** DO NOT WRITE ON PACKET **

4 ASSESS

Check Concepts

Section 4.1

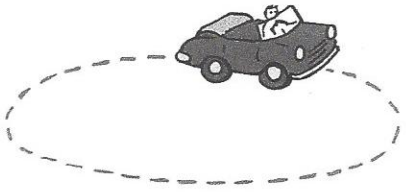
1. How can you be both at rest and also moving about 107,000 km/h at the same time?
2. You cover 10 meters in a time of 1 second. Is your speed the same if you cover 20 meters in 2 seconds?

Section 4.2

3. Does the speedometer of a car read instantaneous speed or average speed?
4. Average speed = distance covered divided by travel time. Do some algebra and multiply both sides of this relation by travel time. What does the result say about distance covered?

Section 4.3

5. Which is a vector quantity, speed or velocity? Defend your answer.



6. What two controls on a car cause a change in speed? What control causes only a change in velocity?

Section 4.4

7. What is the acceleration of a car moving along a straight-line path that increases its speed from zero to 100 km/h in 10 s?
8. By how much does the speed of a vehicle moving in a straight line change each second when it is accelerating at 2 km/h·s? At 4 km/h·s? At 10 km/h·s?
9. Why does the unit of time enter twice in the unit of acceleration?

Section 4.5

10. What is the meaning of *free fall?*
11. For a freely falling object dropped from rest, what is the instantaneous speed at the end of the fifth second of fall? The sixth second?
12. For a freely falling object dropped from rest, what is the *acceleration* at the end of the fifth second of fall? The sixth second? At the end of any elapsed time t?

Section 4.6

13. How far will a freely falling object fall from rest in five seconds? Six seconds?
14. How far will an object move in one second if its average speed is 5 m/s?

15. How far will a freely falling object have fallen from a position of rest when its instantaneous speed is 10 m/s?

Section 4.7

16. What does the slope of the curve on a distance-versus-time graph represent?

17. What does the slope of the curve on a velocity-versus-time graph represent?

Section 4.8

18. Does air resistance increase or decrease the acceleration of a falling object?

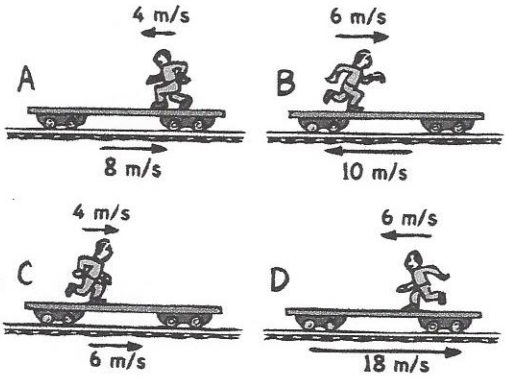
Section 4.9

19. What is the appropriate equation for how fast an object freely falls from a position of rest? For how far that object falls?

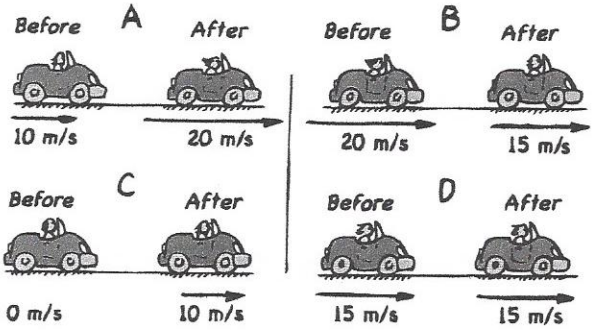
Think and Rank

Rank each of the following sets of scenarios in order of the quantity or property involved. List them from left to right. If scenarios have equal rankings, then separate them with an equal sign. (e.g., A = B)

20. Jogging Jake runs along a train flatcar that moves at the velocities shown. From greatest to least, rank the relative velocities of Jake as seen by an observer on the ground. (Call the direction to the right positive.)



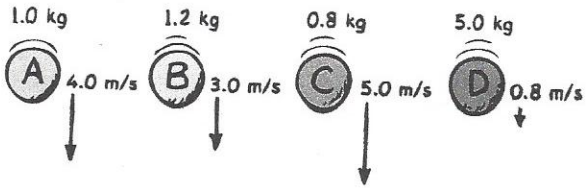
21. Below we see before and after snapshots of a car's velocity. The time interval between before and after for each is the same.



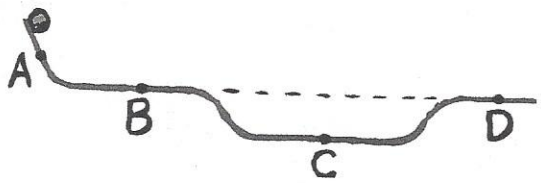
a. Rank the cars in terms of the change in velocity, from most positive to most negative. (Negative numbers rank lower than positive ones, and remember, tie scores can be part of your ranking.)

b. Rank them in terms of acceleration, from greatest to least.

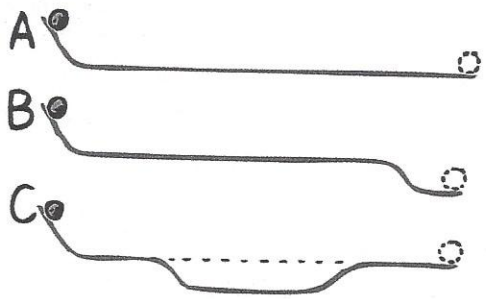
22. These are drawings of same-size balls of different masses thrown straight downward. The speeds shown occur immediately after leaving the thrower's hand. Ignore air resistance. Rank their *accelerations* from greatest to least. Or are the accelerations the same for each?



23. A track is made of a piece of channel metal bent as shown. A ball is released from rest at the left end of the track and continues past the various points. Rank the ball at points A, B, C, and D, from fastest to slowest. (Again, watch for tie scores.)

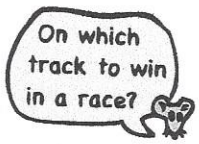


24. A ball is released from rest at the left end of three different tracks. The tracks are bent from pieces of metal of the same length.



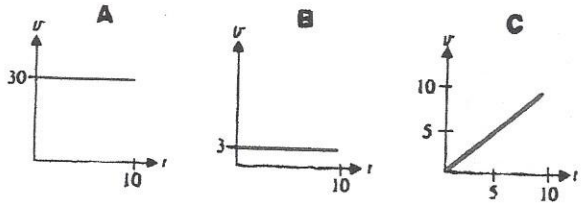
a. From fastest to slowest, rank the tracks in terms of the *speed* of the ball at the end. Or, do all balls have the same speed there?

b. From longest to shortest, rank the tracks in terms of the *time* for the ball to reach the end. Or do all balls reach the the end in the same time?



c. From greatest to least, rank the tracks in terms of the *average speed* of the ball. Or do the balls all have the same average speed on all three tracks?

25. **In** the speed versus time graphs, all times t are in s and all speeds v are in m/s.



a. From greatest to least, rank the graphs in terms of the greatest *speed* at 10 seconds.

b. From greatest to least, rank the graphs in terms of the greatest *acceleration.*

c. From greatest to least, rank the graphs in terms of the greatest *distance* covered in 10 seconds.

Plug and Chug

These are to familiarize you with the central equations of the chapter.

$$\text{Average speed} = \frac{\text{total distance covered}}{\text{time interval}}$$

26. Calculate your average walking speed when you step 1 meter in 0.5 second.

27. Calculate the speed of a bowling ball that moves 8 meters in 4 seconds.

28. Calculate your average speed if you run 50 meters in 10 seconds.

$$\text{Distance} = \text{average speed} \times \text{time}$$

29. Calculate the distance (in km) that Charlie runs if he maintains an average speed of 8 km/h for 1 hour.

30. Calculate the distance you will travel if you maintain an average speed of 10 m/s for 40 seconds.

31. Calculate the distance (in km) you will travel if you maintain an average speed of 10 km/h for 1/2 hour.

$$\text{Acceleration} = \frac{\text{change of velocity}}{\text{time interval}}$$

32. Calculate the acceleration of a car (in km/h/s) that can go from rest to 100 km/h in 10 s.

33. Calculate the acceleration of a bus that goes from 10 km/h to a speed of 50 km/h in 10 seconds.

34. Calculate the acceleration of a ball that starts from rest and rolls down a ramp and gains a speed of 25 m/s in 5 seconds.

From a rest position:

$$\text{instantaneous speed} = \text{acceleration} \times \text{time};$$

$$v = at$$

35. Calculate the instantaneous speed (in m/s) at the 10-second mark for a car that accelerates at 2 m/s^2 from a position of rest.

36. Calculate the speed (in m/s) of a skateboarder who accelerates from rest for 3 seconds down a ramp at an acceleration of 5 m/s^2.

Velocity acquired in free fall, from rest:

$$v = gt$$

37. Calculate the instantaneous speed of an apple 8 seconds after being dropped from rest.

38. On a distant planet a freely-falling object has an acceleration of 20 m/s^2. Calculate the speed an object dropped from rest on this distant planet acquires in 1.5 seconds.

Distance fallen in free fall, from rest:

$$d = \frac{1}{2}gt^2$$

39. A sky diver steps from a high-flying helicopter. If there were no air resistance, how fast would she be falling at the end of a 12-second jump?

40. Calculate the vertical distance an object dropped from rest would cover in 12 seconds if it fell freely without air resistance.

41. An apple drops from a tree and hits the ground in 1.5 seconds. Calculate how far it falls.

Think and Explain .....

42. Light travels in a straight line at a constant speed of 300,000 km/s. What is the light's acceleration?