Physics
Unit 1: Motion
Test 1 Review

Name: Answers

Part I: Length

1. How long is a meter?
A long step

2. How many centimeters long is the tilted line below? 14.8cm or 14.9cm

3. How many meters long is the tilted line below? 0.148m or 0.149m

4. 322cm = 3.22 m 3 22.00

Part II: Speed and Velocity

5. What is the difference between speed and velocity?
Speed is how fast something moves.
Velocity is speed and direction.

6. Describe something that has a speed of about 1m/s.
Slow walking pace

7. 1m/s is equal to about 2 miles per hour. 2.24

8. Estimate your top running speed, in m/s. Briefly explain how you came up with your answer.
7m/s. I think I can travel about 7 long steps in one second.

9. If you have trouble with number 10, you will find a hint hidden in #6, #7, and #8 (but not in #1-5). What is the hint? ← distance
v = m/s ← time

10. Write the formula for average velocity.
$v = d/t$

11. If a bug crawls 12m in 5 seconds, what is its average velocity?

$$v = \frac{12m}{5s} = 2.4 m/s$$

12. A runner has a speed of 6m/s. What does that mean?

Each second, the runner travels 6m

13. A different runner has a speed of -6m/s. What does that mean?

Each second, he or she goes 6m in the other direction

Part III: Acceleration

6 m/s/s

14. A third runner has an *acceleration* of 6m/s^2. What does that mean?

Each second, 6m/s is added to his/her speed.

15. A fourth runner has an *acceleration* of -2m/s^2. What does that mean?

Each second, 2m/s is subtracted from her/his speed.

16. How are velocity and acceleration similar, and how are they different?

Similarity: They both tell you how much something changes every second

Difference:

Acceleration: tells how much velocity changes each second.

Velocity: How much position changes each second

17. A runner is traveling at a velocity of 7m/s. If the runner has an acceleration of -3m/s^2...

a. ...what speed will the runner have after one more second? 4m/s

b. ...what speed will the runner have after two seconds? 1m/s

18. Write the formula for acceleration.

$a = \frac{\Delta V}{\Delta t}$ ← Final Velocity − Starting Velocity

19. A fish has a velocity of 8m/s. Then the fish speeds up. After accelerating for 8 seconds, the fish has a new velocity of 24m/s.

start

Final $\Delta = 24\text{m/s} - 8\text{m/s} = 16\text{m/s}$

a. What is the fish's change in velocity?

b. What is the fish's acceleration during those 8 seconds?

$$a = \frac{\Delta V}{\Delta t} = \frac{16\text{m/s}}{8\text{s}} = 2\text{m/s/s} = 2\text{m/s}^2$$

20. If the fish keeps the same acceleration, what speed will it have after...

a. one more second? 26m/s

b. two more seconds? 28m/s

21. A car has a speed of 34m/s. Four seconds later, the car's velocity is 22m/s. What is the car's acceleration?

$a = \frac{\Delta V}{\Delta t}$ $\Delta V = \text{Final velocity} - \text{Starting velocity} = 22\text{m/s} - 34\text{m/s} = -12\text{m/s}$

$a = \frac{\Delta V}{\Delta t} = \frac{-12\text{m/s}}{4} = -3\text{m/s/s}$

22. If that car keeps the same acceleration, what speed will it have after...

a. one more second? 19m/s

b. two more seconds? 16m/s

23. What is the approximate acceleration due to Earth's gravity? (give the smartypants answer, if you can)

$g = 10\text{m/s/s}$ downward

24. If you drop a ball off of a tall building, what **velocity** (don't give speed here, give velocity) will it have after falling for 3 seconds?

-30m/s or 30m/s downward or 30m/s toward the dirt

25. What velocity (**not speed**) will the ball have after falling for 8 seconds?

80m/s downward

Bonus Questions:

Bonus A. **A bowling ball is dropped from the top of a building. If it takes the ball 4 seconds to hit the ground, how tall is the building?**

4s ⇒ Final V = 40m/s ⇒ Ave V = 20m/s

$d = rt = 20\text{m/s}(4\text{s}) = 80\text{m}$

Bonus B. **Suppose you throw a ball directly upward with an initial velocity of 60m/s. How high will this ball go before it stops and begins to fall back to the ground?**

60m/s ⇒ 6s

↑

Starting V ⇒ ave V = 30m/s

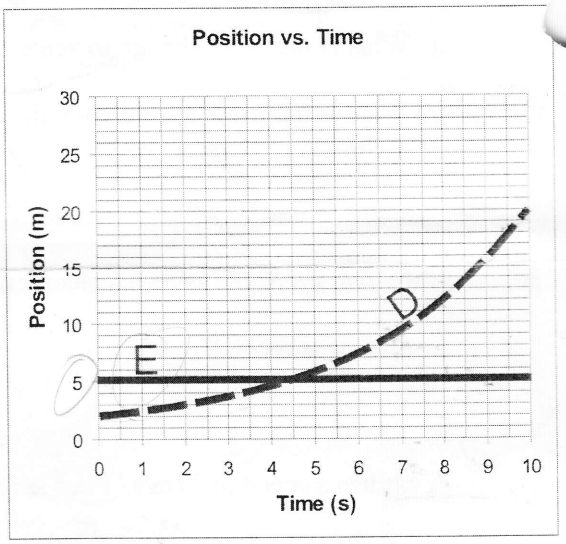
$d = rt$

$= 30\text{m/s}(6\text{s})$

$= 180\text{m}$

Part IV: Interpreting Graphs

The three graphs on the right have curves for nine different people (letters A-I). Some of those people did not move at all. Some of those people had a constant velocity, and the rest of the people had some type of acceleration.



26. List all of the people who did not move at all.

E, F, B

27. List all of the people who moved at constant speeds.

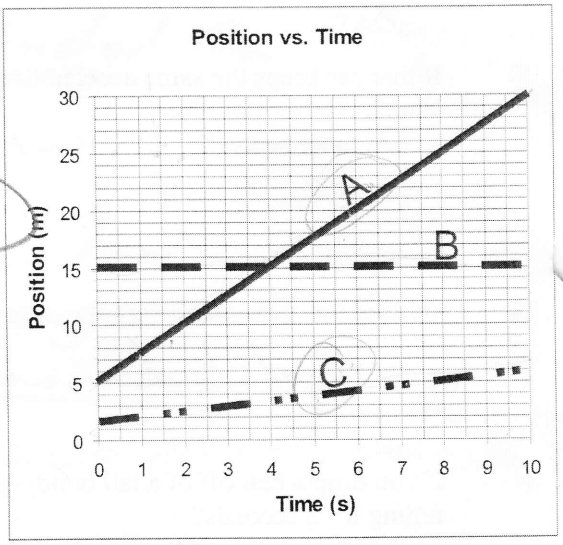
A, C, H

28. How can you tell that their speeds were constant?

Lines were straight.

29. Who had the fastest constant speed?

H



steepness = speed

30. How can you tell?

It is the steepest line

steeper = faster

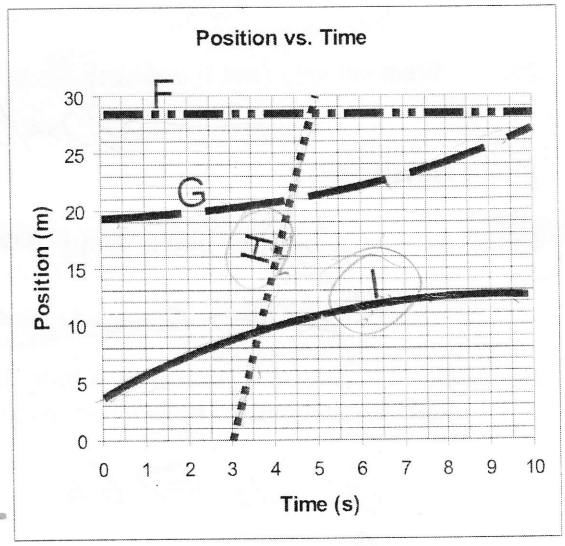
31. List all of the people who had positive acceleration.

D, G

32. How can you tell they had positive acceleration?

They curved upward.

or They got steeper.



33. Who had the highest acceleration? How can you tell?

D. It curved upward the fastest.

34. Who had negative acceleration?

I

35. What does negative acceleration mean?

slowing down

or

decelerating

Part V: Acceleration Scenarios

36. In the beginning, a dog is sitting still. Then it begins to run. The dog runs for 10 seconds with a constant acceleration. During those 10 seconds, the dog travels 60 meters. Fill in the blanks below for the dog's activity. Then calculate the dog's acceleration. Show your work in the space below.

Beginning

d = 0m

t = 0s

v = 0m/s

Midpoint

v = 6m/s

Ave V. $= \frac{d}{t} = \frac{60m}{10s} = 6m/s$

End

d = 60m

t = 10s

v = 12m/s

6m/s (2)

Acceleration = 1.2m/s/s

1. Find Ave. V. write it at midpoint

ΔV = Final V. − Starting V

$\Delta V = 12m/s - 0m/s = 12m/s$

2. Double the average velocity to get the final velocity.

$a = \frac{\Delta V}{\Delta t} = \frac{12m/s}{10s} = 1.2m/s/s$

37. *Performance Task:* Mr. Stapleton will demonstrate an accelerating object. Your job is to collect data and accurately determine object's acceleration. Correctly fill in all of the blanks below, including appropriate measuring tools. Show your work in the empty space.

Measuring tools: Meter Stick Timer

Beginning	Midpoint	End
d = 0m	v = 1.17m/s	d = 7m
t = 0s	$v = \frac{d}{t} = \frac{7m}{6s} = 1.17 m/s$	t = 6s
v = 0m/s		v = 2.33m/s

Acceleration = 0.39 m/s/s

$$a = \frac{\Delta v}{\Delta t} = \frac{2.33 m/s}{6s} = 0.39 \ m/s/s$$

Bonus C: If you drop a bowling ball from a 100m tall building, what speed will it have when it hits the ground – assuming that air resistance does not slow down its fall? Your answer must be within 1 m/s of the correct answer. Assume that $g = 10 m/s^2$