

Chapter-11 / Simple Interest

Notation of the signs:-

- ① P = Principal
- ② R = Rate of interest
- ③ S.I = Simple Interest
- ④ T = Time Period.
- ⑤ A = Total amount paid along with the interest.

Formula : ① $S.I = \frac{P \times R \times T}{100}$

② $P = \frac{100 \times S.I}{R \times T}$

③ $R = \frac{100 \times S.I}{P \times T}$

④ $T = \frac{100 \times S.I}{P \times R}$

⑤ $A = S.I + P$ ⑥ $S.I = A - P$

⑦ $P = A - S.I$

Exercise - 11A

1. (iii) Given: P = Rs 9275

T = 2 years

R = $7\frac{1}{2}\%$ p.a = $\frac{15}{2}\%$ p.a

To find: S.I and A.

$S.I = \frac{P \times R \times T}{100} = \frac{9275 \times 15 \times 2}{2 \times 100} = \text{Rs } 1391.25$

Rough

9275
15
46375
9275
139125

Now, $A = P + S.I$
 $= 9275 + 1391.25$
 $= \text{Rs } 10666.25$

2. Given: $P = \text{Rs } 7500$
 $A = \text{Rs } 8625$
 $R = 7\frac{1}{2}\%$, $P.a = \frac{15}{2}\%$, $P.a$

Solⁿ To find: Time (T)

We have, $S.I = A - P$

$$\Rightarrow \frac{P \times R \times T}{100} = 8625 - 7500$$

$$\Rightarrow \frac{7500 \times 15 \times T}{2 \times 100} = 1125$$

$$\Rightarrow T = \frac{1125 \times 2}{75 \times 15} = 2 \text{ years.}$$

Rough

$$\begin{array}{r} 2 \times 5 \quad 75 \\ \hline 1125 \times 2 \\ \hline 75 \times 15 \end{array}$$

Q.4. Given: $P = \text{Rs } 6300$
 $S.I = \text{Rs } 2100$
 $T = 4 \text{ years.}$

To find: $R\%$.

Solⁿ: We know, $S.I = \frac{P \times R \times T}{100}$

$$\Rightarrow 2100 = \frac{6300 \times R \times 4}{100}$$

$$\Rightarrow \frac{2100 \times 100}{63 \times 4} = R$$

$$\Rightarrow \frac{25}{2} = R$$

$$\Rightarrow 8\frac{1}{3}\% = R$$

So, Rate $\% = 8\frac{1}{3}\%$.

6. Let sum (P) = Rs x

$$\text{So, ATQ, S.I} = \frac{3}{5}x$$

$$T = 5 \text{ yrs.}$$

To find: R%.

Solⁿ:- We know, $S.I = \frac{PRT}{100}$

$$\Rightarrow \frac{3x}{5} = \frac{x \times R \times 5}{100}$$

$$\Rightarrow \frac{3 \times 100}{5} = R$$

$$\Rightarrow 12 = R$$

$$\text{So, R\%} = 12\%, \text{ p.a.}$$

Q.8. Given: S.I = Rs 7840

$$T = 2 \text{ yrs}$$

$$R = 6\frac{1}{4}\% \text{ p.a} = \frac{25}{4}\% \text{ p.a.}$$

To find: P

Solⁿ:- We have, $S.I = \frac{PRT}{100}$

$$\Rightarrow 7840 = \frac{P \times 25 \times 2}{4 \times 100}$$

$$\Rightarrow \frac{7840 \times 4 \times 100}{25 \times 2} = P$$

$$\Rightarrow 7840 \times 8 = P$$

$$\Rightarrow P = 62720$$

$$\text{So, } P = \text{Rs } 62720.$$

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Q.9. Let $P = x$

So, A.T.Q, $A = 3 \text{ treble of } P$
 $= 3x$

$T = 16 \text{ yrs.}$

To find: R%.

Soln:- We have,

$$S.I = A - P$$

$$\Rightarrow \frac{PRT}{100} = 3x - x$$

$$\Rightarrow \frac{x \times R \times 16}{100} = 2x$$

$$\Rightarrow R = \frac{2 \times 100}{168} = 12 \frac{4}{8}$$

$$= 12 \frac{1}{2}$$

So, R% = $12 \frac{1}{2}$ %, p.a.

Q.10. Given: R% = 6%.

$A = \text{Rs } 4130$

$T = 3 \text{ yrs.}$

To find: P

Soln:- We know, $S.I = A - P$

$$\Rightarrow \frac{P \times R \times T}{100} = 4130 - P$$

$$\Rightarrow \frac{P \times 6 \times 3}{100} = 4130 - P$$

$$\Rightarrow 18P = (4130 - P) \times 100$$

$$\Rightarrow 18P = 413000 - 100P$$

$$\Rightarrow 118P = 413000$$

$$\Rightarrow P = \frac{413000}{118} = \frac{413 \times 1000}{118}$$
$$= \frac{7 \times 59 \times 1000}{2 \times 59} = 3500$$

Rough

$$2 \overline{) 118}$$

$$7 \overline{) 413}$$

12. For 1st case

$$A = \text{Rs } 10160$$

$$T = 3 \text{ yrs}$$

$$R = 9\%$$

So, let $P = x$.

We know, $S.I = A - P$.

$$\Rightarrow \frac{PRT}{100} = 10160 - x$$

$$\Rightarrow \frac{x \times 9 \times 3}{100} = 10160 - x$$

$$\Rightarrow 27x = (10160 - x) \times 100$$

$$\Rightarrow 27x = 10160 \times 100 - 100x$$

$$\Rightarrow 127x = 10160 \times 100$$

$$\Rightarrow x = \frac{10160 \times 100}{127}$$

$$= \frac{1016 \times 1000}{127}$$

$$= \frac{2 \times 2 \times 2 \times 127 \times 1000}{127}$$

$$= 8 \times 1000 = \text{Rs } 8000$$

Rough

$$\begin{array}{r} 2 \overline{) 10160} \\ \underline{20} \\ 208 \\ \underline{416} \\ 600 \\ \underline{1270} \\ 330 \end{array}$$

2nd case

When, $P = \text{Rs } 8000$

$$T = 2 \text{ yrs.}$$

$$R\% = 8\% \text{ p.a.}$$

$$\therefore S.I = \frac{PRT}{100} = \frac{8000 \times 8 \times 2}{100} = 1280$$

$$\therefore A = P + S.I$$

$$= 8000 + 1280$$

$$= \text{Rs } 9280$$

4ms

Chapter - 13 / Algebraic Expressions

① An algebraic Expression,

$$3x + 4y - 2xy.$$

Here, 3, 4 and 2 are the constants or numbers

x and y are the variables or literals.

② Terms of an algebraic expression are always separated by either addition or subtraction.

Eg. $3x + 4y - 2xy$, here, this Alg.

Exp. has 3 terms, separated by + & -

Types of Algebraic Expressions:-

① Monomial:- The algebraic Expression having only one term is known as monomial.

Eg. $5x$, $-\frac{2xy}{z}$, -35 , $\frac{43}{6}$ etc.

② Binomial:- Algebraic Expression having two terms, Eg. $5x + 3$, $2xy - \frac{3}{5}z$ etc.

③ Trinomial:- Algebraic Expression having three terms, Eg. $x + 2y - 3z$

$$z^2 - \frac{2x}{y} - 27 \text{ etc.}$$

④ Multinomial:- Algebraic expression having more than one term.

So, binomial, Trinomial, ... are all multinomial.

Eg. $x^4 + x^3y + \frac{xy}{3} + \frac{x^2}{2} + 3$

Factors of a term :-

Eg. (i) $3ab$, Here the factors of monomial $3ab$ are, $3, a, b, 3a, 3b, 3ab, ab$
Here, 3 is the numerical factor
and a, b, ab are the literal factors.

(ii) $-9a^2b$,

The Numerical factor = -9
The literal factors are = a, a^2, b, ab, a^2b
All the factors are = $-9, a, a^2, ab, a^2b, -9a, -9a^2, 9b, 9a^2b$.

Constant term :- This is the numerical portion of an Algebraic Expression.

Eg. $3x - 4y + 2$, here, the constant term is 2 .

Coefficient :- $-2xyz^2$

} Here, Numerical coefficient = -2
And the literal coefficient = xyz^2

Here, the coef. of $x = -2yz^2$

" " " $y = -2xz^2$

" " " $z^2 = -2xy$ etc.

" " " $xyz = -2z$ etc.

Like Terms :- Terms having the same literal coefficients.

Eg. (i) $3xy, -5xy, \frac{5}{6}xy$ are like terms

(ii) $2a^2b, 4ab^2, \frac{-2}{5}ab$ are unlike terms

Polynomial :-

An algebraic expression in which the variables involved have the non-negative integral powers, is called a polynomial.

Eg. $2x^3 - 3x^2 + 5x + 6$ is a polynomial

But $2x^3 - \frac{3}{x} + 5x + 6$ is not a polynomial.

$$\Rightarrow 2x^3 - 3x^{-2} + 5x + 6$$

Polynomial of one variable :-

Eg. (i) $3x + 7 \rightarrow$ only variable is x

(ii) $2y^2 - 5y + 7 \rightarrow$ variable is y

(iii) $2a^3 - \frac{5}{3}a + 6 \rightarrow$ variable is a .

Polynomial of Two or more variables

(i) $x + y + xy \rightarrow (x, y)$

(ii) $x^2 + y^2 + xyz \rightarrow (x, y, z)$

(iii) $x^2 + xy^2 + x^2yz^2 + p \rightarrow (x, y, z, p)$

Exercise - 13A

1. (iv) $\frac{3a + 2b - 5c}{7}$

$$= \frac{3a}{7} + \frac{2}{7}b - \frac{5}{7}c \rightarrow \text{Trinomial}$$

(v) $xy + yz - zx \rightarrow$ Trinomial

(vi) $3x^2 \div p = \frac{3x^2}{p} \rightarrow$ monomial

(vii) $ax^2 + bxy^2 = ax^2 + bxy^2 \rightarrow$ binomial

Q.2. (v) $\frac{2ab}{c}$ Ex-13A

Numerical coefficient = 2

Literal coefficient = $\frac{ab}{c}$

(vi) $-\frac{2x^2}{yz}$

Numerical coefficient = -2

Literal coefficient = $\frac{x^2}{yz}$

Q.3. given: $-5p^2q^3r^4$

(i) coefficient of $p^2 = -5q^3r^4$

(ii) coefficient of $-pq^2r^3 = 5pqr$

(iii) coefficient of $5q^3r = -p^2r^3$

Q.4. given: (iii) $-2xy^2, x^2y, 5y^2x, x^2z$

The like terms are: $-2xy^2, 5y^2x$

(iv) given: $abc, ab^2c, acb^2, c^2ab, b^2ac, a^2bc, cab^2$

The like terms are: $ab^2c, acb^2, b^2ac, cab^2$

Q.5. (i) The quotient of x by 8 is multiplied by y .

$$\Rightarrow \frac{x}{8} \times y$$

(ii) One-third of x multiplied by the sum of p and q .

$$\Rightarrow \frac{1}{3}x \times (p+q)$$

(iii) From a rod $(p+q)$ units in length, n equal pieces are cut. Find the length of each piece.

$$\Rightarrow \frac{p+q}{n}$$

(viii) The number obtained when m times the difference of x and y is subtracted from n -times the sum of x and y .

$$\Rightarrow n(x+y) - m(x-y)$$

(x) The product of three numbers a, b and c subtracted from the sum of x and y .

$$\Rightarrow (x+y) - abc$$

~~Q.6.~~ ~~Q.6.~~

Degree of a polynomial

The highest power of the variable in a polynomial is called its degree.

Eg. (i) $2y^2 - 5y + 1$, ~~its~~ degree = 2.

(ii) $2x^2y - 5xy + x$, degree = 3.

Q.6. (i) $8x^2 - 3x + 6\sqrt{x} + 1$, its not a polynomial.

(ii) $5n^2 - \frac{2}{n} + 7$, its not a polynomial

(iii) $9x^2y^2 - 3xy^2 + 5x^2y - 6x$, it is a polynomial.

its degree = 4

(iv) $6p^4 - \underline{p^3p^2} + pq^3 + q^4$, it is a polynomial.

its degree = 5

Exercise - 13 B

1. (iii) $2x + 9y - 7z, 3y + z - 3x, 2z - 4y - x$

1st method (Row wise)

$$\begin{aligned} & 2x + 9y - 7z + 3y + z - 3x + 2z - 4y - x \\ &= (2x - 3x - x) + (9y + 3y - 4y) + (-7z + z + 2z) \\ &= -2x + 8y - 4z \end{aligned}$$

2nd method (Column-wise)

$$\begin{array}{r} 2x + 9y - 7z \\ -3x + 3y + z \\ (+) -x - 4y + 2z \\ \hline -2x + 8y - 4z \end{array}$$

(v) $3x^3 + 2x^2 - 6x + 3, 2x^3 - 3x^2 - x - 4, 1 + 2x - 3x^2 - 4x^3$

$$\begin{aligned} &= 3x^3 + 2x^2 - 6x + 3 + 2x^3 - 3x^2 - x - 4 + 1 + 2x - 3x^2 - 4x^3 \\ &= (3x^3 + 2x^3 - 4x^3) + (2x^2 - 3x^2 - 3x^2) + (-6x - x + 2x) \\ &\quad + (3 - 4 + 1) \end{aligned}$$

$$= x^3 - 4x^2 - 5x + 0$$

$$= x^3 - 4x^2 - 5x$$

(vii) $3z^3 - z^2 + 5, 1 - 2z + z^2, 3 + 2z - z^3$

$$= 3z^3 - z^2 + 5 + 1 - 2z + z^2 + 3 + 2z - z^3$$

$$= (3z^3 - z^3) + (-z^2 + z^2) + (-2z + 2z) + (5 + 1 + 3)$$

$$= 2z^3 + 0 + 0 + 9$$

$$= 2z^3 + 9$$

2. Simplify:-

$$\begin{aligned}
 \text{(i)} \quad & 4x^3 - 2x^2 + 5x - 1 + 8x + x^2 - 6x^3 + 7 - 6x + 3 \\
 & \qquad \qquad \qquad - 3x^2 - x^3 \\
 & = (4x^3 - 6x^3 - 3x^3) + (-2x^2 + x^2 - 3x^2) \\
 & \qquad \qquad \qquad + (5x + 8x - 6x) + (-1 + 7 + 3) \\
 & = -5x^3 - 4x^2 + 7x + 9
 \end{aligned}$$

$$\begin{aligned}
 \text{(ii)} \quad & 2 - 3z^2 + 5yz + 7y^2 - 8 + z^2 - 6yz - 9y^2 + 1 \\
 & \qquad \qquad \qquad - 2z^2 - 2yz - y^2 \\
 & = (-3z^2 + z^2 - 2z^2) + (7y^2 - 9y^2 - y^2) \\
 & \qquad \qquad \qquad + (5yz - 6yz - 2yz) + (2 - 8 + 1) \\
 & = -4z^2 - 3y^2 - 3yz - 5
 \end{aligned}$$

$$\begin{aligned}
 \text{(iii)} \quad & 2m - 3n + 5p + 2m + n - 2p - 3m - 4n + p \\
 & = (2m + 2m - 3m) + (-3n + n - 4n) + (5p - 2p + p) \\
 & = m - 6n + 4p
 \end{aligned}$$

Q.3. Given: The two adjacent sides of a rectangle,

$$\begin{aligned}
 \text{let, } l &= 3a - b \\
 b &= 6b - a
 \end{aligned}$$

$$\begin{aligned}
 \therefore \text{ Perimeter} &= 2(l + b) \\
 &= 2(3a - b + 6b - a) \\
 &= 2(2a + 5b) \\
 &= 4a + 10b
 \end{aligned}$$

4. Given: The three sides of a triangle are
 $2y+3z$, $z-y$, $4y-2z$

$$\begin{aligned}\therefore \text{Perimeter} &= \text{sum of three sides of a } \Delta \\ &= 2y+3z+z-y+4y-2z \\ &= (2y-y+4y)+(3z+z-2z) \\ &= 5y+2z.\end{aligned}$$

5. Subtract:-

(ii) $5x^2-3xy-7y^2$ from $3x^2-xy-2y^2$
So, the difference is,

$$\begin{aligned}3x^2-xy-2y^2 - (5x^2-3xy-7y^2) \\ = 3x^2-xy-2y^2-5x^2+3xy+7y^2 \\ = (3x^2-5x^2) + (-xy+3xy) + (-2y^2+7y^2) \\ = -2x^2+2xy+5y^2\end{aligned}$$

(iv) $ab-bc-ca$ from $3ab+2bc-4ca$

$$\begin{aligned}\Rightarrow 3ab+2bc-4ca - (ab-bc-ca) \\ = 3ab+2bc-4ca-ab+bc+ca \\ = (3ab-ab) + (2bc+bc) + (-4ca+ca) \\ = 2ab+3bc-3ca\end{aligned}$$

(vi) $2abc-a^2-b^2$ from b^2+a^2-2abc

$$\begin{aligned}\Rightarrow \cancel{a^2} b^2 + a^2 - 2abc - (2abc - a^2 - b^2) \\ = b^2 + a^2 - 2abc - 2abc + a^2 + b^2 \\ = (a^2+a^2) + (b^2+b^2) + (-2abc-2abc) \\ = 2a^2 + 2b^2 - 4abc\end{aligned}$$

Q. 6. (i) 1st method

$$\begin{aligned} & (x + 2x^2 - 3x^3 + 2 - x^2 + 6x - x^3) - (6x^3 - 5x^2 + 4x - 3) \\ &= x + 2x^2 - 3x^3 + 2 - x^2 + 6x - x^3 - 6x^3 + 5x^2 - 4x + 3 \\ &= (-3x^3 - x^3 - 6x^3) + (2x^2 - x^2 + 5x^2) + (x + 6x - 4x) \\ & \quad + (2 + 3) \\ &= -10x^3 + 6x^2 + 3x + 5 \end{aligned}$$

2nd method OR

1st case

$$\begin{aligned} \text{The sum: } & x + 2x^2 - 3x^3 + 2 - x^2 + 6x - x^3 \\ &= (-3x^3 - x^3) + (2x^2 - x^2) + (x + 6x) \\ & \quad + 2 \\ &= -4x^3 + x^2 + 7x + 2 \end{aligned}$$

2nd case

$$\begin{aligned} & -4x^3 + x^2 + 7x + 2 - (6x^3 - 5x^2 + 4x - 3) \\ &= -4x^3 + x^2 + 7x + 2 - 6x^3 + 5x^2 - 4x + 3 \\ &= (-4x^3 - 6x^3) + (x^2 + 5x^2) + (7x - 4x) + (2 + 3) \\ &= -10x^3 + 6x^2 + 3x + 5 \end{aligned}$$

(✓)

(iii) ATQ, (According to question)

$$\begin{aligned} & (6x^2 - 8xy - y^2 + 2xy - 2y^2 - x^2) - (x^2 - 5xy + 2y^2 \\ & \quad \quad \quad + y^2 - 2xy - 3x^2) \\ &= 6x^2 - 8xy - y^2 + 2xy - 2y^2 - x^2 - x^2 + 5xy - 2y^2 \\ & \quad \quad \quad - y^2 + 2xy + 3x^2 \\ &= (6x^2 - x^2 - x^2 + 3x^2) + (-y^2 - 2y^2 - 2y^2 - y^2) \\ & \quad \quad \quad + (-8xy + 2xy + 5xy + 2xy) \\ &= 7x^2 - 6y^2 + xy \end{aligned}$$

Q.7. (ii) ATQ, (According to question),

$$\begin{aligned} & 2x^2 - y^2 + 4z^2 - (x^2 + y^2 - z^2) \\ &= 2x^2 - y^2 + 4z^2 - x^2 - y^2 + z^2 \\ &= (2x^2 - x^2) + (-y^2 - y^2) + (4z^2 + z^2) \\ &= x^2 - 2y^2 + 5z^2 \end{aligned}$$

8. (iii) ATQ,

$$\begin{aligned} & x^2 + mn - m^2 - (m^2 - 2mn + 5n^2) \\ &= x^2 + mn - m^2 - m^2 + 2mn - 5n^2 \\ &= (x^2 - 5n^2) + (mn + 2mn) + (-m^2 - m^2) \\ &= x^2 - 4n^2 + 3mn - 2m^2 \end{aligned}$$

10. ATQ,

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

12. ATQ,

$$\begin{aligned} & 3 - 2x + x^2 - x^3 - (x^3 - 3x^2 + 5x - 2) \\ &= 3 - 2x + x^2 - x^3 - x^3 + 3x^2 - 5x + 2 \\ &= (3 + 2) + (-2x - 5x) + (x^2 + 3x^2) + (-x^3 - x^3) \\ &= 5 - 7x + 4x^2 - 2x^3 \end{aligned}$$

13. Given:

$$x = 2a^2 + 3b^2 - 5ab$$

$$y = b^2 - 3a^2 + 7ab$$

$$z = 6a^2 - b^2 + ab$$

(i) $x + y - z$

$$\begin{aligned} &= (2a^2 + 3b^2 - 5ab) + (b^2 - 3a^2 + 7ab) - (6a^2 - b^2 + ab) \\ &= 2a^2 + 3b^2 - 5ab + b^2 - 3a^2 + 7ab - 6a^2 + b^2 - ab \\ &= (2a^2 - 3a^2 - 6a^2) + (3b^2 + b^2 + b^2) + (-5ab + 7ab - ab) \\ &= -7a^2 + 5b^2 + ab \end{aligned}$$

15. Given: Perimeter of a rectangle = $16x^3 - 6x^2 + 12x + 4$

Let, One side = $8x^2 + 3x = l$

To find the other side = b

We know,

$$\text{Perimeter} = 2(l + b)$$

$$16x^3 - 6x^2 + 12x + 4 = 2(8x^2 + 3x + b)$$

$$\Rightarrow 16x^3 - 6x^2 + 12x + 4 = 16x^2 + 6x + 2b$$

$$\Rightarrow 16x^3 - 6x^2 + 12x + 4 - (16x^2 + 6x) = 2b$$

$$\Rightarrow 16x^3 - 6x^2 + 12x + 4 - 16x^2 - 6x = 2b$$

$$\Rightarrow (16x^3) + (-6x^2 - 16x^2) + (12x - 6x) + (4) = 2b$$

$$\Rightarrow 16x^3 - 22x^2 + 6x + 4 = 2b$$

$$\Rightarrow \frac{1}{2} (16x^3 - 22x^2 + 6x + 4) = b$$

$$\Rightarrow 8x^3 - 11x^2 + 3x + 2 = b$$

So the breadth = $8x^3 - 11x^2 + 3x + 2$.