NCERT Solutions Class 11 Maths
Chapter 9: Straight Lines
EXERCISE 9.3

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Quick Summary: In NCERT Solutions Class 11 Maths Chapter 9 Exercise 9.3, students learn to work with the general equation of a straight line and master various forms of line equations. This exercise covers slope-intercept form, point-slope form, intercept form, and distance calculations which are essential for CBSE board exams and competitive entrance tests.

Key Takeaways:

- Converting general form $Ax + By + C = 0$ to slope-intercept form $y = mx + c$
- Using perpendicular distance formula $d = (|Ax_1 + By_1 + C|)/(\sqrt{A^2 + B^2})$ for point to line distance
- Finding distance between parallel lines using $d = (|C_1 - C_2|)/(\sqrt{A^2 + B^2})$
- Converting equations to intercept form $(x)/(a) + (y)/(b) = 1$ for easy graphing

Complete Solutions

Question 1

QUESTION

Reduce the following equations into slope-intercept form and find their slopes and the y-intercepts:

(i) x + 7y = 0

(ii) 6x + 3y - 5 = 0

(iii) y = 0

SOLUTION

This question asks us to convert given linear equations into slope-intercept form () and then identify the slope () and y-intercept ().

(i)

Step 1: Isolate term

Subtract from both sides of the equation:

Step 2: Solve for

Divide both sides by 7:

Step 3: Express in slope-intercept form

We can rewrite this as:

Step 4: Identify slope and y-intercept

Comparing with , we have:

Slope,

y-intercept,

(ii)

Step 1: Isolate term

Subtract and add 5 to both sides:

Step 2: Solve for

Divide both sides by 3:

Step 3: Simplify and express in slope-intercept form

Separate the terms:

Step 4: Identify slope and y-intercept

Comparing with , we have:

Slope,

y-intercept,

(iii)

Step 1: Express in slope-intercept form

We can rewrite this as:

Step 2: Identify slope and y-intercept

Comparing with , we have:

Slope,

y-intercept,

Final Answer:

(i)

(ii)

(iii)

ANSWER

(i) y = -(1)/(7)x + 0,\; -(1)/(7),\; 0

(ii) y = -2x + (5)/(3),\; -2,\; (5)/(3)

(iii) y = 0x + 0,\; 0,\; 0

Question 2

QUESTION

Reduce the following equations into intercept form and find their intercepts on the axes:

(i) 3x + 2y - 12 = 0

(ii) 4x - 3y = 6

(iii) 3y + 2 = 0

SOLUTION

This question tests our understanding of the intercept form of a straight line and how to convert general equations into this form. The intercept form is given by , where and are the x and y intercepts respectively.

(i)

Step 1: Rearrange the equation to have the constant term on the right side.

Step 2: Divide both sides by 12 to get 1 on the right side.

Step 3: Simplify the fractions.

Step 4: Identify the intercepts.

The x-intercept is 4 and the y-intercept is 6.

Answer: The intercept form is , x-intercept is 4, and y-intercept is 6.

(ii)

Step 1: The constant term is already on the right side.

Step 2: Divide both sides by 6 to get 1 on the right side.

Step 3: Simplify the fractions.

Step 4: Identify the intercepts.

The x-intercept is and the y-intercept is -2.

Answer: The intercept form is , x-intercept is , and y-intercept is -2.

(iii)

Step 1: Rearrange the equation to isolate y.

Step 2: Solve for y.

Step 3: Identify the intercepts.

This is a horizontal line. It has an intercept with the y-axis at but no intercept with the x-axis.

Answer: , intercept with -axis and no intercept with -axis.

ANSWER

(i) (x)/(4) + (y)/(6) = 1,\; 4,\; 6

(ii) (x)/(3) + (y)/(-2) = 1,\; (3)/(2),\; -2

(iii) y = -(2)/(3),\; intercept with y-axis = -(2)/(3) and no intercept with x-axis

Question 3

QUESTION

Find the distance of the point (-1, 1) from the line 12(x + 6) = 5(y - 2).

SOLUTION

This question asks us to find the perpendicular distance of a point from a given line. We will use the formula for the distance of a point from a line.

Step 1: Rewrite the equation of the line in the standard form

The given equation is . Expanding and rearranging, we get:

So, , , and .

Step 2: Apply the formula for the distance of a point from a line

The distance of a point from the line is given by:

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

Step 3: Simplify the expression

Final Answer: The distance of the point from the line is 5 units.

ANSWER

5 units

Question 4

QUESTION

Find the points on the x-axis whose distances from the line (x)/(3) + (y)/(4) = 1 are 4 units.

SOLUTION

We need to find points on the x-axis that are 4 units away from the given line. This problem involves using the formula for the distance of a point from a line.

Step 1: Define a general point on the x-axis

Any point on the x-axis has coordinates of the form . Let's denote our point as .

Step 2: Rewrite the equation of the line in general form

The given line is . To use the distance formula, we need to rewrite this in the form . Multiplying by 12 (the least common multiple of 3 and 4), we get:

So, the general form is:

Step 3: Apply the distance formula

The distance of a point from a line is given by:

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

Step 4: Simplify and solve for x

Multiplying both sides by 5:

This gives us two possibilities:

Case 1:

Case 2:

Step 5: State the points

The points are and .

Final Answer: The points on the x-axis are and .

ANSWER

(-2, 0) and (8, 0)

Question 5

QUESTION

Find the distance between parallel lines:

(i) 15x + 8y - 34 = 0 and 15x + 8y + 31 = 0

(ii) l(x + y) + p = 0 and l(x + y) - r = 0

SOLUTION

This question asks us to find the distance between two sets of parallel lines. We will use the formula for the distance between parallel lines.

(i) and

Step 1: Recall the formula for the distance between parallel lines.

The distance between two parallel lines and is given by:

Step 2: Identify the coefficients.

In this case, , , , and .

Step 3: Substitute the values into the formula.

Step 4: Simplify the expression.

Final Answer: The distance between the lines is units.

(ii) and

Step 1: Rewrite the equations in the standard form.

The equations can be rewritten as:

and

Step 2: Identify the coefficients.

Here, , , , and .

Step 3: Substitute the values into the distance formula.

Step 4: Simplify the expression.

Final Answer: The distance between the lines is units.

ANSWER

(i) (65)/(17) units

(ii) (1)/(√2) \left| (p + r)/(l) \right| units

Question 6

QUESTION

Find equation of the line parallel to the line 3x - 4y + 2 = 0 and passing through the point (-2, 3).

SOLUTION

We need to find the equation of a line that is parallel to the given line and passes through the point .

Step 1: Find the slope of the given line.

The given line is . We can rewrite this in slope-intercept form () to find its slope.

The slope of the given line is .

Step 2: Determine the slope of the parallel line.

Parallel lines have the same slope. Therefore, the slope of the line we want to find is also .

Step 3: Use the point-slope form to find the equation of the new line.

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

We are given the point , so and . We also know that .

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

Step 4: Simplify the equation to the standard form.

Multiply both sides by 4 to eliminate the fraction:

Rearrange the equation to get it in the form :

Final Answer: The equation of the line is .

ANSWER

3x - 4y + 18 = 0

Question 7

QUESTION

Find equation of the line perpendicular to the line x - 7y + 5 = 0 and having x-intercept 3.

SOLUTION

We need to find the equation of a line that is perpendicular to the given line and has an x-intercept of 3.

Step 1: Find the slope of the given line

Rewrite the given equation in slope-intercept form ():

The slope of the given line is .

Step 2: Find the slope of the perpendicular line

The slope of a line perpendicular to the given line is the negative reciprocal of . Let the slope of the perpendicular line be .

Step 3: Use the x-intercept to find a point on the line

The x-intercept is the point where the line crosses the x-axis, which means . Given that the x-intercept is 3, the point is .

Step 4: Use the point-slope form to find the equation of the line

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

Using the point and the slope , we get:

Step 5: Rewrite the equation in standard form

Add to both sides to get the equation in the form :

Final Answer: The equation of the line is .

ANSWER

y + 7x = 21

Question 8

QUESTION

Find angles between the lines √3x + y = 1 and x + √3y = 1.

SOLUTION

This question asks us to find the angles between two given lines. We'll use the formula involving the slopes of the lines to find the angle.

Step 1: Find the slopes of the lines

The given lines are and . Let's rewrite them in the slope-intercept form , where is the slope.

For the first line, , we have . So, the slope .

For the second line, , we have , which gives . So, the slope .

Step 2: Use the formula for the angle between two lines

The angle between two lines with slopes and is given by:

Substituting the values of and , we get:

Step 3: Find the angle

Since , we have . We know that , so .

Step 4: Find the other angle

The two lines also form another angle, which is the supplement of . This angle is .

Final Answer: The angles between the lines are and .

ANSWER

30^\circ and 150^\circ

Question 9

QUESTION

The line through the points (h, 3) and (4, 1) intersects the line 7x - 9y - 19 = 0 at right angle. Find the value of h.

SOLUTION

This question involves finding the value of given that a line passing through and is perpendicular to the line . We will use the concept of slopes of perpendicular lines.

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

We can rewrite the equation in the slope-intercept form , where is the slope.

So, the slope of this line is .

Step 3: Use the condition for perpendicular lines

If two lines are perpendicular, the product of their slopes is -1. That is, .

Therefore,

Step 4: Solve for

Final Answer: The value of is .

ANSWER

(22)/(9)

Question 10

QUESTION

Prove that the line through the point (x_1, y_1) and parallel to the line Ax + By + C = 0 is A(x - x_1) + B(y - y_1) = 0.

SOLUTION

We are asked to find the equation of a line that passes through a given point and is parallel to another given line . This problem tests our understanding of the relationship between slopes of parallel lines and the point-slope form of a line.

Step 1: Find the slope of the given line

The given line is . We can rewrite this in slope-intercept form () to find its slope.

Therefore, the slope of the given line is .

Step 2: Determine the slope of the parallel line

Since the line we want to find is parallel to the given line, their slopes must be equal. Thus, the slope of the required line is also .

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

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

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

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

Step 4: Rearrange the equation

Multiply both sides by to eliminate the fraction:

Rearrange the terms to get the desired form:

Final Answer: The equation of the line through the point and parallel to the line is .

Question 11

QUESTION

Two lines passing through the point (2, 3) intersect each other at an angle of 60^\circ. If slope of one line is 2, find equation of the other line.

SOLUTION

This question tests our understanding of the relationship between the slopes of two lines and the angle between them. We will use the formula for the angle between two lines and the point-slope form of a line to find the equation of the other line.

Step 1: Recall the formula for the angle between two lines

If is the angle between two lines with slopes and , then

Step 2: Apply the given information

We are given that and one of the slopes, say . Let the other slope be . Then,

Since , we have

Step 3: Solve for

We have two cases:

Case 1:

Multiplying numerator and denominator by , we get

Case 2:

Multiplying numerator and denominator by , we get

Step 4: Find the equation of the line

The line passes through . Using the point-slope form , we have .

For , we have , which simplifies to .

For , we have , which simplifies to .

Final Answer: The equations of the other line are or .

ANSWER

$(\sqrt{3} + 2)x + (2\sqrt{3} - 1)y = 8\sqrt{3} + 1$

or

$(\sqrt{3} - 2)x + (1 + 2\sqrt{3})y = -1 + 8\sqrt{3}$

Question 12

QUESTION

Find the equation of the right bisector of the line segment joining the points (3, 4) and (-1, 2).

SOLUTION

This question requires us to find the equation of the right bisector of the line segment joining two given points. We will use concepts of midpoint and perpendicular lines.

Step 1: Find the midpoint of the line segment.

The midpoint of the line segment joining points and is given by:

Here, and . Therefore,

So, the midpoint is .

Step 2: Find the slope of the line segment.

The slope of the line segment joining points and is given by:

Here, and . Therefore,

So, the slope of the line segment is .

Step 3: Find the slope of the right bisector.

The right bisector is perpendicular to the line segment. If the slope of the line segment is , the slope of the perpendicular line is .

Since the slope of the line segment is , the slope of the right bisector is:

Step 4: Find the equation of the right bisector.

We know the slope of the right bisector is and it passes through the midpoint . Using the point-slope form of a line, , we have:

Therefore, the equation of the right bisector is .

ANSWER

$2x + y = 5$

Question 13

QUESTION

Find the coordinates of the foot of perpendicular from the point (-1, 3) to the line 3x - 4y - 16 = 0.

SOLUTION

We need to find the foot of the perpendicular from the point to the line .

Step 1: Find the equation of the line perpendicular to the given line and passing through the given point.

The given line is . Its slope is .

The slope of the line perpendicular to this line is .

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

Step 2: Find the point of intersection of the two lines.

We need to solve the system of equations:

...(1)

...(2)

Multiply equation (1) by 3 and equation (2) by 4:

...(3)

...(4)

Add equations (3) and (4):

Substitute into equation (2):

Step 3: State the coordinates of the foot of the perpendicular.

The coordinates of the foot of the perpendicular are .

ANSWER

\left((68)/(25), -(49)/(25)\right)

Question 14

QUESTION

The perpendicular from the origin to the line y = mx + c meets it at the point (-1, 2). Find the values of m and c.

SOLUTION

This question tests our understanding of straight lines, perpendicularity conditions, and solving simultaneous equations. We need to find the slope () and y-intercept () of the given line.

Step 1: Use the given point to form an equation

Since the point lies on the line , it must satisfy the equation of the line. Substituting and , we get:

Rearranging, we have our first equation:

(Equation 1)

Step 2: Use the perpendicularity condition

The line joining the origin to the point is perpendicular to the line . The slope of the line joining and is:

Since the two lines are perpendicular, the product of their slopes is -1:

Therefore,

Step 3: Solve for c

Substitute the value of into Equation 1:

Final Answer:

ANSWER

m = (1)/(2),\; c = (5)/(2)

Question 15

QUESTION

If p and q are the lengths of perpendiculars from the origin to the lines x \cos θ - y \sin θ = k \cos 2θ and x \sec θ + y \csc θ = k, respectively, prove that p^2 + 4q^2 = k^2.

SOLUTION

This question involves finding the perpendicular distance from a point (the origin) to two given lines and then proving a relation between these distances. The formula for the perpendicular distance from a point to a line is given by .

Step 1: Find the perpendicular distance from the origin to the first line.

The first line is . Rewriting this in the form , we get .

Using the perpendicular distance formula with , we have:

Since , we get:

Thus, .

Step 2: Find the perpendicular distance from the origin to the second line.

The second line is . Rewriting this in the form , we get .

Using the perpendicular distance formula with , we have:

We know that and . Therefore:

Thus, .

Step 3: Prove that .

We have and . We want to show that .

Since , we have:

Since , we get:

Final Answer: We have shown that .

Question 16

QUESTION

In the triangle ABC with vertices A(2, 3), B(4, -1) and C(1, 2), find the equation and length of altitude from the vertex A.

SOLUTION

We need to find the equation and length of the altitude from vertex in triangle , where , , and .

Step 1: Find the slope of side

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

Step 2: Find the slope of the altitude from

The altitude from is perpendicular to . The product of the slopes of two perpendicular lines is -1. Let the slope of the altitude from be . Then:

Step 3: Find the equation of the altitude from

We know the slope of the altitude from is 1, and it passes through the point . Using the point-slope form of a line, :

So, the equation of the altitude from is .

Step 4: Find the length of the altitude from

The length of the altitude is the perpendicular distance from point to the line . The equation of line can be found using point-slope form with point and slope -1:

The perpendicular distance from a point to a line is given by:

In our case, and the line is , so , , , and .

Final Answer: The equation of the altitude from is , and its length is .

ANSWER

y - x = 1,\; √2

Question 17

QUESTION

If p is the length of perpendicular from the origin to the line whose intercepts on the axes are a and b, then show that

\displaystyle (1)/(p^2) = (1)/(a^2) + (1)/(b^2).

SOLUTION

We need to prove the relation between the perpendicular distance from the origin to a line and the intercepts made by the line on the axes.

Step 1: Write the equation of the line in intercept form

The equation of a line with intercepts and on the x and y axes, respectively, is given by:

Step 2: Convert the equation to general form

Multiplying throughout by , we get:

Rearranging to the general form , we have:

Step 3: Use the formula for the perpendicular distance from a point to a line

The perpendicular distance from the origin (0, 0) to the line is given by:

Simplifying:

Step 4: Square both sides of the equation

Squaring both sides, we get:

Step 5: Take the reciprocal of both sides

Taking the reciprocal of both sides, we have:

Step 6: Split the fraction

Splitting the fraction on the right-hand side, we get:

Step 7: Simplify

Simplifying the fractions, we obtain:

Therefore, we have shown that .

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Key Formulas

Important Formulas for Exercise 9.3

Formula / Concept	Description
General Equation of a Line	The equation of a line in the general form is given by $Ax + By + C = 0$, where A, B, and C are real numbers, and A and B are not both zero.
Slope-Intercept Form	The equation of a line with slope m and y-intercept c is $y = mx + c$.
Point-Slope Form	The equation of a line passing through a point (x_1, y_1) with a slope of m is $y - y_1 = m(x - x_1)$.
Intercept Form	The equation of a line that makes intercepts a and b on the x-axis and y-axis respectively is $\frac{x}{a} + \frac{y}{b} = 1$.
Slope of a Line	The slope m of a non-vertical line passing through the points (x_1, y_1) and (x_2, y_2) is given by $m = \frac{y_2 - y_1}{x_2 - x_1}$.
Condition for Parallel Lines	Two lines are parallel if and only if their slopes are equal ($m_1 = m_2$). For lines in general form $A_1x + B_1y + C_1 = 0$ and $A_2x + B_2y + C_2 = 0$, the condition is $\frac{A_1}{A_2} = \frac{B_1}{B_2}$.
Condition for Perpendicular Lines	Two lines are perpendicular if and only if the product of their slopes is -1 ($m_1 m_2 = -1$). For lines in general form, the condition is $A_1A_2 + B_1B_2 = 0$.
Distance of a Point from a Line	The perpendicular distance (d) of a point (x_1, y_1) from the line $Ax + By + C = 0$ is given by the formula $d = \frac{\lvert Ax_1 + By_1 + C\rvert}{\sqrt{A^2 + B^2}}$.
Distance Between Two Parallel Lines	The distance between two parallel lines $Ax + By + C_1 = 0$ and $Ax + By + C_2 = 0$ is given by $d = \frac{\lvert C_1 - C_2\rvert}{\sqrt{A^2 + B^2}}$.

❓ Top FAQs

Q1. How many questions are in NCERT Solutions Class 11 Maths Chapter 9 Straight Lines Exercise 9.3 for CBSE board exam 2025-26?

Exercise 9.3 of NCERT Solutions for Class 11 Maths Chapter 9 Straight Lines contains exactly 17 questions. These questions focus on the general equation of a line, slope-intercept form, and point-slope form, which carry significant weightage in CBSE board exam 2025-26.

Q2. Where can I download free PDF of NCERT Solutions for Class 11 Maths Chapter 9 Straight Lines Exercise 9.3 with step by step solutions?

You can download the free PDF of NCERT Solutions for Class 11 Maths Chapter 9 Straight Lines Exercise 9.3 from the official NCERT website or various educational portals offering step by step solutions. These PDF solutions are updated for the 2025-26 session and include detailed explanations for all 17 questions covering general equation of line concepts.

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

Chapter 9 Straight Lines carries 4 marks in CBSE Class 11 Maths board exam 2025-26 as part of Unit III - Coordinate Geometry. Exercise 9.3 questions on general equation of line, slope-intercept form, and point-slope form are crucial for scoring these marks.

Q4. Which is the most difficult question in Exercise 9.3 of NCERT Solutions Class 11 Maths Chapter 9 Straight Lines?

Questions 15, 16, and 17 in Exercise 9.3 of NCERT Solutions Class 11 Maths Chapter 9 Straight Lines are considered most difficult as they involve complex applications of point-slope form and general equation of line. These questions require thorough understanding of coordinate geometry concepts 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 9.3?

The Slope-Intercept Form in NCERT Solutions for Class 11 Maths Chapter 9 Exercise 9.3 is represented as $y = mx + c$, where m is the slope and c is the y-intercept. This form is extensively used in Exercise 9.3 questions to convert general equation of line and is important for CBSE board exam 2025-26 preparation.

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