

# The Line

## Class 1

**Example 1**  $a(3,-1)$  and  $b(-5,7)$  are two points find  $|ab|$ .

**Example 2** Two point are  $a(5,2)$  and  $b(8,k)$  such that  $|ab| = 5$  . Find the values of  $k \in R$  .

**Example 3** Find the midpoint of  $(-3,4)$  and  $(9,-8)$

**Example 4** If  $a(3,7)$  is the midpoint of  $[pq]$  where  $p(6,5)$  find  $q$  .

**Example 5** Find the area of  $(-2,4)$ ,  $(1,-3)$ , and  $(6,-2)$

**Example 6**  $a(-1,3)$ ,  $b(1,-1)$  and  $c(-3,k)$  are the vertices of a triangle  $abc$  . If the area of the triangle is 10 find two possible values of  $k \in R$  .

**Example 7** Find slope between  $a(2,-3)$  and  $b(3,-1)$

**Example 8** If the line  $L$  has the following slope find the slope of the lines parallel and perpendicular to  $L$ .

**Example 9**  $L$  is the line  $3x - 7y = 13$  and  $M$  is the line  $7x + 3y = 21$  prove that  $L \perp M$  .

## Class 2

**Example 1** If  $(3,2)$  is on  $5x - 6y = k$  find the value of  $k$ .

**Example 2** Find the equation of a line containing the point  $(2,-5)$  and with slope  $m = -\frac{3}{7}$

**Example 3**  $a(1,3)$  and  $b(4,-5)$  are two points find the equation of the line  $ab$ .

**Example 4** Find the equation of the line perpendicular to  $3x + 4y = 16$  through the point  $(-2, 5)$ .

**Example 5** Find the equation of the line through the origin, which makes an angle of  $45^\circ$  with the positive  $x$ -axis.

**Example 6** Find the equation of the line perpendicular to the line  $8x - 3y = 0$ , which forms a triangle of area 12 square units with the  $x$ , and  $y$  axes in the first quadrant.

**Example 7** Find the equations of the two lines through the point  $(1,4)$  which cuts equal intercepts with the  $x$  and  $y$  axes.

**Example 8** Draw the line  $x + 2y = 4$ .

**Example 9** Draw the line  $x + 2y = 0$

**Example 10** Draw the lines  $x = -1$  and  $y = 2$

**Example 11**  $L$  is the line  $2x + 3y = 8$  and  $M$  is the line  $x - 2y = -3$  find  $p$  where  $L$  and  $M$  intersect.

## Class 3

**Example 1**  $a(-1,1)$ ,  $b(1,2)$ ,  $c(2,-1)$ , and  $d(x,y)$  are four vertices in a parallelogram  $abcd$ . Find  $d$ .

**Example 2** Find image of  $(5,-2)$  under central symmetry in  $(3,-1)$

**Example 3** Find the image of  $2x - y = 5$  under (i)  $S_x$  (ii)  $S_o$

**Example 4** Find image of  $(1,2)$  under axial symmetry in  $x = 3$

**Example 5** Find the image of  $(3,4)$  under axial symmetry in the line  $L$  which has the equation  $x + y = 3$

**Example 6** Find the image of  $2x - y = -5$  under the translation  $(1,2)$  to  $(4,-1)$

**Example 7** Find the point which divides  $(3,-4)$  and  $(5,1)$  in the ratio  $1 : 2$  internally.

**Example 8** In what ratio does  $a(2,4)$  divide  $p(0,6)$  and  $q(6,0)$

**Example 9** Find the measure of the obtuse angle between  $2x - y = 8$  and  $5x + y = 1$  to the nearest degree.

**Example 10** Find the equation of the two lines through  $(2,3)$  which makes an angle of  $45^\circ$  with the line  $2x - y + 9 = 0$ .

**Example 11**

A line containing the point  $(-4,-2)$  has a slope of  $m$ , where  $m \neq 0$ .

This line intersects the  $x$  axis at  $(x_1,0)$  and the  $y$  axis at  $(0,y_1)$ . Given that  $x_1 + y_1 = 3$ , find the slopes of the two lines that satisfy this condition.

Find the measure of the acute angle between these two lines and give your nearest to the nearest degree.

## Class 4

**Example 1** Find the distance from  $(2,-3)$  to  $x + 5y - 4 = 0$

**Example 2** If the distance from  $(1,2)$  to  $3x + 4y + k = 0$  is 6 find two possible values of  $k$ .

**Example 3** Find the distance between the lines  $3x + 4y - 1 = 0$  and  $3x + 4y - 15 = 0$

**Example 4** Find the equation of the two lines through the point  $(-3,0)$ , which are at a distance of  $\sqrt{5}$  from the  $(4,1)$ .

**Example 5** If  $p$  is the length of the perpendicular from the origin to the line

$$\frac{x}{a} + \frac{y}{b} = 1,$$

prove that

$$\frac{1}{p^2} = \frac{1}{a^2} + \frac{1}{b^2}$$