Name Key!

Date:

Cohort:

Advisor:

Physical Sci #3

Motion Graphs

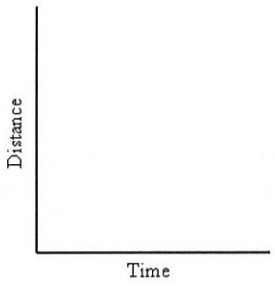
Describing the motion of an object is occasionally hard to do with words. Sometimes **graphs** help make motion easier to picture, and therefore understand.

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.
- **Acceleration** tells us the rate speed or direction changes.

DISTANCE-TIME GRAPHS

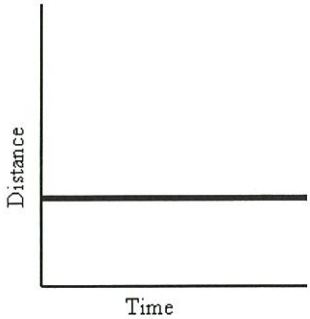
Plotting distance against time can tell you a lot about motion. Let's look at the axes:



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.

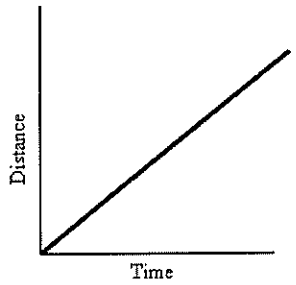
Distance is plotted on the Y-axis (side of the graph). The higher up the graph, the further from the start.

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**.

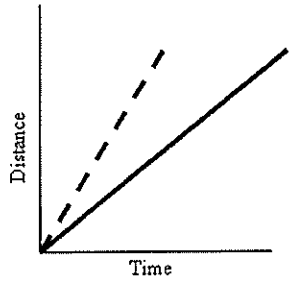
If an object is moving at a constant speed, it means it has the same increase in distance in a given time:



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.

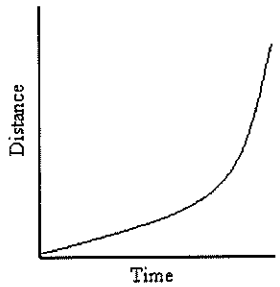
Let's look at two moving objects:
Both of the lines in the graph show that each object moved the same distance, but the steeper dashed line got there before the other one:



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**.

Graphs that show acceleration look different from those that show constant speed.



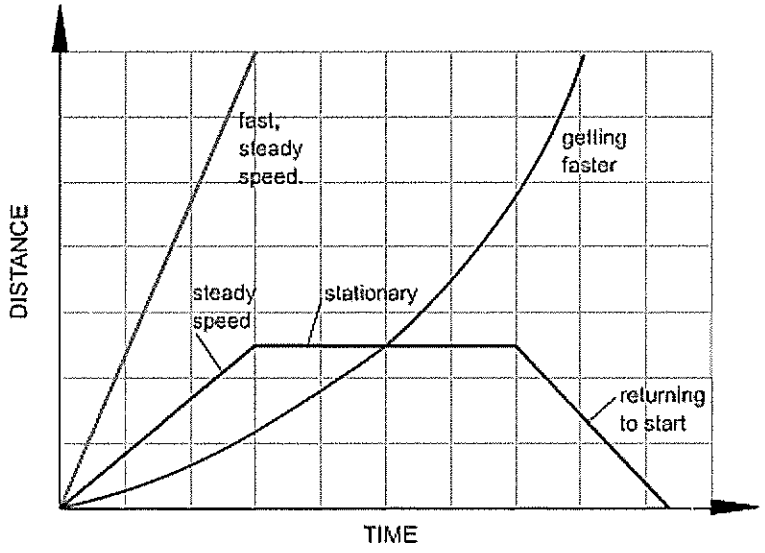
The line on this graph is curving upwards. This shows an **increase in speed**, since the line is getting steeper:

In other words, in a given time, the distance the object moves is change (getting larger). It is **accelerating**.

Summary:

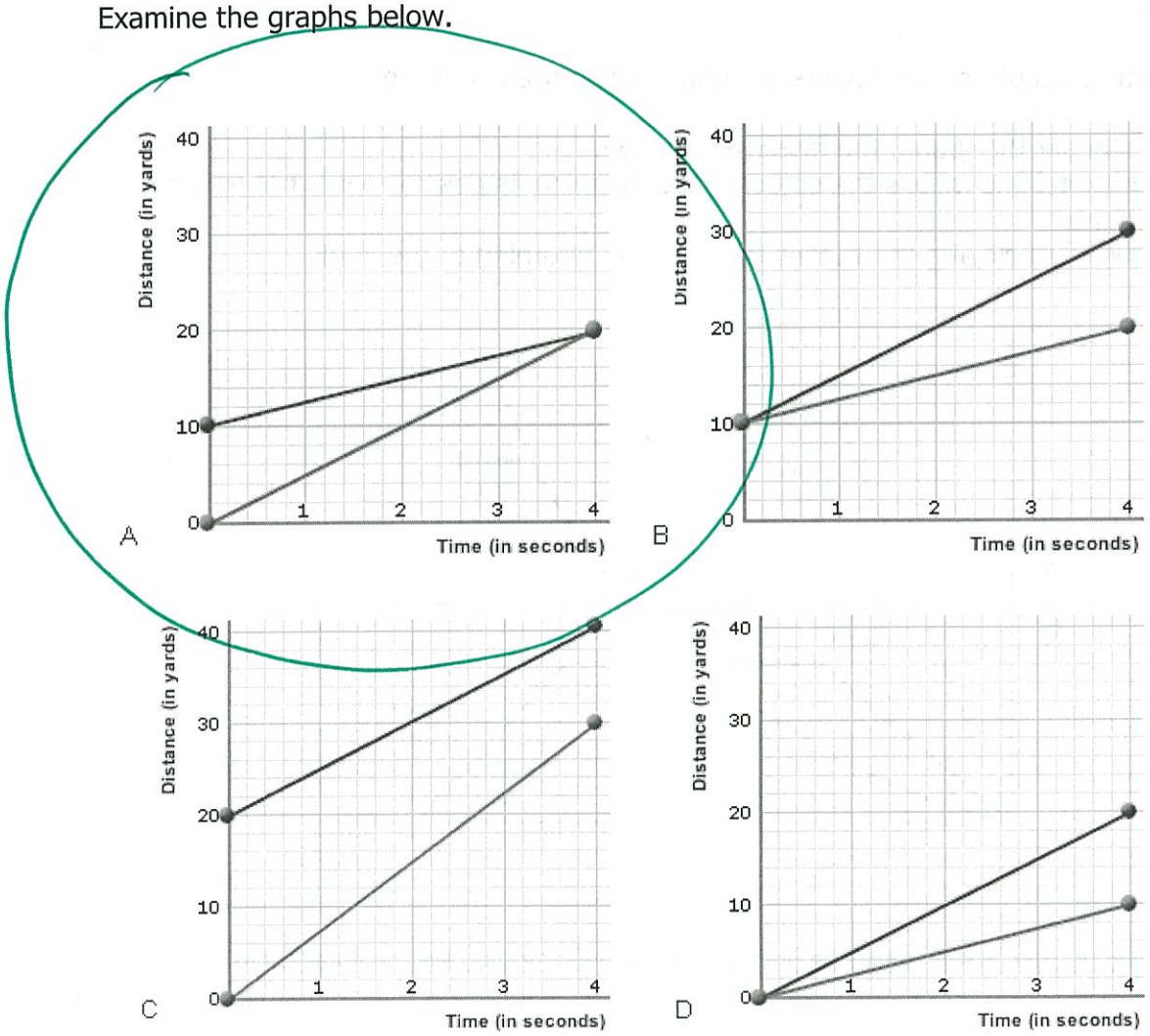
A distance-time graph tells us how far an object has moved with time.

- The steeper the graph, the faster the motion.
- A horizontal line means the object is not changing its position - it is not moving, it is at rest.
- A downward sloping line means the object is returning to the start.



(Graph from:
http://www.bbc.co.uk/schools/gcsebitesize/physics/forces/speedvelocityaccelerationfhrev2.shtml)

Examine the graphs below.



Which of the graphs shows that one of runners started 10 yards further ahead of the other? Explain your answer.

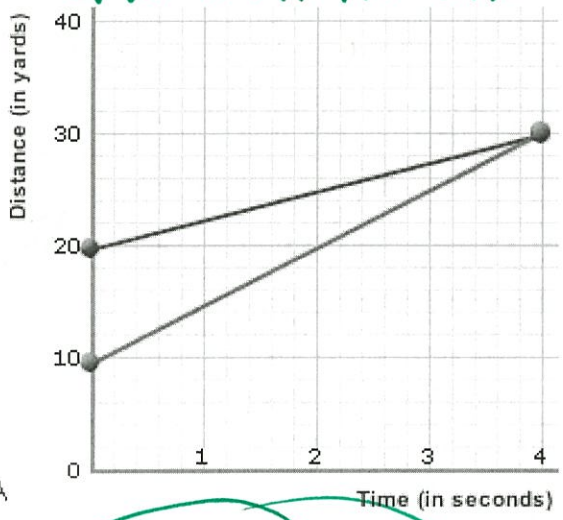
Graph A because one of the lines starts at 0 yards and the other one starts at 10 yards.

In which of the following graphs below are both runners moving at the same speed?

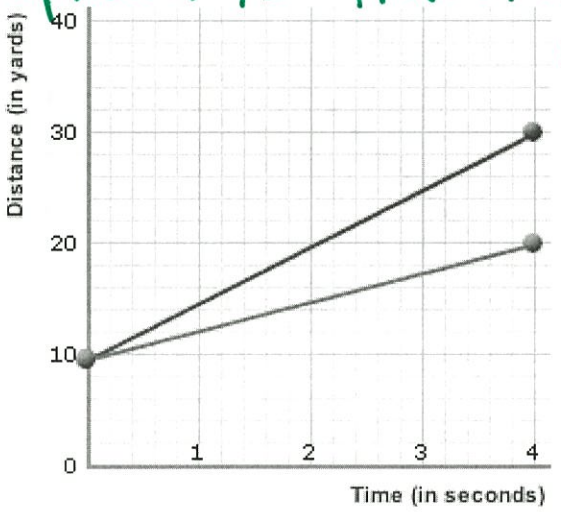
Explain your answer.

Graph D because the lines are parallel. The top line represents traveling 10 yards in 4 seconds and the bottom line represents traveling 10 yard in 4 seconds.

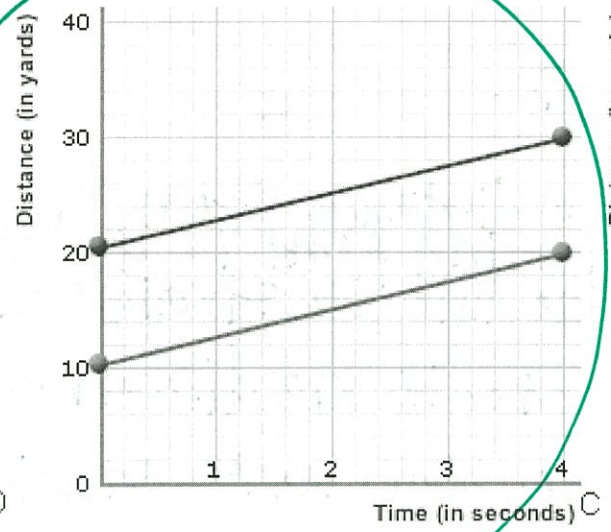
A



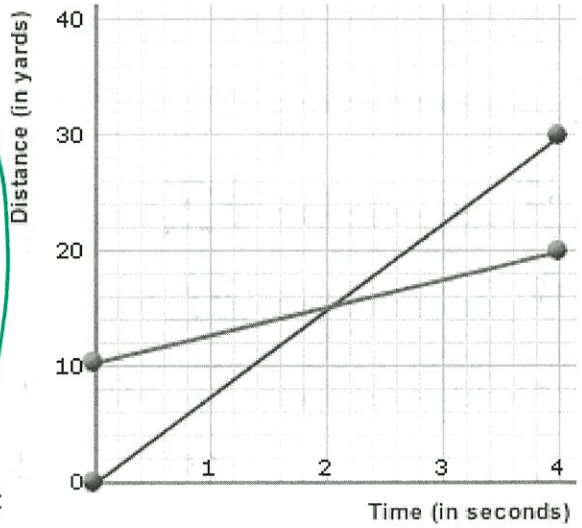
B



D



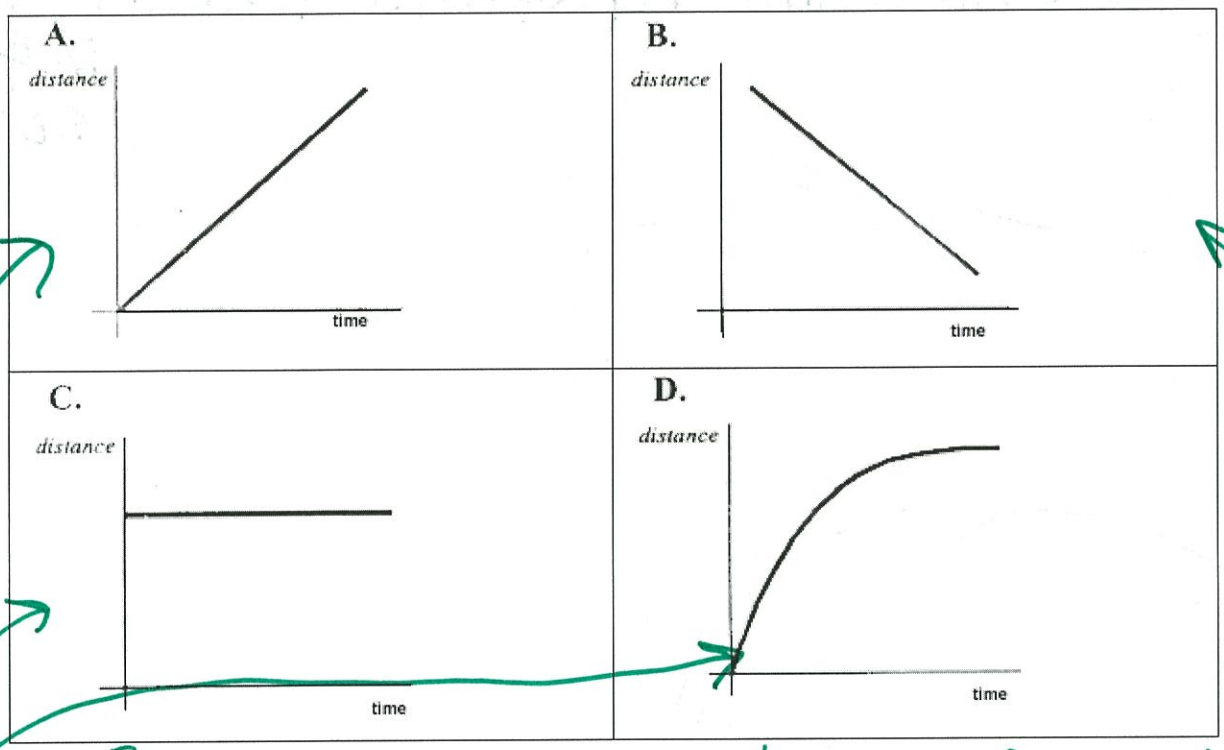
C



The distance-time graphs below represent the motion of a car. Match the descriptions with the graphs. **Explain your answers.**

Descriptions:

1. The car is stopped.
2. The car is traveling at a constant speed.
3. The speed of the car is decreasing.
4. The car is coming back.



Graph A matches description B because the distance from the starting point is decreasing.

Graph B matches description 4 because the line is straight.

Graph C matches description 2 because there is no distance travelled

Graph D matches description 1 because the line isn't straight