NCERT Solutions Class 11 Maths
Chapter 9: Straight Lines
EXERCISE 9.2

Document Information:
Class: 11 | **Subject:** Mathematics | **Chapter:** 9 | **Exercise:** 9.2
Total Questions: 19 | **Academic Year:** 2025-26
Source: www.ncertbooks.net | **Generated:** February 21, 2026

Quick Summary: In NCERT Solutions Class 11 Maths Chapter 9 Exercise 9.2, students learn various forms of equation of a straight line through comprehensive problem-solving. This exercise covers slope-intercept form, point-slope form, and equations of coordinate axes, which are fundamental concepts for CBSE Class 11 board exams and competitive entrance tests.

Key Takeaways:

- Point-slope form: y - y_1 = m(x - x_1) where m is slope and (x_1, y_1) is a given point
- Slope-intercept form: y = mx + c where m is slope and c is y-intercept
- Equations of coordinate axes: x-axis is y = 0 and y-axis is x = 0
- Lines passing through origin have equation y = mx where slope determines the line's direction

Complete Solutions

Question 1

QUESTION

Write the equations for the x-axis and y-axis.

SOLUTION

The question asks us to determine the equations that represent the x-axis and y-axis in the Cartesian plane. This involves understanding how coordinates relate to these axes.

Step 1: Understanding the x-axis

The x-axis is a horizontal line. Any point on the x-axis has a y-coordinate of 0. The x-coordinate can be any real number, but the y-coordinate is always zero.

Step 2: Formulating the equation for the x-axis

Since the y-coordinate is always 0 for any point on the x-axis, the equation representing the x-axis is simply:

Step 3: Understanding the y-axis

The y-axis is a vertical line. Any point on the y-axis has an x-coordinate of 0. The y-coordinate can be any real number, but the x-coordinate is always zero.

Step 4: Formulating the equation for the y-axis

Since the x-coordinate is always 0 for any point on the y-axis, the equation representing the y-axis is:

Final Answer:

For the x-axis: ; for the y-axis: .

In summary, the equation represents all points where the y-coordinate is zero, which is precisely the x-axis. Similarly, the equation represents all points where the x-coordinate is zero, which is the y-axis.

ANSWER

For the x-axis: $y = 0$; for the y-axis: $x = 0$.

Question 2

QUESTION

Find the equation of the line passing through the point (-4, 3) with slope (1)/(2).

SOLUTION

We need to find the equation of a line that passes through the point and has a slope of . This question tests our understanding of the point-slope form of a line.

Step 1: Recall the point-slope form

The point-slope form of a line is given by:

where is a point on the line and is the slope of the line.

Step 2: Identify the given values

We are given the point and the slope .

Step 3: Substitute the values into the point-slope form

Substituting these values into the point-slope form, we get:

Simplifying:

Step 4: Simplify the equation to the general form

Multiply both sides by 2 to eliminate the fraction:

Rearrange the equation to get the general form :

Final Answer: The equation of the line is .

ANSWER

$x - 2y + 10 = 0$

Question 3

QUESTION

Find the equation of the line passing through (0, 0) with slope m.

SOLUTION

We are asked to find the equation of a line that passes through the origin and has a given slope .

Step 1: Recall the point-slope form of a line.

The point-slope form of a line is given by:

where is a point on the line and is the slope of the line.

Step 2: Substitute the given point and slope into the point-slope form.

We are given the point , so and . We are also given the slope .

Substituting these values into the point-slope form, we get:

Step 3: Simplify the equation.

Simplifying the equation, we have:

Final Answer:

The equation of the line passing through with slope is .

Conclusion:

The equation represents a straight line that always passes through the origin. The slope determines the steepness and direction of the line. If is positive, the line rises from left to right; if is negative, the line falls from left to right; and if is zero, the line is horizontal.

ANSWER

y = mx

Question 4

QUESTION

Find the equation of the line passing through (2, 2√3) and inclined with the x-axis at an angle of 75^\circ.

SOLUTION

We need to find the equation of a line that passes through the point and is inclined at an angle of with the x-axis.

Step 1: Find the slope of the line

The slope of a line inclined at an angle with the x-axis is given by . In our case, . We need to find .

We can express as . Using the formula for , we have:

We know and . Substituting these values:

So, the slope .

Step 2: Use the point-slope form of the equation of a line

The point-slope form of the equation of a line is given by , where is a point on the line and is the slope.

In our case, and . Substituting these values:

Step 3: Simplify the equation

Final Answer: The equation of the line is .

ANSWER

$(\sqrt{3} + 1)x - (\sqrt{3} - 1)y = 4(\sqrt{3} - 1)$

Question 5

QUESTION

Find the equation of the line intersecting the x-axis at a distance of 3 units to the left of the origin with slope -2.

SOLUTION

We are asked to find the equation of a line given its slope and the point where it intersects the x-axis.

Step 1: Identify the given information

The line intersects the x-axis at a distance of 3 units to the *left* of the origin. This means the line passes through the point .

The slope of the line is given as .

Step 2: Use the point-slope form of a line

The point-slope form of a line is given by:

, where is a point on the line and is the slope.

In our case, and .

Substituting these values into the point-slope form, we get:

Step 3: Simplify the equation

Step 4: Rearrange the equation into the standard form

To get the equation in the form , we rearrange the terms:

Final Answer: The equation of the line is .

ANSWER

2x + y + 6 = 0

Question 6

QUESTION

Find the equation of the line intersecting the y-axis at a distance of 2 units above the origin and making an angle of 30^\circ with the positive direction of the x-axis.

SOLUTION

We need to find the equation of a line given its y-intercept and the angle it makes with the positive x-axis.

Step 1: Identify the given information

The line intersects the y-axis at a distance of 2 units above the origin. This means the y-intercept, , is 2.

The line makes an angle of with the positive direction of the x-axis. This means the slope, , is given by .

Step 2: Calculate the slope

We know that . Therefore, the slope .

Step 3: Use the slope-intercept form of a line

The slope-intercept form of a line is given by: , where is the slope and is the y-intercept.

Substituting the values of and , we get: .

Step 4: Rearrange the equation to the general form

Multiply both sides of the equation by to eliminate the fraction:

Rearrange the terms to get the equation in the general form (Ax + By + C = 0):

Final Answer: The equation of the line is .

ANSWER

$x - \sqrt{3}y + 2\sqrt{3} = 0$

Question 7

QUESTION

Find the equation of the line passing through the points (-1, 1) and (2, -4).

SOLUTION

We need to find the equation of the line that passes through the points and .

Step 1: Find the slope (m) of the line.

The slope of a line passing through two points and is given by:

In our case, and . Substituting these values, we get:

So, the slope of the line is .

Step 2: Use the point-slope form of the equation of a line.

The point-slope form is given by:

We can use either of the given points. Let's use . Substituting and , we get:

Step 3: Simplify the equation to the standard form.

Multiply both sides by 3 to eliminate the fraction:

Rearrange the terms to get the equation in the form :

Final Answer: The equation of the line is .

ANSWER

$5x + 3y + 2 = 0$

Question 8

QUESTION

The vertices of \triangle PQR are P(2, 1), Q(-2, 3) and R(4, 5). Find the equation of the median through the vertex R.

SOLUTION

We are given the vertices of a triangle and asked to find the equation of the median through vertex .

Step 1: Understand the definition of a median

A median of a triangle is a line segment joining a vertex to the midpoint of the opposite side. In this case, we need the median through vertex , so we need to find the midpoint of side .

Step 2: Find the midpoint of side

Let be the midpoint of . The coordinates of the midpoint are given by the midpoint formula:

Here, and . So,

Thus, the midpoint of is .

Step 3: Find the equation of the median

We have the coordinates of and . The equation of the line passing through two points and is given by:

Substituting the coordinates of and :

Step 4: Simplify the equation

Cross-multiplying, we get:

Final Answer: The equation of the median through vertex is .

ANSWER

3x - 4y + 8 = 0

Question 9

QUESTION

Find the equation of the line passing through (-3, 5) and perpendicular to the line through the points (2, 5) and (-3, 6).

SOLUTION

We need to find the equation of a line that passes through the point and is perpendicular to the line passing through the points and .

Step 1: Find the slope of the line passing through and

The slope of the line passing through points and is given by:

Here, and . Therefore,

Step 2: Find the slope of the line perpendicular to the given line

If two lines are perpendicular, the product of their slopes is -1. Let be the slope of the line perpendicular to the given line. Then,

Step 3: Find the equation of the line with slope and passing through

The point-slope form of a line is given by:

Here, and . Therefore,

Final Answer: The equation of the required line is .

ANSWER

5x - y + 20 = 0

Question 10

QUESTION

A line perpendicular to the line segment joining the points (1, 0) and (2, 3) divides it in the ratio 1 : n. Find the equation of this line.

SOLUTION

This question involves finding the equation of a line that is perpendicular to a given line segment and divides it in a specific ratio. We'll use concepts of slope, section formula, and the equation of a line.

Step 1: Find the coordinates of the point dividing the line segment

Let the point divide the line segment joining and in the ratio . Using the section formula:

So, the coordinates of point are .

Step 2: Find the slope of the line segment AB

The slope of the line segment joining and is:

Step 3: Find the slope of the perpendicular line

The slope of the line perpendicular to is the negative reciprocal of :

Step 4: Find the equation of the perpendicular line

The equation of the line with slope passing through the point is:

Multiplying both sides by to eliminate fractions:

Final Answer: The equation of the line is .

ANSWER

$(1 + n)x + 3(1 + n)y = n + 11$

Question 11

QUESTION

Find the equation of a line that cuts off equal intercepts on the coordinate axes and passes through the point (2, 3).

SOLUTION

This question asks us to find the equation of a line with equal intercepts on the coordinate axes, given that it passes through the point . This tests our understanding of the intercept form of a line.

Step 1: Recall the intercept form of a line

The intercept form of a line is given by:

, where and are the x and y intercepts, respectively.

Step 2: Apply the condition of equal intercepts

Since the line cuts off equal intercepts, we have . Therefore, the equation becomes:

Step 3: Simplify the equation

Multiplying both sides by , we get:

Step 4: Use the given point to find the value of

The line passes through the point . Substituting and into the equation , we get:

Step 5: Substitute the value of back into the equation

Substituting into the equation , we get:

Final Answer: The equation of the line is .

This method works because the intercept form directly relates the intercepts to the equation of the line. By using the condition of equal intercepts and the given point, we can uniquely determine the equation of the line. A common mistake is to forget the intercept form or to incorrectly substitute the point's coordinates.

ANSWER

$x + y = 5$

Question 12

QUESTION

Find the equations of the lines passing through the point (2, 2) and cutting off intercepts on the axes whose sum is 9.

SOLUTION

We need to find the equations of lines passing through the point such that the sum of their intercepts on the axes is 9.

Step 1: Define the intercepts

Let the intercepts on the x-axis and y-axis be and respectively. We are given that .

Step 2: Write the equation of the line in intercept form

The equation of a line in intercept form is given by:

Step 3: Express in terms of

Since , we can write . Substituting this into the intercept form equation, we get:

Step 4: Use the given point

Since the line passes through , we can substitute and into the equation:

Step 5: Solve for

Multiplying both sides by to clear the fractions, we get:

Step 6: Factor the quadratic equation

Factoring the quadratic equation, we have: So, or .

Step 7: Find the corresponding values of

If , then .

If , then .

Step 8: Find the equations of the lines

Case 1: and . The equation of the line is: Multiplying by 6, we get:

Case 2: and . The equation of the line is: Multiplying by 6, we get:

Final Answer: The equations of the lines are and .

ANSWER

$x + 2y - 6 = 0$ and $2x + y - 6 = 0$

Question 13

QUESTION

Find the equation of the line through the point (0, 2) making an angle (2π)/(3) with the positive x-axis. Also, find the equation of the line parallel to it and crossing the y-axis at a distance of 2 units below the origin.

SOLUTION

This question asks us to find the equation of a line given a point and an angle, and then to find the equation of a parallel line with a specified y-intercept. It tests our understanding of slope-intercept form and parallel lines.

Step 1: Find the slope of the first line

The angle the line makes with the positive x-axis is . The slope is given by the tangent of this angle:

Step 2: Find the equation of the first line

We know the slope and a point on the line. We can use the point-slope form of a line:

Substituting and :

Rearranging to the standard form:

Step 3: Find the slope of the parallel line

Parallel lines have the same slope. Therefore, the slope of the parallel line is also .

Step 4: Find the y-intercept of the parallel line

The parallel line crosses the y-axis 2 units below the origin, so its y-intercept is . This means in the slope-intercept form .

Step 5: Find the equation of the parallel line

Using the slope-intercept form with and :

Rearranging to the standard form:

Final Answer: The equation of the first line is , and the equation of the parallel line is .

ANSWER

First line: $\sqrt{3}x + y - 2 = 0$; parallel line through (0, -2): $\sqrt{3}x + y + 2 = 0$

Question 14

QUESTION

The perpendicular from the origin to a line meets it at the point (-2, 9). Find the equation of the line.

SOLUTION

This question requires us to find the equation of a line given the point where the perpendicular from the origin meets the line. We will use the concept of slopes of perpendicular lines to solve this.

Step 1: Find the slope of the line from the origin to the point (-2, 9)

The line connecting the origin (0, 0) and the point (-2, 9) has a slope given by:

Step 2: Find the slope of the required line

Since the required line is perpendicular to the line connecting the origin and (-2, 9), its slope is the negative reciprocal of :

Step 3: Find the equation of the line using the point-slope form

We know the slope of the required line is and it passes through the point (-2, 9). Using the point-slope form of a line, , we get:

Step 4: Simplify the equation

Multiply both sides by 9 to eliminate the fraction:

Step 5: Rearrange the equation into the standard form

Rearrange the terms to get the equation in the form :

Final Answer: The equation of the line is .

ANSWER

$2x - 9y + 85 = 0$

Question 15

QUESTION

The length L (in centimetre) of a copper rod is a linear function of its Celsius temperature C. In an experiment, L = 124.942 when C = 20 and L = 125.134 when C = 110. Express L in terms of C.

SOLUTION

We are given that the length of a copper rod is a linear function of its temperature . We have two data points: when , and when . We need to express in terms of .

Step 1: Define the linear function

Since is a linear function of , we can write it in the form:

, where is the slope and is the y-intercept.

Step 2: Calculate the slope

We can find the slope using the two given points and :

So,

Step 3: Use the point-slope form

We can use the point-slope form of a linear equation: . Using the point :

We can simplify the fraction:

Final Answer:

ANSWER

L = (192)/(90)(C - 20) + 124.942

Question 16

QUESTION

The owner of a milk store finds that he can sell 980 litres of milk each week at Rs 14 per litre and 1220 litres each week at Rs 16 per litre. Assuming a linear relationship between selling price and demand, how many litres could he sell weekly at Rs 17 per litre?

SOLUTION

This problem involves finding a linear relationship between the selling price of milk and the quantity sold, then using that relationship to predict sales at a new price.

Step 1: Define variables and points

Let be the quantity of milk sold (in litres) and be the selling price per litre (in Rs). We are given two points: and .

Step 2: Find the slope of the line

The slope of the line passing through points and is given by:

In our case, and . So,

Step 3: Find the equation of the line

Using the point-slope form of a line, , we have:

Step 4: Solve for x when y = 17

We want to find the quantity when the price is Rs 17. Substitute into the equation:

Multiply both sides by 120:

Final Answer: The owner could sell litres of milk weekly at Rs 17 per litre.

ANSWER

1340 litres

Question 17

QUESTION

P(a, b) is the mid-point of a line segment between the axes. Show that the equation of the line is (x)/(a) + (y)/(b) = 2.

SOLUTION

This question tests our understanding of coordinate geometry, specifically the midpoint formula and the intercept form of a line's equation. We need to show that a line with midpoint between the axes has the equation .

Step 1: Define the intercepts

Let the line intersect the x-axis at point and the y-axis at point . These are the x and y intercepts, respectively.

Step 2: Apply the midpoint formula

Since is the midpoint of the line segment , we can use the midpoint formula:

Step 3: Solve for the intercepts

From the midpoint equations, we can solve for and :

So, the coordinates of points A and B are and .

Step 4: Use the intercept form of a line

The intercept form of a line is given by:

where is the x-intercept and is the y-intercept.

Step 5: Substitute the values of the intercepts

Substitute and into the intercept form:

Step 6: Simplify the equation

Multiply both sides of the equation by 2:

Therefore, the equation of the line is .

Question 18

QUESTION

Point R(h, k) divides a line segment between the axes in the ratio 1 : 2. Find the equation of the line.

SOLUTION

This question involves finding the equation of a line given a point that divides the line segment between the axes in a specific ratio. We will use the section formula and the intercept form of a line.

Step 1: Define the points on the axes

Let the line intersect the x-axis at point and the y-axis at point . The point divides the line segment in the ratio .

Step 2: Apply the section formula

Using the section formula, the coordinates of point are given by:

Step 3: Express and in terms of and

From the above equations, we have:

Step 4: Write the intercept form of the line equation

The equation of a line in intercept form is given by:

Step 5: Substitute the values of and

Substituting and into the intercept form, we get:

Step 6: Simplify the equation

Multiplying both sides by , we get:

Rearranging the terms to match the required format:

Rewriting to match the answer format:

Final Answer: The equation of the line is .

ANSWER

$2kx + hy = 3kh$

Question 19

QUESTION

By using the concept of the equation of a line, prove that the three points (3, 0), (-2, -2) and (8, 2) are collinear.

SOLUTION

We need to prove that the points , and are collinear using the concept of the equation of a line.

Step 1: Find the equation of the line passing through the first two points.

Let the points be and . The equation of the line passing through points and is given by:

Substituting the coordinates of A and B:

Cross-multiplying, we get:

So, the equation of the line is:

Step 2: Check if the third point lies on the same line.

Let the third point be . We need to check if this point satisfies the equation .

Substitute and into the equation:

Since the equation is satisfied, the point lies on the line .

Step 3: Conclude that the points are collinear.

Since the point lies on the line passing through and , all three points are collinear.

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📝 Key Formulas

Important Formulas for Exercise 9.2

Formula / Concept	Description
Point-Slope Form	The equation of a line with a given slope m passing through a point (x_1, y_1) is given by y - y_1 = m(x - x_1).
Slope-Intercept Form	The equation of a line with slope m and y-intercept b is y = mx + b.
Equation of a Horizontal Line	The equation of a horizontal line passing through a point (a, b) is y = b.
Equation of a Vertical Line	The equation of a vertical line passing through a point (a, b) is x = a.
Two-Point Form	The equation of a line passing through two points (x_1, y_1) and (x_2, y_2) is given by y - y_1 = (y_2 - y_1)/(x_2 - x_1)(x - x_1).
Intercept Form	The equation of a line that makes an x-intercept of a and a y-intercept of b is (x)/(a) + (y)/(b) = 1.
Normal Form	The equation of a line where p is the length of the perpendicular from the origin to the line and α is the angle this perpendicular makes with the positive x-axis is x \cos α + y \sin α = p.
General Equation of a Line	The general equation of a line is Ax + By + C = 0, where A, B, and C are real constants, and A and B are not both zero.

❓ Top FAQs

Q1. How many questions are included in NCERT Solutions for Class 11 Maths Chapter 9 Straight Lines Exercise 9.2?

Exercise 9.2 of NCERT Solutions for Class 11 Maths Chapter 9 Straight Lines contains exactly 19 questions. These questions cover various forms of equation of a line including slope-intercept form and point-slope form, which are crucial topics for CBSE board exam 2025-26.

Q2. Where can I download free PDF of NCERT Solutions for Class 11 Maths Chapter 9 Straight Lines Exercise 9.2 for session 2025-26?

You can download the free PDF of NCERT Solutions for Class 11 Maths Chapter 9 Straight Lines Exercise 9.2 from the official NCERT website or various educational portals offering updated solutions for CBSE session 2025-26. These step by step solutions are available in downloadable format to help students prepare effectively for their exams.

Q3. How many marks does Chapter 9 Straight Lines carry in CBSE Class 11 Maths board exam 2025-26?

Chapter 9 Straight Lines carries 4 marks weightage in CBSE Class 11 Maths board exam 2025-26 under Unit III - Coordinate Geometry. This weightage is shared across the entire coordinate geometry unit, making Exercise 9.2 an important section for exam preparation.

Q4. Which is the most difficult question in NCERT Solutions Class 11 Maths Chapter 9 Straight Lines Exercise 9.2 for CBSE board exam preparation?

Questions 15-19 in Exercise 9.2 of NCERT Solutions Class 11 Maths Chapter 9 are considered relatively challenging as they involve complex applications of slope-intercept form and point-slope form. These questions require strong conceptual understanding and step by step problem-solving approach for CBSE board exam 2025-26.

Q5. What is Slope-Intercept Form explained in NCERT Solutions for Class 11 Maths Chapter 9 Straight Lines Exercise 9.2?

The Slope-Intercept Form covered in NCERT Solutions for Class 11 Maths Chapter 9 Exercise 9.2 is $y = mx + c$, where m represents the slope and c is the y-intercept. This fundamental concept is extensively used throughout Exercise 9.2 and is crucial for solving problems in CBSE board exam 2025-26.

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