

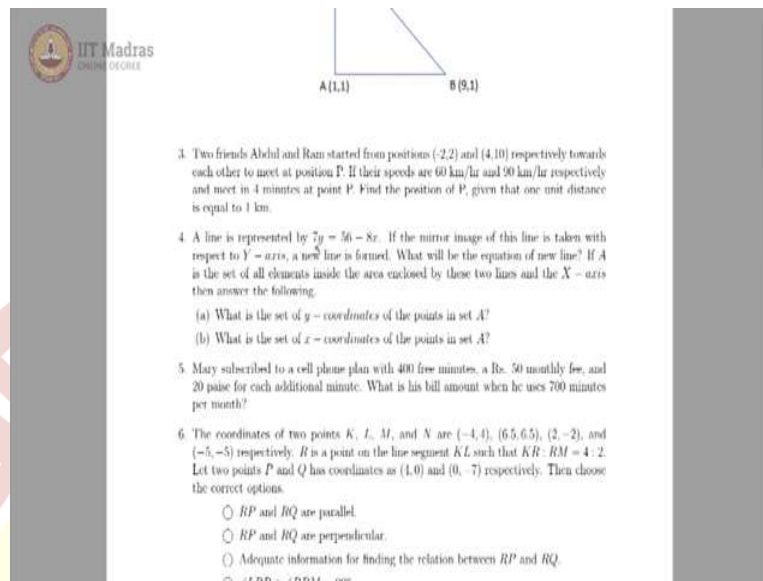


IIT Madras

ONLINE DEGREE

Mathematics for Data Science 1
Indian Institute of Technology, Madras
Week 02 - Tutorial 04

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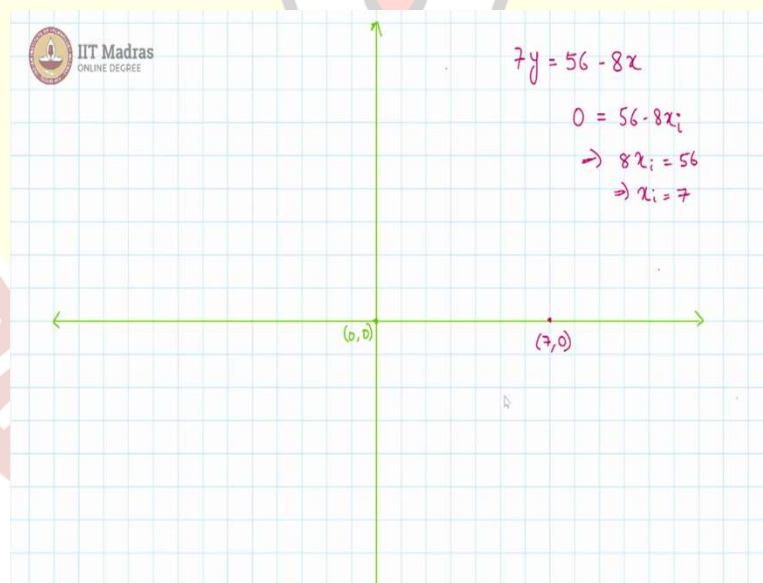


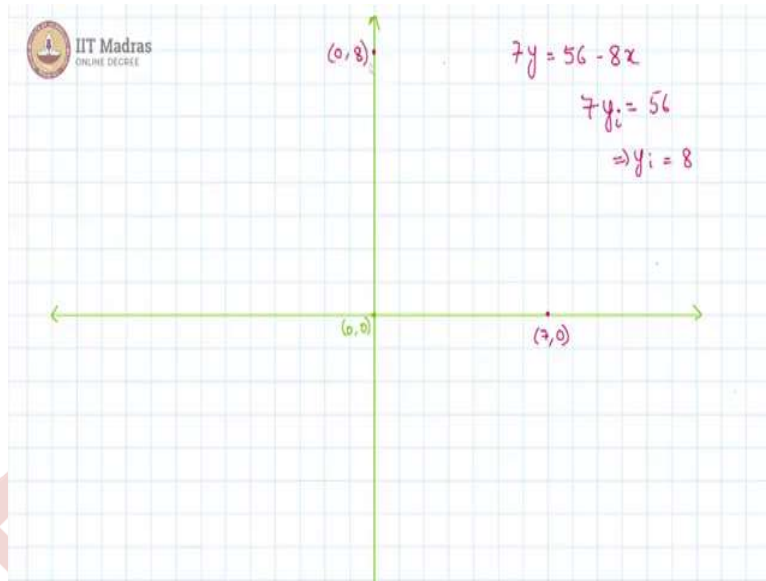
The slide features the IIT Madras logo in the top left corner. To the right of the logo is a diagram showing a line segment AB on a coordinate plane. Point A is at (1,1) and point B is at (9,1). Below the diagram is a list of six problems:

- Two friends Abhir and Ram started from positions $(-2,2)$ and $(4,10)$ respectively towards each other to meet at position P. If their speeds are 60 km/hr and 90 km/hr respectively and meet in 4 minutes at point P. Find the position of P, given that one unit distance is equal to 1 km.
- A line is represented by $7y = 56 - 8x$. If the mirror image of this line is taken with respect to $Y = \text{axis}$, a new line is formed. What will be the equation of new line? If A is the set of all elements inside the area enclosed by these two lines and the X -axis then answer the following.
 - What is the set of y -coordinates of the points in set A?
 - What is the set of x -coordinates of the points in set A?
- 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 his bill amount when he uses 700 minutes per month?
- 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 a point on the line segment KL such that $KR:RM = 4:2$. Let two points P and Q has coordinates as $(1,0)$ 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.
 - ☐ $\angle RPP \perp \angle PRM$ are

Now, fourth question, there is a line which is represented by $7y = 56 - 8x$.

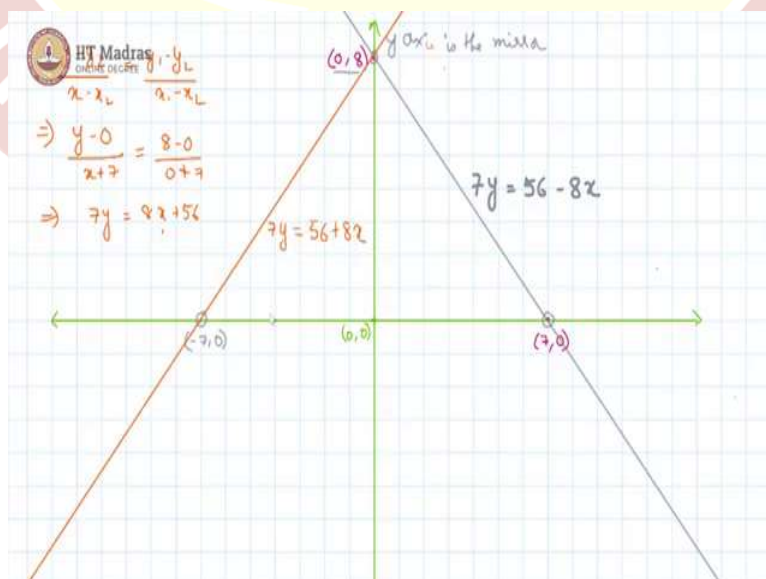
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Let us first draw this line, so this is our origin and our line equation is $7y = 56 - 8x$. In order to draw this line, in order to find out the curve, we need two points, two points are enough. And the easiest way to find out these two points is to work with the intercepts, that is when this line cuts the X-axis and when it cuts the Y-axis. So when, it is cutting the X-axis, y will be 0, so we just take the Y-coordinate to be 0, and we write $0 = 56 - 8x$ and to denote that this is the intercept, I am going to call it x_i and that gives us $8x_i = 56$ and that gives us $x_i = 7$. So, the x- intercept is 7 which is here. So, (7,0) is one point. And now, for the other point, we take x to be 0 and thus we can say $7y$ is equal to 56. Again, for the intercept, I am going to use y_i , $56 - 0$, therefore y_i , the y intercept is 8. So, this point here, which is (0,8), this is our y-intercept.

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So, this is a straight line, we have been given $7y = 56 - 8x$. It passes through $(7,0)$ and $(0,8)$. Now, for a mirror image, what happens is, and here we are treating the Y-axis as the mirror, so Y-axis is the mirror, you are at the same distance from your mirror as your reflection. So, your reflection will be at the exact distance from the mirror on the opposite side as you, so for example, if we take our $(0,7,0)$ on the other side, which is this point that is $(-7,0)$, that would be the reflection of $(7,0)$ with respect to the Y-axis as the mirror. However, $(0,8)$, since it is already on the Y-axis, its reflection is going to coincide with itself, so this is the other point of the reflection.

And thus, the mirror image for this line is going to be this other line which passes through these two points, $(-7,0)$ and $(0,8)$. For finding the equation of this line, we can use the two point form. And when we apply the values, we get $(y - 0) / (x + 7) = (8 - 0) / (0 + 7)$, which gives us $7y = 8x + 56$. So, the mirror image line if you have to write it in the same form as the other one, $7y = 56 + 8x$.

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A(1,1) B(9,1)

3. Two friends Abhil and Ram started from positions $(-2,2)$ and $(4,10)$ respectively towards each other to meet at position P. If their speeds are 60 km/hr and 90 km/hr respectively and meet in 4 minutes at point P. Find the position of P, given that one unit distance is equal to 1 km.

4. A line is represented by $7y = 56 - 8x$. If the mirror image of this line is taken with respect to $Y - \text{axis}$, a new line is formed. What will be the equation of new line? If A is the set of all elements inside the area enclosed by these two lines and the $X - \text{axis}$ then answer the following.

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

(b) What is the set of $x - \text{coordinates}$ 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 his bill amount when he uses 700 minutes per month?

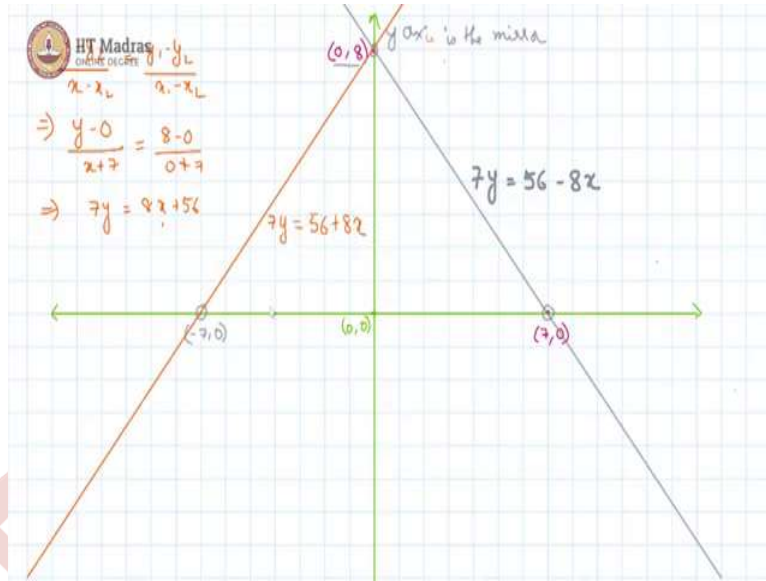
6. The coordinates of two points K, L, M, and N are $(-4,4)$, $(6,5,6,5)$, $(2,-2)$, and $(-5,-5)$ respectively. R is a point on the line segment KL such that $KR : RM = 4 : 2$. Let two points P and Q has coordinates as $(1,0)$ and $(0,-7)$ respectively. Then choose the correct options.

☐ RP and RQ are parallel.

☐ RP and RQ are perpendicular.

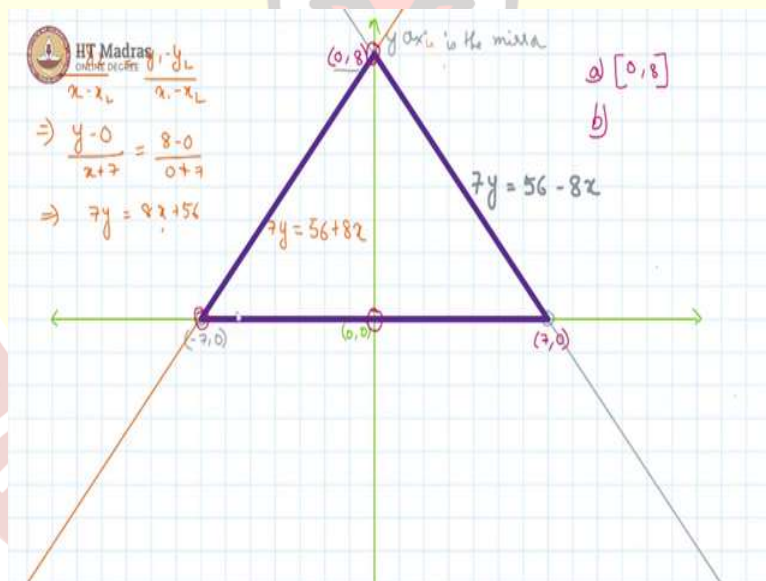
☐ Adequate information for finding the relation between RP and RQ.

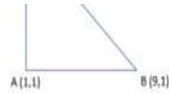
☐ $\angle RPP \pm \angle PPM = 90^\circ$



Now, in the next part of the question, they are asking if A is the set of all elements inside the area enclosed by these two lines and the X-axis. So, we are looking at this triangle, and in this triangle, we have being asked what is the set of Y coordinates of the points in set A.

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3. Two friends Abhil and Ram started from positions $(-2, 2)$ and $(4, 10)$ respectively towards each other to meet at position P . If their speeds are 60 km/hr and 90 km/hr respectively and meet in 4 minutes at point P . Find the position of P , given that one unit distance is equal to 1 km.
4. A line is represented by $7y = 56 - 8x$. If the mirror image of this line is taken with respect to $Y = \text{axis}$, a new line is formed. What will be the equation of new line? If A is the set of all elements inside the area enclosed by these two lines and the $X - \text{axis}$ then answer the following.
 - (a) What is the set of $y - \text{coordinates}$ of the points in set A ?
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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 his bill amount when he 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 a point on the line segment KL such that $KR : RM = 4 : 2$. Let two points P and Q has coordinates as $(1, 0)$ and $(0, -7)$ respectively. Then choose the correct options.
 - ☐ RP and BQ are parallel.
 - ☐ RP and BQ are perpendicular.
 - ☐ Adequate information for finding the relation between RP and BQ .
 - ☐ $\angle BDP \neq \angle PDM$ are

So, all possible Y coordinates in this set. So, every point within this triangle and on the triangle itself count, and as you can clearly see the least Y coordinate here is 0, and the maximum Y coordinate here is 8. So, the set of Y coordinates is going to be the closed interval $[0, 8]$, because we are considering the triangle also to be part of this set, not just the points inside the triangle interior to the triangle, we are considering the triangle also to be part of the set. So, this is the answer for part A. And for part B we have what is the set of X coordinates of the points in set A, and again, we look for the least and the maximum here, the least is -7 and the maximum is 7. And every value in between is there so this would be again the closed interval $[-7, 7]$.