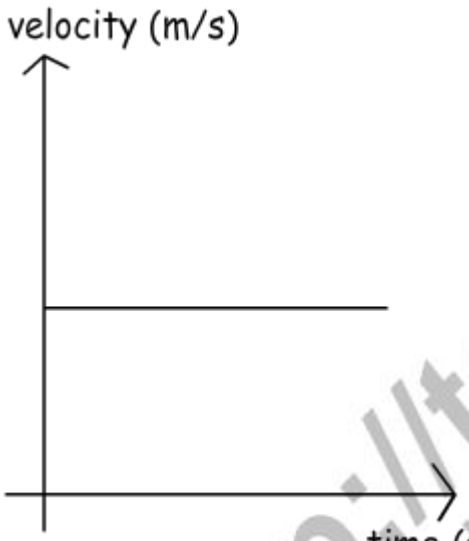
Velocity & Time Graphs

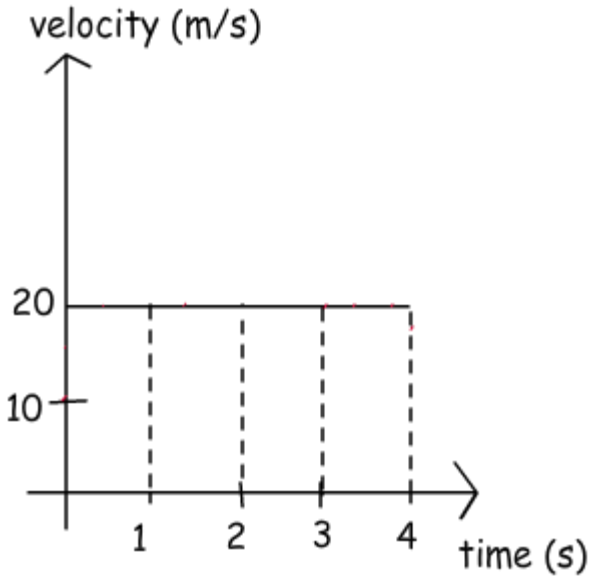
In velocity vs. time graphs, x axis is time as in the case of position vs. time graphs and y axis is velocity. There are two purposes this graph. One of them is area under the graph which gives the displacement and the slope which gives the acceleration.

1. According to the graph the velocity is constant, time passes but velocity is not changing.



It is showing the relation of velocity and time, how velocity is changing with time. It can be said for this graph acceleration is zero because there is no change in velocity. Moreover, from velocity vs. time graphs we can calculate displacement of the object.

Since, the velocity times time gives us displacement the ***area*** under the velocity vs. time graph also gives us the ***displacement*** of the object.

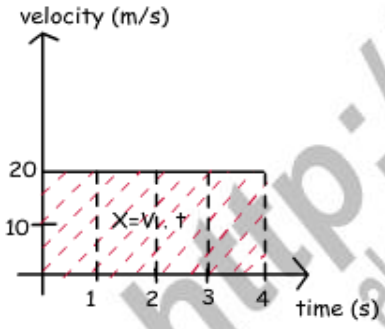


Example In the given graph calculate the displacement of the object for time (0s – 4s).

To solve this problem, We can use two methods.

1). The area under the graph will give us the displacement.

Then we compare the results of two techniques. The results are the same, thus, we can say that in velocity vs. time graphs we can find the displacement by looking at the area under the graph.



Area of the rectangle= A X B

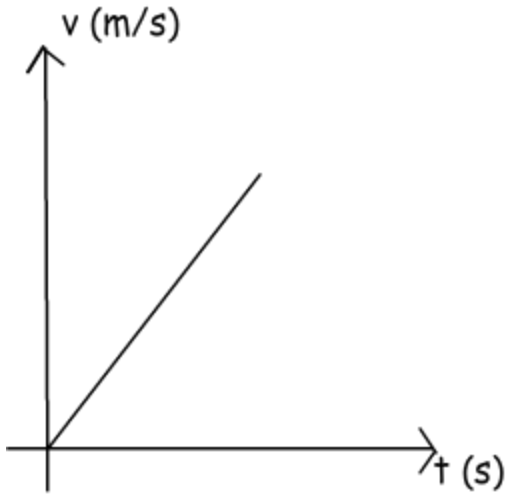
where A and B are the sides of the rectangle

Area of the rectangle= 20m/s X 4s =80m

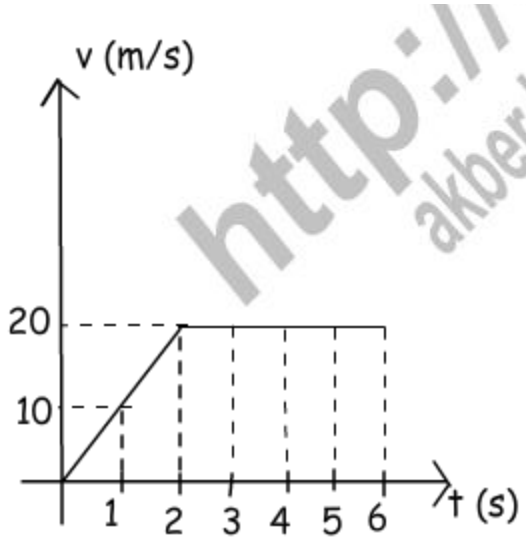
Displacement=Velocity X time

Displacement=20m/s X 4s=80m

2. In this graph there is a linear increase in velocity with respect to time so, the acceleration of the motion is constant. Moreover, we can calculate the displacement by looking at under the area of the graph.

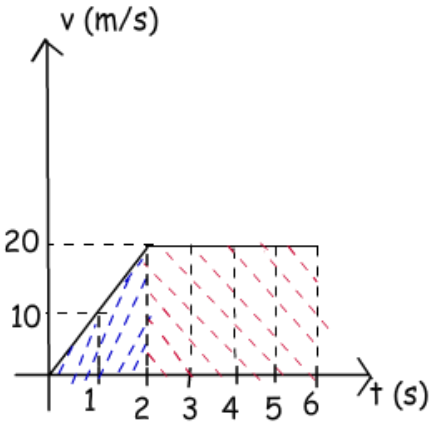


Example: Calculate the displacement of the car from the given graph.



We can calculate displacement by using the area under the graph, First calculate the area of the triangle shown with blue lines and then rectangle shown with red lines. Finally the sum of these two areas gives us the total displacement of the car.

0



area of the triangle= $\frac{1}{2}$ a.b

where a, and b are the perpendicular sides of the triangle

Area = $\frac{1}{2}$ 20m/s . 2s=20m

area of the rectangle= a.b

where a, and b are the sides of the rectangle

Area=20m/s . (6-2)s=80m

Sum of the areas;

Total displacement=A. of the Triangle + A. of the Rectangle

Total displacement=20m+80m=100m