CBSE Class 11 Maths Notes Chapter 10: CBSE Class 11 Maths Notes Chapter 10 Straight Lines is all about understanding lines in the coordinate plane.

The chapter covers various forms of equations that represent straight lines, making it easier to work with them. For instance, you'll learn about slope-intercept form, where the equation looks like y = mx + b, and point-slope form, which is useful for finding equations when you have a point and the slope of a line.

There's the two-point form, handy when you have two points and need to find the equation of the line passing through them. Understanding these forms helps you draw and analyze lines better.

CBSE Class 11 Maths Notes Chapter 10 PDF

You can click on the link provided to get the CBSE Class 11 Maths Notes for Chapter 10 on Straight Lines in PDF format.

By using the PDF, students can improve their understanding and skills in this area of math, which can help them do better in their studies.

[CBSE Class 11 Maths Notes Chapter 10 PDF]

CBSE Class 11 Maths Notes Chapter 10 Straight Lines PDF

The solutions for CBSE Class 11 Maths Notes Chapter 10 on Straight Lines are available below. In this chapter, students learn about the fundamental concepts of straight lines, including equations, slopes, intercepts, and parallelism.

These notes provide detailed explanations and examples to help students grasp the concepts effectively. By referring to these solutions, students can enhance their understanding of straight lines and strengthen their problem-solving skills.

What is a Straight Line?

A straight line is a fundamental geometric concept defined as a path traced by points moving in a constant direction with zero curvature. In simpler terms, it's the shortest distance between two points. This concept is crucial in various fields, from mathematics and physics to engineering and architecture.

Understanding straight lines allows us to analyze and describe the relationships between points in space efficiently. Whether it's plotting coordinates on a graph or determining the trajectory of an object, the notion of a straight line serves as a fundamental building block for many mathematical and scientific applications.

General Form of a Line

The relation between variables such as x and y agrees with all points on the curve.

The general form of the equation of a straight line is given as:

$Ax + By + C = 0$

Where, A, B, and C are constants and x, y are variables.

Slope of a Line

In geometry, the slope or gradient of a line, denoted by 'm', is a measure of its inclination or steepness. When represented by the angle θ, the tangent of θ, denoted as 'tan θ', represents the slope of the line. However, it's important to note that the slope is undefined when the line is vertical, as the tangent of 90 degrees is undefined. Conversely, a horizontal line has a slope of 0, as the tangent of 0 degrees is 0.

Therefore, for any line other than vertical, its slope 'm' can be expressed as 'tan θ', where θ is the angle of inclination, and θ is not equal to 90 degrees. Understanding slope is crucial in various mathematical and scientific contexts, such as calculating rates of change, analyzing gradients in terrain, and determining the direction of vectors in physics.

Slope Intercept Form

The straight - line equation in slope-intercept form is given as:

$Y = mx + C$

Where m represents the slope of the line and C is the y-intercept.

Shortest Straight Line Distance

The shortest straight line distance between two points say P and Q having coordinates (P_1, Q_1) and (P_2, Q_2) is expressed as:

$$PQ=\sqrt{(P_1-Q_1)^2+(P_2-Q_2)^2}$$

Equation of Line – Different Forms

1. The equation of a line parallel to the x-axis and at a distance (p) from the x-axis is given by y = ± p.
2. The equation of a line parallel to the y-axis and at a distance (q) from y-axis is given by x = ± q.
3. The equation of a line [Point-slope form] having slope (m) and passing through the point (a_0, b_0) is given by $y – b_0 = m(x – a_0)$.
4. The equation of a line [Two-point-form] passing through two points (a1, b1) and (a2, b2) is given by,

$y−b1=(b2−b1a2−a1)(x−a1)$

5. The equation of a line [Slope intercept form] making an intercept (p) on the y-axis (slope m) is given by y = mx + p. [value of p will be +ve or -ve based on the intercept made on the +ve or -ve side of the y-axis].

6. The equation of the line [Intercept form] making intercepts p and q on the x and y-axis, respectively, is given by

$xa+yb=1$

In normal form, the equation of the line is given by x cos ω + y sin ω = p. Where p = Length of perpendicular (p) from the origin and ω = Angle, which normally makes with the +ve x-axis direction.

The points (m_1, n_1) and (m_2, n_2) are on the same or opposite side of a line px + qy + r = 0 if $pm_1 + qn_1 + r$ and $pm_2 + qn_2 + r$ are of the same sign or of opposite signs respectively. The lines $xm_1 + yn_1 + o1 = 0$ and $xm_2 + yn_2 + o = 0$ are perpendicular, if, $m_2m_1 + n_2n_1 = 0$.

Sample Questions

Go through the straight line class 11 problem provided here.

Question: If the three lines 2x + y – 3 =0 , 5x + ky – 3 = 0 and 3x – y – 2 = 0 are concurrent then find the Value of k.

Solution: If three lines are said to be concurrent when they pass through a common point. It means that the point of intersection of two lines lies on the third line.

Given equation :

2x + y – 3 =0 ……(1)

5x + ky – 3 = 0 ……(2)

3x – y – 2 = 0 ……..(3)

By solving the line equation (1) and (3) using cross multiplication method,

$x−2−3=y−9+4=1−2−3$

(or)

x = 1 and y = 1

Therefore, the point of intersection of two lines is given as (1, 1). By substituting the point (1, 1) in equation (2), we get

5.1 + k .1 – 3 = 0 or k = – 2.

Therefore, the value of k is -2.

Question: Find the equation of the line which is at a distance 3 from the origin and the perpendicular from the origin to the line makes on angle of $30^\circ 30^\circ$ with positive direction of x-axis

Solution: Given, $p=3p=3$ and $\omega=30^\circ \omega=30^\circ$

Equation of line is given by

$x\cos\omega+y\sin\omega=p \Rightarrow x\cos30^\circ+y\sin30^\circ=3 \Rightarrow x(3–\sqrt{}2)+y(12)=3 \therefore 3–\sqrt{}x+y=6.$

Question: Find the angle between x-y=2 and x-3y=6.

Solution: Given lines: $x−y=2x−y=2$ and $x−3y=6x−3y=6$

Slopes are 1 and 1313.

Angle between the lines:

$\tan\theta=\left|\left|\left|13−11+(13\times1)\right|\right|\right|=\left|\left|\left|\left|−2343\right|\right|\right|\right| \therefore \theta=\tan−1(12).$

Question: Find the slope of the line passing through the point (-3,6) and the middle point of the line joining the points (4,-5) and (-2,9).

Solution: Mid-point of the line segment joining the points (4,−5)
and (−2,9) is

(4−22,−5+92)=(1,2)

Slope of the line passing through the points (1,2)
and (−3,6) is

$m=6-2-3-1=4-4=-1$.

Benefits of CBSE Class 11 Maths Notes Chapter 10 Straight Lines

Studying CBSE Class 11 Maths Notes Chapter 10: Straight Lines provide several benefits:

Understanding Basic Geometry: This chapter provides a foundational understanding of straight lines, which is fundamental to coordinate geometry and analytical geometry.

Graphical Representation: Learning about straight lines helps students understand how to plot and interpret graphs, which is essential for visualizing mathematical concepts.

Equation Forms: Understanding different forms of equations for straight lines, such as slope-intercept form, point-slope form, and two-point form, enhances problem-solving skills and flexibility in mathematical representations.

Geometric Concepts: Concepts like angle between two lines, distance between a point and a line, and collinearity of points deepen students' understanding of geometric properties and relationships.