Distance-time Graphs

Describing the motion of an object is occasionally hard to do with words. Sometimes graphs help make motion easier to picture, and therefore understand.

Remember:

• Motion is a change in position measured by distance and time.
• Speed tells us the rate at which an object moves.
• Velocity tells the speed and direction of a moving object.

**DISTANCE-TIME GRAPHS**

Plotting distance against time can tell you a lot about motion. Let's look at the axes:

- Time is always plotted on the X-axis (bottom of the graph). The further to the right on the axis, the longer the time from the start.
- Distance is plotted on the Y-axis (side of the graph). The higher up the graph, the further from the start.

If an object is not moving, a horizontal line is shown on a distance-time graph.

- Time is increasing to the right, but its distance does not change. It is not moving. We say it is **At Rest**.
If an object is moving at a constant speed, it means it has the same increase in distance in a given time:

Time is increasing to the right, and distance is increasing constantly with time. The object moves at a **constant speed**.

**Constant speed is shown by straight lines on a graph.**

Let's look at two moving objects:
Both of the lines in the graph show that each object moved the same distance, but the steeper dashed line got there before the other one:

A steeper line indicates a larger distance moved in a given time. In other words, **higher speed**.
Both lines are **straight**, so both speeds are **constant**.

We can also use the graph to determine the speed of an object.
1. The amount the graph goes up represents the distance traveled (20 meters).
2. The amount the graph goes over represents the time (2 seconds).
3. We can then calculate speed by dividing 20 meters by 2 seconds to get 10 m/s.

**Summary:**
A distance-time graph tells us how far an object has moved with time.
- The steeper the line, the faster the motion.
- A horizontal line (↔) means the object is not changing its position - it is not moving, it is at rest.
For each graph, calculate the speed for runners A, B, C and D. Show your work!

1.

For graph 1:
- A = 
- B = 
- C = 
- D = 

2.

For graph 2:
- A = 
- B = 
- C = 
- D =
Calculate the speed of runner A and B and *then graph each of the following runners.*

3.

Runner A runs 40 m in 2 seconds.

Runner B runs 20 m in 2 seconds.

Describe how you can look at the graph and determine which runner is moving faster. ______________________________________________________________
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4.

Runner A runs 30 m in 2 seconds.

Runner B runs 40 m in 3 seconds.

Describe how you can look at the graph and determine which runner is moving faster. ______________________________________________________________
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