

FlexiPrep

NCERT Class 11 Mathematics Solutions: Chapter 10 – Straight Lines Miscellaneous Exercise 10 Part 8 (For CBSE, ICSE, IAS, NET, NRA 2022)

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Definition:

Straight Lines - is the line that does not change direction.

Slope of a Line - also called as gradient of straight line. It is the measure of the ratio of the vertical change to the horizontal change.

x –Intercept - is the point where the graph of the line crosses the x – axis.

y –Intercept - is the point where the graph of the line crosses the y – axis.

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1. In what ratio, the line joining $(-1, 1)$ and $(5, 7)$ is divided by the line $x + y = 4$?

Answer:

The equation of the line joining the points $(-1,1)$ and $(5,7)$ is given by

$$y - 1 = \frac{7 - 1}{5 + 1}(x + 1)$$

$$y - 1 = \frac{6}{6}(x + 1)$$

$$x - y + 2 = 0 \dots \text{eq (1)}$$

The equation of the given line is

$$x + y - 4 = 0 \dots \text{eq (2)}$$

The point of intersection of lines equation (1) and (2) is given by

$$x = 1 \text{ and } y = 3$$

Consider point $(1,3)$ divide the line segment joining $(-1,1)$ and $(5,7)$ in the ratio $1 : k$.

Accordingly, by section formula,

$$(1,3) = \left(\frac{k(-1) + 1(5)}{1 + k}, \frac{k(1) + 1(7)}{1 + k} \right)$$

$$\Rightarrow (1,3) = \left(\frac{-k + 5}{1 + k}, \frac{k + 7}{1 + k} \right)$$

$$\Rightarrow \frac{-k + 5}{1 + k} = 1, \frac{k + 7}{1 + k} = 3$$

$$\therefore \frac{-k + 5}{1 + k} = 1$$

$$\Rightarrow -k + 5 = 1 + k$$

$$\Rightarrow 2k = 4$$

$$\Rightarrow k = 2$$

So, the line joining the points $(-1,1)$ and $(5,7)$ is divided by line $x + y = 4$ in the ratio $1 : 2$.

2. Find the distance of the line $4x + 7y + 5 = 0$ from the point $(1,2)$ along the line $2x - y = 0$.

Answer:

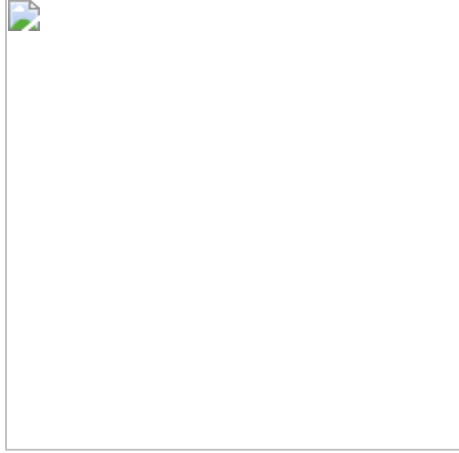
The given lines are

$$2x - y = 0 \dots \text{eq (1)}$$

$$4x + 7y + 5 = 0 \dots \text{eq (2)}$$

$A(1,2)$ is a point on line (1).

Consider B be the point of intersection of lines equation (1) and (2).



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On solving equations (1) and (2) ,

$$x = -\frac{5}{18} \text{ and } y = -\frac{5}{9}$$

Coordinates of point B are $\left(-\frac{5}{18}, -\frac{5}{9}\right)$

By using distance formula, the distance between points A and B can be obtained as

$$\begin{aligned} AB &= \sqrt{\left(1 + \frac{5}{18}\right)^2 + \left(2 + \frac{5}{9}\right)^2} \text{ units} \\ &= \sqrt{\left(\frac{23}{18}\right)^2 + \left(\frac{23}{9}\right)^2} \text{ units} \\ &= \sqrt{\left(\frac{23}{2 \times 9}\right)^2 + \left(\frac{23}{9}\right)^2} \text{ units} \\ &= \sqrt{\left(\frac{23}{9}\right)^2 \left(\frac{1}{2}\right)^2 + \left(\frac{23}{9}\right)^2} \text{ units} \\ &= \sqrt{\left(\frac{23}{9}\right)^2 \left(\frac{1}{4} + 1\right)} \text{ units} . \\ &= \frac{23}{9} \sqrt{\frac{5}{4}} \text{ units} \\ &= \frac{23}{9} \times \frac{\sqrt{5}}{2} \text{ units} \end{aligned}$$

$$= \frac{23\sqrt{5}}{18} \text{ units .}$$

So, the required distance is $\frac{23\sqrt{5}}{18}$ units .

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