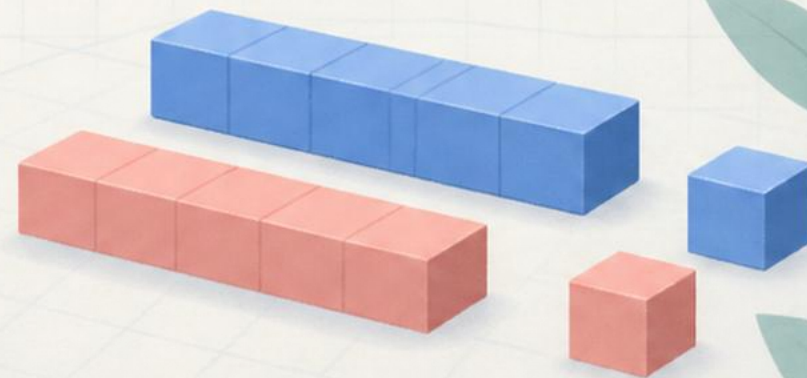
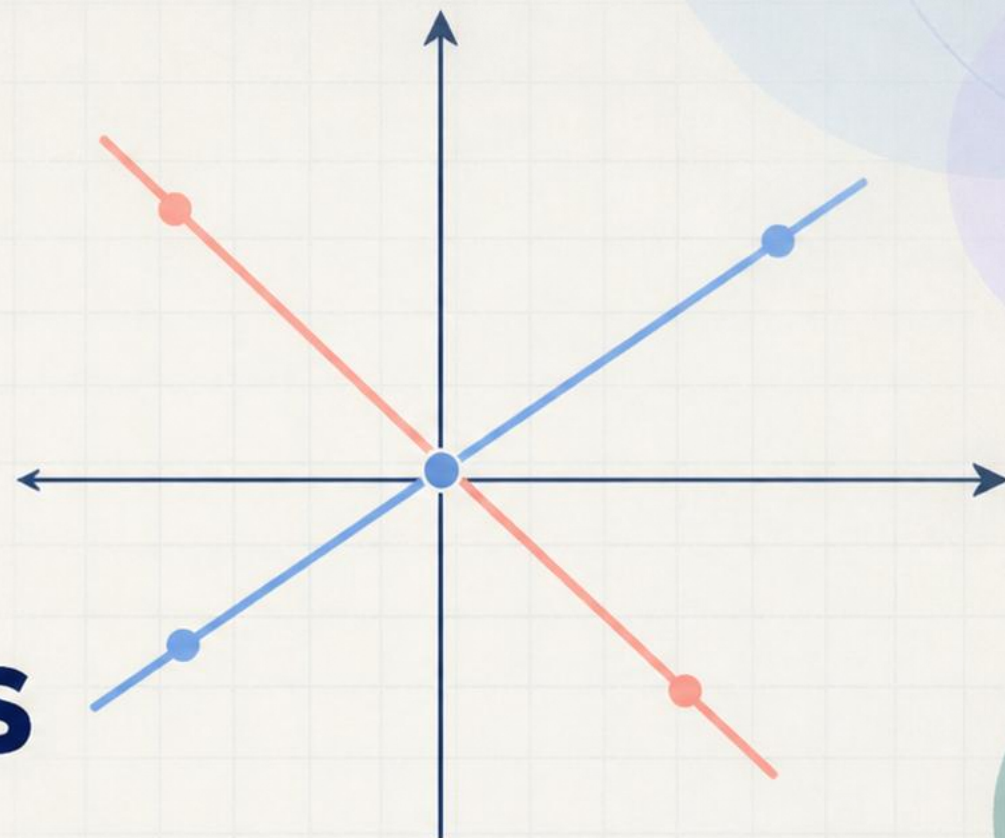


MATHEMATICS • CLASS 9

CHAPTER 2

Introduction to Linear Polynomials

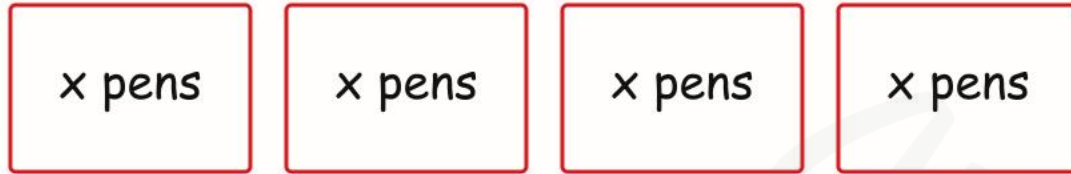
CHAPTER NOTES



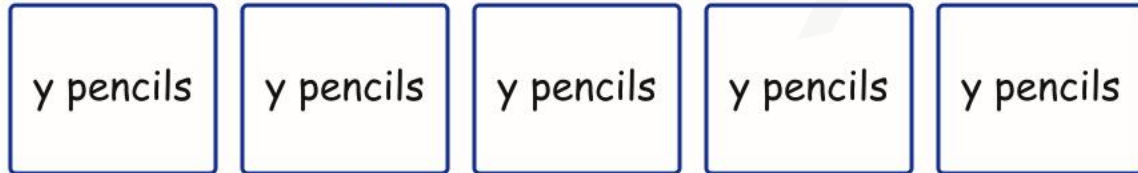
ALGEBRAIC EXPRESSIONS: TERMS & PARTS

- An algebraic expression combines numbers, variables and operation symbols.

4 RED BOXES (x PENS EACH)



5 BLUE BOXES (y PENCILS EACH)



3 EXTRA PENS



$$\text{Total items} = 4x + 5y + 3$$

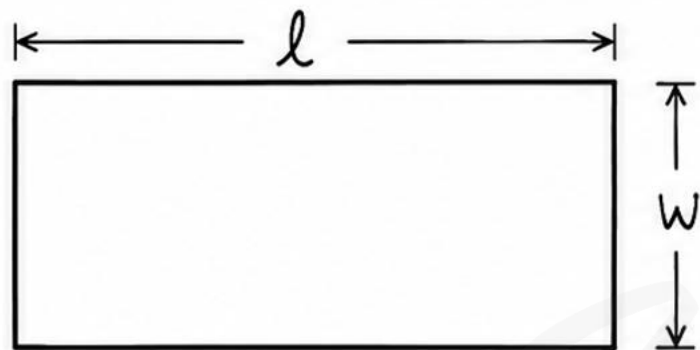
Diagram illustrating the parts of the algebraic expression $4x + 5y + 3$:

- COEFFICIENT OF x** (4)
- VARIABLE x** (x)
- COEFFICIENT OF y** (5)
- VARIABLE y** (y)
- CONSTANT** (3)

- VARIABLE**: a letter whose value may change.
Here, x = pens in one red box;
 y = pencils in one blue box.
 - TERM**: each part separated by + or -.
Terms: $4x$, $5y$ and 3 .
 - COEFFICIENT**: the numerical factor multiplying a variable.
Coefficients of x and y are 4 and 5.
 - CONSTANT**: a term without a variable.
Constant = 3.
- * Unlike terms cannot be combined.

BUILDING EXPRESSIONS FROM SITUATIONS

GARDEN COST: TWO VARIABLES



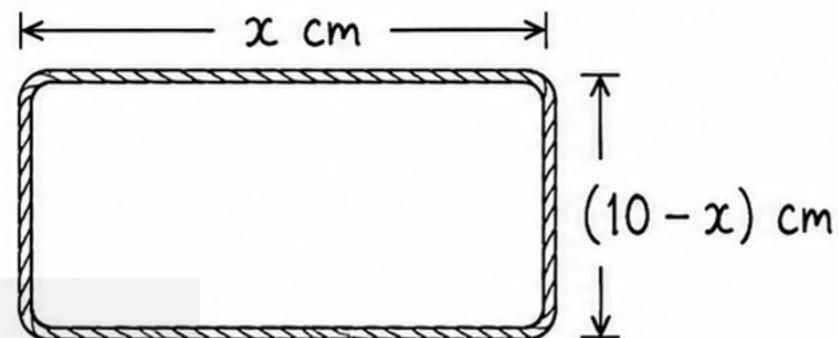
- Wire along two lengths: $2l \times ₹100 = ₹200l$
- Wood along two widths: $2w \times ₹80 = ₹160w$
- Seeds for area lw : $lw \times ₹50 = ₹50lw$

$$\text{Total cost} = ₹(200l + 160w + 50lw)$$

This is a polynomial in two variables, l and w .

Two independent measurements $\rightarrow$ two variables

20 cm WIRE RECTANGLE: ONE VARIABLE



$$\text{Perimeter} = 20 \text{ cm}$$

$$2(\text{length} + \text{width}) = 20$$

$$\text{length} + \text{width} = 10$$

$$\text{width} = 10 - x$$

$$\begin{aligned}\text{Area, } A &= x(10 - x) \\ &= 10x - x^2 \text{ cm}^2\end{aligned}$$

The area changes with x , so A is a function of x .
 $10x - x^2$ is a quadratic polynomial.

One measurement written using another $\rightarrow$ one variable

ONE-VARIABLE POLYNOMIALS & DEGREE

- A one-variable (univariate) polynomial is an algebraic expression in only one variable.
- The exponents of the variable are whole numbers: 0, 1, 2, 3, ...
- DEGREE = the highest power of the variable with a non-zero coefficient.

For $p(x) = 4x^3 - 7x + 2$,
highest power = 3, so degree = 3.

1.	CONSTANT POLYNOMIAL	$8 = 8x^0$	degree 0
2.	LINEAR POLYNOMIAL	$3z + 7$ ↑ highest-power term	degree 1
3.	QUADRATIC POLYNOMIAL	$x^2 + 5x + 1$ ↑ highest-power term	degree 2
4.	CUBIC POLYNOMIAL	$5y^3 + y^2 + 2y - 1$ ↑ highest-power term	degree 3

Degree tells the greatest exponent — not the number of terms.

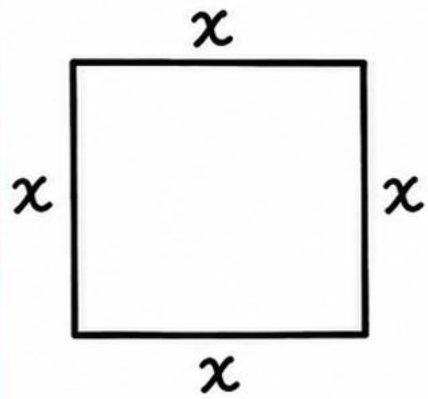
LINEAR POLYNOMIALS & CONSTANT CHANGE

A linear polynomial in one variable has degree 1.

$$p(x) = ax + b, \text{ where } a \neq 0$$

a is the coefficient of x ; b is the constant term.

SQUARE PERIMETER



$$\begin{aligned}\text{Perimeter} &= x + x + x + x \\ &= 4x\end{aligned}$$

$4x$ is linear because the highest power of x is 1.

CHESS CLUB FEE

Joining fee = ₹200

Each match = ₹50

Total paid after m matches = ₹ $(200 + 50m)$

m :	0	1	2	3	4
Amount (₹):	200	250	300	350	400

$+50$ $+50$ $+50$ $+50$



- A linear pattern has a constant difference between consecutive terms.
- Here the amount increases by ₹50 for every extra match.
constant difference = coefficient of $m = 50$



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