Review Test 2 1-D Kinematics

1. Allen Frith, age 45, fell for 1.08 seconds at his Tennessee home without suffering any substantial injuries. How high was the roof? (This is based on a true story)

$t = 1.08s$, $a = -9.8 m/s^2$, $v_i = 0 m/s$, $\Delta y = ?$

$\Delta y = v_i t + \frac{1}{2} a t^2$

$\Delta y = \frac{1}{2}(-9.8 m/s^2)(1.08s)^2$

positive – how high?

5.72 m

2. Disgusted with physics, you take your book and toss it **UPWARD** off of the stands at Burger at 20 m/s. If Burger is 30 meters high how long does it take your book to hit the pavement below?

$a = -9.8 m/s^2$, $v_i = +20 m/s$, $\Delta y = -30 m$, $t = ?$, $v_f = ?$

$v_f^2 = v_i^2 + 2a\Delta y$ | $v_f = v_i + at$

$v_f^2 = (20 m/s)^2 + 2(-9.8)(-30)$ | $-31.43 = 20 + (-9.8)t$

$v_f = -31.43 m/s$

Quadform or $v_f \rightarrow t$

$t = \frac{(-31.43 - 20)}{-9.8}$

5.25 s

3. Lance Armstrong begins his descent of Alp Duez from rest in a time of 2.5 seconds with an acceleration of 6 m/s^2 how far will he have traveled when he reaches a speed of 20 m/s?

$v_i = 0 m/s$, $\Delta x = ?$, $t = 2.5s$, $a = 6 m/s^2$, $v_f = 20 m/s$

$\Delta x = v_i t + \frac{1}{2} a t^2$ | $v_f^2 = v_i^2 + 2a\Delta x$

$\Delta x = \frac{1}{2}(6)(2.5)^2$ | $(20)^2 = 2(6)\Delta x$

18.75 m or 33.3 m

Bad problem – unclear & yields two different answers.

4. A women initially traveling at 118 **km/hr** was brought to rest in a distance of 0.5 m. What acceleration (in m/s^2) did she experience? (This is a true story. . . The woman did survive)

$v_i = 118 km/hr = 32.7 m/s$, $\Delta x = 0.5 m$, $v_f = 0 m/s$, $a = ?$

$v_f^2 = v_i^2 + 2a\Delta x$

$(0 m/s)^2 = (32.7 m/s)^2 + 2a(0.5m)$

$-1069.29 = a$

$-1069.29 m/s^2$

5. In Austria near the Hungarian border lies a castle which has a well that is roughly 224 meters deep. If you were to drop a penny into the well what would its **VELOCITY** be just before it hits the bottom?

$\Delta y = -224 m$, $a = -9.8 m/s^2$, $v_f = ?$, $v_i = 0 m/s$

$v_f^2 = v_i^2 + 2a\Delta y$

$v_f^2 = 2(-9.8 m/s^2)(-224 m)$

$v_f^2 = 4390.4 m^2/s^2$

$v_f = -66.26 m/s$

6. Super gazelle has the ability to leap vertically to a height of 7 meters. What is the total time that super gazelle spends in the air?

$v = 0 m/s$, $\Delta y = -7 m$, $a = -9.8 m/s^2$, $v_i = 0 m/s$, $\frac{1}{2}t = ?$

$\Delta y = v_i t + \frac{1}{2} a t^2$

$-7 m = \frac{1}{2}(-9.8 m/s^2) t^2$

$\sqrt{t^2} = \sqrt{\frac{-7}{-4.9}}$

$t = 1.19 \times 2 \Rightarrow$ 2.38s

7. As you are sitting in your desk, you throw your pencil straight up in the air with a velocity of 12 m/s. It is caught by me on its way down at a point that is 0.4 meters above where it was thrown. What is the **VELOCITY** of the pencil when I catch it?

$v = 0 m/s$, $v_i = 12 m/s$, $v_f = ?$, $\Delta y = +0.4 m$, $a = -9.8 m/s^2$

$v_f^2 = v_i^2 + 2a\Delta y$

$v_f^2 = (12 m/s)^2 + 2(-9.8 m/s^2)(0.4 m)$

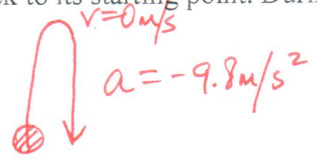
$v_f^2 = 136.16 m^2/s^2$

Negative velocity → headed down!

$-11.67 m/s$

8. A ball tossed vertically upward rises, reaches its highest point, and then falls back to its starting point. During this time the acceleration of the ball is always _____.

a. opposite its velocity.
c. in the direction of motion.
b. directed upward.
(d.) directed downward.

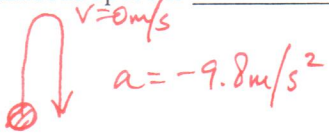


9. If you drop a feather and a coin at the same time in a vacuum tube, which will reach the bottom of the tube first?

a. The coin
(b.) Neither-they will both reach the bottom at the same time.
c. The feather

10. A ball is thrown straight up. At the top of its path its instantaneous speed is _____.

a. about 20 m/s.
c. 50 m/s.
b. about 10 m/s.
(d.) 0 m/s.



11. Acceleration due to gravity is also called

(a.) free-fall acceleration.
c. instantaneous velocity.
b. displacement.
d. negative velocity.

12. When there is no air resistance, objects of different masses

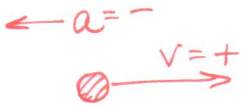
a. fall with different accelerations with different displacements.
b. fall with different accelerations with similar displacements.
c. fall with equal accelerations with different displacements.
(d.) fall with equal accelerations with similar displacements.

13. Acceleration is

a. displacement.
c. the rate of change of displacement.
(b.) the rate of change of velocity.
d. velocity.

14. When velocity is positive and acceleration is negative, what happens to the object's motion?

a. The object speeds up.
(c.) The object slows down.
b. Nothing happens to the object.
d. The object remains at rest.



15. Suppose an object is in free fall. Each second the object falls _____.

a. with the same average speed.
b. with the same instantaneous speed.
c. the same distance as in the second before.
(d.) a larger distance than in the second before.

Review previous home work assignments, labs, and notes. There will be some conceptual (multiple choice) questions on the test. The problems above are meant to be samples of the types of problems that will be on the test.