# Chapter 1 Worksheet

## Part 1: Sentence Completion

1. Motion is a --**change**-in the object's --**position**---with respect to --**time**--.
2. A --**reference**-(**coordinate system**) is needed to measure the position of an object in motion.
3. A physical quantity that has a magnitude (number and a unit) only is called a **--scalar--.**
4. A physical quantity that has both magnitude and direction is called a --**vector**--.
5. 1 meter is equivalent to --**100**--centimeter and 1 millimeter is equivalent to $\mathbf{10^{-1}}$ cm.
6. The **--meter--** is the metric (SI) unit of length in the metric system and the ---second--- is the unit for time.
7. The prefix ---**kilo**-- has a power of ten as **---$\mathbf{10^{3}}$---**and the $10^{-9}$ has the prefix **nano**.
8. The measure of how fast or how slowly an object is called ---**speed**---.
9. The measure of how fast or how slowly the velocity is changing is called ---**acceleration**.
10. Change of velocity over time is called ----**acceleration----.**
11. The ---**uniform motion**--- is any straight line motion in which equal displacements occurs during any successive equal time intervals.
12. The ---**instantaneous**---velocity is the velocity (speed and direction) at the moment and not the average over the entire hour.
13. Millisecond = --$\mathbf{10^{-3}}$--second.

## Part 2: General Review Questions

1. What is the basic metric unit of mass? What is the basic SI unit of mass?
   **Gram, kilogram**
2. Give the metric prefix for 1000,000
   **Mega = $\mathbf{10^{6}}$**
3. Give the power of ten of 0.0002
   **$\mathbf{2\times10^{-4}}$**
4. Write the abbreviation of 5.6 kilometers, 2.3 millimeters
   **5.6km, 2.3mm**
5. Which is larger? 1cm or 1mm, 100m or 1km
   **1cm, 1km**
6. Does the car speedometer measures average speed or the instantaneous speed?
   **Instantaneous speed**
7. You throw a ball against a wall and the ball bounces back toward you with the same speed as it had before it hits the wall. Does the velocity of the ball remain the same as the speed?
   **No. The magnitude of velocity remains the same as before but the direction has changed**
8. Suppose in an unidentified system of measurement the distance/displacement is measured by the unit J and time by K

   **A.** What would the unit of speed be in this system? **J/K**

   **B.** What would the unit of velocity be in this system? **J/K**

   **C.** What would the unit of acceleration be in this system? **$\mathbf{J/K^{2}}$**

**9.** Two cars A and B are moving with constant velocities v and 2v respectively at a certain amount of time. During this time interval, which car A or B is moving with greater acceleration?

**Because the two cars are moving with constant velocities, therefore the acceleration is zero.**

**Part3: Multiple Choices**

**1.** Which is a vector quantity?
- **A.** Speed.
- **B.** **Displacement**.
- **C.** Distance.
- **D.** Mass.

**2.** When a quantity is multiplied or divided by one, the value is
- **A.** Increased.
- **B.** Decreased.
- **C.** **Unchanged**.
- **D.** None of the above.

**3.** The unit $m/s^2$ is for
- **A.** Velocity
- **B.** Speed
- **C.** Instantaneous speed
- **D.** **Acceleration**

**4.** Displacement
- **A.** Is a measurement of mass
- **B.** Is a measurement of time
- **C.** Can be described only with a number
- **D.** **Showing direction and distance**

**5.** Temperature is
- **A.** A vector quantity.
- **B.** **A scalar quantity**.
- **C.** Neither a vector nor a scalar.
- **D.** None of the above.

**Part4: True/False** (If your answer is F, then try to correct the statement)

**1.** Velocity is the same as speed**.**
- **A.** True
- **B.** **False (velocity is a vector and speed is a scalar)**

**2.** Velocity is always constant.
- **A.** True
- **B.** **False (velocity is not always a constant)**

3. Velocity is a scalar and speed is a vector quantity.
   **A.** True
   **B. False (velocity is a vector and speed is scalar)**

4. Uniform motion is motion along a straight line of constant slope.
   **A. True**
   **B.** False

5. The average speed and instantaneous speed are the same.
   **A.** True
   **B. False (instantaneous speed is the speed at the moment (when time approaches zero). Average speed is the total distance traveled divided by the time of travel)**

**Part6: Exercises**

1. A driver covers a distance of 300 km in a time of 2.5 hours. What is the average speed for this trip?

   **Given Data:** $d = 300km,\ t = 2.5hr$

   **Wanted:** $\bar{v}$ ?

$$\because \bar{v} = \frac{d}{t} \Rightarrow \therefore \bar{v} = \frac{300km}{2.5hr} = 120km/hr$$

2. A driver drives for 4.5 hours at an average speed of 65 km/h. What distance does he travel in this time?

   **Given Data:** $\bar{v} = 65km/hr,\ t = 4.5hr$

   **Wanted: *d*?**

$$\because d = \bar{v}t \Rightarrow \therefore d = (65km/hr)(4.5hr) = 292.5km$$

3. A student walks a distance of 320 m with an average speed of 1.5 m/s. What time was required to walk this distance?

   **Given Data:** $d = 320m,\ \bar{v} = 1.5m/\sec$

   **Wanted: *t*?**

$$\because t = \frac{d}{\bar{v}}, \Rightarrow \therefore t = \frac{320m}{1.5m/\sec} = 213.3\sec$$

4. Starting from rest and moving in a straight line, a runner runs with velocity of 6 m/s in a time of 2 s. What is average acceleration of the runner?

   **Given Data:** $v_i = 0m/\sec,\ v_f = 6m/\sec,\ t = 2\sec$

   **Wanted:** $\bar{a}$ **?**

$$\bar{a} = \frac{v_f - v_i}{t} = \frac{6m/\sec - 0m/\sec}{2} = 3m/\sec^2$$

5. The velocity of a train decreases from 40 m/s to 20 m/s in 4 s. What is the average acceleration of the train?

   **Given Data:** $v_i = 40m/\sec,\ v_f = 20m/\sec,\ t = 4\sec$

   **Wanted:** $\bar{a}$

$$\bar{a} = \frac{v_f - v_i}{t} = \frac{20m/\sec - 40m/\sec}{4\sec} = -5m/\sec^2$$ "-" means slowing down

**6.** A car is moving at 25 m/s when the driver applies the brakes. If it stops in 3 s, what is its average acceleration?

**Given Data:** $v_i = 25m/\sec,\ v_f = 0m/\sec,\ t = 3\sec$

**Wanted:** $\bar{a}$

$$\bar{a} = \frac{v_f - v_i}{t} = \frac{0m/\sec - 25m/\sec}{3} = -8.33m/\sec^2$$ "–" Means slowing down

**7.** Convert 0.05 km to centimeters

$$(0.05km)(\frac{10^3 m}{1km}) = (5\times10^{-2})(10^3 m) = 50m$$

**Part 7: Challenge Problems**

**1.** A car is travelling in a straight line with an initial velocity of 10 m/s accelerates at 2 m/sec$^2$ to a velocity of 20 m/s.

**A.** How much time does it take for the car to reach velocity of 20 m/s?

Given Data: $v_i = 10m/\sec,\ v_f = 20m/\sec,\ a = 2m/\sec^2$

Wanted: $t$

$$\because a = \frac{v_f - v_i}{t} \Rightarrow \therefore t = \frac{v_f - v_i}{a} = \frac{20m/\sec - 10m/\sec}{2m/\sec^2} = 5\sec$$

**B.** What is the distance traveled by the car during this time?

**2.** A car traveling around a circle track with constant speed. Is this car moving with constant velocity? Explain

**No. The car direction is changing although its magnitude is constant. Changing direction is enough for the velocity not to be constant or uniform**

**3.** What is your age in milliseconds?

Assume you are 20y old

$$(20y)(\frac{365d}{1y})(\frac{24hr}{1d})(\frac{60\min}{1hr})(\frac{60\sec}{1\min})(\frac{10^{-3}m\sec}{\sec}) = 20\times365\times24\times60\times60\times10^{-3}m\sec$$

= 630720000x10$^{-3}$= 6.30720 x 10$^5$ msec