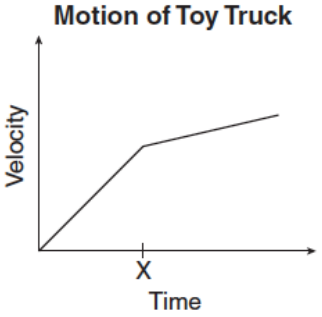
Motion Unit Review

1. To create real-time graphs of an object's displacement versus time and velocity versus time, a student would need to use a

A motion sensor
.B low-g accelerometer.
C potential difference probe.
D force probe.

2. **A student applied a constant force to a toy truck. A graph of the truck's movement is shown below**



Which of the following could *best* explain the change in velocity at time X?

A The truck's momentum became greater than its inertia.

B The truck went from moving in a straight path to moving in a curved path.

C The truck began traveling up a slightly sloped surface.

D The truck went from rolling on a rough surface to rolling on a polished surface.

3. How much time will it take for a person to walk the length of a football field (100 meters) at constant speed of 5 m/s?

A 20 seconds **B** 33 seconds **C** 60 seconds **D** 166 seconds

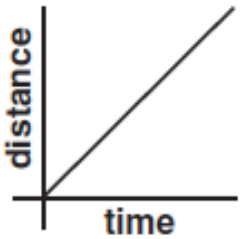
4. A ball is dropped from rest from a height 6.0 meters above the ground. The ball falls freely and reaches the ground 1.1 seconds later. What is the average speed of the ball?

A 5.5m/s
B 6.1m/s
C 6.6m/s
D 11m/s

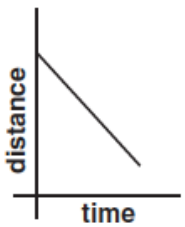
5. An object moves away from a motion detector with a constant speed. Which graph *best* represents the motion of the object?

A

B



C



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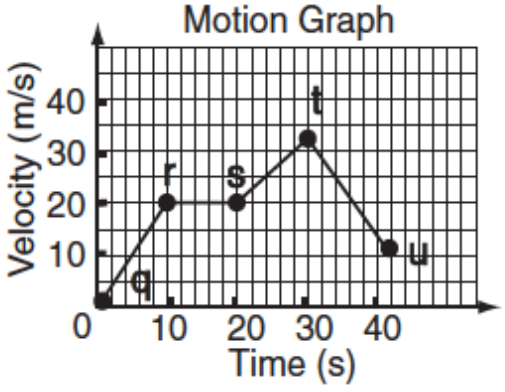


6. The graph below shows the velocity of a car that is moving in a straight line.

During which of the following intervals are forces on the car balanced?

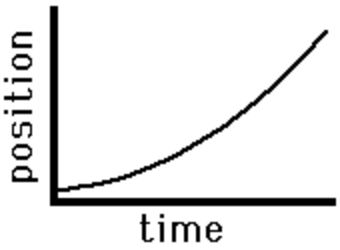
A q to r
B r to s
C s to t
D t to u

Class Questions

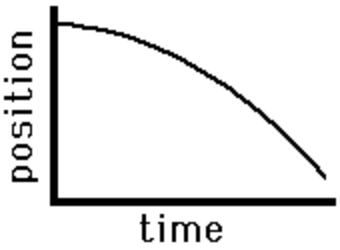
7. Determine whether the following values are scalar or vector quantities:
a. 8 m/s B. 3 blocks East C. -3 m/s/s 5 ft

8. Use the principle of slope to describe the motion of the objects depicted by the two plots below. In your description, be sure to include such information as the direction of the velocity vector (i.e., positive or negative), whether there is a constant velocity or an acceleration, and whether the object is moving slow, fast, from slow to fast or from fast to slow. Be complete in your description.

Practice A

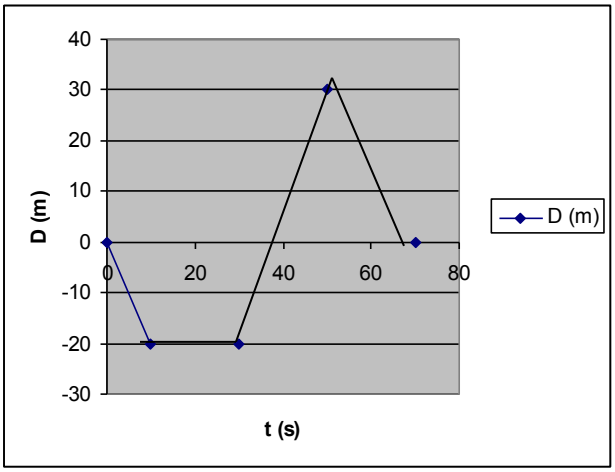


Practice B



9. Convert the units of the following average velocities.
a. speed of a sprinter: 10 m/s into km/h

Describe the motion of the car shown in Figure B below:



Answer the following questions about the car whose motion is graphed in Figure B above.

10. When was the car 20 m west of the origin?

11. Where was the car at 50 s?

12. The car suddenly reversed direction. When and where did that occur?

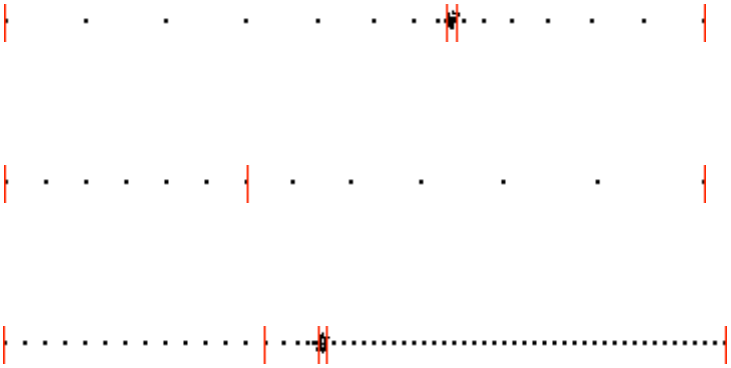
13. What is the total distance traveled?

14. What is the displacement?

15. Draw a position-time graph for a person who starts on the positive side of the origin and walks with uniform motion toward the origin. Repeat for a person who starts on the negative side of the origin and walks toward the origin.

16. Describe the difference between average and instantaneous speed. How could you determine the values for these?

17. Describe the motion characteristics during each section of the diagrams below.



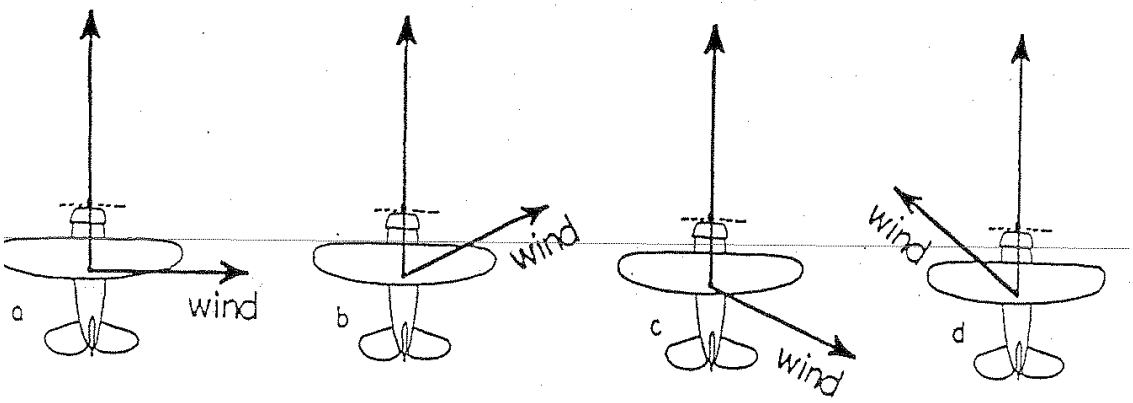
18. Newton's second law of motions is :

19. Use the particle model to draw a motion diagram for a car that starts from rest, speeds up to a constant speed, and then slows to a stop. Then draw a PT graph and a VT graph for this motion.

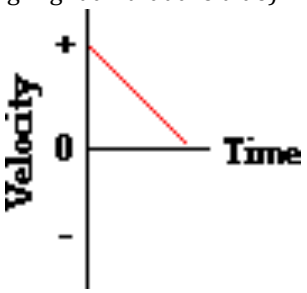
Begin	End

20.

Below we see a top view of an airplane being blown offcourse by wind in various directions.
Use the parallelogram rule to show the resulting speed and direction of travel for each case.
In which case does the airplane travel fastest across the ground? _____ Slowest? _____



21 . Consider the graph at the right. The object whose motion is represented by this graph is ... (circle or highlight all that are true):



moving in the positive direction.

moving with a constant velocity.

moving with a negative velocity.

slowing down.

changing directions.

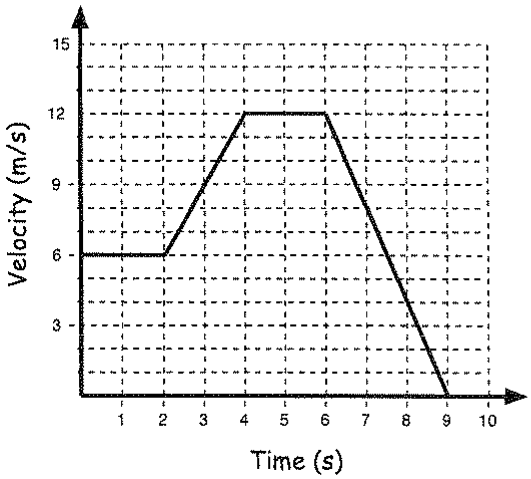
speeding up.

moving with a positive acceleration.

moving with a constant acceleration.

22.

2. The graph below shows the velocity vs time for an object in motion. Give a description of what the object is doing during each of the intervals listed in the table below



Region	Start Time (s)	End Time (s)	Description of Motion

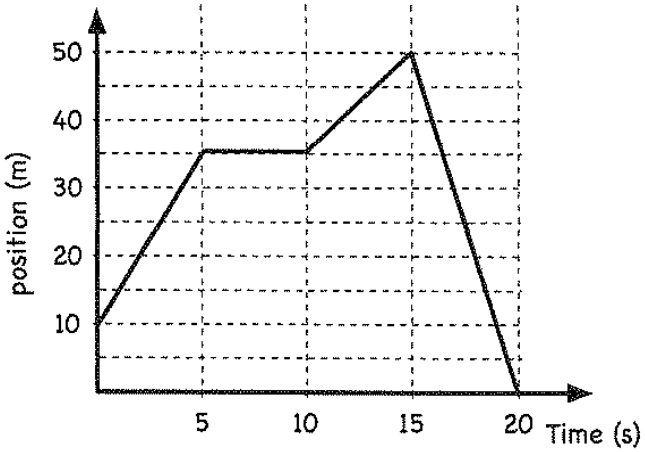
23. What is the difference between speed, velocity and acceleration?

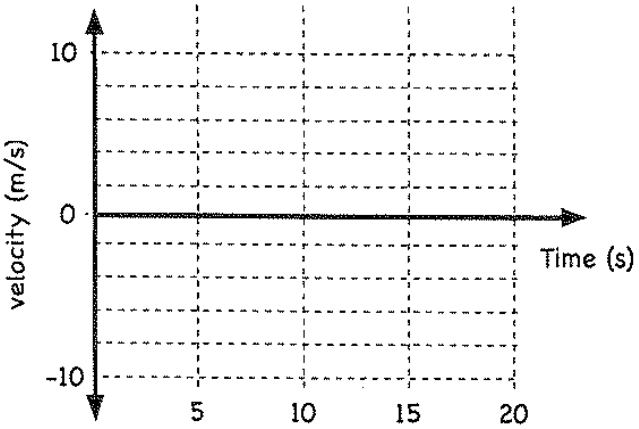
a. What does the slope in a position vs. time graph represent?

b. What does the slope in a velocity vs. time graph represent?

24.

3. The graph below is a graph of position versus time. Use this graph to create a graph of velocity vs. time.



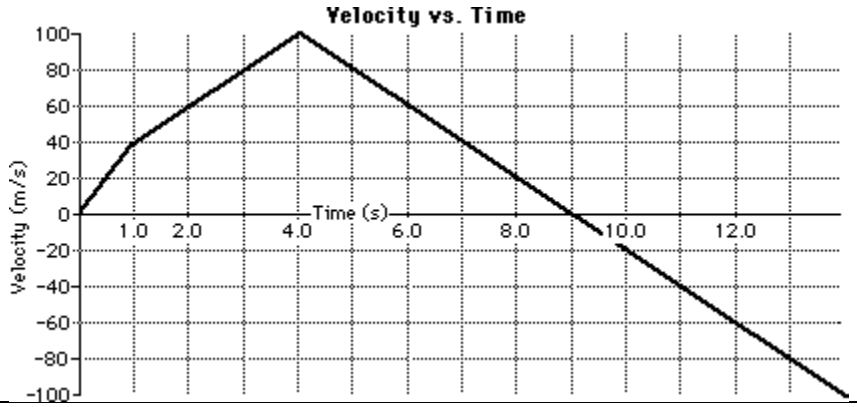


25.
The velocity-time graph for a two-stage rocket is shown below. Use the graph and your understanding of slope calculations to determine the acceleration of the rocket during the listed time intervals. **Show your work!!!**

a. t = 0 - 1 second!

b. t = 1 - 4 second

c. t = 4 - 12 second



26.
Look at the v-t graph below of the toy train.

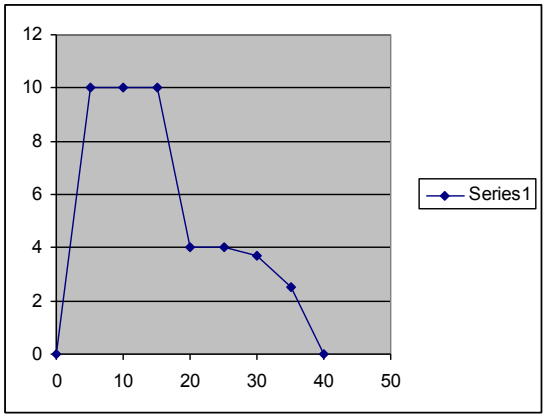
a. During which time interval or intervals is the speed constant?

b. During which interval or intervals is the train's acceleration positive?

c. During which time interval is its acceleration the most negative?

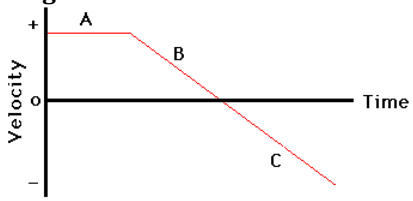
Using the figure above, find the average acceleration during the following time intervals:

a. 0 to 5 s b. 15 to 20 s c. 0 to 40 s



27. Describe the motion depicted by the following velocity-time graphs. In your descriptions, make reference to the direction of motion (+ or - direction), the velocity and acceleration and any changes in speed (speeding up or slowing down) during the various time intervals (e.g., intervals A, B, and C).

Diagram A **Description**



28. A golf ball rolls up a hill toward a miniature golf hole. Assign the direction toward the hole as being positive.

a. If the ball starts with a speed of 2.0 m/s and slows at a constant rate of 0.50 m/s^2, what is the velocity after 2.0 s?

29. A car starting from rest accelerates at a rate of 8.0 m/s/s. What is its final speed at the end of 4.0 seconds?

$$\text{Acceleration} = \frac{\text{Final speed} - \text{Beginning speed}}{\text{Time}}$$

$$a = \frac{v_2 - v_1}{t}$$

30. After traveling for 6.0 seconds, a runner reaches a speed of 10 m/s. What is the runner's acceleration?

$$v_2 = v_1 + (a \times t)$$

$$t = \frac{v_2 - v_1}{a}$$

31. A cyclist accelerates at a rate of 7.0 m/s^2. How long will it take the cyclist to reach a speed of 18 m/s?