

Unit 4 Review

Vocabulary Review

Each term may be used once.

acceleration
constant acceleration
constant velocity
displacement
force
force of gravity
friction force

inertia
interaction pair
net force
Newton's first law
Newton's second law
Newton's third law
position-time graph

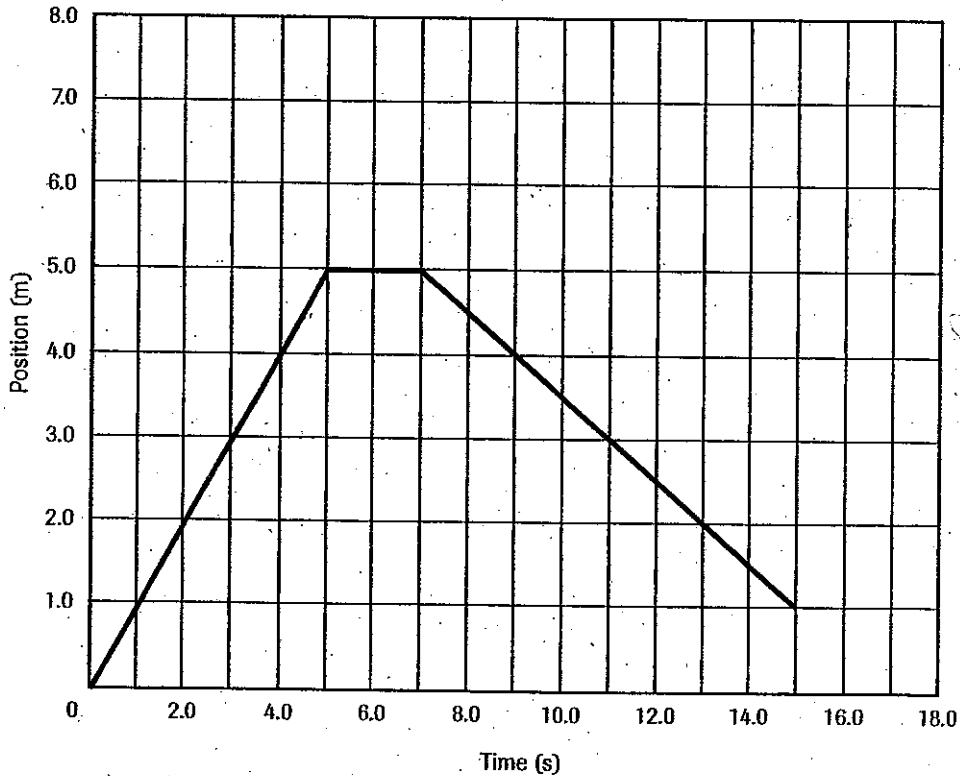
scalar
time interval
uniform motion
vector quantity
velocity
velocity-time graph

1. A quantity that has a magnitude and direction is a(n) vector quantity.
2. A change in time is a(n) time interval.
3. The change in position of an object is its displacement.
4. The ratio of the displacement to the time interval in which the displacement occurs is the velocity.
5. The acceleration is the ratio of the change in velocity to the time interval in which the change took place.
6. A quantity that has only a magnitude is a(n) scalar.
7. A graph that shows how position depends on time is a(n) position-time graph.
8. In uniform motion equal displacements occur during successive equal time intervals.
9. An object that has the same average velocity for all time intervals is moving at constant velocity.
10. A graph that shows how velocity depends on time is a(n) velocity-time graph.
11. Motion that can be described by a constant slope on a velocity time graph is constant acceleration.
12. The vector sum of two or more forces acting on an object is the net force.
13. The acceleration of a body is directly proportional to the net force on it and inversely proportional to its mass; this is a statement of Newton's 2nd law.

14. The two forces in an interactive pair act on different objects and are equal in magnitude and opposite in direction; this is a statement of Newton's third law
15. An attractive force that exists between all objects is Force of gravity
16. An object that is at rest will remain at rest or an object that is moving will continue to move in a straight line with constant speed, if and only if the net force acting on the object is zero; this is a statement of Newton's 1st law
17. The horizontal force exerted on one surface by another when surfaces are in relative motion is the Friction force.
18. The tendency of an object to resist changes in its motion is inertia.
19. A push or pull is a(n) Force.
20. Two forces that are in opposite directions and have equal magnitudes are a(n) interaction pair.

Multiple Choice

The position-time graph below shows the position of a teacher at various times as he walks across the front of the room. The position 0 m represents the left side of the room and movement to the right is positive. Circle the letter of the choice that best completes each statement.



- The teacher was walking to the right during the time interval
a. 1 – 2 s b. 6 – 7 s c. 10 – 12 s d. 7 – 12 s
- The teacher's displacement for the time interval 0 – 3 s is
a. –3 m b. 0 m c. +1 m d. +3 m
- The teacher's average velocity for the time interval 1 – 3 s is
a. –1 m/s b. +1 m/s c. +2 m/s d. +3 m/s
- The teacher is standing still during the time interval
a. 1 – 2 s b. 6 – 7 s c. 10 – 12 s d. 12 – 15 s

5. The average velocity for the time interval 10 – 12 s is

- a. +1 m/s b. +0.5 m/s c. 0 m/s d. -0.5 m/s

6. The teacher's average velocity for the time interval 0 – 15 s is

- a. -2 m/s b. 0 m/s c. +0.067 m/s d. +0.75 m/s

Short Answer

Refer to the diagrams below, showing the location of an object represented by a circle. Complete the table by writing the position of each object.

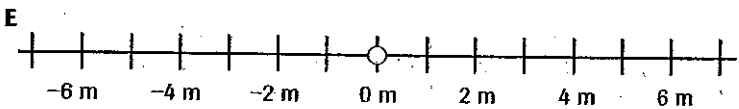
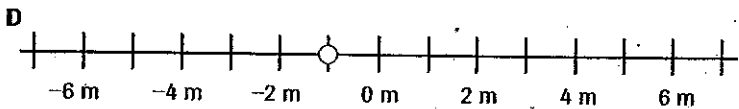
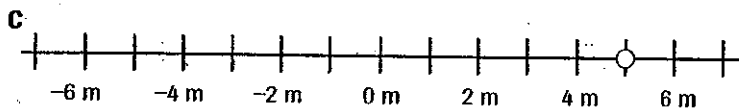
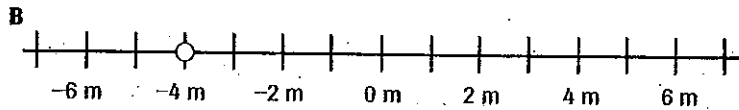
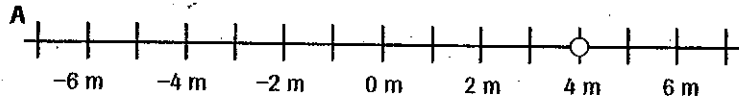


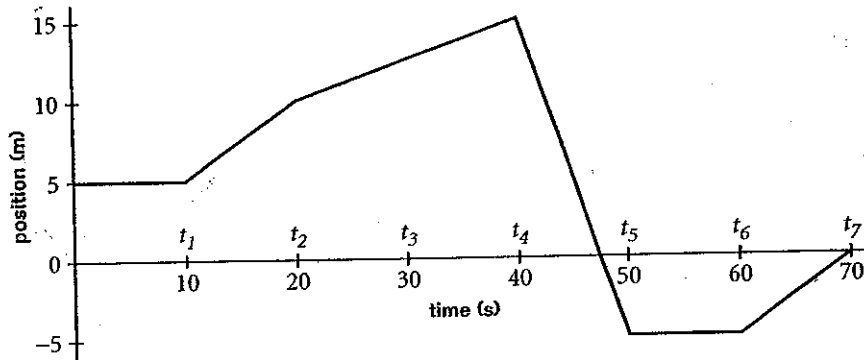
Diagram	Position Vector
A	+4 m
B	-4 m
C	+5 m
D	-1 m
E	0 m

For each term on the left, write the letter of the matching term on the right.

1. C symbol that represents time interval
2. f Greek letter delta used to mean change
3. i definition of time interval
4. d one way of representing the vector quantity acceleration
5. h symbol that represents position
6. a magnitude of the displacement vector
7. j definition of displacement
8. g one way of representing the vector quantity velocity
9. e symbol that represents displacement
10. b symbol that represents the scalar quantity mass

- a. distance
- b. m
- c. Δt
- d. \vec{a}
- e. Δd
- f. Δ
- g. v
- h. d
- i. $t_2 - t_1$
- j. $d_2 - d_1$

A minivan travels along a straight road. It initially starts moving towards the east. Below is the position-time graph of the minivan. Use the information in the graph to answer questions 1 to 7.



1. Does the minivan move to the east? If so, during which time interval(s)?

YES. 10 - 40 s, 60 - 70 s

2. Does the minivan move to the west? If so, during which time interval(s)?

YES. 40 - 50 s

3. Is the minivan's speed between t_1 and t_2 greater than, less than, or equal to its speed between t_2 and t_3 ?

GREATER THAN

4. Is the minivan's speed between t_4 and t_5 greater than, less than, or equal to its speed between t_6 and t_7 ?

GREATER THAN

5. Does the minivan ever stop completely? If so, at which time(s)?

YES. 0 - 10 s, 50 - 60 s

6. Does the minivan ever move with a constant velocity? If so, at which time(s)?

YES. 10 - 20 s, 20 - 40 s, 40 - 50 s, 60 - 70 s.

7. What is the total displacement of the minivan during the trip?

-5 m

Refer to the velocity-time graph of a jogger to complete the two tables.

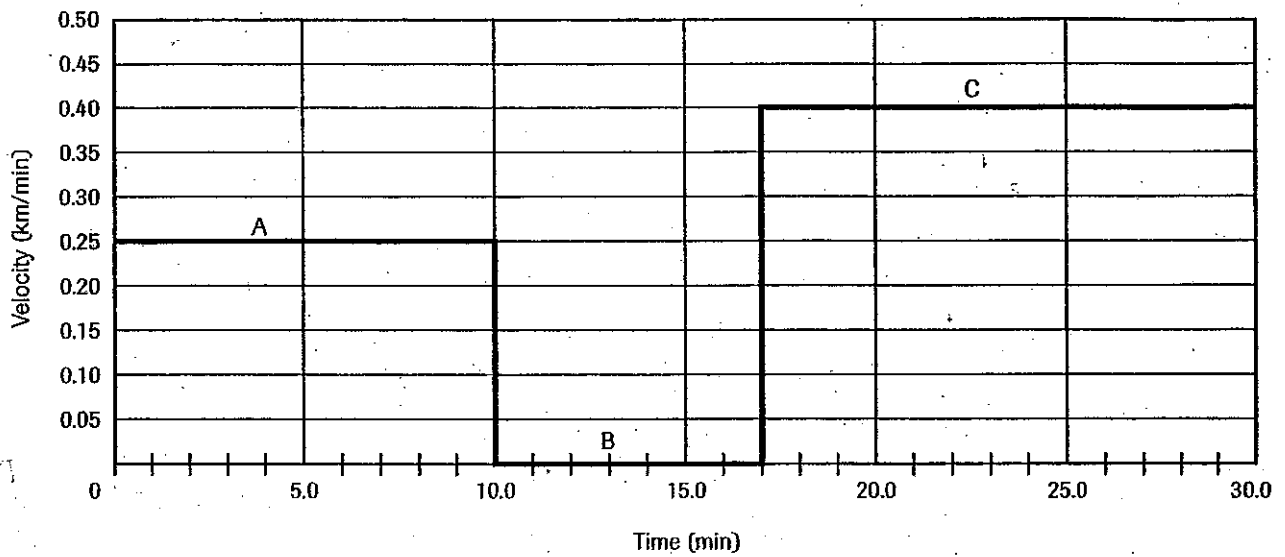


Table 1			
Segment	v	Δt	Δd
A	0.25 km/min	10 min	2.5 km
B	0	7	0
C	0.40	13	5.2 km

Table 2			
Δt	Distance Ran	Displacement	Average Velocity
30 min	7.7 km	+ 7.7 km	+ 0.26 km/min

8. During a relay race along a straight road, the first runner on a three person team runs a distance d_1 with a velocity v_1 . The runner then hands off the baton to the second runner, who runs d_2 with a constant velocity v_2 . The baton is then passed to the third runner, who completes the race by traveling d_3 with a constant velocity of v_3 .

a. In terms of d and v , find the time it takes for each runner to complete a segment of the race.

Runner 1 d_1 / v_1 Runner 2 d_2 / v_2 Runner 3 d_3 / v_3

b. What is the total distance of the race course?

$d_1 + d_2 + d_3$

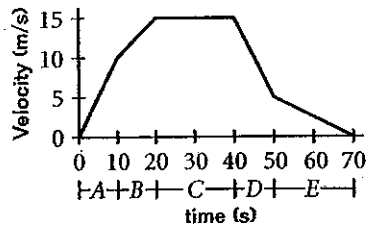
c. What is the total time it takes for the team to complete the race?

$d_1 / v_1 + d_2 / v_2 + d_3 / v_3$

9. During takeoff, a plane accelerates at 4 m/s^2 and takes 40 s to reach takeoff speed. What is the velocity of the plane at takeoff?

$$\begin{aligned} \Delta v &= a \cdot t \\ &= (4)(40) \\ &= 160 \text{ m/s} \end{aligned}$$

10. Below is the velocity-time graph of an object moving along a straight path. Use the information in the graph to fill in the table below.



For each of the lettered intervals below, indicate the motion of the object (whether it is speeding up, slowing down, or at rest), the direction of the velocity (+, -, or 0), and the direction of the acceleration (+, -, or 0).

Time Interval	Motion	v	a
A	SPEEDING UP	+	+
B	✓	+	+
C	CONSTANT V	+	0
D	SLOWING DOWN	+	-
E	SLOWING DOWN	+	-

11. A soccer ball with a mass of 0.950 kg is traveling east at 10 m/s. What is the momentum of the soccer ball?

$$\begin{aligned} \text{momentum} &= m v \\ &= (0.950)(10) \\ &= 9.5 \text{ kg}\cdot\text{m/s} \end{aligned}$$

12. A force of 200 N directed south is exerted on the ball in question 11 for 0.025 s. What is the impulse on the ball?

$$\begin{aligned} \text{impulse} &= F \Delta t \\ &= (200)(0.025) \\ &= 5 \text{ N}\cdot\text{s} \end{aligned}$$