Science 1206
Worksheet 13: Analyzing Graphs of Motion

1. Which of the following is used to determine the instantaneous velocity on a d-t graph?

   A) Area under the curve from zero to that time
   B) Height of the curve at that time
   C) Slope of the tangent to the curve at that time
   D) Total length of the curve
   E) impossible to determine from this type of plot

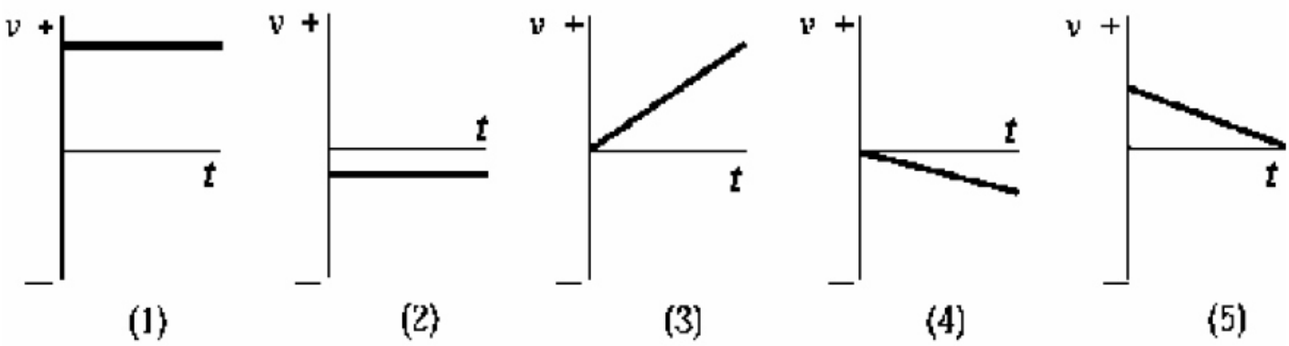
2. What does a straight line with a positive slope represent on a d-t graph?

   A) Constant positive acceleration.
   B) Constant negative acceleration.
   C) Constant positive velocity
   D) Constant negative velocity
   E) Zero velocity.

3. What does a straight line with a negative slope represent on a d-t graph?

   A) Constant positive acceleration.
   B) Constant negative acceleration.
   C) Constant positive velocity
   D) Constant negative velocity
   E) Zero velocity.

Use the graphs below to answer questions 4-6:



4. Which v-t graph best describes the motion of an object whose velocity is constant and negative?

   A) 1
   B) 2
   C) 3
   D) 4
   E) 5

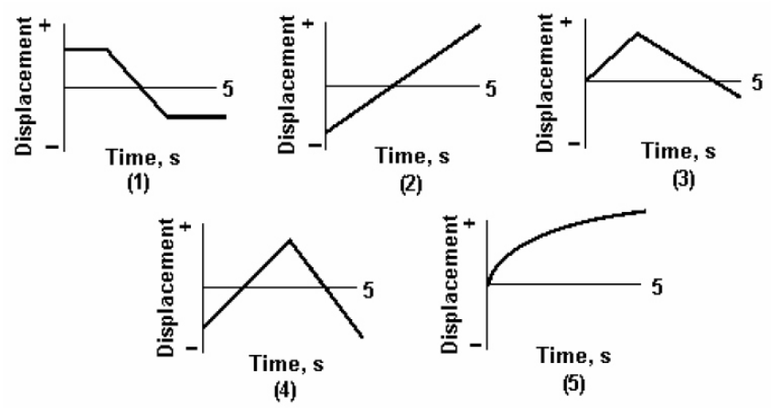
5. In which v-t graph does the object end up farthest from its starting point?

   A) 1
   B) 2
   C) 3
   D) 4
   E) 5

6. In which v-t graph does the object come to a stop while travelling right?

A) 1
B) 2
C) 3
D) 4
E) 5

Use the graphs below to answer questions 7-9



7. Which graph is the object closest to the origin at t = 0.5 s

A) 1
B) 2
C) 3
D) 4
E) 5

8. Which graph is the object slowing down as it travels to the right?

A) 1
B) 2
C) 3
D) 4
E) 5

9. Which graph does the object start to the left of the reference point and travel with uniform motion to the right?

A) 1
B) 2
C) 3
D) 4
E) 5

10. What does a parabolic curve that opens upward on a d-t graph represent?

A) Constant positive acceleration.
B) Constant negative acceleration.
C) no acceleration.
D) Positive followed by a negative acceleration.
E) Negative followed by a positive acceleration

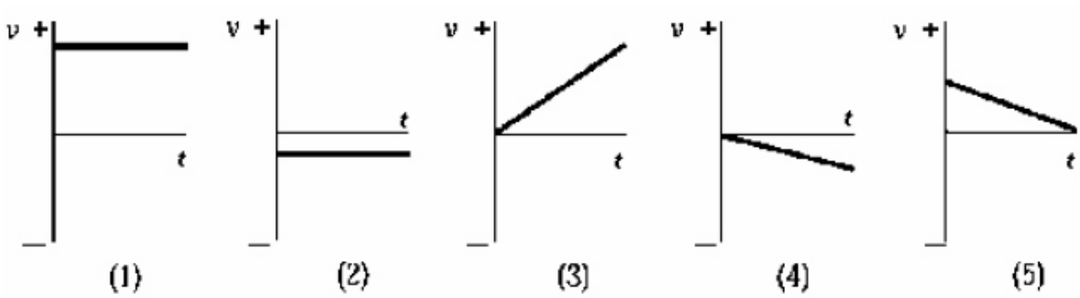
11. How is zero acceleration represented on a v-t graph?

A) Straight line with a positive slope.
B) Straight line with a negative slope.
C) Straight line with zero slope.
D) Either a, b, or c.
E) None of these is correct.

12. How is constant acceleration represented on a v-t graph?

A) Straight line with a positive slope.
B) Straight line with a negative slope.
C) Straight line with zero slope.
D) Either a, b, or c.
E) None of these is correct

Use the following to answer questions 13-15:



13. Which v-t best describes the motion of an object with positive velocity and negative acceleration?

A) 1
B) 2
C) 3
D) 4
E) 5

14. Which v-t graph best describes the motion of an object with negative velocity and negative acceleration?

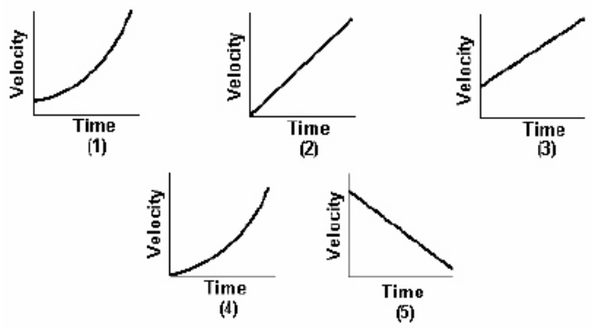
A) 1
B) 2
C) 3
D) 4
E) 5

15. In which v-t graph is the magnitude of the objects acceleration the greatest?

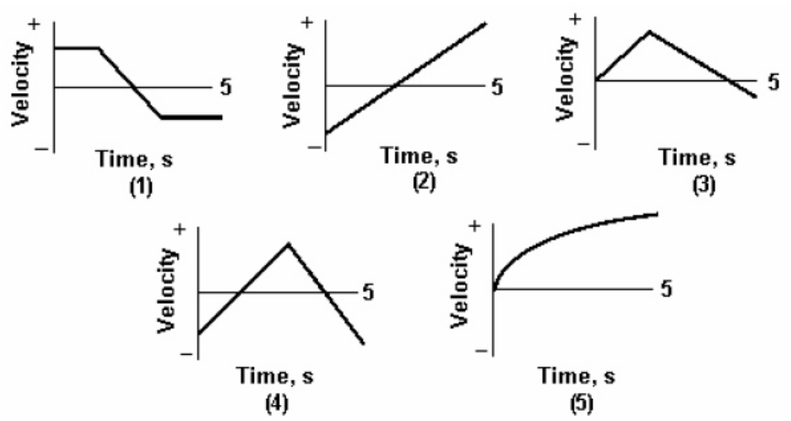
A) 1
B) 2
C) 3
D) 4
E) 5

16. A car accelerates uniformly from a velocity of 10 km/h to 30 km/h in one minute. Which v-t graph best describes the motion of the car?

A) 1
B) 2
C) 3
D) 4
E) 5



Use the following to answer questions 17-19:



17. In which graph does the object have no acceleration at t = 5 s?

A) 1
B) 2
C) 3
D) 4
E) 5

18. In which graph does the object have a constant acceleration for the entire 5 s?

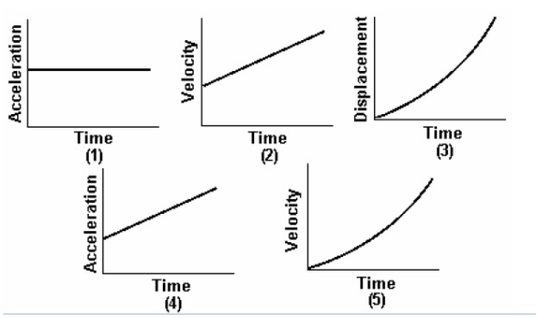
A) 1
B) 2
C) 3
D) 4
E) 5

19. In which graph does the object never have a constant acceleration?

A) 1
B) 2
C) 3
D) 4
E) 5

20. Two of the graphs shown are INCORRECT for an object undergoing constant acceleration. They are

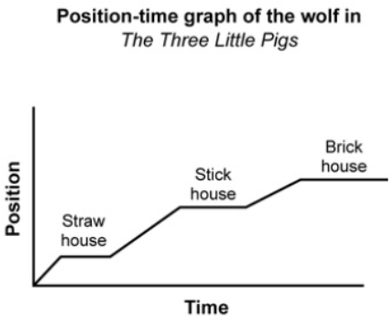
A) 1 and 2
B) 2 and 3
C) 3 and 4
D) 4 and 5
E) 1 and 5



POSITION-TIME GRAPHS

The graph at right represents the story of "The Three Little Pigs." The parts of the story are listed below.

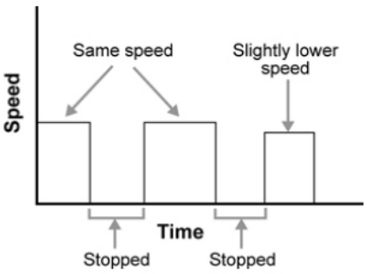
- The wolf started from his house. The graph starts at the origin.
- Traveled to the straw house. The line moves upward.
- Stayed to blow it down and eat dinner. The line is flat because position is not changing.
- Traveled to the stick house. The line moves upward again.
- Again stayed, blew it down, and ate seconds. The line is flat.
- Traveled to the brick house. The line moves upward.
- Died in the stew pot at the brick house. The line is flat.



The graph illustrates that the pigs' houses are generally in a line away from the wolf's house and that the brick house was the farthest away.

SPEED-TIME GRAPHS

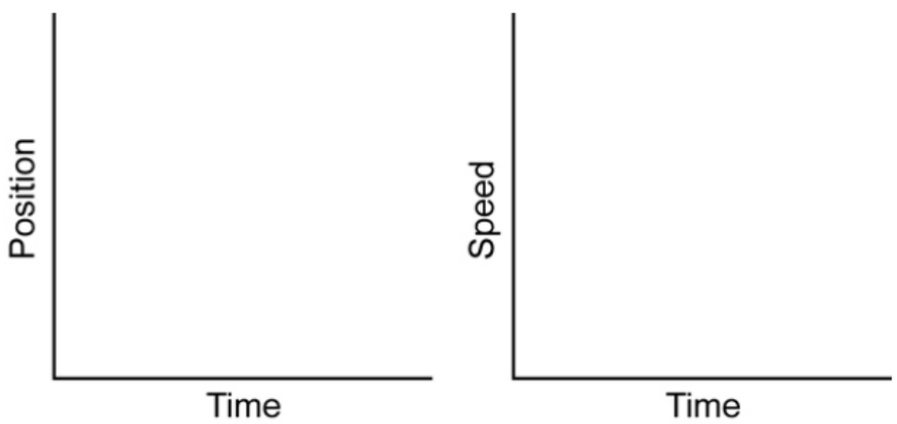
A speed-time graph displays the speed of an object over time and is based on position-time data. Speed is the relationship between distance (position) and time, v = d/t. For the first part of the wolf's trip in the position versus time graph, the line rises steadily. This means the speed for this first leg is constant. If the wolf traveled this first leg faster, the slope of the line would be steeper. The wolf moved at the same speed toward his first two "visits." His third trip was slightly slower. Except for this slight difference, the wolf was either at one speed or stopped (shown by a flat line in the speed versus time graph.



PRACTICE

1. Graph Red Riding Hood's movements according the following events listed in the order they occurred:

- Little Red Riding Hood set out for Grandmother's cottage at a good walking pace.
- She stopped briefly to talk to the wolf.
- She walked a bit slower because they were talking as they walked to the wild flowers.
- She stopped to pick flowers for quite a while.
- Realizing she was late, Red Riding Hood ran the rest of the way to Grandmother's cottage.



2. Graph the altitude of the sky rocket on its flight according to the following sequence of events listed in order.

• The skyrocket was placed on the launcher.

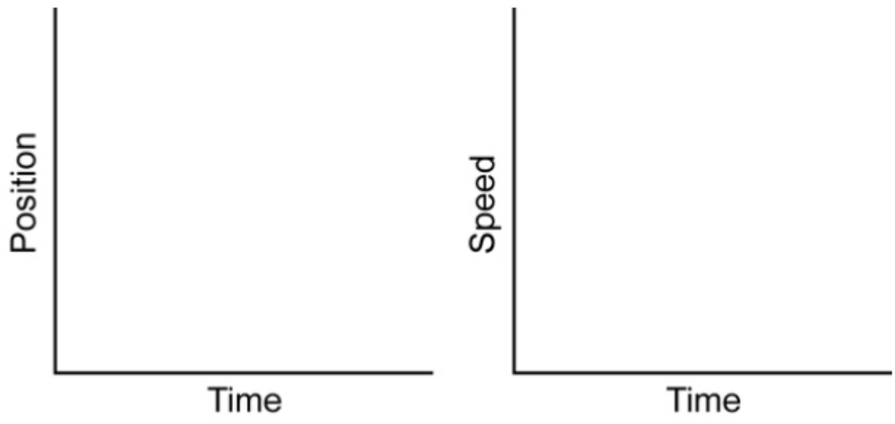
• As the rocket motor burned, the rocket flew faster and faster into the sky.

• The motor burned out; although the rocket began to slow, it continued to coast ever higher.

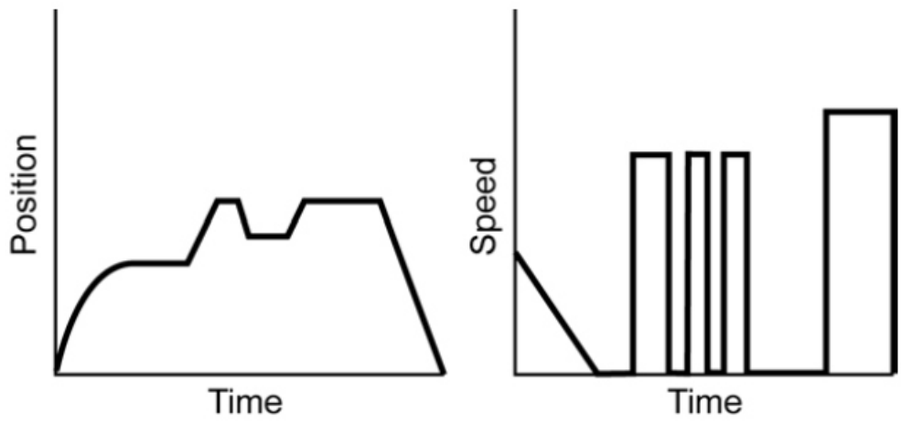
• Eventually, the rocket stopped for a split second before it began to fall back to Earth.

• Gravity pulled the rocket faster and faster toward Earth until a parachute popped out, slowing its descent.

• The descent ended as the rocket landed gently on the ground.

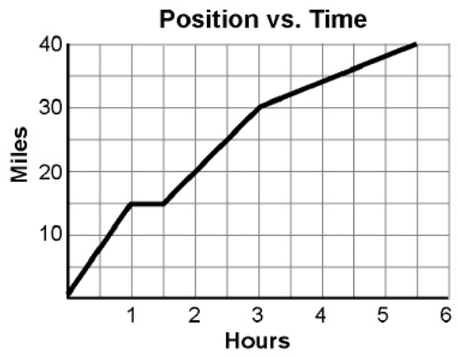


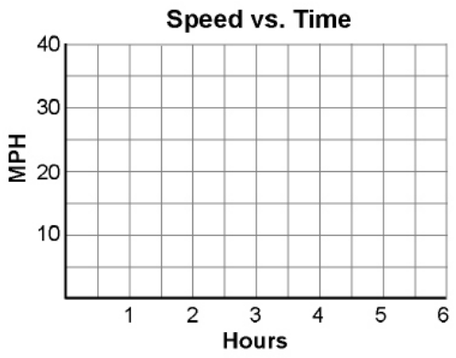
3. A story told from a graph: Tim, a student at Cumberland Junior High, was determined to ask Caroline for a movie date. Use these graphs of his movements from his house to Caroline's to write the story.



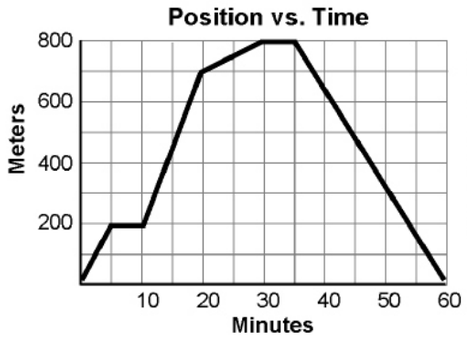
4. For each position-time graph, calculate and plot speed on the speed-time graph to the right.

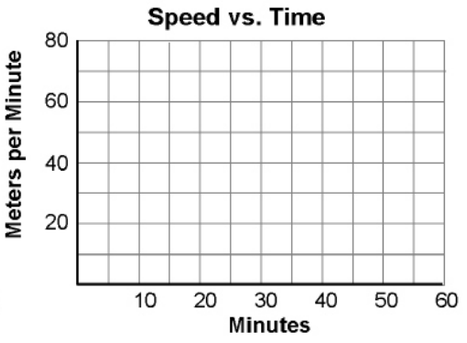
a. The bicycle trip through hilly country





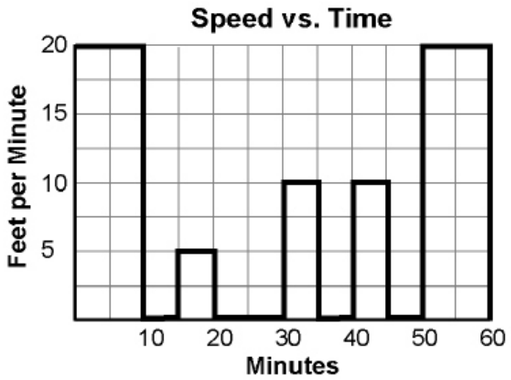
b. A walk in the park

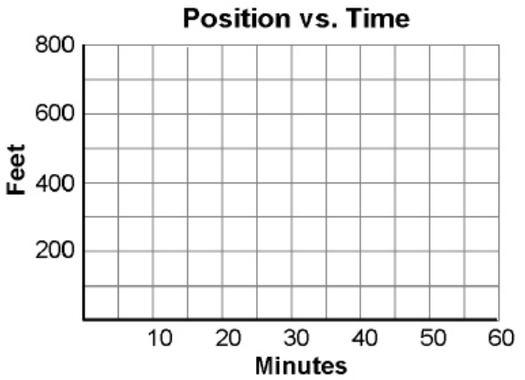




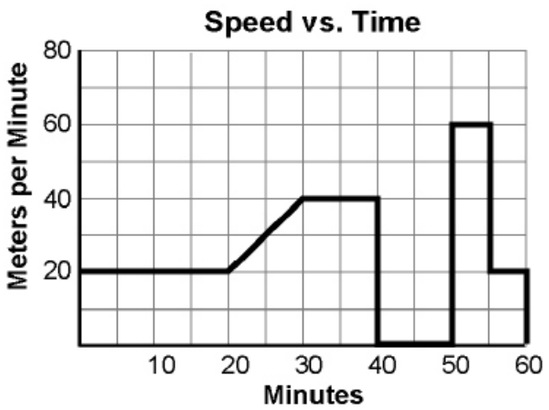
5. For each speed-time graph, calculate and plot the distance on the position-time graph to the right. For this practice, assume that movement is always away from the starting position.

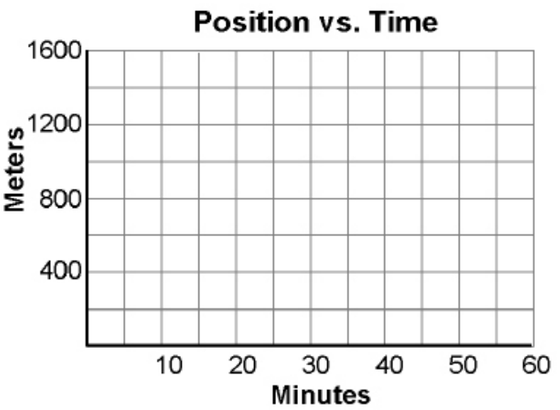
a. The honey bee among the flowers





b. Rover runs the street

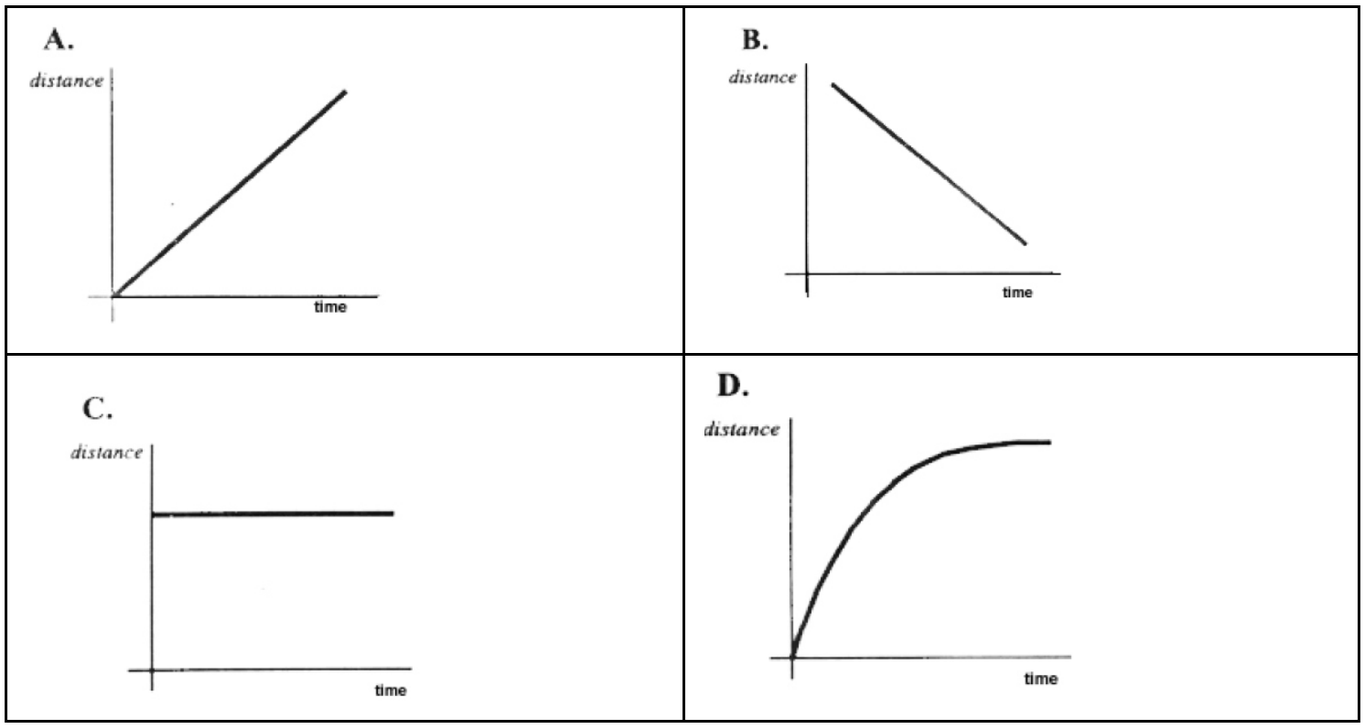




6. The distance-time graphs below represent the motion of a car. Match the descriptions with the graphs. Explain your answers.

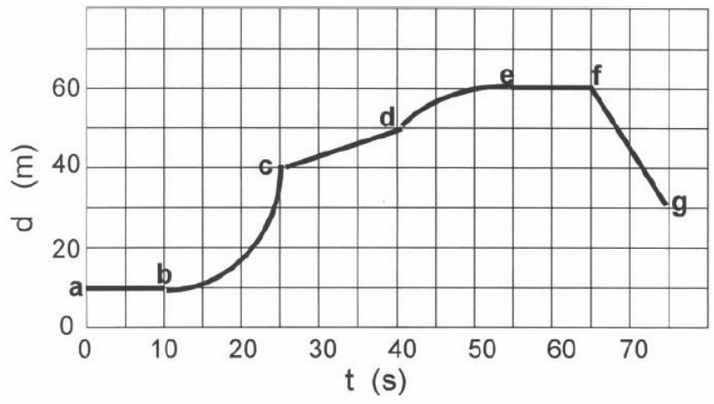
Descriptions:

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 at a constant speed.



Graph A matches description _____ because _____.
Graph B matches description ____ because _____.
Graph C matches description _____ because _____.
Graph D matches description ____ because _____.

7. Use the displacement-time graph carts motion:



A) In which section(s) is the cart accelerating? _____

B. In which section(s) is the cart not moving? _____

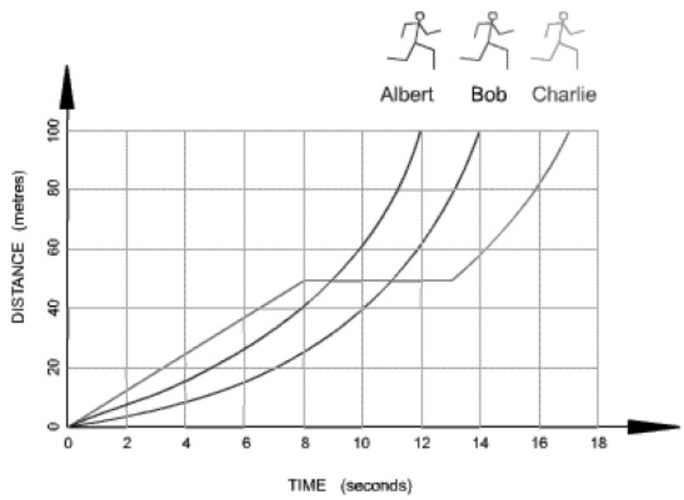
C. In which section(s) is the cart moving backwards? _____

D. In which section(s) is the cart's instantaneous velocity at any time equal to its average velocity? _

E. What is the velocity of the cart in these sections?
a-b __0 m/s_____ c-d _____ e-f _____ f-g _____

F. How far does the cart move in section b-c? _____ e-f? _____

8. The graph below shows how three runners ran a 100-meter race.



A) Which runner won the race? Explain your answer.

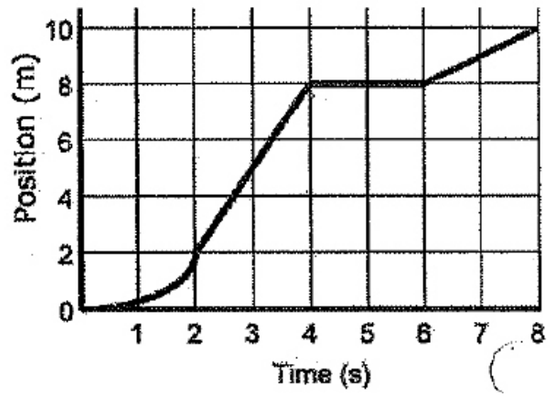
B) Which runner stopped for a rest? Explain your answer.

C) How long was the stop? Explain your answer.

D) How long did Bob take to complete the race? Explain your answer.

E) Calculate Albert's average speed. (Figure the distance and the time first!)

9. A woman walks away from a away from a starting point in a straight line. A position-time graph for her motion is shown to the right.



A) Describe her motion between 0s and 2 seconds:_____

B) Describe her motion between 2s and 4 seconds: _____

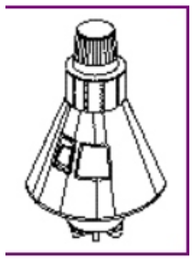
C) Describe her motion between 4s and 6 seconds: _____

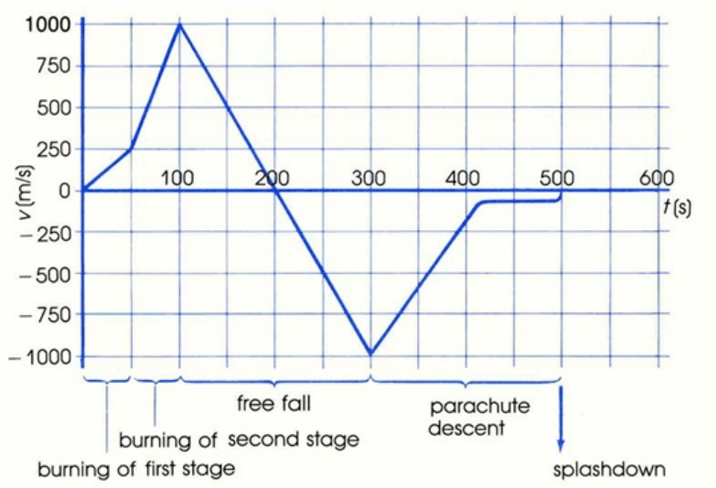
E) Describe her motion between 6s and 8 seconds: _____

F) Complete the table below:

Time Interval	Woman Velocity
2 to 4 seconds	3 m/s
2 to 6 seconds	0 m/s
6 to 8 seconds	1m/s

10. The graph below is for a space capsule attached to a rocket. Describe the graph below:





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