Physics Practice Exam 1
Fall 2009

1. An oak tree was planted 22 years ago. How many seconds does this correspond to? (Do not take leap days into account.) 6.9×10^8

$22 \text{ years} \times \frac{365 \text{ day}}{\text{years}} \times \frac{24 \text{ hr}}{\text{day}} \times \frac{60 \text{ min}}{\text{hr}} \times \frac{60 \text{ s}}{\text{min}} = 693792000$

$6.9 \times 10^8 \text{ seconds}$

2. A plot of land contains 5.8 acres. How many square meters does it contain?
[1 acre = 43,560 ft^2; 1 ft = 0.3048 m].
$2.3 \times 104 \text{ m}^2$

$5.8 \text{ ac} \times \frac{43560 \text{ ft}^2}{\text{ac}} \times \frac{0.3048 \text{ m}}{\text{ft}} \times \frac{0.3048 \text{ m}}{\text{ft}} = 23471.77 \text{ m}^2$

$2.3 \times 10^4 \text{ m}^2$

3. What is $\frac{0.674}{0.74}$ to the proper number of significant figures?

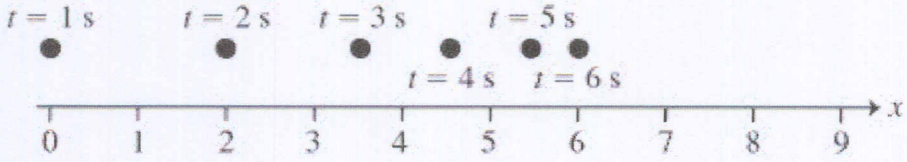
0.91

$0.910810810811 \sim 0.91$

4. If successive images of an object in a motion diagram get closer and closer together, then that object is accelerating or decelerating.

TRUE FALSE
Answer: TRUE

5. The figure below shows the position of a particle (moving along a straight line) as a function of time. Which of the following statements is true?



A) The object is moving at a constant velocity.
B) The object is accelerating (speeding up).
C) The object is decelerating (slowing down).
Answer: C

6. A car travels 95 km to the north at 70.0 km/h, then turns around and travels 21.9 km at 80.0 km/h. What is the difference between the average speed and the average velocity on this trip?
Ans: 27 km/h

$95\ km \times \frac{hr}{70\ km} = 1.357$

$speed = \frac{total\ distance}{time}$ $\quad 95 + 21.9 = 116.9$

$speed\ avg = \frac{116.9\ km}{1.63075\ hr}$ $\quad 21.9\ km \times \frac{hr}{80\ km} = 0.2737$

$= 71.68 \frac{km}{hr}$

$velocity = \frac{displacement}{time}$

$velocity = 95 - 21.9 = 73.1$ $\quad velocity\ avg\ \frac{73.1\ km}{1.63075\ hr} = 44.826$

$difference = 73.1 - 44.826 = 26.859$

$\sim 27\ km/hr$

7. The position of an object is given by $x = bt^2 - ct$, where b = 2.0 m/s2 and c = 6.7 m/s. What is the instantaneous velocity of the object when t = 2.2?
Ans: 2.1 m/s

$\frac{dx}{dt} = v$ $\quad \frac{d}{dt}[bt^2] - \frac{d}{dt}[ct]$

$2bt - c$ $\quad 2(2)(2.2) - 6.7 = 2.1 \frac{m}{s}$

$b = 2$, $t = 2.2$, $c = 6.7$

8. A package is dropped from a helicopter moving upward at 15 m/s. If it takes 16.0 s before the package strikes the ground, how high above the ground was the package when it was released?
Ans: ~ 1000 m

$S_f = S_i + V_i \Delta t + \frac{1}{2} a \Delta t^2$

$0 = ? \quad 15 \frac{m}{s}(16) + \frac{1}{2}(-9.81)(16)^2$

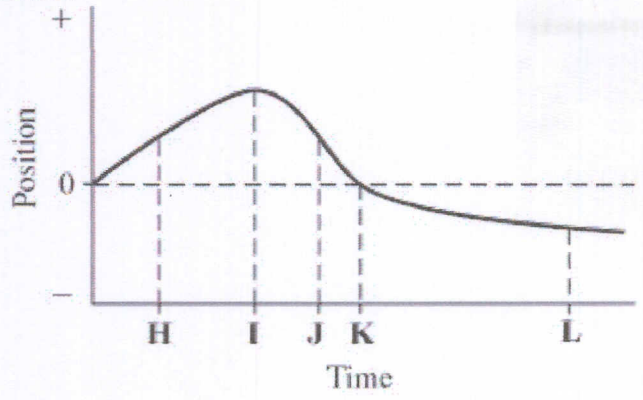
$-240 + 1255.68 = ? = 1015.68 \sim 1016\ m$

9. If the "velocity versus time" graph of an object is a horizontal line, that object cannot be accelerating.

TRUE FALSE

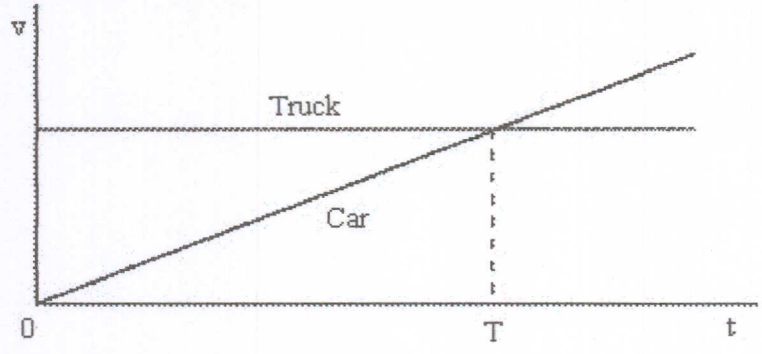
10. A skier begins skiing straight down a hill having a constant slope, starting from rest. If friction is negligible, as the skier goes down the hill, his/her
A) acceleration is constant, with a value less than 9.8 m/s/s.
B) acceleration is constant, with a value of roughly 9.8 m/s/s.
C) acceleration increases with time.
D) acceleration is zero.
Answer: A

11. The plot below shows the position of an object as a function of time. The letters H-L represent particular moments of time. At which moment in time is the speed of the object equal to zero?



A ball is thrown vertically upward and then comes back down. During the ball's flight up and down, its velocity and acceleration vectors are . . .
A) always in opposite directions.
B) always in the same direction.
C) first in opposite directions and then in the same direction.
D) first in the same direction and then in opposite directions.
Answer: C

12. The motions of a car and a truck along a straight road are represented by the velocity-time graphs below. The two vehicles are initially alongside each other at time t = 0.



At time T, what is true of the distances travelled by the vehicles since time t = 0?
A) They will have travelled the same distance.
B) The truck will not have moved.
C) The car will have travelled further than the truck.
D) The truck will have travelled further than the car.
Answer: D

13. A vector of length 4.0 units is directed at 23.0° counter-clockwise from the positive x-axis. Find the x-component of the vector.
Ans: 3.7 units

4 cos 23° = 3.68 ~ 3.7 units

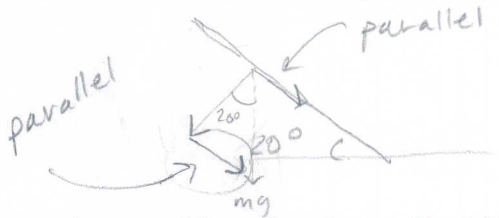
14. Given $\vec{A} = 3\,\mathbf{i} + 4\,\mathbf{j}$ and $\vec{B} = 2\,\mathbf{i} + 2\,\mathbf{j}$, find the magnitude of $\vec{C} = \vec{A} + 4\,\vec{B}$.
Ans: 16

A: 3 4
B: 4(2) 4(2)
C: 11 i + 12 j

|C| = √(11² + 12²) = 16.28 ~ 16

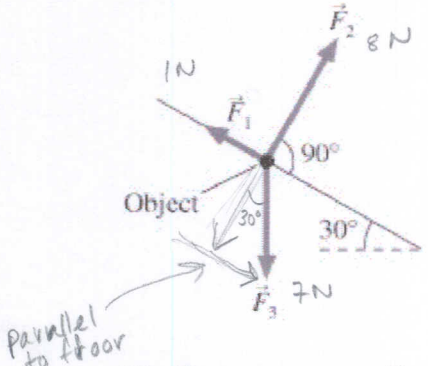
15. Which of the following is NOT a vector?
A) acceleration
B) speed
C) velocity
D) displacement
Answer: B

16. A person is standing on an incline having a slope of 20° (with respect to the horizontal direction). The component of the force of gravity (mg) that is parallel to the surface is:
A) mg sin(20)
B) mg cos(20)
C) mg tan(20)
D) mg sin(70)
Answer: A



Sloped

17. Three forces are exerted on an object placed on a tilted floor. Forces are vectors. The three forces are directed as shown in the figure. Assuming the forces have magnitudes $F_1 = 1$ N, $F_2 = 8$ N and $F_3 = 7$ N, where N is the standard unit of force, what is the component of the net force, Fnet $= F_1 + F_2 + F_3$ parallel to the floor? Ans: 2.5 N



tilted

	x	y
F_1	−1	0
F_2	0	8
F_3	$7\sin 30° - 7\cos 30°$	
F_{net} =	2.5 x	1.938 y

parallel to tilted floor

18. Draw corresponding graphs for the indicated motion scenarios