Part 1. *(1.0 point each)*

Please circle ◯ the correct answer, to the nearest number for quantitative questions, for each of the following:

1. The distance ***d*** that a certain particle moves may be calculated from the expression $d = at + bt^2$, where ***a*** and ***b*** are constants; and ***t*** is the elapsed time. Complete the following statement: The dimensions of the quantities ***a*** and ***b*** are, respectively,

A) $\frac{[L]}{[T]}, \frac{[L]}{[T]^2}$. B) [L], $[L]^2$. C) $\frac{[L]}{[T]^2}, \frac{[L]}{[T]^3}$. D) $\frac{[L]}{[T]}, \frac{[L]^2}{[T]^2}$. E) $\frac{1}{[T]}, \frac{1}{[T]^2}$.

2. A car is moving at a constant velocity when it is involved in a collision. The car comes to rest after **0.450 s** with an average acceleration of **65.0 m/s^2** in the direction opposite that of the car's velocity. What was the velocity, in **km/h**, of the car before the collision?

A) 29.2. B) 80.5. C) 44.8. D) 105. E) 144.

3. A car starts from rest and accelerates at a constant rate in a straight line. In the *first* second the car covers a distance of **2.0 meters**. How much ***additional*** distance will the car cover during the ***second*** **second** of its motion?

A) 2.0 m. B) 4.0 m. C) 6.0 m. D) 13.0 m. E) 8.0 m.

4. A rock is thrown ***vertically upward*** from the surface of the earth. The rock rises to some maximum height and falls back toward the surface of the earth. Which one of the following statements concerning this situation is true if air resistance is neglected?

A) As the ball rises, its acceleration vector points upward.
B) The ball is a freely falling body for the duration of its flight.
C) The acceleration of the ball is zero when the ball is at its highest point.
D) The speed of the ball is negative while the ball falls back toward the earth.
E) The velocity and acceleration of the ball always point in the same direction.

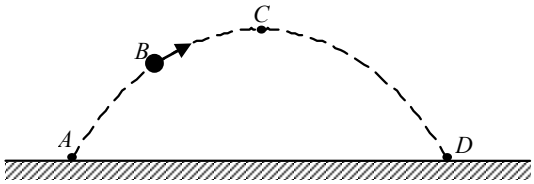
5. A rock is dropped from rest from a height ***h*** above the ground. It falls and hits the ground with a speed of **11 m/s**. From what height should the rock be dropped so that its speed on hitting the ground is **22 m/s**? Neglect air resistance.

A) 1.4*h*. B) 2.0*h*. C) 3.0*h*. D) 4.0*h*. E) 0.71*h*.

6. A tennis ball is thrown from ground level with velocity v_o directed ***30°*** **above** the **horizontal**. If it takes the ball **1.0 s** to reach the top of its trajectory, what is the magnitude of the initial velocity?

A) 4.9 m/s B) 11.3 m/s C) 34.4 m/s D) 9.8 m/s E) 19.6 m/s

7. A tennis ball is thrown upward at an angle from point ***A***. It follows a parabolic trajectory and hits the ground at point ***D***. At the instant shown, the ball is at point ***B***. Point ***C*** represents the highest position of the ball above the ground. While in flight, how do the ***x*** and ***y*** components of the velocity vector of the ball compare at the points ***B*** and ***C***?



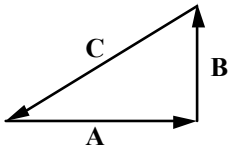
A) The velocity components are non-zero at *B* and zero at *C*.
B) The *x* components are the same; the *y* component at *C* is zero m/s.
C) The *x* components are the same; the *y* component has a larger magnitude at *C* than at *B*.

D) The x component is larger at C than at B; the y component at B points up while at C, it points downward.
E) The *x* component is larger at *B* than at *C*; the *y* component at *B* points down while at *C*, it points upward.

8. A ball is shot straight up from the surface of the earth with an initial velocity of **19.6 m/s.** How much time elapses between the throwing of the ball and its return to the original launch point? Neglect any effects due to air resistance.

A) 4.00 s. B) 12.0 s. C) 2.00 s. D) 8.00 s. E) 16.0 s.

9. Which expression is ***false*** concerning the vectors shown in the sketch?
Note: Bold letter represents vector.



A) $\mathbf{C} = \mathbf{A} + \mathbf{B}$ B) $\mathbf{C} + \mathbf{A} = -\mathbf{B}$ C) $\mathbf{A} + \mathbf{B} + \mathbf{C} = 0$
D) $C < A + B$ E) $A^2 + B^2 = C^2$

10. A vector $\mathbf{F}_1$ has a magnitude of ***40.0 units*** and points **35.0°** above the positive *x* axis. A second vector $\mathbf{F}_2$ has a magnitude of ***65.0 units*** and points in the **negative *y* direction**. Use the component method of vector addition to find the **magnitude** and **direction**, relative to the **positive *x* axis**, of the resultant $\mathbf{F} = \mathbf{F}_1 + \mathbf{F}_2$.

A) 53.3 units, 52.1° below the +*x* axis.
B) 53.3 units, 52.1° above the +*x* axis.
C) 76.3 units, 37.9° below the +*x* axis.
D) 76.3 units, 52.1° above the +*x* axis.
E) 76.3 units, 52.1° above the +*x* axis.

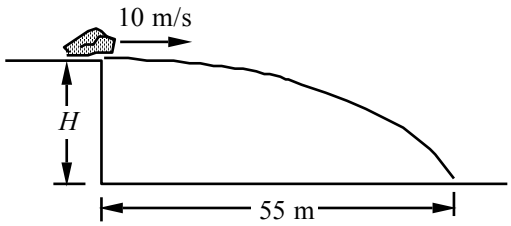
11. A train travels due south at **60 m/s**. It reverses its direction and travels due north at **60 m/s**. What is the change in velocity of the train?

A) 120 m/s, due north. B) 120 m/s, due south. C) zero m/s.
D) 60 m/s, due north. E) 60 m/s, due south.

Part 2:

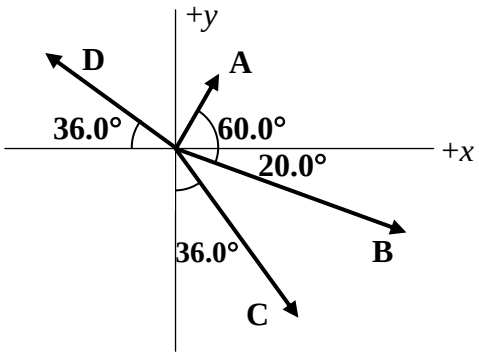
Please read each of the following questions carefully and show your work in the space provided. Include the appropriate units with your answer. ***(3 points each)***

P1. A rock is kicked ***horizontally*** at a velocity of **10 m/s** from the edge of a cliff. The rock strikes the ground **55 m** from the foot of the cliff of height ***H*** as suggested in the figure, which is not drawn to scale. What is the approximate value of ***H***, the height of the cliff? Neglect air resistance.



Answer (with units) _____

P2. Use the component method of vector addition to find the **direction and the magnitude** of the resultant of the four displacements shown in the figure. The magnitudes of the displacements are:
***A* = 2.25 cm, *B* = 6.35 cm, *C* = 5.47 cm, and *D* = 4.19 cm**.



Answer (magnitude with units) _____

Answer (direction with units) _____

Good Luck

Some useful constants:

$$g = 9.81\ m/s^2$$