IIT Madras

ONLINE DEGREE

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

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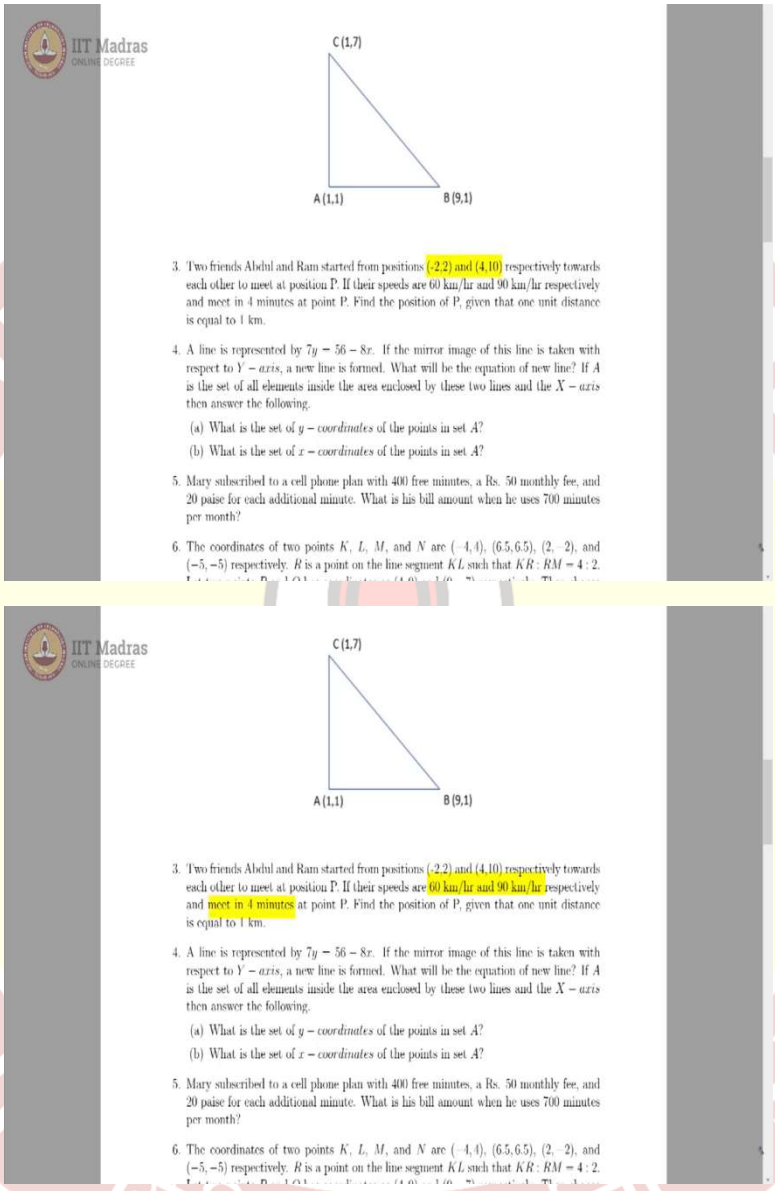

In the third question, the two friends positioned at these two locations and both of them go to a position P. The speeds are given, and the time of their meeting is given, then what should be this position P given that 1unit distance is equal to 1 kilometre. So first let us look at their positions.

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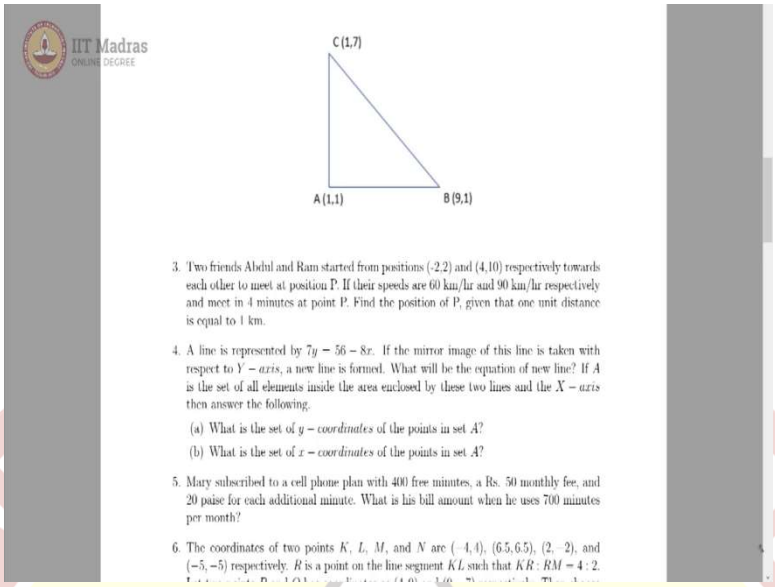

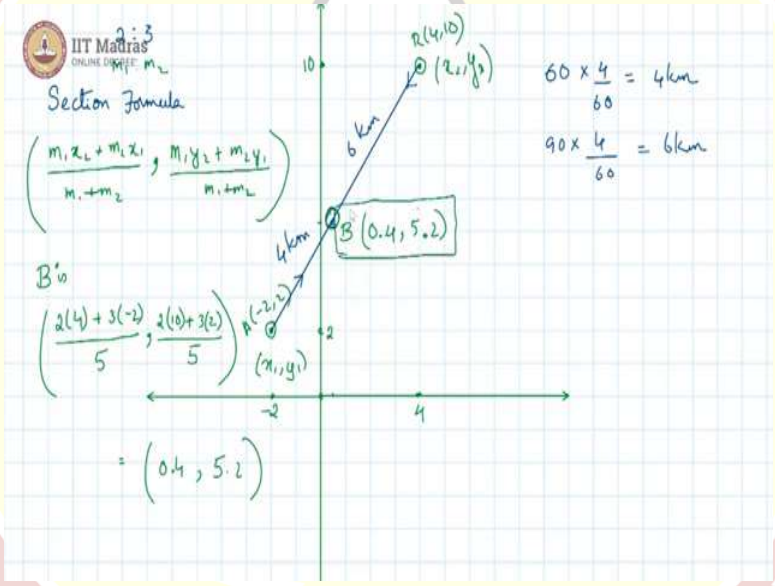

So, this point is the origin, and now among the 2 friends, 1 Abdul is at (-2,2), so this is -2 here, and this is 2 here. So, Abdul is here, A (-2,2). And we have the other one Ram at (4,10), which is this is 4 on the x axis and this is 10 on the y axis, so Ram is here (4,10). It says they are moving 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 60×4/60 because it is 4 minutes and the units are in hours kilometre per hour, so we do 4/60 is equal to 4km.

So, Abdul is moving 4 km, whereas Ram is moving 90×4/60, 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 $(m_1x_2+ \ m_2x_1)/(m_1+m_1)$. This will be the x coordinate of that point and $(m_1 \ y_2+ \ m_2 \ y_1)/(m_1 + m_1)$ 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_1x_2 would be 2×4 + m_2x_1 would be 3×(-2) the whole by m_1+m_1 is 5 and $(m_1 \ y_2$ would be 2×10 + $m_2 \ y_1$would be 3×2)/5 again. So that gives us 8-6 = 2, 2/5 is 0.4, and 2×10 = 20, 3×2 = 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).