Practice Test 1

Acceleration and Velocity

To receive full credit you must include the correct unit with each of your answers.

Solve for each unknown.

1. You have traveled at a constant velocity of 68 km/hr for the past 5 hours. How far have you traveled?

$d = vt = 68 \cdot 5 =$ **340 km**

2. Beginning at a stop, you accelerate at a constant rate of 18 m/sec^2. How fast are you moving after 7 seconds?

$v = at + v_i = 18 \cdot 7 + 0 =$ **126 m/sec**

3. Driving with a velocity of 50 mi/hr, how long will it take you to go 19 miles?

$d = vt \quad 19 = 50t \quad t =$ **0.38 hours** (about 23 minutes)

4. When braking you go from a speed of 45 ft/sec to a stop in 4 seconds. What is your deceleration?

$v = at + v_i \quad 0 = a(4) + 45 \quad a =$ **-11.25 ft/sec^2**

A cone falls from the very top of an ancient redwood tree that stands 370 feet tall.

5. Write an equation relating the height of the pine cone above the ground in feet to the time since it first broke off of the tree.

$h = -16t^2 + 370$ (initial velocity is 0)

6. How high will the cone be above the ground after 3 seconds?

$h = -16(3)^2 + 370 =$ **226 feet**

7. How far has the pine cone fallen after 3 seconds?

$370 - 226 =$ **144 feet**

8. What is the acceleration of the cone?

-32 ft/sec^2

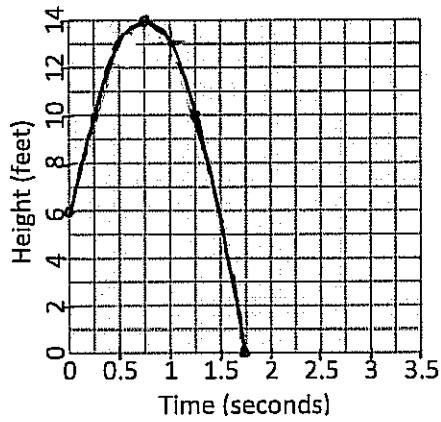
9. When will the cone hit the ground?

$0 = -16t^2 + 370$

$t^2 = 23.125$

$t = 4.8$ seconds after breaking off the tree.

The parabola on the graph below shows the relationship between the height of a basketball and the amount of time since the shot was taken. (This particular shot missed the rim completely.)



10. What was the maximum height above ground that the basketball reached?

14 feet

11. How long after it was shot did the ball reach its maximum height?

0.75 seconds

12. How long after it was shot did the basketball remain in the air?

1.75 seconds

13. What was the initial height at which the ball was released?

6 feet

14. The height of the basketball rim is 10 feet. When did the ball pass by the rim on its way down?

1.25 seconds after it was released.

15. What was the initial vertical velocity of the ball?

$t_{vertex} = \frac{V_i}{32}$ $0.75 = \frac{V_i}{32}$ $V_i =$ 24 ft/sec

The equation that describes the relationship of the height, y, of an arrow fired straight into the air to the amount of time, x, since it was fired is $y = ax^2 + bx + c$.

16. Which letter, a, b, or c represents the initial velocity of the arrow?

b (the linear coefficient)

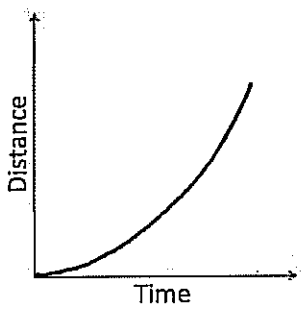
17. What does the letter c represent in the equation?

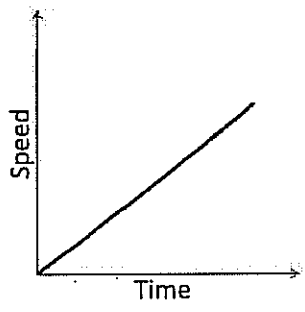
initial height

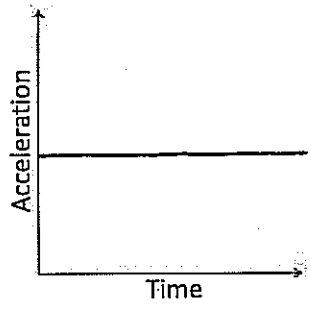
18. What must a equal in this equation?

-16

19. Draw a line or curve on each graph showing the relationship between the two variables when an object is experiencing constant acceleration.







Kangaroos are known for being some of the best jumpers in the animal planet. When they first leave the ground, they have a vertical velocity of 21 ft/sec.

20. Write an equation that relates the height of a kangaroo in feet, *h*, to the time since it began its jump in seconds, *t*.

$h = -16t^2 + 21t$ (initial height is 0 since it starts on the ground.)

21. How high off the ground is the kangaroo after 1 second?

$h = -16(1)^2 + 21(1) =$ 5 feet

22. When will the kangaroo be 3 feet off the ground?

$3 = -16t^2 + 21t$

$0 = -16t^2 + 21t - 3$

$t = \frac{-21 \pm \sqrt{21^2 - 4(-16)(-3)}}{2(-16)} = \frac{-21 \pm 15.78}{-32}$

= 0.16 and 1.15 seconds after beginning to jump.

23. When will the kangaroo reach its maximum height?

$t_v = \frac{v_i}{32} = \frac{21}{32} =$ 0.66 seconds after jumping.

24. How high can a kangaroo jump?

$h = -16(0.66)^2 + 21(0.66) =$ 6.89 feet

25. How long does it remain in the air?

$0 = -16t^2 + 21t$

$0 = t(-16t + 21)$

$t = 0$ or $-16t + 21 = 0$

$t = 1.31$ seconds