

About this review: the following questions are representative of the types of questions that may appear on the test. Some questions may be exactly the same, but in most cases, actual test questions will be similar but not identical. You must know *how* to answer these questions; simply memorizing the answers will not work. Not all of these questions will appear on the test, but every type of question on the test will appear in this review. Remember, in order to receive partial credit on the test, you must show your work. You must also include correct units, even when those units are specified in the question.

1. "Meter" is a unit that we have been using in class. a) What does a meter measure? b) Describe something that is 1m.

length

long steps

2. "Meters per second" is a unit that we have been using in class. a) What does "meters per second" measure? b) Describe something that is 1m/s.

velocity

2 mph. walking pace.

3. Measure the length of this line. a) What is that length, in meters? b) What is it in cm?

3.25 cm

0.0325 m

4. Convert these measurements appropriately:

$$\begin{array}{ll} \text{a. } 0.72\text{m} = 72 \text{ cm} & \text{b. } 0.98\text{cm} = 0.0098 \text{ m} \\ \text{c. } 722\text{cm} = 7.22 \text{ m} & \text{d. } 3.4\text{m} = 340 \text{ cm} \end{array}$$

5. Define "velocity."

Speed (actually, it's speed + direction)

6. Write the formula for average velocity.

$$v = \frac{d}{t}$$

7. If a bug crawls 1m in 30 seconds, what is its average velocity?

$$v = \frac{1}{30} = 0.033 \text{ m/s}$$

8. Define "acceleration."

How fast something speeds up or slows down.

9. A runner has an acceleration of 3m/s^2 . What does that mean?

Each second, 3m/s is added to his/her velocity.

10. Write the formula for acceleration.

$$a = \frac{\Delta v}{\Delta t} \leftarrow \begin{matrix} \text{change in velocity} \\ \text{time} \end{matrix}$$

11. A fish has a velocity of 2m/s. Then the fish speeds up. After accelerating for 3 seconds, the fish has a new velocity of 8m/s. What is the fish's acceleration during those three seconds?

$$a = \frac{\Delta v}{\Delta t} = \frac{6\text{m/s}}{3\text{s}} = 2\text{m/s}^2$$

12. Suppose an object is sitting still. Then it accelerates with constant acceleration. How do you find its final velocity?

double its average velocity

At the top of a hill, you hold a sled still and then release it. At the moment you release the sled, you start a timer. You stop the timer when the sled reaches the "finish line," at the bottom of the hill. **The sled reaches the finish line in 15 seconds. The distance traveled by the sled is 40m.**

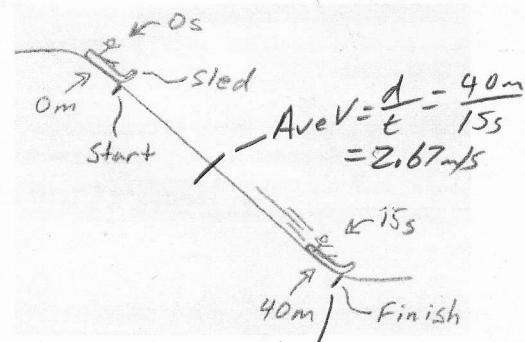
13. Sled's average velocity during the "race" = 2.67m/s

14. Sled's velocity at the top of hill = 0m/s

15. Sled's velocity at the bottom of hill = 5.33m/s

16. Sled's average acceleration = 0.36m/s^2

$$\Delta v = 5.33\text{m/s} - 0\text{m/s} = 5.33\text{m/s} \quad a = \frac{\Delta v}{\Delta t} = \frac{5.33\text{m/s}}{15\text{s}} = 0.36\text{m/s}^2$$



$$\begin{aligned} V &= \text{double average} \\ &= 5.33\text{m/s} \end{aligned}$$

17. If the sled from #16 were to continue accelerating at the same rate for 1 more second, how fast would it be going?
 $5.33 \text{ m/s} + 0.36 \text{ m/s} = 5.69 \text{ m/s}$
18. Suppose an aardvark is standing still. You would like to scare the aardvark and then calculate its acceleration when it begins moving. However, you do not have any measuring tools. This means you will have to estimate.
- Once the aardvark starts moving, how do you estimate the distance it travels? *Count long steps.*
 - How do you estimate the aardvark's travel time? *Count mississippis*
 - How do you figure out the aardvark's initial velocity? *It's not moving, so it's zero.*
 - How do you find the aardvark's average velocity? *Long steps ÷ mississippis (d/t)*
 - How do you find the aardvark's final velocity? *Double the average.*
 - How do you find the aardvark's acceleration? *Final velocity ÷ mississippis (dv/dt)*
19. Suppose a bowling ball is dropped from an airplane. a) If there is no air resistance, how fast will the bowling ball be falling after 11 seconds? b) Explain why this is true?
a) 110 m/s b) each second gravity adds 10 m/s to speed.
20. Sam has an acceleration of -1.4 m/s^2 [**notice that acceleration is negative**]. Explain what this means.
Each second 1.4 m/s is subtracted from his speed.
21. Suppose Sam's velocity is 4 m/s , and that his acceleration is -1.4 m/s^2 . If this is true, how fast will Sam be traveling if he keeps accelerating at this rate for one more second? $4 \text{ m/s} - 1.4 \text{ m/s} = 2.6 \text{ m/s}$

Performance Tasks: For each of these, you should use a meter stick and a timer.

22. Wind up the string on one of the classroom pulley apparatuses. Then let the weight drop and unwind the string. Collect the necessary data that will allow you to determine the weight's acceleration as it falls. Calculate its acceleration. Present ALL of the necessary data and show all of your calculations.

see Explanations Sheets

23. Roll a "car" down the hallway. Collect the necessary data that will allow you to determine its acceleration as it slows to a stop. Calculate this acceleration. Present ALL of the necessary data and show all of your calculations. **Be sure to record the number of your car**

Advanced Problems: You cannot get an A⁺ on the test without being able to answer questions like these bold questions. You can, however, still get an A.

24. If you throw a ball directly upward, it will keep going up until it reaches its high point. Then it will fall back down.
- What is the ball's acceleration on its way up? [assuming there is no air resistance]. -10 m/s^2
 - If the ball's initial velocity (when it left your hand) was 40 m/s , how long will it take the ball to reach its highest point? 4 s
 - How high will this ball go before returning to the ground? 80 m
25. If you throw a ball up into the air with an initial velocity of 20 m/s ...
- How long will it stay in the air? 2 s
 - How high will it go? 20 m
26. If you drop a ball off of a tall building, how far will it travel during the first 3 seconds?

45 m