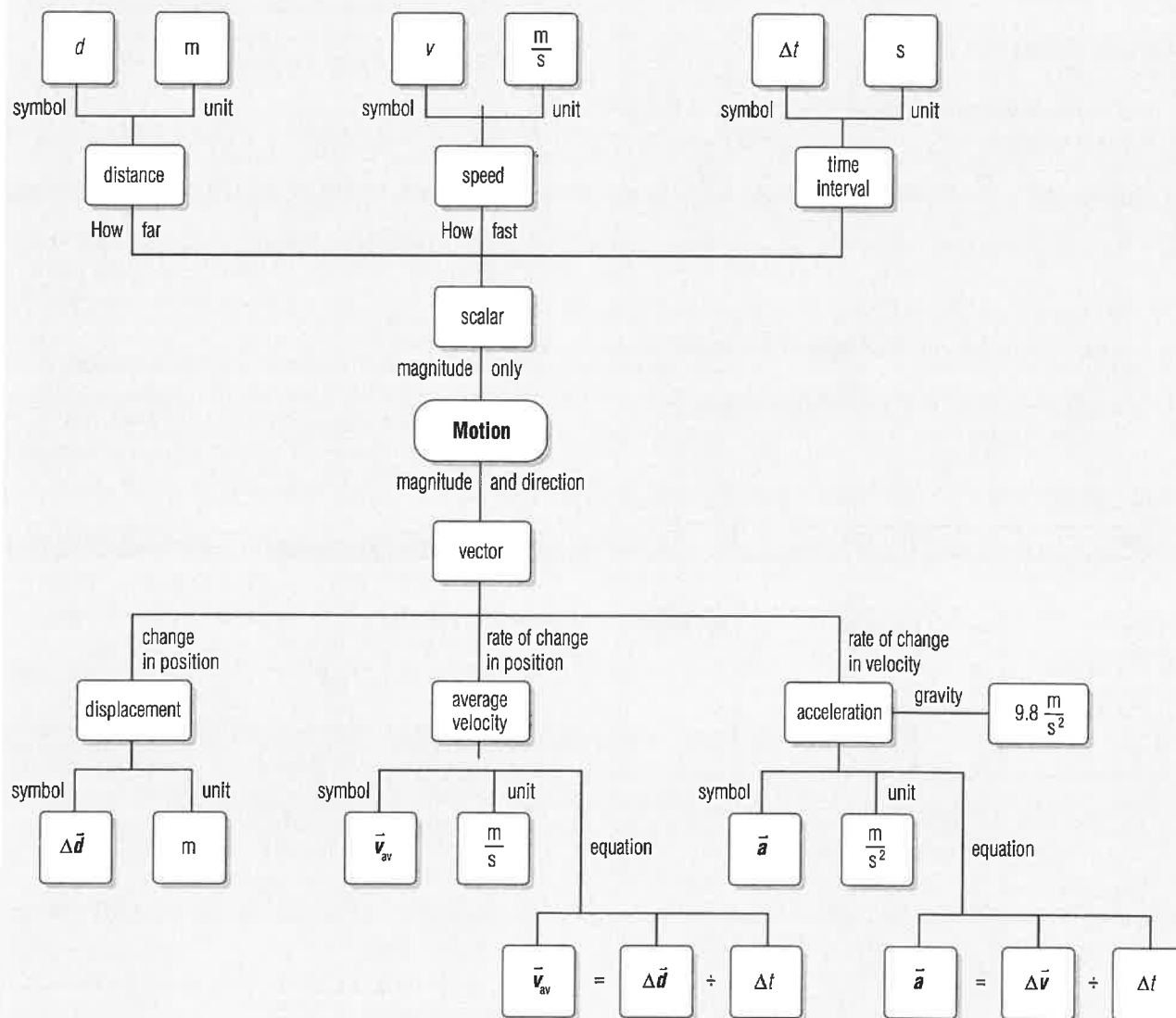


UNIT 3 REVIEW ANSWERS, p. 412–417

Visualizing Key Ideas

1.



Using Key Terms

2. (a) True
- (b) False. Average velocity is the rate of change in *displacement*. Or: Average *speed* is the rate of change in distance.
- (c) False. Direction *is* needed when calculating displacement. Or: Direction is not needed when calculating *distance*.
- (d) False. The slope of a position-time graph is average *velocity*. Or: The slope of a *velocity*-time graph is acceleration.
- (e) True
- (f) False. If the direction of the velocity is opposite the direction of the acceleration, the object will *slow down*. Or: If the direction of the velocity is the *same* as the direction of the acceleration, the object will speed up.
- (g) False. The slope of a velocity-time graph is average *acceleration*. Or: The slope of a *position*-time graph is average velocity.
- (h) True

- (i) False. A change in velocity is *not* always positive.
- (j) True
- (k) True

Checking Concepts

3. A vector quantity has both a magnitude and a direction, whereas a scalar quantity has only a magnitude.
4. (a) Vector
(b) Scalar
(c) Vector
(d) Vector
(e) Scalar
(f) Vector
5. Time interval is the final time minus the initial time.
6. Displacement is the final position minus the initial position.
- 7.

Direction	Left	Right	Up	Down	North	South	East	West
Sign	–	+	+	–	+	–	+	–

8.

Term	Symbol	SI Unit Name	Unit Symbol
Time interval	Δt	second	s
Displacement	$\Delta \vec{d}$	metre	m
Velocity	$\vec{v}$	metre per second	m/s

9. The object's displacement during the next 3.0 s time interval is 1.2 m forward.
10. Uniform motion is represented as a straight line on a position-time graph.
11. (a) A negative slope would represent the object travelling west.
(b) A zero slope would represent the object remaining stationary.
12. On a position-time graph, the slope represents the average velocity.
13. The mathematical relationship between average velocity, displacement, and time is

$$\vec{v}_{av} = \frac{\Delta \vec{d}}{\Delta t}$$
14. The two common units used for velocity are m/s and km/h.
15. Change in velocity is calculated by subtracting the initial velocity from the final velocity.
16. (a) If the change in velocity is positive, the ball's velocity will increase.

- (b) If the change in velocity is negative, the ball's velocity will decrease.
- (c) If the change in velocity is zero, the ball's velocity will not change.

17. Deceleration is used to describe acceleration that is opposite the direction of motion.
18. The direction of the motorcycle's acceleration is south.
19. If the car slowed down, the acceleration would be given a positive (+) sign.
20. The slope of a velocity-time graph represents the average acceleration.
21. The mathematical relationship of acceleration, change in velocity, and time interval is given by

$$\vec{a} = \frac{\Delta \vec{v}}{\Delta t}$$
22. Air resistance acts opposite the direction of motion of falling objects; therefore, it produces a net acceleration less than 9.8 m/s².
23. The acceleration due to gravity on or near the surface of Earth is 9.8 m/s².

Understanding Key Ideas

24. If an object is travelling in one direction in a straight line, the magnitude of the displacement is equal to the distance travelled.
25. There is a change in velocity because the tennis ball is travelling in different directions. One of the directions would be represented by a positive sign (+) while the other direction is represented by a negative sign (–).
26. Acceleration is the rate of change in velocity. Both sprinters had the same change in velocity, but if the time interval to change their velocity is different then the accelerations would be different.
- 27.

Initial Velocity (m/s)	Final Velocity (m/s)	Acceleration (+ or –)
+3.6	+1.6	–
–4.0	+1.0	+
–5.0	–5.0	zero
–4.0	–6.0	–
+2.5	0.0	–

28. Both the rock and the table tennis ball would accelerate downward at the same rate; therefore they would hit the surface of the Moon at the same time travelling the same speed.

29. (a) Not accelerated motion
 (b) Accelerated motion
 (c) Accelerated motion since the direction is changing
 (d) Accelerated motion
30. (a) The object is travelling at a constant velocity.
 (b) The object is accelerating.
 (c) The object is moving forward.
 (d) The object is moving backward.
 (e) The object has zero velocity.

Thinking Critically

31. Students' answers may vary but should suggest that the average speed of the cyclist is more meaningful. This is because the average velocity of all cyclists, regardless of how fast they are riding, will be zero when they cross the finish line. The average speed will indicate how fast they are riding.
32. (a) Students' answers may vary but may include that a best-fit line shows the trend of the data and the best-fit line can be extended beyond the data to indicate what might happen.
 (b) Student's answers may vary but may include that the idea that a best-fit line is an average and does not indicate the situation at a particular instant. Different people may draw slightly different best-fit lines since they are drawn to show a trend to the data.
33. (a) Students' answers may vary but may include that both are vectors and both describe motion.
 (b) Students' answers may vary but may include that velocity determines how quickly displacement changes, whereas acceleration determines how quickly the velocity changes, and velocity and displacement have different units.
34. (a) The skater's overall change in velocity is zero.
 (b) The skater's average acceleration is also zero.

Developing Skills

35.

t_i (s)	t_f (s)	Δt (s)	d_i (m)	d_f (m)	Δd (m)	Direction of motion [left or right]
5.0	6.5	1.5	+17.3	+20.0	+2.7	right
6.2	8.3	2.1	+26.9	+32.2	+5.3	right
0.0	105.4	105.4	+42.2	+26.8	-15.4	left

36.

Time Interval	Displacement (m) [left or right]	Distance (m)
0 s–20 s	7 m [left]	7 m
20 s–40 s	9 m [right]	9 m
0 s–40 s	2 m [right]	16 m

37. (a) The object is travelling up.
 (b) The object is initially at 1 m up.
 (c) The object's final position is 6 m up.
 (d) The object's displacement is 5 m up.
 (e) The time interval for this object's motion is 20 s.
38. B
 39. C
 40. C
 41. C
 42. B
 43. A
 44. B
 45. C
 46. C
 47. A
 48. B
 49. C
 50. C
 51. C

Pause and Reflect Answer

Students' answers may vary but may include that uniform motion is constant motion. In other words, the object's direction of motion is not changing and its speed is not changing. An object with uniform motion travels the same distance during equal amounts of time. With accelerated motion, the velocity could be changing, the direction of motion could be changing, or both could be changing. The greater the acceleration, the more quickly the velocity changes. Students may also suggest that uniform motion feels "smooth." Accelerated motion feels like your motion is changing, and you would feel a force.

