Name_____

Motion Graphs

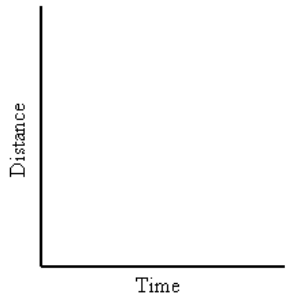
Describing the motion of an object is occasionally hard to do with words. Sometimes **graphs** help make motion easier to picture, and therefore understand.

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

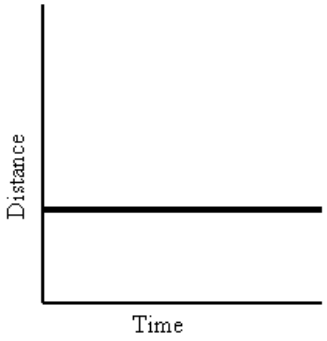
Plotting distance against time can tell you a lot about motion. Let's look at the axes:



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.

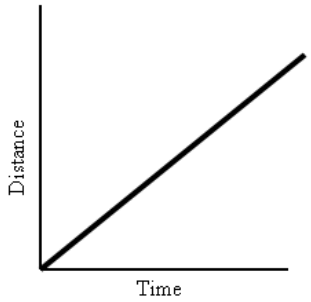
Distance is plotted on the Y-axis (side of the graph). The higher up the graph, the further from the start.

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**.

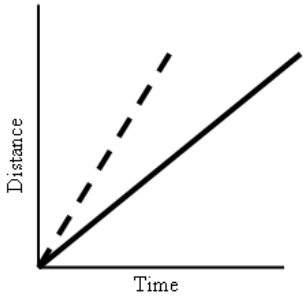
If an object is moving at a constant speed, it means it has the same increase in distance in a given time:



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.

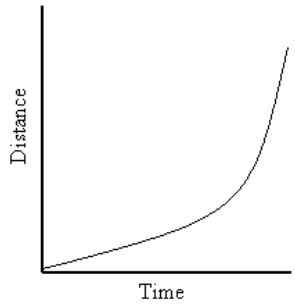
Let's look at two moving objects:
Both of the lines in the graph show that each object moved the same distance, but the steeper dashed line got there before the other one:



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.



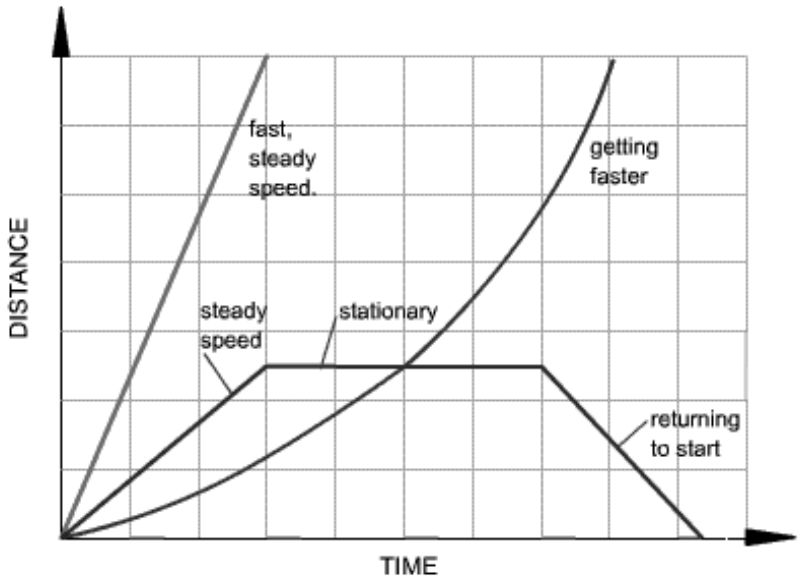
The line on this graph is curving upwards. This shows an **increase in speed**, since the line is getting steeper:

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.

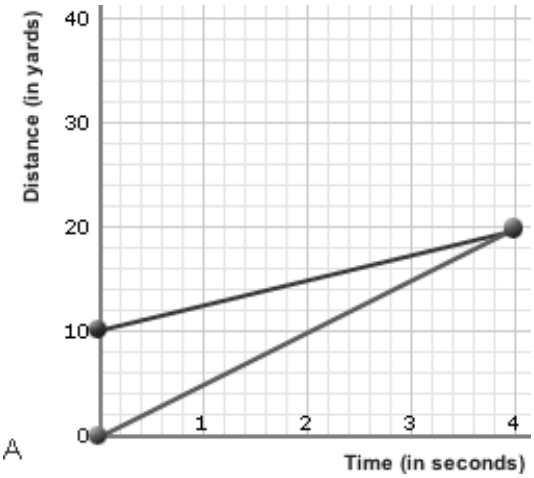
- The steeper the graph, the faster the motion.
- A horizontal line means the object is not changing its position - it is not moving, it is at rest.
- A downward sloping line means the object is returning to the start.



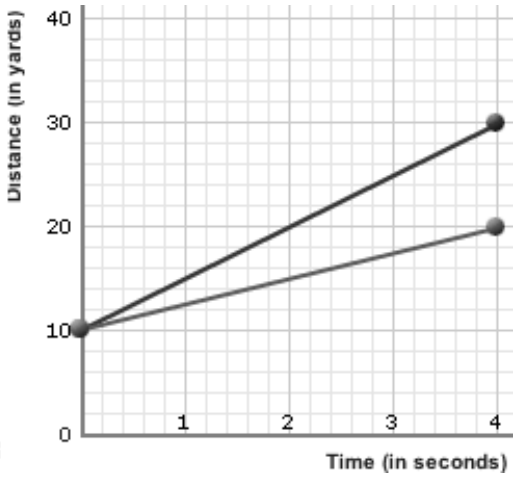
(Graph from:
http://www.bbc.co.uk/schools/gcsebitesize/physics/forces/speedvelocityaccelerationfhrev2.shtml)

Examine the graphs below.

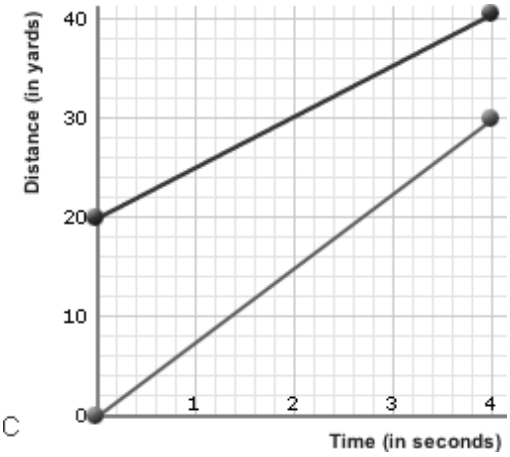
A



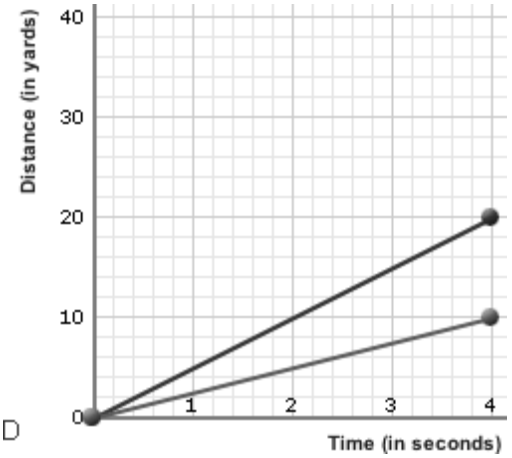
B



C



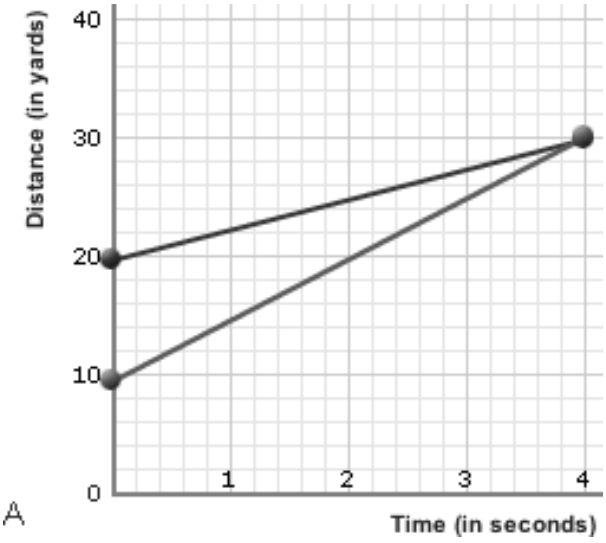
D



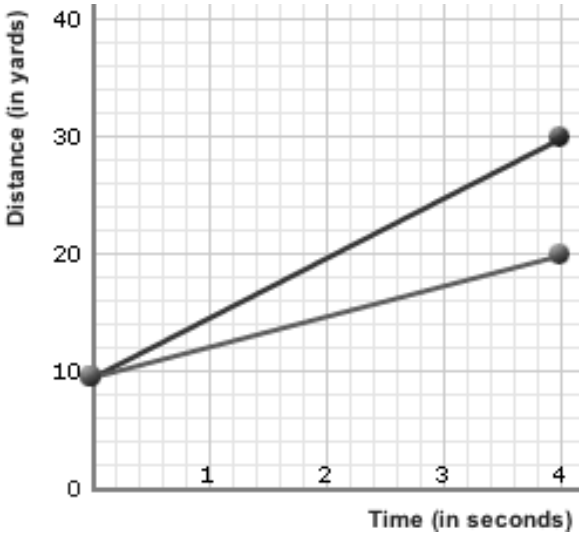
Which of the graphs shows that one of runners started 10 yards further ahead of the other? Explain your answer.

In which of the following graphs below are both runners moving at the same speed? Explain your answer.

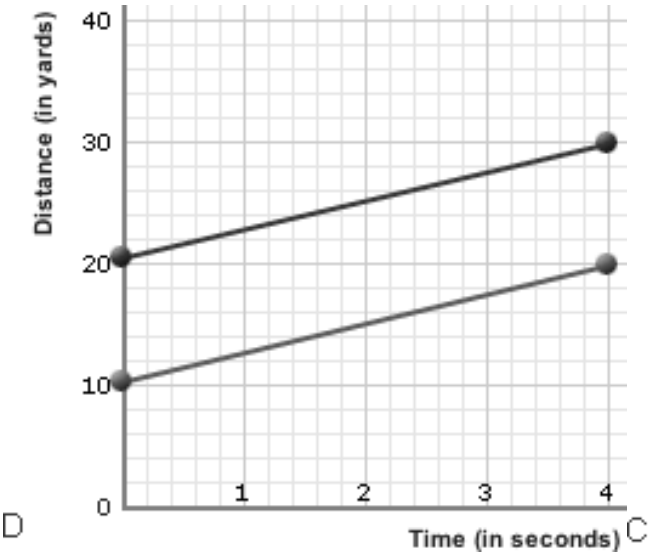
A



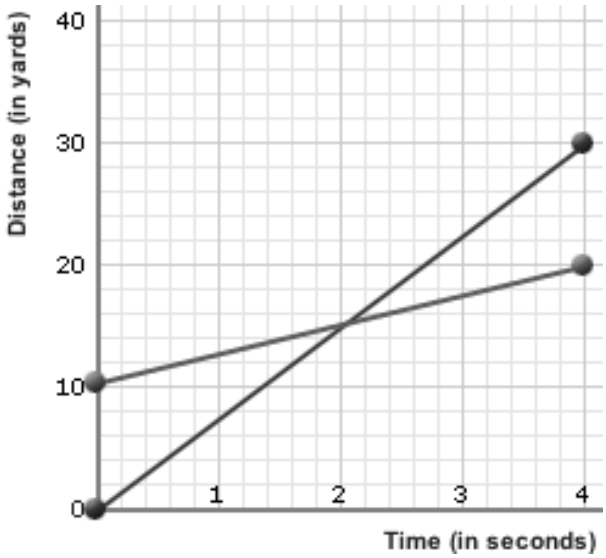
B



D



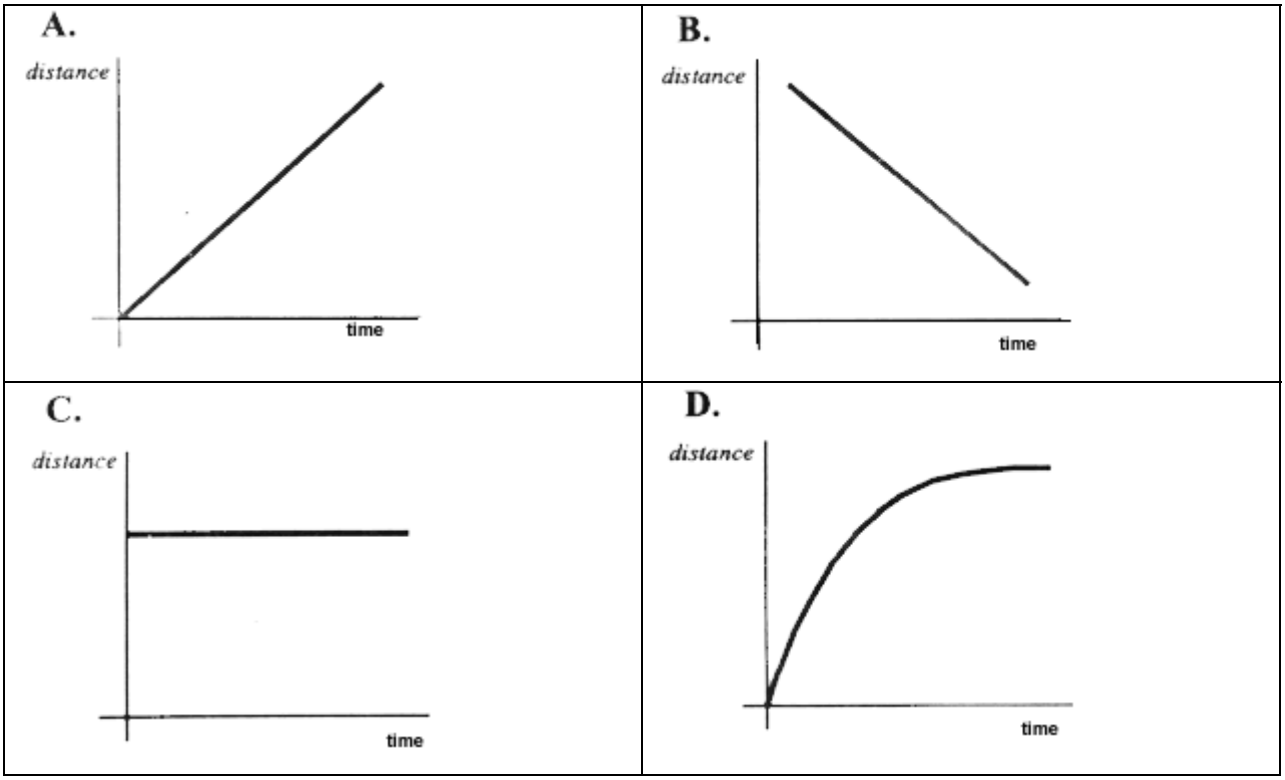
C



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 _____ because _____.

Graph B matches description _____ because _____.

Graph C matches description _____ because _____.

Graph D matches description _____ because _____.