

**PRACTICE PAPER 04 (2026-27)**  
**CHAPTER 02 INTRODUCTION TO LINEAR POLYNOMIALS**

**SUBJECT: MATHEMATICS**

**CLASS : IX**

**MAX. MARKS : 40**

**DURATION : 1½ hrs**

**General Instructions:**

- (i). All questions are compulsory.
- (ii). This question paper contains 20 questions divided into five Sections A, B, C, D and E.
- (iii). **Section A** comprises of 10 MCQs of 1 mark each. **Section B** comprises of 4 questions of 2 marks each. **Section C** comprises of 3 questions of 3 marks each. **Section D** comprises of 1 question of 5 marks each and **Section E** comprises of 2 Case Study Based Questions of 4 marks each.
- (iv). There is no overall choice.
- (v). Use of Calculators is not permitted

**SECTION – A**

**Questions 1 to 10 carry 1 mark each.**

1. A publishing company spends ₹60,000 as a fixed setup cost and ₹45 for printing each book. If  $x$  books are printed, the total printing cost is:  
(a)  $60000x + 45$                       (b)  $45x + 60000$                       (c)  $60045x$                       (d)  $60000 + 45$
2. The graph of a linear polynomial passes through (0, 7) and (5, 22). The slope of the graph is:  
(a) 2                      (b) 3                      (c) 4                      (d) 5
3. A mobile company charges a fixed monthly rental of ₹199 and ₹3 per SMS sent. The monthly bill for  $x$  SMS is:  
(a)  $199x + 3$                       (b)  $3x + 199$                       (c)  $202x$                       (d)  $199 + 3$
4. The constant term of  $13x - 27$  is:  
(a) 13                      (b) -13                      (c) 27                      (d) -27
5. A school library contains 18,000 books. Every year, 650 new books are added. The total number of books after  $t$  years is:  
(a)  $18000 + 650t$                       (b)  $18000t + 650$                       (c)  $650t - 18000$                       (d)  $18650t$
6. If  $p(x) = 8x - 19$ , then  $p(5) =$   
(a) 19                      (b) 21                      (c) 23                      (d) 25
7. Which of the following equations represents a line passing through the origin?  
(a)  $y = 9x + 1$                       (b)  $y = 9x - 3$                       (c)  $y = 9x$                       (d)  $y = 1 - 9x$
8. A water tank initially contains 3000 litres of water and gains 80 litres every hour. The amount of water after  $h$  hours is:  
(a)  $3000 + 80h$                       (b)  $3000 - 80h$                       (c)  $80h - 3000$                       (d)  $3080h$

**In the following questions 9 and 10, a statement of assertion (A) is followed by a statement of Reason (R). Choose the correct answer out of the following choices.**

- (a) Both A and R are true and R is the correct explanation of A.
- (b) Both A and R are true but R is not the correct explanation of A.
- (c) A is true but R is false.
- (d) A is false but R is true.

9. **Assertion (A):** The graph of  $y = -4x + 15$  cuts the y-axis at (0,15).  
**Reason (R):** For a linear polynomial  $y = ax + b$ , the y-intercept is equal to b.
10. **Assertion (A):** The lines  $y = 6x + 2$  and  $y = 6x - 8$  are parallel.  
**Reason (R):** Parallel lines have equal slopes.

### SECTION – B

Questions 11 to 14 carry 2 marks each.

11. A school organises an educational trip. The transportation cost is represented by  $T = 120x + 3500$ , where  $x$  is the number of students participating.  
Find: (i) The transportation cost for 25 students.  
(ii) The transportation cost for 40 students.  
(iii) By how much does the transportation cost increase when the number of students increases from 25 to 40?
12. A coaching institute charges a fixed admission fee and ₹450 per month. A student pays ₹3600 for 6 months. Find: (i) The admission fee.  
(ii) The total fee for 10 months.
13. The  $n$ th term of a number pattern is  $18n - 11$   
Find: (i) The 12th term.  
(ii) The 25th term.  
(iii) The difference between these two terms.
14. The equation of a straight road is  $y = 12x - 9$   
Find: (i) Its slope.  
(ii) Its y-intercept.  
(iii) Explain whether the road rises or falls as  $x$  increases.

### SECTION – C

Questions 15 to 17 carry 3 marks each.

15. A bicycle rental company charges a fixed booking fee and ₹35 per hour.  
A customer rents a bicycle for 8 hours and pays ₹430.  
Find: (i) The fixed booking fee.  
(ii) The linear equation representing the total rental charge.  
(iii) The rental charge for 15 hours.  
(iv) The additional amount required when the rental duration increases from 8 hours to 15 hours.
16. A graph passes through the points (2, 5) and (8, 29)  
Find: (i) The slope of the graph.  
(ii) The equation of the graph.  
(iii) The value of  $y$  when  $x = 15$ .  
(iv) The value of  $x$  when  $y = 53$ .
17. Draw the graph of linear equation  $3x - 7y = 21$ . Check whether (8, 1) is a solution of the given equation or not.

### SECTION – D

Questions 18 carry 5 marks each.

18. A digital coaching platform charges a one-time registration fee and ₹250 per month as subscription charges. A student pays ₹4900 for 16 months.

- Find: (i) The registration fee.  
(ii) The linear equation representing the total payment.  
(iii) The payment for 24 months.  
(iv) The number of months corresponding to a payment of ₹7400.  
(v) If another platform charges ₹300 per month with no registration fee, determine which platform is cheaper for 24 months.

### **SECTION – E (Case Study Based Questions)**

**Questions 19 to 20 carry 4 marks each.**

#### **19. Case Study - 1: Electric Bus Transportation Project**

To promote sustainable transportation, a city introduced electric buses. The operating company charges a fixed maintenance cost of ₹50,000 per month and an additional ₹2,500 for every route operated daily. During a planning exercise, city officials analysed different route combinations to estimate monthly expenses. Students were asked to represent the operating expenditure using linear polynomials and determine the impact of increasing the number of routes. Such mathematical models help urban planners make efficient decisions regarding public transportation systems while maintaining environmental sustainability and cost effectiveness.



**Answer the following Questions:**

- Write the linear equation representing the monthly operating cost.
- Calculate the operating cost for 20 routes.
- Find the number of routes corresponding to a monthly expenditure of ₹1,25,000.
- State the slope of the equation and explain its practical significance.

#### **20. Case Study - 2: Forest Conservation and Tree Population Study**

Environmental scientists are studying a protected forest area containing 48,000 trees. Due to a planned afforestation programme, 1,200 new trees are planted every year. Researchers use mathematical models to predict future tree population and evaluate the effectiveness of conservation policies. Students participating in an environmental awareness campaign analyse the situation using linear polynomials and determine how the tree population changes over time. Since the number of trees increases by a constant amount every year, the relationship can be represented by a linear polynomial.



**Answer the following Questions:**

- Write the linear equation representing the tree population after  $t$  years.
- Find the population after 10 years.
- Determine after how many years the population will become 60,000.
- State whether the situation represents linear growth or linear decay.

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**(ANSWERS)**

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**SECTION – A**

Questions 1 to 10 carry 1 mark each.

1. A publishing company spends ₹60,000 as a fixed setup cost and ₹45 for printing each book. If  $x$  books are printed, the total printing cost is:

(a)  $60000x + 45$                       (b)  $45x + 60000$                       (c)  $60045x$                       (d)  $60000 + 45$

**Ans: (b)  $45x + 60000$**

Fixed cost = ₹60,000

Variable cost = ₹45 per book

Therefore,  $C = 45x + 60000$

2. The graph of a linear polynomial passes through (0, 7) and (5, 22). The slope of the graph is:

(a) 2                                      (b) 3                                      (c) 4                                      (d) 5

**Ans: (b) 3**

$$m = \frac{22 - 7}{5 - 0}$$

$$= \frac{15}{5}$$

$$= 3$$

3. A mobile company charges a fixed monthly rental of ₹199 and ₹3 per SMS sent.

The monthly bill for  $x$  SMS is:

(a)  $199x + 3$                       (b)  $3x + 199$                       (c)  $202x$                       (d)  $199 + 3$

**Ans: (b)  $3x + 199$**

4. The constant term of  $13x - 27$  is:

(a) 13                                      (b) -13                                      (c) 27                                      (d) -27

**Ans: (d) -27**

5. A school library contains 18,000 books. Every year, 650 new books are added.

The total number of books after  $t$  years is:

(a)  $18000 + 650t$                       (b)  $18000t + 650$                       (c)  $650t - 18000$                       (d)  $18650t$

**Ans: (a)  $18000 + 650t$**

6. If  $p(x) = 8x - 19$ , then  $p(5) =$

(a) 19                                      (b) 21                                      (c) 23                                      (d) 25

**Ans: (b) 21**

$$p(5) = 8(5) - 19 = 40 - 19 = 21$$

7. Which of the following equations represents a line passing through the origin?  
 (a)  $y = 9x + 1$  (b)  $y = 9x - 3$  (c)  $y = 9x$  (d)  $y = 1 - 9x$   
**Ans: (c)  $y = 9x$**

8. A water tank initially contains 3000 litres of water and gains 80 litres every hour.  
 The amount of water after  $h$  hours is:  
 (a)  $3000 + 80h$  (b)  $3000 - 80h$  (c)  $80h - 3000$  (d)  $3080h$   
**Ans: (a)  $3000 + 80h$**

**In the following questions 9 and 10, a statement of assertion (A) is followed by a statement of Reason (R). Choose the correct answer out of the following choices.**

- (a) Both A and R are true and R is the correct explanation of A.  
 (b) Both A and R are true but R is not the correct explanation of A.  
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9. **Assertion (A):** The graph of  $y = -4x + 15$  cuts the y-axis at (0,15).  
**Reason (R):** For a linear polynomial  $y = ax + b$ , the y-intercept is equal to b.  
**Ans: (a) Both A and R are true and R is the correct explanation.**

10. **Assertion (A):** The lines  $y = 6x + 2$  and  $y = 6x - 8$  are parallel.  
**Reason (R):** Parallel lines have equal slopes.  
**Ans: (a) Both A and R are true and R is the correct explanation.**

### **SECTION – B**

**Questions 11 to 14 carry 2 marks each.**

11. A school organises an educational trip. The transportation cost is represented by  $T = 120x + 3500$ , where  $x$  is the number of students participating.  
 Find: (i) The transportation cost for 25 students.  
 (ii) The transportation cost for 40 students.  
 (iii) By how much does the transportation cost increase when the number of students increases from 25 to 40?  
**Ans:** Given,  $T = 120x + 3500$   
 For 25 students,  
 $T = 120(25) + 3500 = 3000 + 3500 = 6500$   
 For 40 students,  
 $T = 120(40) + 3500 = 4800 + 3500 = 8300$   
 Increase in cost =  $8300 - 6500 = 1800$
12. A coaching institute charges a fixed admission fee and ₹450 per month. A student pays ₹3600 for 6 months.  
 Find: (i) The admission fee.  
 (ii) The total fee for 10 months.  
**Ans:** Let admission fee = ₹ $b$   
 Total fee:  $F = 450x + b$   
 Given:  $3600 = 450(6) + b = 2700 + b$   
 $\Rightarrow b = 900$   
 Admission fee = ₹900  
 For 10 months:  
 $F = 450(10) + 900 = 4500 + 900 = 5400$

13. The  $n$ th term of a number pattern is  $18n - 11$

Find: (i) The 12th term.

(ii) The 25th term.

(iii) The difference between these two terms.

**Ans:**  $T_{12} = 18(12) - 11 = 216 - 11 = 205$

$T_{25} = 18(25) - 11 = 450 - 11 = 439$

Difference:  $439 - 205 = 234$

14. The equation of a straight road is  $y = 12x - 9$

Find: (i) Its slope.

(ii) Its  $y$ -intercept.

(iii) Explain whether the road rises or falls as  $x$  increases.

**Ans:** Comparing  $y = 12x - 9$  with  $y = ax + b$ , we get

$a = 12$  and  $b = -9$

Hence, Slope = 12 and  $Y$ -intercept =  $-9$

Since slope is positive, the graph rises from left to right.

### SECTION - C

Questions 15 to 17 carry 3 marks each.

15. A bicycle rental company charges a fixed booking fee and ₹35 per hour.

A customer rents a bicycle for 8 hours and pays ₹430.

Find: (i) The fixed booking fee.

(ii) The linear equation representing the total rental charge.

(iii) The rental charge for 15 hours.

(iv) The additional amount required when the rental duration increases from 8 hours to 15 hours.

**Ans:** Let fixed booking fee = ₹ $b$

Total rental charge:  $y = 35x + b$

Given:  $430 = 35(8) + b = 280 + b$

$\Rightarrow b = 150$

Thus, fixed booking fee = ₹150

Equation:  $y = 35x + 150$

For 15 hours:

$y = 35(15) + 150 = 525 + 150 = 675$

Additional amount:  $675 - 430 = 245$

16. A graph passes through the points (2, 5) and (8, 29)

Find: (i) The slope of the graph.

(ii) The equation of the graph.

(iii) The value of  $y$  when  $x = 15$ .

(iv) The value of  $x$  when  $y = 53$ .

**Ans:** Slope:  $m = \frac{29-5}{8-2} = \frac{24}{6} = 4$

Equation:  $y = 4x + b$

Using point (2,5),

$5 = 4(2) + b$

$\Rightarrow 5 = 8 + b$

$\Rightarrow b = -3$

Equation:  $y = 4x - 3$

When  $x = 15$  then  $y = 4(15) - 3 = 60 - 3 = 57$

When  $y = 53$  then  $53 = 4x - 3 \Rightarrow 4x = 56 \Rightarrow x = 14$

17. Draw the graph of linear equation  $3x - 7y = 21$ . Check whether (8, 1) is a solution of the given equation or not.

Ans.  $3x - 7y = 21$  ... (i)

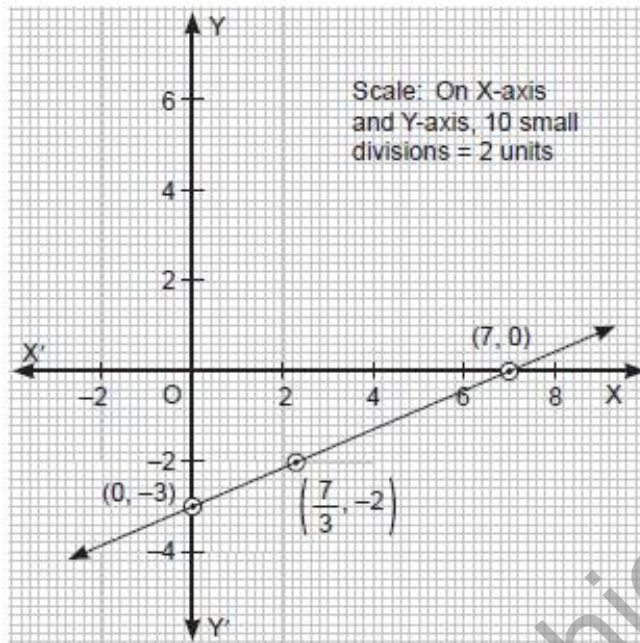
|     |    |   |       |
|-----|----|---|-------|
| $x$ | 0  | 7 | $7/3$ |
| $y$ | -3 | 0 | -2    |

On putting  $x = 8$  and  $y = 1$  in (i), we have

$$3 \times 8 - 7 \times 1 = 21 \quad 24 - 7 = 21$$

$$17 = 21, \quad \text{false ( } 17 \neq 21 \text{ )}$$

Hence, (8, 1) is not a solution of the equation  $3x - 7y = 21$ .



**18.** A village water tank initially stores 24,000 litres of water. Every day, 600 litres are supplied to nearby houses.

Find: (i) A linear equation representing the amount of water remaining after  $d$  days.

(ii) Water remaining after 25 days.

(iii) After how many days will only 6,000 litres remain?

(iv) Explain why the situation represents a linear relationship.

**Ans:** Initial water = 24,000 litres

Daily decrease = 600 litres

$$\text{Equation: } W = 24000 - 600d$$

For 25 days,

$$W = 24000 - 600(25)$$

$$= 24000 - 15000$$

$$= 9000$$

For 6000 litres remaining,

$$24000 - 600d = 6000$$

$$\Rightarrow 600d = 18000$$

$$\Rightarrow d = 30$$

The water decreases by a fixed quantity every day.

Therefore, the relationship is linear.

### SECTION - D

**Questions 18 carry 5 marks each.**

**19.** A digital coaching platform charges a one-time registration fee and ₹250 per month as subscription charges. A student pays ₹4900 for 16 months.

Find: (i) The registration fee.

- (ii) The linear equation representing the total payment.
- (iii) The payment for 24 months.
- (iv) The number of months corresponding to a payment of ₹7400.
- (v) If another platform charges ₹300 per month with no registration fee, determine which platform is cheaper for 24 months.

**Ans:** (i) Let registration fee = ₹ $b$

$$y = 250x + b$$

$$\text{Given: } 4900 = 250(16) + b = 4000 + b$$

$$\Rightarrow b = 900$$

Registration fee = ₹900

$$(ii) \text{ Equation: } y = 250x + 900$$

(iii) For 24 months:

$$y = 250(24) + 900$$

$$= 6000 + 900$$

$$= 6900$$

(iv) For payment ₹7400:

$$250x + 900 = 7400$$

$$\Rightarrow 250x = 6500$$

$$\Rightarrow x = 26$$

(v) For second platform:

$$300(24) = 7200$$

Comparison:

$$\text{Platform 1} = ₹6900$$

$$\text{Platform 2} = ₹7200$$

$$\text{Difference: } 7200 - 6900 = 300$$

Therefore Platform 1 is cheaper by ₹300.

### SECTION – E (Case Study Based Questions)

Questions 19 to 20 carry 4 marks each.

#### 20. Case Study - 1: Electric Bus Transportation Project

To promote sustainable transportation, a city introduced electric buses. The operating company charges a fixed maintenance cost of ₹50,000 per month and an additional ₹2,500 for every route operated daily. During a planning exercise, city officials analysed different route combinations to estimate monthly expenses. Students were asked to represent the operating expenditure using linear polynomials and determine the impact of increasing the number of routes. Such mathematical models help urban planners make efficient decisions regarding public transportation systems while maintaining environmental sustainability and cost effectiveness.



**Answer the following Questions:**

- (a) Write the linear equation representing the monthly operating cost.
- (b) Calculate the operating cost for 20 routes.

- (c) Find the number of routes corresponding to a monthly expenditure of ₹1,25,000.  
 (d) State the slope of the equation and explain its practical significance.

**Ans:** (a) Fixed cost = ₹50,000

Cost per route = ₹2,500

Equation:  $y = 2500x + 50000$

(b) For 20 routes:

$$y = 2500(20) + 50000 = 50000 + 50000 = 100000$$

(c) For ₹125000:

$$2500x + 50000 = 125000$$

$$\Rightarrow 2500x = 75000$$

$$\Rightarrow x = 30$$

(d) Slope = 2500.

It represents the increase in operating cost for every additional route.

## 21. Case Study - 2: Forest Conservation and Tree Population Study

Environmental scientists are studying a protected forest area containing 48,000 trees. Due to a planned afforestation programme, 1,200 new trees are planted every year. Researchers use mathematical models to predict future tree population and evaluate the effectiveness of conservation policies. Students participating in an environmental awareness campaign analyse the situation using linear polynomials and determine how the tree population changes over time. Since the number of trees increases by a constant amount every year, the relationship can be represented by a linear polynomial.



**Answer the following Questions:**

- (a) Write the linear equation representing the tree population after  $t$  years.  
 (b) Find the population after 10 years.  
 (c) Determine after how many years the population will become 60,000.  
 (d) State whether the situation represents linear growth or linear decay.

**Ans:** (a) Initial population = 48,000 trees

Increase per year = 1,200 trees

Equation:  $P = 48000 + 1200t$

(b) For 10 years:

$$P = 48000 + 1200(10)$$

$$= 48000 + 12000$$

$$= 60000$$

(c) For population 60,000:

$$48000 + 1200t = 60000$$

$$\Rightarrow 1200t = 12000$$

$$\Rightarrow t = 10$$

(d) Since the population increases uniformly every year, the situation represents linear growth.