

Physics
Unit 1: Motion
Measuring Velocity

Name: _____

Velocity (symbol = v):

Average Velocity: when we measure velocity, *average velocity* is what we will actually measure. This is the average speed of an object as it travels through a given distance. The object may speed up or slow down over that distance, but the average velocity that we calculate will not show this.

| Basic Metric Units Relating To Velocity | | | |
|---|--------------|---|------------------|
| Metric Base Unit | Abbreviation | What it measures | A rough estimate |
| | | Distance or Length | |
| | | Time | |
| | | Velocity (or <i>average velocity</i>) | |

m/s: _____

In math, “/” means “_____,” so “m/s” means “_____”

_____.”

Formula for Calculating Average Velocity (**make sure that your units are meters and seconds**):

Practice Problems:

1. A ball rolls 15 meters (15m) in 5 seconds (5s). What is its average velocity over these 15 meters?
2. A car travels 50m in 2 seconds. What is its average velocity over these two meters?

Meter Stick Units:

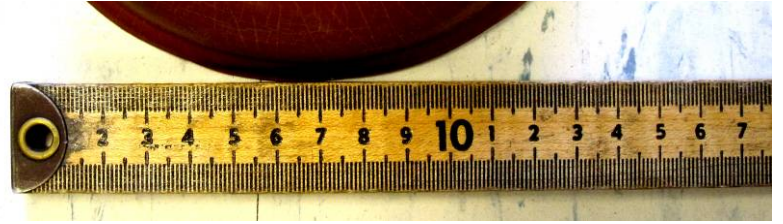
The numbered marks on a meter stick are _____ (abbreviated _____)

One centimeter is about _____

There are _____ cm in one meter.

Two Ways to Convert Between m and cm:

1m = 100cm, so...



Method 1) Convert from meters to centimeters by multiplying by 100. Convert from centimeters to meters by dividing by 100

$$m \times 100 = cm \quad \text{or} \quad cm/100 = m$$

Method 2) Convert from meters to centimeters by moving the decimal point two places to the right. Convert from centimeters to meters by moving the decimal point two places to the left.

*****Remember, centimeters are much smaller than meters, so there are a lot more of them in any distance. Measurements in cm should be much bigger numbers (100 times bigger).*****

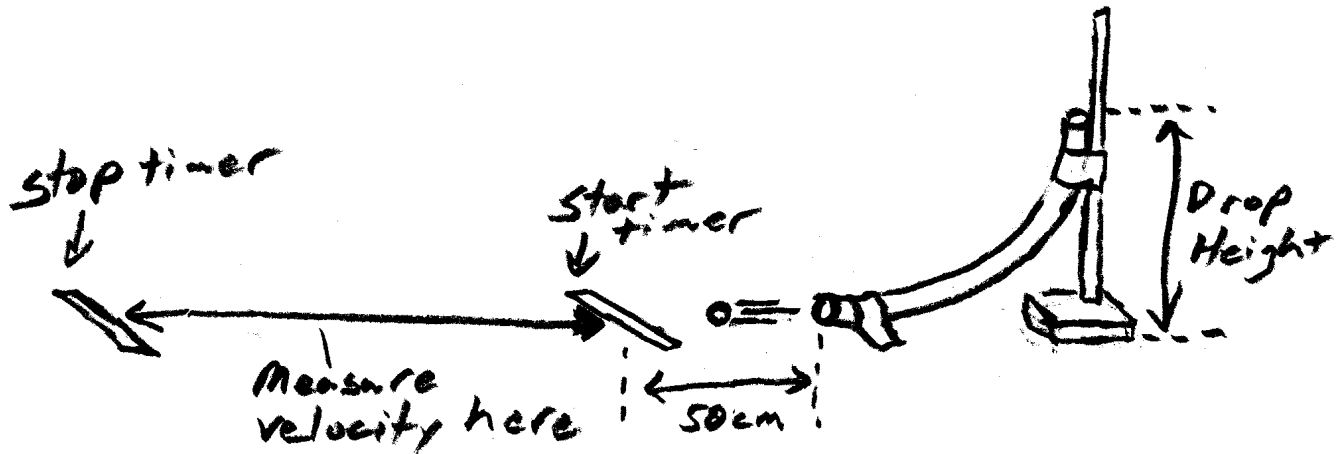
Practice: Measure the lengths of the following items in centimeters and meters. **Round to the nearest centimeter.** Label your measurements with the appropriate units.

| | Centimeters | Meters |
|--------------------------|-------------|--------|
| 1. Length of this paper. | | |
| 2. Width of this paper. | | |
| 3. Length of your table | | |
| 4. Width of your table | | |
| 5. Height of your table | | |
| 6. Length of this room | | |
| 7. Width of this room | | |
| 8. Height of the ceiling | | |

Velocity Practice:

Use a plastic water pipe to accelerate (speed up) a ball. Hold the pipe at a slope, so that it makes a gentle curve where it touches the floor. Drop a ball in the top of the pipe. Use tape to make a first line 50cm from the end of the pipe. Look at the “horizontal distance traveled,” below, and place a second piece of tape this distance from the first piece of tape.

Measure the ball’s velocity between the two tape marks. Start your timer when the ball reaches the first tape, and stop your timer after the ball reaches the second tape. Repeat three times and then choose the time that you think is closest to the correct time. Use this to calculate the ball’s velocity.



***Don't forget to include proper units! (meters, seconds, etc.)

| Drop Height | Horizontal Distance Traveled (between tape marks) | Travel Time Trial 1 | Travel Time Trial 2 | Travel Time Trial 3 | Most Likely Travel Time | Average Velocity over this distance |
|--------------------------|---|---------------------|---------------------|---------------------|-------------------------|-------------------------------------|
| <i>Example</i> (0.3m) | 2m | | | | | |
| 0.2m | 2m | | | | | |
| 0.2m | 4m | | | | | |
| 0.7m | 2m | | | | | |
| 0.7m | 4m | | | | | |

More Velocity Practice:

1. A cheetah runs 59m in 2 seconds. What is its velocity?
2. A jogger runs around a 400m track in 90s. What is the jogger's velocity?
3. A bicyclist travels 6m in 1.5s. What is the bicyclist's velocity?
4. A motorcycle circles a 400m track in 15 seconds. What is its velocity?

For the next few problems, you will have to convert cm to m before you calculate velocity.

5. A snail travels 3cm in 400 seconds. What is its velocity?
6. A ball rolls 30cm in 2 seconds. What is its velocity?
7. A parachute falls 160cm in 1second. What is its velocity?
8. As I typed this, my cursor moved 7cm in 6 seconds. What was my cursor's velocity?

Estimate the following distances:

- | | |
|---|--|
| 9. Height of a person, in m. _____ | 10. Length of a pencil, in cm. _____ |
| 11. Height of a table, in cm. _____ | 12. Height of a basketball goal, in m. _____ |
| 13. Length of an average car, in cm _____ | 14. Width of a human eyeball, in m. _____ |