MATHS BASE MAKER

Class 9 CBSE Mathematics | Ganita Manjari

Chapter 2: Introduction to Linear Polynomials

STUDENT PRACTICE WORKSHEET (concept + questions)

PART 1: CORE CONCEPTS & DEFINITIONS

• **Polynomial:** An algebraic expression consisting of variables, coefficients, and constants connected by addition or subtraction. Example in 4x + 5y + 3: Terms are 4x, 5y, 3; Variables are x, y; Coefficients are 4 (for x) and 5 (for y); Constant is 3.

• **Degree & Standard Form:** Degree is the highest power of the variable. A Linear Polynomial is of degree 1 with standard form ax + b (where a ≠ 0).

Polynomial Type	Standard Form	Degree	Example
Constant Polynomial	c (where c ≠ 0)	0	p(x) = 8, p(x) = –5
Linear Polynomial	ax + b (a ≠ 0)	1	p(x) = 3x + 7, 2x + 3, –5x
Quadratic Polynomial	$ax^2 + bx + c$ (a ≠ 0)	2	$p(x) = x^2 + 5x + 1$
Cubic Polynomial	$ax^3 + bx^2 + cx + d$ (a ≠ 0)	3	$p(x) = 5x^3 + x^2 + 2x – 1$

PART 2: PRACTICE QUESTIONS

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https://youtu.be/1psBmwyZlQU

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Sample Question: Degrees and Coefficients

Find the degrees and coefficients of x^2, z^3, and x in the following:

• $6x^2 – 5x + 3$

• $3z^3 + 2z^2 + 2z – 1$

- -5
- $2y - 7$

Final Answer: **(i) $6x^2 - 5x + 3$: Degree = 2; Coeff of x^2 = 6; Coeff of x = −5**
(ii) $3z^3 + 2z^2 + 2z - 1$: Degree = 3; Coeff of z^3 = 3; Coeff of z^2 = 2; Coeff of z = 2
(iii) −5: Degree = 0 (Constant polynomial); Coeff of x = 0
(iv) 2y − 7: Degree = 1 (Linear polynomial in y); Coeff of y = 2

Sample Question: Value of Given Polynomial

Find the value of each given polynomial at the stated value:
(a) $p(x) = 4x^2 - 5x + 3$, if $x = -1$
(b) $p(y) = 2y^3 + 2y^2 + 2y - 1$, if $y = 2$

Final Answer: **(a) $p(-1) = 4(-1)^2 - 5(-1) + 3 = 4 + 5 + 3 = 12$ [Note: If $4x^2 + 5x + 3$, value is 2]**
(b) $p(2) = 2(2)^3 + 2(2)^2 + 2(2) - 1 = 16 + 8 + 4 - 1 = 27$

Linear Pattern Questions

1. Water Tank Problem

A water tank initially contains 900 liters of water. Every hour, 45 litres are used.
(i) How much water will remain after 5 hours?
(ii) Find a linear expression for the amount of water left after n hours.

Final Answer: **(i) 675 litres [900 − 5(45) = 900 − 225 = 675]**
(ii) 900 − 45n

2. Candle Problem

A candle of height 30 cm burns uniformly by 2 cm every hour.
(i) What will be its height after 8 hours?
(ii) Write a linear expression for the height after t hours.

Final Answer: **(i) 14 cm [30 − 8(2) = 30 − 16 = 14]**
(ii) 30 − 2t

3. Gaming Centre Problem

A gaming centre charges a fixed entry fee and ₹50 per hour. A student paid:
- ₹250 for 3 hours
- ₹450 for 7 hours

Find the linear equation relating bill amount and hours.

Final Answer: **Linear Equation: y = 50x + 100 (where Fixed Entry Fee = ₹100)**

Graphing Linear Equations: Table of Values & Slope Analysis

Table of Values & Slopes

Complete a 3-point table of values (x, y) and identify the slope (a) and y-intercept (b) in the form y = ax + b for each of the following lines:

(a) y = 2x + 5
(b) y = 2x – 5
(c) y = –2x + 5
(d) y = –2x – 5
(e) y = 2x
(f) y = 3x

Final Answer: **(a) a = 2, b = 5; Points: (0, 5), (1, 7), (–1, 3)**
(b) a = 2, b = –5; Points: (0, –5), (1, –3), (2, –1)
(c) a = –2, b = 5; Points: (0, 5), (1, 3), (2, 1)
(d) a = –2, b = –5; Points: (0, –5), (1, –7), (–1, –3)
(e) a = 2, b = 0; Points: (0, 0), (1, 2), (2, 4)
(f) a = 3, b = 0; Points: (0, 0), (1, 3), (2, 6)

Graph Interpretation Questions

Graph 1: Line passing through points (0, 1) and (2, 2)

1. Is the slope positive or negative?
2. Find the value of a.
3. Find the value of b (y-intercept).
4. Write equation in the form y = ax + b.

Final Answer: **1. Slope is Positive (line rises to the right)**
2. a = 0.5 (or 1/2)
3. b = 1
4. y = 0.5x + 1

Graph 2: Line passing through points (0, –4) and (4, 0)

1. Is the slope positive or negative?
2. Find the value of a.
3. Find the value of b (y-intercept).
4. Write equation in the form y = ax + b.

Final Answer: **1. Slope is Positive**
2. a = 1
3. b = –4
4. y = x – 4

Graph 3: Line passing through points (0, –2) and (–2, 0)

1. Is the slope positive or negative?

2. Find the value of a.
3. Find the value of b (y-intercept).
4. Write equation in the form y = ax + b.

Final Answer: 1. Slope is Negative (line falls to the right)
2. a = –1
3. b = –2
4. y = –x – 2

Graph 4: Line passing through points (0, 0) and (2, 3)

1. Is the slope positive or negative?
2. Find the value of a.
3. Find the value of b (y-intercept).
4. Write equation in the form y = ax + b.

Final Answer: 1. Slope is Positive
2. a = 1.5 (or 3/2)
3. b = 0
4. y = 1.5x

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