3y)
It can be written as
= 2x (2x – 3y) + 3y (2x – 3y)

By further calculation
$= 4x^2 – 6xy + 6xy – 9y^2$
$= 4x^2 – 9y^2$

(iv) (2x – 3y) (2x – 3y)
It can be written as
= 2x (2x – 3y) – 3y (2x – 3y)
By further calculation
$= 4x^2 – 6xy – 6xy + 9y^2$
$= 4x^2 – 12xy + 9y^2$

(v) (-2x + 3y) (2x – 3y)
It can be written as
= -2x (2x – 3y) + 3y (2x – 3y)
By further calculation
$= - 4x^2 + 6xy + 6xy – 9y^2$
$= - 4x^2 + 12xy – 9y^2$