



Races

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Races:

'A gives B a start of x meters':

This statement implies that, while A starts the race from starting point, whereas, B starts 10 meters ahead of A. To cover a race of 100 meters in this case, A will have to cover 100 meters while B will have to cover only $(100 - x)$.

- 'A beats B by x m': This statement implies that in the same time, while A reached the winning point, whereas, B is behind A by x m. To cover a race of 100 meters in this case, A has covered 100 meters while B has covered only $(100 - x)$
- A can give B a start of t minutes: This statement implies that A will start t minutes after B starts from the starting point. Both A and B will reach the finishing point at the same time.
- A gives B x meters and t minutes: This statement implies that A and B start from the starting point at the same instant, but while A reaches the finishing point, B is behind by x meters, and, B takes t minutes compared to A to complete the race. So, B covers remaining x meters in extra t minutes. This gives the speed of B as x/t .
- Dead Heat: A dead heat situation is when all participants reach the finishing point at the same instant of time
- Important note: These are the terminologies of 'races', rest we can use the concepts of time speed and distance.

Circular Motion: In this article we will discuss about the objects moving in the circular motion at different speeds usually on a circular track, starting from a particular point in opposite and same direction.

1. Time after they meet again at starting point: In this type of questions, we first calculate the time taken by all the objects/person to complete one round of the circular field. Then next, find the LCM of all the timings. The LCM is the time taken by them to meet together at the starting point.

Example 1: There is a track with a length of 240 meters and 3 people, P, Q and R are running around it at 8 m/min, 12 m/min and 20 m/min respectively in the same direction. When will P, Q and R meet at the starting point for the first time?

Solution:

Time taken by each to complete one round of track = $240/8$, $240/12$ and $240/20$
 = 30 min, 20 min, and 12 min.

Thus, time taken by them to meet together at starting point = LCM (30, 20, 12)
 = 60 min.

2. Time taken to meet for the first time on the track (at any point):

$$\frac{\text{Length of circular track}}{\text{Relative Speed}}$$

Example 2: There is a track with a length of 240 meters and two people, X & Y, are running around it at 8 m/min and 12 m/min respectively in the same direction. When will Y overtake X for the 1st time?

Solution:

Time of meeting = $240/(12 - 8) = 240/4 = 60$ min.

In order to visualize we can say that Y covers 4 mtr/min extra over X. So, when Y covers 240 mtrs. extra he will overtake X from the behind and hence they both will meet.

3. Number of points at which they meet:

$$\frac{\text{Time to meet at the starting point}}{\text{Time to meet for the first time at any point on track}}$$

Example 3: There is a track with a length of 240 meters and two people, X & Y, are running around it at 8 m/min and 12 m/min respectively in the same direction.

Solution:

Time to meet again at starting point = LCM($240/8$, $240/12$) = LCM(30, 20) = 60 min

Time to meet for the first time at any point on track = $240/(12-8) = 240/4 = 60$ min.

Thus,

Number of points at which X and Y meet on the track = $60/60 = 1$