CHAPTER ONE

BASIC ALGEBRA, INDICES AND SUBSTITUTION

Addition in algebra:

1. a + a = 2a
2. $x + x = 2x$
3. a + 2a = 3a
4. 4y + 2y + 3y = 9y
5. 6a +a = 6a +1a = 7a
6. 3y + y + 2y = 3y + 1y +2y = 6y
7. 2ab + 3ab = 5ab
8. 4ab + 2ab + 3ab = 9ab
9. $4xy + xy = 4xy + 1xy = 5xy$
10. $xy + 2xy + 3xy = 1xy + 2xy + 3xy = 6xy$

N/B: - In algebra we can only add if the letters or the terms are the same.

- ab = ba, $xy = yx$. and $y^2x = xy^2$
- If the letters or the terms are not the same, then we cannot add.

Examples:

1. a + b = a + b
2. 2a + 3b = 2a + 3b
3. $x + y = x + y$
4. $6x + 2y = 6x + 2y$

Q1. Simplify each of the following:

a) $3a + a + 5x$

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Soln.

$3a + a + 5x = 4a + 5x$.

b) $3x + 4x + 2y + y$.

Soln.

$3x + 4x + 2y + y = 7x + 3y$.

c)) $4x + 2b + 3x + 6b$

Soln.

$4x + 2b + 3x + 6b = 4x + 3x + 2b + 6b = 7x + 8b$.

d) $2ab + 5ab + 4x + 5x$

Soln.

$2ab + 5ab + 4x + 5x = 7ab + 9x$.

e) $4ab + 6x + 6ab + 5x$

Soln.

$4ab + 6x + 6ab + 5x = 4ab + 6ab + 6x + 5x$

$= 10ab + 11x$.

f) $3ab + 4ba$

Soln.

$3ab + 4ab = 3ab + 4ab = 7ab$.

g) $5xy + 4ab + 2yx + 2ba$

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Soln.

$5xy + 4ab + 2yx + 2ba = 5xy + 2yx + 4ab + 2ba$

$= 5xy + 2xy + 4ab + 2ab = 7xy + 6ab$.

h) $4xy + 2y$

Soln.

$4xy + 2y = 4xy + 2y$

i) $2ab + 5a$

Soln.

$2ab + 5a = 2ab + 5a.$

j) $3xy + 2x + 6xy + 4x.$

Soln.

$3xy + 2x + 6xy + 4x = 3xy + 6xy + 2x + 4x = 9xy + 6x.$

k) $x^2y + xy$

Soln.

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

l) $3a^2b + 4ab$

Soln.

$3a^2b + 4ab = 3a^2b + 4ab.$

m) $3a^2b + 4a^2b$

Soln.

$3a^2b + 4a^2b = 7a^2b$

n) $3a^2b + 4ab^2$

Soln.

$3a^2b + 4ab^2 = 3a^2$

Soln.

$2x^2y^2 + 5x^2y^2 = 7x^2y^2$

p) $2x^2y^2 + 5x^2y$

Soln.

$2x^2y^2 + 5x^2y = 2x^2y^2 + 5x^2y$.

q) $3x^2y^2 + 5xy + 2x^2y^2 + 6xy$

Soln.

$3x^2y^2 + 5xy + 2x^2y^2 + 6xy = 3x^2y^2 + 2x^2y^2 + 5xy + 6xy$

$= 5x^2y^2 + 11xy$.

r) $3a^2b + 4ba^2 + ab + 6ab$

Soln.

$3a^2b + 4ba^2 + ab + 6ab = 3a^2b + 4a^2b + 1ab + 6ab$

$= 7a^2b + 7ab$.

s) $3ac + 5ab + 5ca + 4a^2b$.

Soln.

$3ac + 5ab + 5ca + 4a^2b = 3ac + 5ca + 5ab + 4a^2b$

$= 3ac + 5ac + 5ab + 4a^2b = 8ac + 5ab + 4a^2b$.

t) $4ab + 3a^2b + 6ba + 4ba^2$

Soln.

$4ab + 3a^2b + 6ba + 4ba^2 = 4ab + 6ba + 3a^2b + 4ba^2$

$= 4ab + 6ab + 3a^2b + 4a^2b = 10ab + 7a^2 b$.

Subtraction in Algebra:

N/B: - In algebra, we can only subtract when the letters or terms are the same.

Examples:

1. $2a – a = a$.

2. $4a - 2a = 2a.$

3. $7b - 3b = 4b.$

4. $2ab - a = 2ab - a.$

5. $3ab - b = 3ab - b.$

6 $5ab - 2ba = 5ab - 2ab = 3ab.$

7. $5a^2b - 4ab = 5a^2b - 4ab.$

8. $5a^2b - 4a^2b = 1a^2b = a^2b.$

9. $3x^2y^2 - y^2x^2 = 3x^2y^2 - x^2y^2 = 3x^2y^2 - 1x^2y^2 = 2x^2y^2$

10. $2x^3y - x^2y = 2x^3y - x^2y.$

11. $2x^3y - 1x^3y = 1x^3y = x^3y.$

Q1. Simplify the following:

a) $5x + 2x - 4x$

Soln.

$5x + 2x - 4x = 7x - 4x = 3x.$

b) $5x + 4x - 2x + 5y - 3y$

Soln.

$5x + 4x - 2x + 5y - 3y = 9x - 2x + 5y - 3y = 7x + 2y.$