

Tarun Classes of Mathematics

IIT-JEE Mains | CBSE | PU-CET | NDA

CLASS 9 – CBSE | MATHEMATICS

Introduction to Linear Polynomials

SECTION -A (Multiple choice questions)

- The slope of the line passing through $(-1,4)$ and $(3,12)$ is:
(a) 2 (b) 3 (c) 4 (d) 5
- The slope of the line $y = -4x + 7$ is:
(a) -7 (b) 4 (c) 7 (d) -4
- The slope of a horizontal line is:
(a) 0 (b) 1 (c) Undefined (d) -1
- The lines $y = 2x + 3$ and $y = 2x - 5$ are:
(a) Perpendicular (b) Parallel (c) Intersecting at one point (d) Coincident
- Which of the following equations represents a line passing through the origin?
(a) $y = 2x + 3$ (b) $y = 8x - 1$ (c) $y = 10x$ (d) $y = 4x + 9$
- A savings account starts with ₹12000 and grows by ₹1500 every month. The total balance after t months is:
(a) $1500 + 12000t$ (b) $12000 + 1500t$ (c) $(13500)t$ (d) $12000 - 1500t$
- A candle is 20 cm tall and burns down at 2 cm per hour. The remaining height (in cm) after t hours is:
(a) $-2 + 20t$ (b) $20 - 2t$ (c) $(18)t$ (d) $20 + 2t$
- A library charges a fixed registration fee of ₹100 plus a late fee of ₹5 per day. If a book is returned x days late, the total charge is:
(a) $₹100x + ₹5$ (b) $₹5x + ₹100$ (c) $₹105x$ (d) $₹-5x + ₹100$
- If $p(x) = 8x - 5$, then $p(4) =$
(a) -27 (b) 27 (c) 37 (d) 32

10. The slope of the line $2x + 3y = 6$ is:

- (a) $\frac{2}{3}$ (b) $-\frac{2}{3}$ (c) $\frac{3}{2}$ (d) $-\frac{3}{2}$

11. A taxi fare starts at ₹60 and remains the same for the initial 3 km. Then it increases by ₹18 per km. What will be the fare for a travel of 12 km?

- (a) ₹276 (b) ₹222 (c) ₹936 (d) ₹162

12. The y-intercept of the line $2x + 3y = 12$ is:

- (a) 6 (b) 4 (c) 3 (d) 12

13. The graph of a linear polynomial $y = ax + b$ is always a:

- (a) Parabola (b) Circle (c) Straight line (d) Curve

14. The zero of the linear polynomial $p(x) = 7x$ is:

- (a) $x = 7$ (b) $x = 1$ (c) $x = 0$ (d) $x = -7$

In the following questions 15 to 18, 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

15. **Assertion (A):** The lines $y = 5x + 7$ and $y = 5x - 2$ are parallel.

Reason (R): Two lines are parallel if and only if they have the same slope.

16. **Assertion (A):** The degree of the polynomial $7x + 5$ is 1.

Reason (R): A linear polynomial always has degree 1.

17. **Assertion (A):** The slope of the line $y = 7x - 3$ is 7.

Reason (R): In the equation $y = mx + c$, m represents the slope of the line.

18. **Assertion (A):** The zero of the polynomial $p(x) = 4x - 8$ is $x = -2$.

Reason (R): A zero of a polynomial $p(x)$ is a value of x for which $p(x) = 0$.

SECTION – B

19. A parking lot charges ₹10 for the first 1 hour and then ₹20 per additional hour. What will be the total charge for parking a car for 5 hours?

20. A rally starts with 120 members. Each hour, 9 members drop out of the group. How many members will remain after 1, 2, 3, ... hours? Find a linear expression to represent the number of members at the end of the n th hour.
21. A mobile phone is bought for Rs 10,000. Its value decreases by Rs 800 every year.
- Find the value of the phone after 3 years.
 - Make a table of values for t varying from 0 to 8 years and show how the value of the phone, v , depreciates with time.
 - Find an expression that relates v and t , and explain why it represents linear decay.
22. A learning platform charges a fixed monthly fee and an additional cost per digital learning module accessed. A student observes that when she accessed 10 modules, her bill was Rs 400. When she accessed 14 modules, her bill was Rs 500. If the monthly bill y depends on the number of modules accessed, x , according to the relation $y = ax + b$, find the values of a and b .
23. The graph of a linear polynomial $p(x)$ passes through the points (2, -5) and (4, 7).
- Find the polynomial $p(x)$.
 - Find the coordinates where the graph of $p(x)$ cuts the axes.
 - Draw the graph of $p(x)$ and verify your answers.
24. How many lines pass through point P (4, -2)? Write the 3 equations of such lines.
25. The work done by a body on application of a constant force is the product of the constant force and the distance travelled by the body in the direction of force. Express this in the form of a linear equation in two variables and draw its graph by taking the constant force as 3 units. What is the work done when the distance travelled is 2 units? Verify it by plotting the graph.
26. Draw the graph of the following equations, and identify their slopes and y -intercepts. Also, find the coordinates of the points where these lines cut the y -axis.
- $y = -3x + 4$
 - $2y = 4x + 7$
27. Draw the graphs of the following sets of lines. In each case, reflect on the role of 'a' and 'b' :
- $y = 3x - 1$, $y = 3x$, $y = 3x + 1$
 - $y = -6x$, $y = -3x$, $y = -x$
28. The linear equation that converts Fahrenheit (F) to Celsius (C) is given by the relation $C = \frac{(5F - 160)}{9}$.
- If the temperature is 86°F , what is the temperature in Celsius?
 - If the temperature is 35°C , what is the temperature in Fahrenheit?
 - If the temperature is 0°C what is the temperature in Fahrenheit and if the temperature is 0°F , what is the temperature in Celsius?
 - What is the numerical value of the temperature which is same in both the scales?

SECTION – C (Case Based Questions)

29. A school library starts with 18,000 books and adds 650 new books every year. Let t represent the number of years and $L(t)$ represent the total number of books.

- (i) Form the linear polynomial for $L(t)$.
- (ii) Find the number of years needed for the library to contain 22,550 books.
- (iii) State whether this situation represents linear growth or linear decay. Explain.
- (iv) What is the slope and y-intercept of the graph?

30. A cloud storage company gives every customer a fixed amount of free storage and then charges a fixed monthly base fee plus an additional cost for every extra GB of storage used beyond the free limit. A customer tracked her monthly bill and found that when she used 50 GB of extra storage, her bill was ₹450, and when she used 90 GB of extra storage, her bill was ₹650. Students studying linear polynomials were asked to model this situation. If the monthly bill y (in ₹) depends on the extra storage used, x (in GB), according to the relation $y = ax + b$, they were asked to find the values of a and b , and use the model to compare plans offered by different companies.

- (i) Using the given information, write the two linear equations in a and b obtained by substituting the two data points into $y = ax + b$.
- (ii) Solve the two equations obtained above to find the values of a and b .
- (iii) A rival company charges the same rate per extra GB but has a different fixed base fee, so its monthly bill is given by $y = 5x + 300$. Is the graph of the rival company's plan parallel to the graph of the customer's plan? Give a reason for your answer.

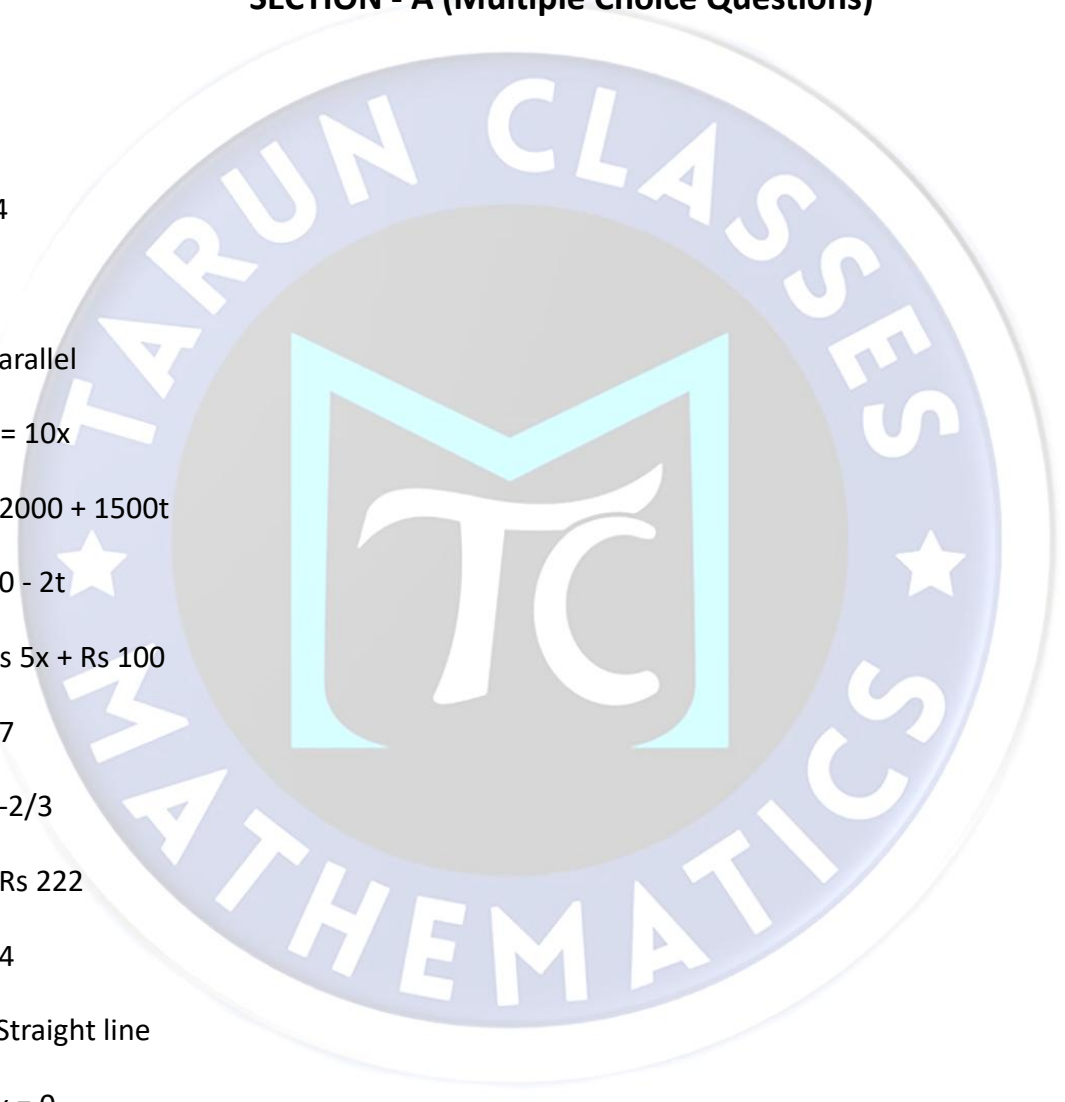
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Introduction to Linear Polynomials - Answer Key

SECTION - A (Multiple Choice Questions)

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1. (a) 2
2. (d) -4
3. (a) 0
4. (b) Parallel
5. (c) $y = 10x$
6. (b) $12000 + 1500t$
7. (b) $20 - 2t$
8. (b) Rs $5x$ + Rs 100
9. (b) 27
10. (b) $-2/3$
11. (b) Rs 222
12. (b) 4
13. (c) Straight line
14. (c) $x = 0$

Assertion – Reasoning

15. (a) Both A and R are true and R is the correct explanation of A.
16. (b) Both A and R are true but R is not the correct explanation of A.
17. (a) Both A and R are true and R is the correct explanation of A.
18. (d) A is false but R is true.

SECTION - B

19. Rs 90
20. $120 - 9n$
21. (i) Rs 7600 (ii) 10000, 9200, 8400, 7600, 6800, 6000, 5200, 4400, 3600 (iii) $v = 10000 - 800t$; linear decay
22. $a = 25$, $b = 150$
23. (i) $p(x) = 6x - 17$ (ii) x-intercept $(\frac{17}{6}, 0)$, y-intercept $(0, -17)$
24. Infinite lines. Example equations: $y = x - 6$, $y = 2x - 10$, $y = -x + 2$
25. $W = 3d$; work done when $d = 2$ is $W = 6$ units
26. (i) slope = -3, y-intercept = 4 (ii) $y = 2x + 3.5$; slope = 2, y-intercept = 3.5
27. (i) same slope 3, so lines are parallel (ii) all pass through origin; steeper as slope magnitude increases
28. (i) 30 degrees C (ii) 95 degrees F (iii) 0 degrees C = 32 degrees F; 0 degrees F is approximately – 17.78 degrees C (iv) -40

SECTION - C (Case Based Questions)

29. (i) $L(t) = 18000 + 650t$ (ii) 7 years (iii) linear growth, since the number of books increases by a fixed amount every year (iv) slope = 650, y-intercept = 18000
31. (i) $450 = 50a + b$ and $650 = 90a + b$ (ii) $a = 5$, $b = 200$ (iii) Yes, the lines are parallel since both have the same slope, 5.