




IIT Madras

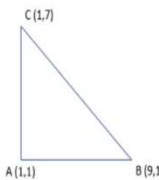
ONLINE DEGREE

Mathematics for Data Science 1
Indian Institute of Technology, Madras
Week 02
Tutorial 03

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3. Two friends Abhi 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?

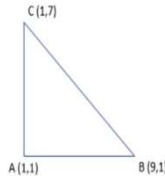
5. Mary subscribed to a cell phone plan with 400 free minutes, a Rs. 50 monthly fee, and 20 paise for each additional minute. What is his bill amount when he uses 700 minutes per month?

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 $KR : RM = 4 : 2$.

In the third question, the two friends positioned at these two locations and both of them go to a position P. The speeds are given, and the time of their meeting is given, then what should be this position P given that 1 unit distance is equal to 1 kilometre. So first let us look at their positions.

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3. Two friends Abdul 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.

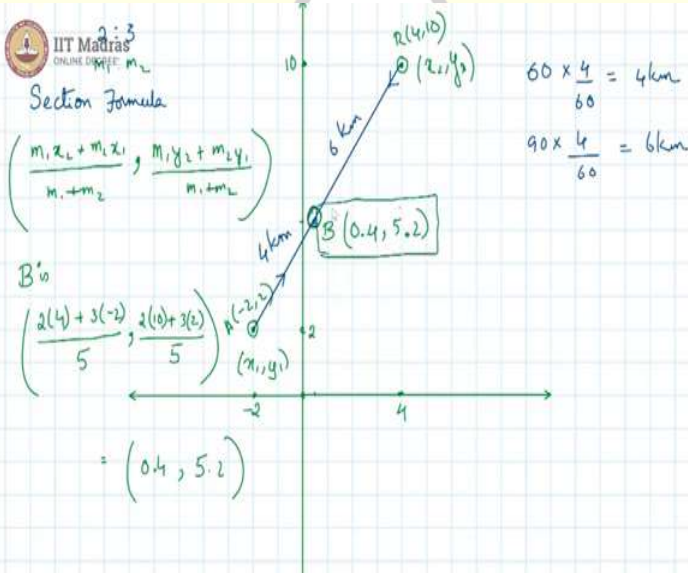
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(a) What is the set of $y - \text{coordinates}$ of the points in set A?

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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 $KR : RM = 4 : 2$.



So, this point is the origin, and now among the 2 friends, 1 Abdul is at $(-2, 2)$, so this is -2 here, and this is 2 here. So, Abdul is here, A $(-2, 2)$. And we have the other one Ram at $(4, 10)$, which is this is 4 on the x axis and this is 10 on the y axis, so Ram is here $(4, 10)$. It says they are moving towards each other, so this is a path they take, where Abdul is moving this way and Ram is moving this way.

And what we know about their movement is, Abdul is moving at 60 kmph and Ram is moving at 90 kmph , so Ram is faster and they are meeting in 4 minutes. If 1 unit is a kilometre, we have $60 \times 4/60$ because it is 4 minutes and the units are in hours kilometre per hour, so we do $4/60$ is equal to 4 km .

So, Abdul is moving 4 km, whereas Ram is moving $90 \times 4 / 60$, which is 6 km, so they meet somewhere in this region and we would like to know that point. And that point we can achieve through the section formula; we do not actually need to find the distances. And for applying the section formula, what we need to know is the ratio of how this point cuts the line segment AR. And that ratio we can use it in this way.

So, we know that this length is supposed to be 4 km and this length is supposed to be 6 km which means the ratio is 4:6 that is 2:3. So, we now apply the section formula, which is $(m_1 x_2 + m_2 x_1) / (m_1 + m_2)$. This will be the x coordinate of that point and $(m_1 y_2 + m_2 y_1) / (m_1 + m_2)$ will be the y coordinate of that point. So, let us call this point B, so this is the formula for B, so we get the point B is applying m_1 is, this is the ratio $m_1 : m_2$ and this is (x_1, y_1) and this is (x_2, y_2)

So, we have, $m_1 x_2$ would be $2 \times 4 + m_2 x_1$ would be $3 \times (-2)$ the whole by $m_1 + m_2$ is 5 and $(m_1 y_2$ would be $2 \times 10 + m_2 y_1$ would be $3 \times 2) / 5$ again. So that gives us $8 - 6 = 2$, $2/5$ is 0.4, and $2 \times 10 = 20$, $3 \times 2 = 6$ or $26 / 5 = 5.2$. So, B is (0.4, 5.2). We can check with our intuition, this point that we marked out actually has an x coordinate between 0 and 1 and a y coordinate between 5 and 6. So the point we are looking for is (0.4, 5.2).

