

Date: _____

Name: _____

Kinematics

Kinematics is the portion of physics that deals with the motion of objects. We briefly covered this in the last physics lesson with speed but today we'll be going further into it.

Some new terminology you'll see today is the word average. This means you take the total of your numerator and denominator before dividing. *For example an average speed is your total distance divided by the total time.*

Last week you learned about speed, which is when you travel a distance over a certain amount of time. Let's see what you remember from that.

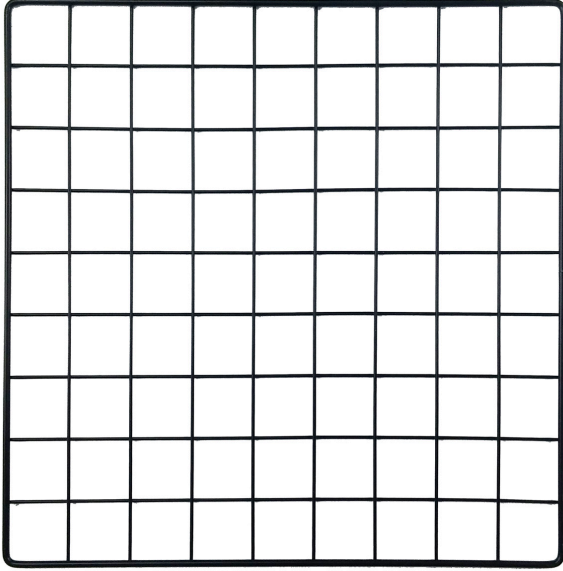
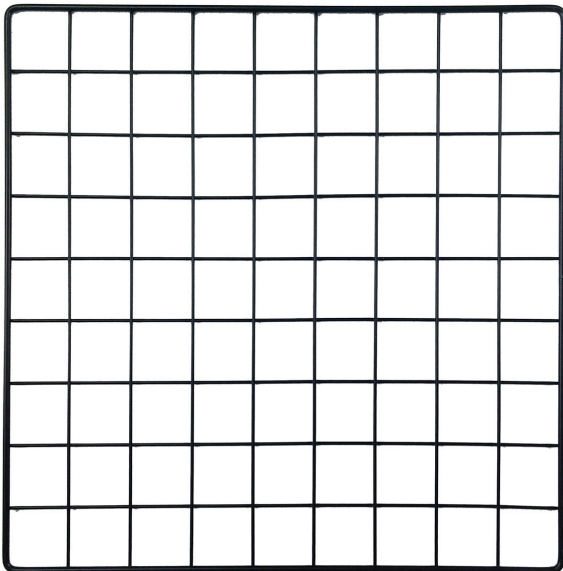
Ryan runs on a track that is 500 yards long two times. This takes him 5 hours to complete. What was his average speed? _____	Rohan is running late for his soccer tournament. It starts in 2 hours and he needs to fly there. The field is 1000 miles away. How fast must the plane go in order for him to make it on time? _____
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Now you'll be learning about something called **velocity**. Last week we learned that speed is a distance over time. Similar to that velocity is displacement over time.

A car drives right 7 miles and then drives left 13 miles. This takes a total of 2 hours to complete. What was the car's average velocity? What about average speed? Velocity_____ Speed_____	You and a friend decide to have a race. Your finish line is 13 miles to the west, while your friends are 5 miles east and 12 miles north. He says this is unfair since he'll need to go at a faster speed but you say that it's not because both of you can have equal velocity. Who is right? _____
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Now it's your turn to draw different ways of getting different velocities and speeds!

On the grids below track two paths starting from any point you want. Your task is to make these tracks completable with a speed and velocity of the values given below. Pretend a car is driving along your track . Your car will have **2 hours** to finish its track so make sure your track is completable within that limit and the speed given. One track should be for the speed given and the other with the velocity given. Each box is 1 mile long

Speed-10 mph Velocity-5 mph	
Speed- 17mph Velocity- 7mph	

The next thing in kinematics is **acceleration**. Acceleration is when your speed is changed. i.e. speeding up or slowing down.

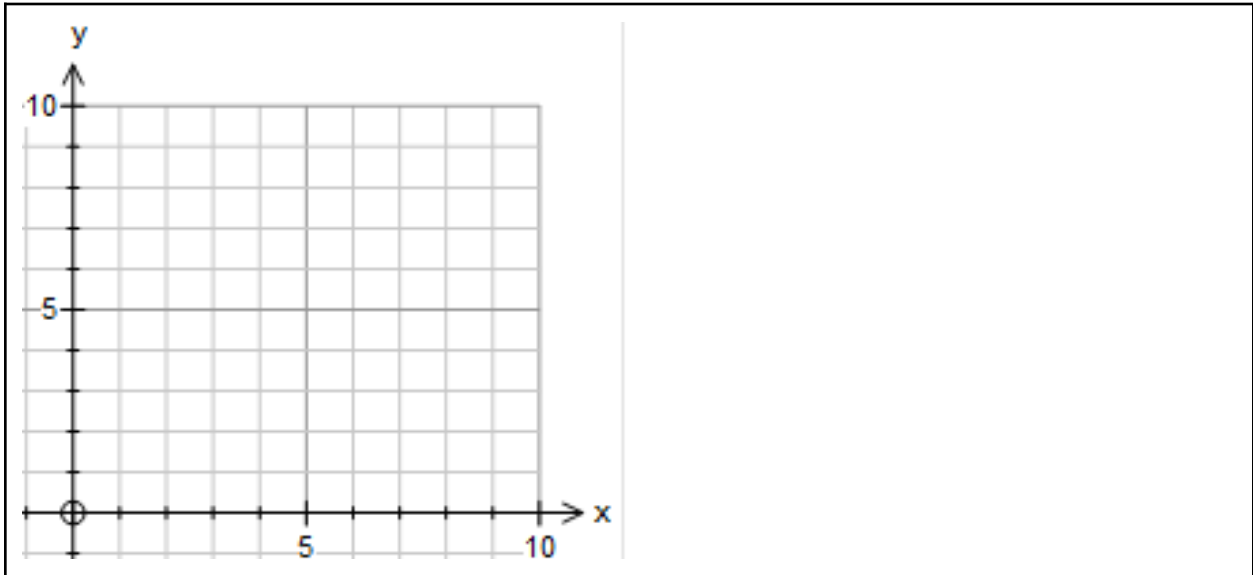
It can be calculated by the difference in your speed over time. $\frac{s_2 - s_1}{t}$.

s_2 is your final speed and s_1 is the initial speed.

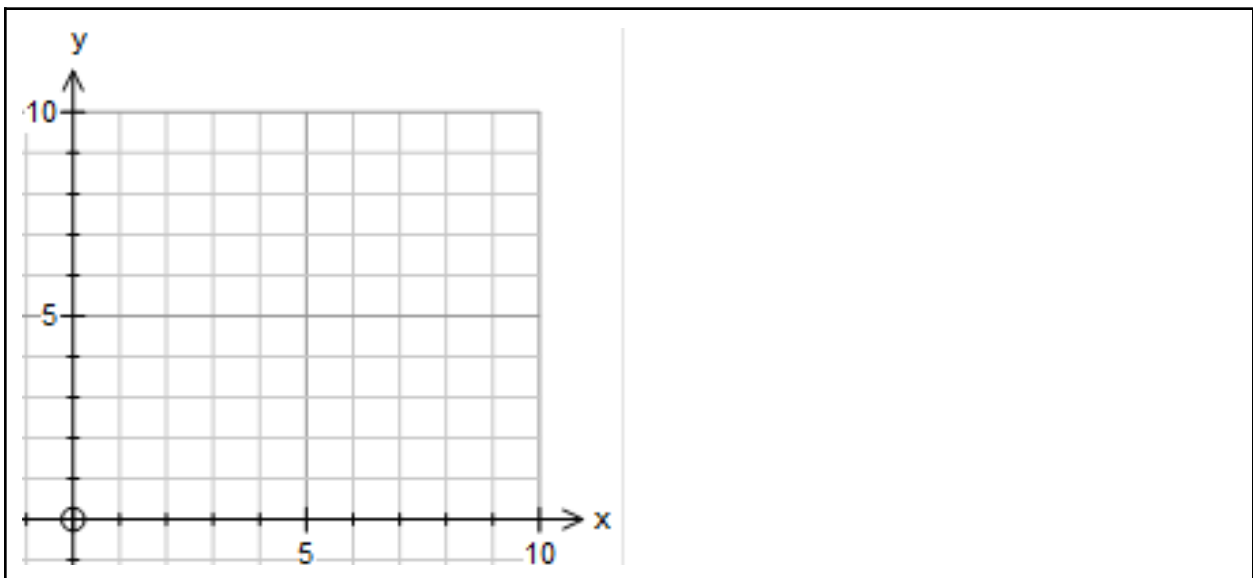
Note: the units of acceleration we will use are mi/s^2 .

Your car is initially not moving but then you press on the accelerator and it gets up to 15 mph. What was your car's acceleration? _____	You're driving on the freeway at a speed of 40 mph. You notice the speed limit is 60 mph and so you accelerate up to that speed. How long does this take? _____
You exit the freeway and go onto a road where the speed limit is 30 mph. What's your acceleration? What do you notice about your answer? _____	You're running at a speed of 2ft/s. You start accelerating at a rate of 1ft/s^2. After 30 seconds how fast are you running? _____

Now we are going to be taking a look at relationships between distance speed and acceleration.



On the graph above plot the points of a car that is driving at 1 mph for 10 hours. At every hour plot where the car is and at the end connect the dots. The y axis is miles and the x axis is hours. Start at the origin



On the graph above plot the points of a car that is initially at 0mph but accelerates at a rate of 1mi/s^2 for 10 hours. Plot the speed of the car at every hour and then connect the dots. What do you notice?