



Algebra

In algebra, we basically deal with two types of quantities, *which are*

1. Variable
2. Constant

Variable

The quantity having no certain value and varies as accordance with the algebraic expression, are known as variable. $x, y, z, a, b, c, u, v, w \dots$ etc. all are variable carrying, no specific value for itself.

Constant

This type of quantities carries a definite value for itself, hence cannot be replaced by any other constant.

1, 2, 3, 4, 5, 6, 7, ... etc. all are constant.

Hence, in algebra, we study about various operations on the functions equipped with variable and constant.

Important Rules on Fundamental Operation

Under the head of fundamental operation, we study about addition, subtraction, division and multiplication.

Rules of Addition

The sign remains the same if we add two positive or two negative variables.

i.e. $(+) \text{ and } (+) = +$, $(-) \text{ and } (-) = -$.

Example 1 What is the value of $2x + 3x + 4x$?

- (a) $9x$ (b) $10x$ (c) $8x$ (d) $7x$

Sol. (a) $2x + 3x + 4x = 9x$

Example 2 What is the sum of x and y ?

- (a) $y - x$ (b) $x - y$
(c) $x + y$ (d) $x \times y$

Sol. (c) Addition $= x + y$

Example 3 What is the sum of $(2x + 4y)$ and $(x + 6y)$?

- (a) $6x + 7y$ (b) $3x + 10y$
(c) $6(x + y)$ (d) $10x + 3y$

Sol. (b)
$$\begin{array}{r} 2x + 4y \\ + 1x + 6y \\ \hline 3x + 10y \end{array}$$

Rules of Subtraction

The sign of the term to be deducted changes, i.e. $(+)$ becomes $(-)$ and $(-)$ becomes $(+)$.

Example 4 Subtract $5a$ from $12a$.

- (a) $9a$ (b) $5a$
(c) $6a$ (d) $7a$

Sol. (d)
$$\begin{array}{r} 12a \\ - 5a \\ \hline 7a \end{array}$$

Example 5 Subtract $12a - 5b$ from $15a + 8b$.

- (a) $3a + 13b$ (b) $13a + 5b$
(c) $13a + 3b$ (d) $15a + 13b$

Sol. (a)
$$\begin{array}{r} 15a + 8b \\ - (12a - 5b) \\ \hline 3a + 13b \end{array}$$

Rules of Multiplication

$$(+)\times(+)=(+)$$

$$(-)\times(-)=(+)$$

$$(-)\times(+)=(-)$$

e.g. $a^1 \times a^1 = a^2$ [Powers are added in multiplication]

$$(+)\times(-)=+2x \times (-5x) = -10x^2$$

$$(-)\times(+)=(-5x) \times 2x = -10x^2$$

$$(-)\times(-)=(-5x) \times (-2x) = +10x^2$$

Example 6 What is multiply of $(a+b)$ and y ?

(a) $ay - by$

(b) $by - ay$

(c) $ay + by$

(d) $(a+b)ay$

Sol. (c) $(a+b) \times y = a \times y + b \times y = ay + by$

Example 7 Simplify $8x^2 \times 10x$.

(a) $10x^3$

(b) $80x^3$

(c) $8x^3$

(d) x^3

Sol. (b) $8x^2 \times 10x = 8x^2 \times 10x^1$
 $= 8 \times 10 \times x^{2+1} = 80x^3$

Example 8 Find the multiply of $(3a+5b)$ and $(2a+4b)$.

(a) $6ab + 22b^2 + 20a^2$

(b) $20a^2 + 22ab + 6b^2$

(c) $22a^2 + 6ab + 20b^2$

(d) $6a^2 + 22ab + 20b^2$

Sol. (d) $(3a+5b) \times (2a+4b)$
 $= 3a \times 2a + 3a \times 4b + 5b \times 2a + 5b \times 4b$
 $= 6a^2 + 12ab + 10ab + 20b^2$
 $= 6a^2 + 22ab + 20b^2$

Rules of Division

For division, we follow the same rule as multiplication for sign whereas powers are subtracted in division.

Example 9 What value will come when $60a$ divide by 15 ?

(a) $4a$

(b) $5a$

(c) $8a$

(d) $9a$

Sol. (a) $\frac{60a}{15} = 4a$

Example 10 What value will come when $84a^2b^2$ divided by $12ab$?

(a) $2ab$

(b) $6ab$

(c) $7ab$

(d) $3ab$

Sol. (c) $\frac{84a^2b^2}{12a^1b^1} = 7ab$

Example 11 Divide $10x+50$ by 10 .

(a) $x+3$

(b) $x+2$

(c) $x+1$

(d) $x+5$

Sol. (d)
$$\begin{array}{r} x+5 \\ 10 \overline{) 10x+50} \\ \underline{10x} \\ 50 \\ \underline{50} \\ 0 \end{array}$$

Example 12 Find the value of $5x - x^2$, when $x = 4$.

(a) 4

(b) 5

(c) 6

(d) 7

Sol. (a) $5x - x^2 = 5 \times x - x \times x$

$$\therefore \quad \quad \quad x = 4$$

$$\therefore \quad 5 \times x - x \times x = 5 \times 4 - 4 \times 4 = 20 - 16 = 4$$



Practice Exercise

1. What is the value of $8u+6u$?

(a) $8u$

(b) $14u$

(c) $6u$

(d) $13u$

2. What is the value of $5a+6a+7a$?

(a) $15a$

(b) $81a$

(c) $18a$

(d) $16a$

3. What is the value of $(2a+3b) + (4a+5b)$?

(a) $8b+7a$

(b) $3a+4b$

(c) $7a+7b$

(d) $6a+8b$

4. What is the value of $12u-9u$?

(a) $3u$

(b) $4u$

(c) $2u$

(d) $9u$

5. What is the value of $(28a+13b)-(21a-6b)$?

(a) $19a+7b$

(b) $7a+19b$

(c) $18a+8b$

(d) $6a+18b$

6. Find the value of $3x \times 6x^2$.

(a) $18x^3$

(b) $6x^3$

(c) $3x^3$

(d) x^3

7. Find the value of $\frac{40a^2b^2}{8ab}$.
 (a) $6ab$ (b) $5ab$ (c) $7ab$ (d) $8ab$
8. Find the value of $\frac{8x+60}{4}$.
 (a) $3x+15$ (b) $4a+10$ (c) $2x+15$ (d) $4x+8$
9. If $a=4, b=5, c=-2$, then find the value of $\frac{2a+3b-4c}{8a+9b-10c}$.
 (a) $\frac{97}{31}$ (b) $\frac{31}{33}$ (c) $\frac{33}{31}$ (d) $\frac{31}{97}$
10. Find the value of $\frac{3a(a-2b)}{5a(2b-a)}$, when $a=3$ and $b=2$.
 (a) $-\frac{3}{2}$ (b) $-\frac{3}{5}$ (c) $-\frac{4}{3}$ (d) $-\frac{2}{3}$
11. What is the value of $2xy+8xy+(-5xy)+xy$?
 (a) $6xy$ (b) $5xy$ (c) $10xy$ (d) $2xy$
12. Find the value of $-12ab-6ab$.
 (a) $6ab$ (b) $18ab$
 (c) $-18ab$ (d) $12ab$
13. Find the sum of $2a^2+3b^2, 5a^2-2b^2+ab$ and $-6a^2-5ab+b^2$.
 (a) $2a^2+b^2-4ab$ (b) a^2+b^2-ab
 (c) $2a^2+b^2-ab$ (d) a^2+2b^2-4ab
14. If $c=35$, find the value of $\frac{9}{5}c+32$.
 (a) 100 (b) 95 (c) 89 (d) 75
15. If $x=-1, y=-2$ and $z=3$, find the value of $x^2-yz-zx$.
 (a) 10 (b) 12 (c) 13 (d) 14

Answers

1	(b)	2	(c)	3	(d)	4	(a)	5	(b)	6	(a)	7	(b)	8	(c)	9	(d)	10	(b)
11	(a)	12	(c)	13	(d)	14	(b)	15	(a)										

Hints & Solutions

1. $8u+6u=14u$
2. $5a+6a+7a=18a$
3.
$$\begin{array}{r} 2a+3b \\ + 4a+5b \\ \hline 6a+8b \end{array}$$
4.
$$\begin{array}{r} 12u \\ -9u \\ \hline 3u \end{array}$$
5.
$$\begin{array}{r} 28a+13b \\ 21a-6b \\ (-) \quad (+) \\ \hline 7a+19b \end{array}$$
6. $6x^2 \times 3x = 6 \times 3 \times x^{2+1} = 18x^3$
7. $\frac{40a^2b^2}{8ab} = \frac{40}{8} a^{2-1} b^{2-1} = 5ab$
8.
$$\begin{array}{r} 2x+15 \\ 4 \overline{) 8x+60} \\ \underline{8x \quad \downarrow} \\ 60 \\ \underline{60} \\ \times \end{array}$$
9. $\because a=4, b=5, c=-2$

$$\therefore \frac{2a+3b-4c}{8a+9b-10c} = \frac{2 \times 4 + 3 \times 5 - 4 \times (-2)}{8 \times 4 + 9 \times 5 - 10 \times (-2)}$$

$$= \frac{2 \times 4 + 3 \times 5 - 4 \times (-2)}{8 \times 4 + 9 \times 5 - 10 \times (-2)}$$

$$= \frac{8+15+8}{32+45+20} = \frac{31}{97}$$
10. $\because a=3$ and $b=2$

$$\therefore \frac{3a(a-2b)}{5a(2b-a)} = \frac{3 \times 3(3-2 \times 2)}{5 \times 3(2 \times 2-3)}$$

$$= \frac{9(3-4)}{15(4-3)} = \frac{9 \times (-1)}{15 \times 1} = \frac{-9}{15} = \frac{-3}{5}$$
11. $2xy+8xy-5xy+xy=11xy-5xy=6xy$
12. $-12ab-6ab=-18ab$
13. $2a^2+3b^2+5a^2-2b^2+ab+(-6a^2-5ab+b^2)$

$$= 7a^2+b^2+ab-6a^2-5ab+b^2$$

$$= a^2+2b^2-4ab$$
14. $\frac{9}{5} \times 35 + 32 = 9 \times 7 + 32 = 63 + 32 = 95$
15. $(-1)^2 - (-2) \times 3 - 3 \times (-1) = 1 + 6 + 3$

$$= 4 + 6 = 10$$



Try Yourself

- 1)** Add $5a + 7b$ and $3a + 8b$.
(a) $8a + 13b$ (b) $8a + 15b$
(c) $6a + 14b$ (d) $9a + 15b$
- 2)** Subtract $3x - 4y$ from $-8x - 3y$.
(a) $-11x + y$ (b) $-10x + y$
(c) $11x - y$ (d) $-12x + y$
- 3)** Multiply $(2a + 3b)$ by $(4a - 5b)$.
(a) $8a^2 - 2ab + 15b^2$
(b) $9a^2 + 2ab + 16b^2$
(c) $8a^2 - 2ab - 15b^2$
(d) $8a^2 + 2ab - 15b^2$
- 4)** Divide $49x + 273$ by 7.
(a) $8x + 39$ (b) $7x + 35$
(c) $7x + 39$ (d) $6x + 38$
- 5)** Find the value of $48a - 5a^2$, when $a = 2$.
(a) 76 (b) 79
(c) 70 (d) 74
- 6)** What is the value of $4x + x - 2x^2 + x - 1$, if $x = -1$?
(a) -8 (b) 9 (c) -9 (d) -5
- 7)** If $a = 18$, $b = 10$ and $c = 6$, find the value of abc .
(a) 1010 (b) 1080
(c) 1024 (d) 1089
- 8)** If $x = 0$ and $y = -1$, find the value of x^2y^2 .
(a) 1 (b) 0 (c) 2 (d) 4
- 9)** Subtract $a + b - c$ from $-a - b - c$.
(a) $-3a - 3b$ (b) $2a - 2b$
(c) $-2a - 2b$ (d) $-2a + 2b$
- 10)** Add $y^3, -2y^3, -3y^3, 4y^3$.
(a) 1 (b) 2 (c) -1 (d) 0

Answers

- | | | | | | | | | | |
|---|-----|---|-----|---|-----|---|-----|----|-----|
| 1 | (b) | 2 | (a) | 3 | (d) | 4 | (c) | 5 | (a) |
| 6 | (c) | 7 | (b) | 8 | (b) | 9 | (c) | 10 | (d) |