ANSWER KEY

Estimations and Unit analysis
1. D
2. B
3. B
4. B

Vectors
1. A
2. B
3. A

Motion along a straight line
1. A
2. A
3. C
4. C
5.
   a. B
   b. B
   c. B

Motion in two and three-dimensions
1. B
2. B
3. A

Forces
1. D
2. B
3. water

1) You clap and hear the sound of the echo off the other side of the canyon wall at 1.5 seconds later. You estimate the canyon wall to be about 0.25 km away. What is the speed of sound (m/s). What is the speed of sound (km/h)

speed = $\frac{d}{t}$ $\quad \frac{0.25\text{ km}}{1.5\text{ sec}} \rightarrow$ m $\quad \frac{0.25 \mid 1000\text{ m}}{1\text{ km}} = 250\text{ m}$

→ D is the answer

m/s - 250/1.5 = 166.666

$\frac{0.25\text{ km}}{1.5\text{ sec}} \rightarrow$ hr $\quad \frac{1.5 \mid 1}{3600} = 4.16 \times 10^{-4}$ hr

km/hr - $0.25 / 4.16 \times 10^{-4} = 600.9$ km/hr

2) What is $0.25\ m^3$ in cm^3

$0.25 \times 1E6 = 250{,}000$ → B is the answer

3) What is 100 km/hr in m/s

100/3.6 → 27.7 → B is the answer

4) A long tube from a construction site has a volume of $0.001\ m^3$ and a mass of 9 kg. Convert the numbers to a density and determine the substance

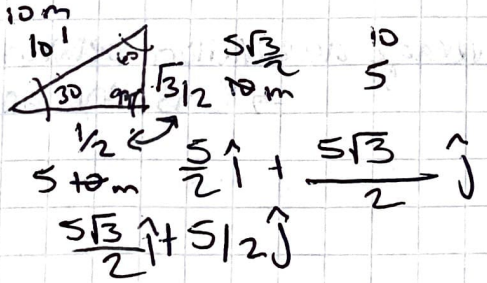
$0.001 \rightarrow 1000\ cm^3 \quad 9 \rightarrow 9000$ g

density = m/v $\quad \frac{1000}{9000}$ → B is the answer

$9.0\ g\,cm^{-3}$ copper

5) $\vec{X}$ is a vector w/ a magnitude of 10 meters and makes an angle of 30° above x axis. What is the component in form

→ A is the answer

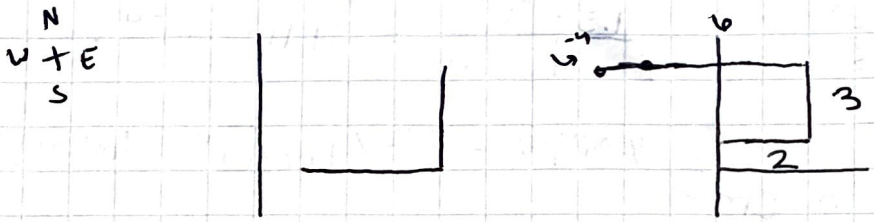


6) $\vec{X}_2$ is a vector w/ a magnitude of 20 meters that makes an angle of 180° w/ respect to x-axis. What is $\vec{X}_2$ in component form

$\vec{X} = 20\hat{i}$ → B is the answer

7) A person goes for a walk. First they head two blocks east Next they head North for 3 blocks. Finally they head West for six blocks

→ A is the answer



8) The position of a particle moving along the x axis is given by $x(t) = 2.0t - 1$ (m) which is true

→ A is the answer

9) (Same x(t) as previous question) What is the velocity if time is measured in seconds

→ A is the answer

$\text{Velocity} = \frac{\Delta x}{\Delta t}$ $x(t) = 2.0t - 1$

↑ velocity = slope

10) A particle moves along the x-axis according to $x(t) = -2t + 7t^2$. What is the average velocity between $t = 0$ and $t = 2$ seconds

$\frac{x_f - x_i}{t_f - t_i}$ $\frac{x(2) - x(0)}{1}$ $-4 + 28 = \frac{24}{2}$ → C is the answer

11) (Same x(t) as previous) What is average acceleration between $t = 0$ & $t = 2$

avg accel = $\frac{24}{2}$ ← avg vel → C is the answer

12) a sprinter has a constant acceleration of $5.0\ m/s^2$

a) How long does it take her to reach 10 m/s
5 m per sec → B is the answer
1-5 2=10

b) What is her displacement at that time
0 → 10 10m → B is the answer

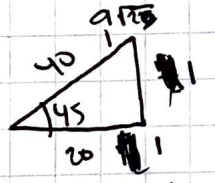
c) Suppose she is running the 100 m sprint. If she continues at 10.0 m/s for remainder of race, what is her total time
10 m/s · 10s = 100 m → B is the answer

13) The world record highest basketball was made from a height of 162.5 m above the basketball hoop. The basketball hoop was place 75 m horizontally from shooter. What is the horizontal velocity required to make the shot
$162.5 = \frac{325}{9.8} = 33.16$ → B is the answer

$\sqrt{33.16} = 5.75$

$75 / 5.75 = 13$

14) A baseball is hit at a 45° angle with respect to the horizontal a 40 m/s. How far away does it land → Im guessing B



15) How long is it in the air → A is the answer

16) Consider Fig 1. What is the spring constant
→ Answer is D

17) A man pushes a palette crate across his shop. He pushes with a force of 75 N. The mass of crate is 75 kg. The friction between crate and floor is 0.1. What is the acceleration of the crate

$75 - 0.1 = \frac{74.9}{75} = 0.99$ → B is the answer