




# IIT Madras

ONLINE DEGREE

**Mathematics for Data Science 1**  
**Indian Institute of Technology, Madras**  
**Week 02 - Tutorial 06**

(Refer Slide Time 00:17)



(a) What is the set of  $y$  - coordinates of the points in set  $A$ ?

(b) What is the set of  $x$  - coordinates of the points in set  $A$ ?

5. Mary subscribed to a cell phone plan with 400 free minutes, a Rs. 50 monthly fee, and 20 paise for each additional minute. What is her bill amount when she uses 700 minutes per month?

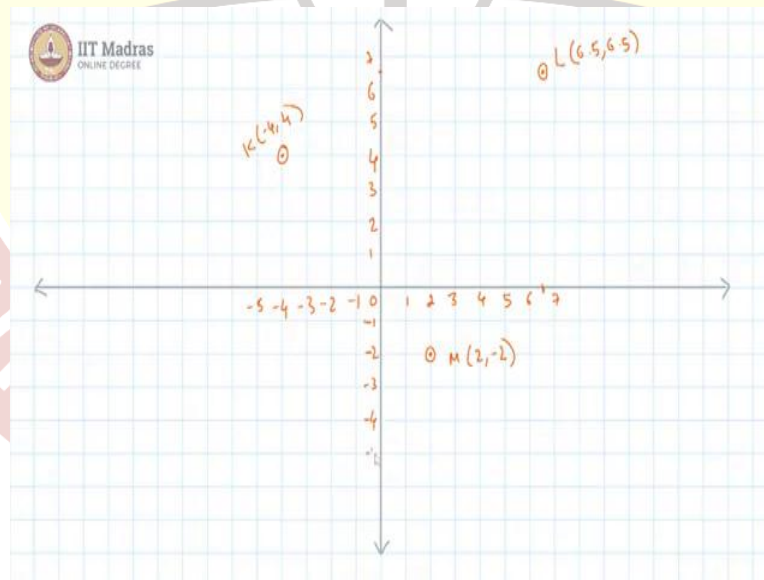
6. The coordinates of two points  $K$ ,  $L$ ,  $M$ , and  $N$  are  $(-4, 4)$ ,  $(6.5, 6.5)$ ,  $(2, -2)$ , and  $(-5, -5)$  respectively.  $R$  is the point of intersection of  $KM$  and  $LN$ , and is known to cut the line segment  $KM$  in the ratio  $KR : RM = 4 : 2$ . Let two points  $P$  and  $Q$  have coordinates as  $(4, 0)$  and  $(0, -7)$  respectively. Then choose the correct options.

- ☐  $RP$  and  $RQ$  are parallel.
- ☐  $RP$  and  $RQ$  are perpendicular.
- ☐ Adequate information for finding the relation between  $RP$  and  $RQ$ .
- ☐  $\angle LRP + \angle PRM = 90^\circ$
- ☐  $\angle LRP + \angle PRM = 180^\circ$
- ☐ Adequate information for finding the relation between  $\angle LRP$  and  $\angle PRM$ .
- ☐ None of the above.

2

For our 6<sup>th</sup> problem we have these 4 points given to us. Let us first plot them out on a graph.

(Refer Slide Time 00:32)



And this will be 0, we have a  $(-4, 4)$ , so this is -1, this is -2, this is -3, this is -4, this is 1, 2, 3 and 4, so this point here is our  $K(-4, 4)$ . And then we have  $(6.5, 6.5)$ , this is 1, 2, 3, 4, 5, 6, 7, this here is 6.5 and 5, 6 and 7, this here is 6.5, here we are with  $L(6.5, 6.5)$ , then we have a  $(2, -2)$ , -1, this is -2. So this point here is our  $M(2, -2)$ . And lastly, we have  $(-5, -5)$ , -4 and -5, this is our point.

(Refer Slide Time 01:48)

(a) What is the set of  $y$  - coordinates of the points in set  $A$ ?  
(b) What is the set of  $x$  - coordinates of the points in set  $A$ ?

5. Mary subscribed to a cell phone plan with 400 free minutes, a Rs. 50 monthly fee, and 20 paise for each additional minute. What is her bill amount when she uses 700 minutes per month?

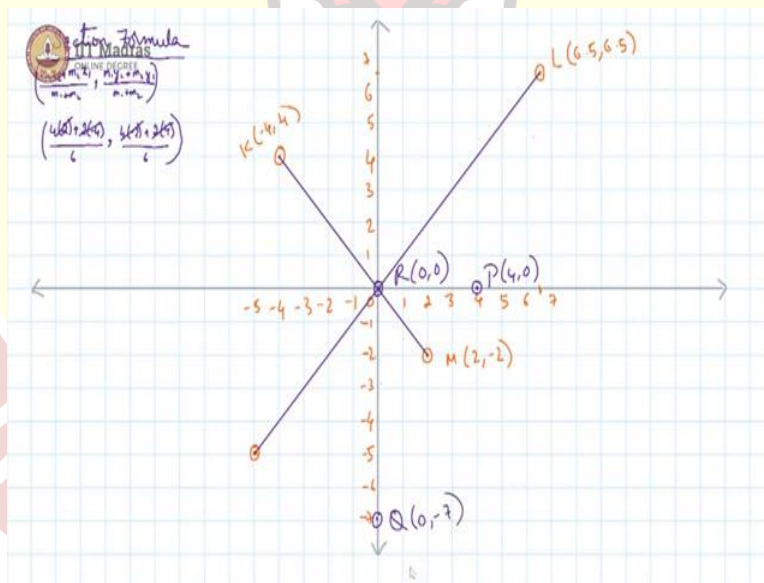
6. The coordinates of two points  $K$ ,  $L$ ,  $M$ , and  $N$  are  $(-4, 4)$ ,  $(6, 5, 6, 5)$ ,  $(2, -2)$ , and  $(-5, -5)$  respectively.  $R$  is the point of intersection of  $KM$  and  $LN$  and is known to cut the line segment  $KM$  in the ratio  $KR:RM = 4:2$ . Let two points  $P$  and  $Q$  have coordinates as  $(4, 0)$  and  $(0, -7)$  respectively. Then choose the correct options.

- ☐  $RP$  and  $RQ$  are parallel.
- ☐  $RP$  and  $RQ$  are perpendicular.
- ☐ Adequate information for finding the relation between  $RP$  and  $RQ$ .
- ☐  $\angle LRP + \angle PRM = 90^\circ$
- ☐  $\angle LRP + \angle PRM = 180^\circ$
- ☐ Adequate information for finding the relation between  $\angle LRP$  and  $\angle PRM$ .
- ☐ None of the above.

2

Now we are told that  $R$  is the point of intersection of  $KM$  and  $LN$ , and it is known to cut the line segment  $KM$  in this ratio, 4 is to 2 ratio, so let us identify  $R$ .

(Refer Slide Time 02:04)



(a) What is the set of  $y$  - coordinates of the points in set  $A$ ?

(b) What is the set of  $x$  - coordinates of the points in set  $A$ ?

5. Mary subscribed to a cell phone plan with 400 free minutes, a Rs. 50 monthly fee, and 20 paise for each additional minute. What is her bill amount when she uses 700 minutes per month?

6. The coordinates of two points  $K$ ,  $L$ ,  $M$ , and  $N$  are  $(-4, 4)$ ,  $(6.5, 6.5)$ ,  $(2, -2)$ , and  $(-5, -5)$  respectively.  $R$  is the point of intersection of  $KM$  and  $LN$ , and is known to cut the line segment  $KM$  in the ratio  $KR : RM = 4 : 2$ . Let two points  $P$  and  $Q$  has coordinates as  $(4, 0)$  and  $(0, -7)$  respectively. Then choose the correct options.

- ☐  $RP$  and  $RQ$  are parallel.
- ☐  $RP$  and  $RQ$  are perpendicular.
- ☐ Adequate information for finding the relation between  $RP$  and  $RQ$ .
- ☐  $\angle LRP + \angle PRM = 90^\circ$
- ☐  $\angle LRP + \angle PRM = 180^\circ$
- ☐ Adequate information for finding the relation between  $\angle LRP$  and  $\angle PRM$ .
- ☐ None of the above.

2

So from our diagram, it appears to be the origin. Lets verify this, so we need this to be in the ratio of 4:2. So when we use the section formula, which is the coordinates of a point cutting a line segment in a ratio,  $m_1 : m_2$  would be this,  $(m_1x_2 + m_2x_1) / (m_1 + m_2)$ . And then we have  $(m_1y_2 + m_2y_1) / (m_1 + m_2)$ . So in this context,  $R$  is going to be  $((4(2) + 2(-4)) / 6, (4(-2) + 2(4)) / 6)$ . And these 2 cancel out because it is  $8 - 8$ , these two also cancel because  $-8 + 8$ . So it is true,  $R$  the point is the origin. Moving on then, we have two other points,  $P$  and  $Q$  given to be  $(4, 0)$ ,  $(0, -7)$ , so these are on the axis. So this point here is  $P(4, 0)$ , and this is  $-6$ , this is  $-7$  so this point here would become  $Q$ , which is  $(0, -7)$ .

(Refer Slide Time 03:58)

(a) What is the set of  $y$  - coordinates of the points in set  $A$ ?

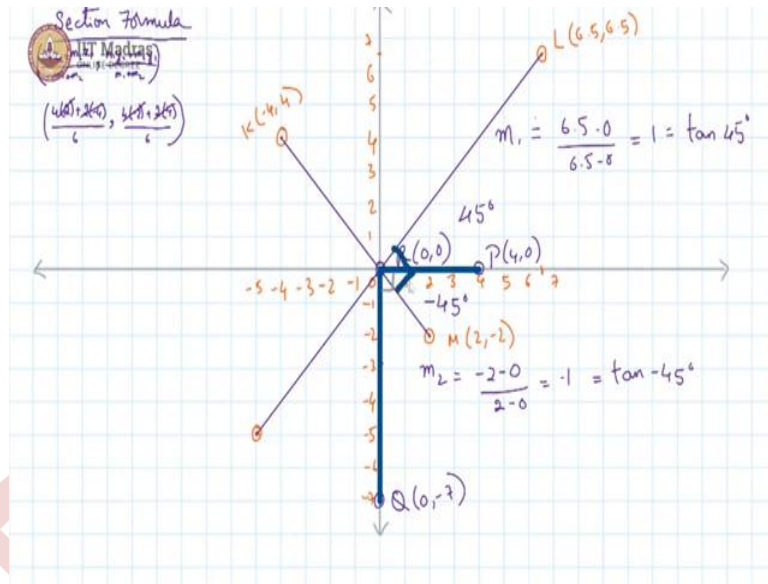
(b) What is the set of  $x$  - coordinates of the points in set  $A$ ?

5. Mary subscribed to a cell phone plan with 400 free minutes, a Rs. 50 monthly fee, and 20 paise for each additional minute. What is her bill amount when she uses 700 minutes per month?

6. The coordinates of two points  $K$ ,  $L$ ,  $M$ , and  $N$  are  $(-4, 4)$ ,  $(6.5, 6.5)$ ,  $(2, -2)$ , and  $(-5, -5)$  respectively.  $R$  is the point of intersection of  $KM$  and  $LN$ , and is known to cut the line segment  $KM$  in the ratio  $KR : RM = 4 : 2$ . Let two points  $P$  and  $Q$  has coordinates as  $(4, 0)$  and  $(0, -7)$  respectively. Then choose the correct options.

- ☐  $RP$  and  $RQ$  are parallel.
- ☐  $RP$  and  $RQ$  are perpendicular.
- ☐ Adequate information for finding the relation between  $RP$  and  $RQ$ .
- ☐  $\angle LRP + \angle PRM = 90^\circ$
- ☐  $\angle LRP + \angle PRM = 180^\circ$
- ☐ Adequate information for finding the relation between  $\angle LRP$  and  $\angle PRM$ .
- ☐ None of the above.

2



Lets look at the options, RP and RQ are parallel, this is one option, lets verify. Now clearly, this is  $90^\circ$ , PQ, PR is perpendicular to RQ and not parallel. So this is definitely wrong and this is definitely right. Is there adequate information for finding the relation between RP and RQ? Yes, we have just found the relation, so there has been adequate information.

Now let us look at  $\angle LRP + \angle PRM$ . So we are interested in this angle plus  $\angle PRM$ . So this sum is the total  $\angle LRM$ , so we need to know what is the angle between LR and RM. So let us look at the slope of LR. So this slope if I call it  $m_1$ , this is equal to  $(6.5 - 0) / (6.5 - 0)$ , which is 1, which is basically  $\tan 45^\circ$ , so this angle here it is  $45^\circ$ .

And now let us look at this angle here, which is PRM. Then, if we look at the slope here, which is  $m_2$  that is  $(-2 - 0) / (2 - 0)$ , which is -1, which is equal to  $\tan -45^\circ$ , therefore this angle here is  $-45^\circ$  because we are going clockwise from the horizontal. So in sum, we know that  $\angle LRM$  is  $45^\circ + 45^\circ$ , leading us to see that this is  $90^\circ$ .

So this is true, which means the following statement is false, so this is false. And here we have again adequate information for finding the relation between LRP and PRM. Clearly, we have four options correct, so none of the above is not correct.