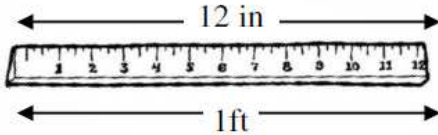


Name: \_\_\_\_\_  
 Period: \_\_\_\_\_

Conversions



Conversion Factors

To do a conversion you need a conversion factor. Conversion factors come from equalities. Since anything divided by itself is 1, a conversion factor also equals 1. Any equality can make two conversion factors.

1 Equality

$$12 \text{ in} = 1 \text{ ft}$$

2 Conversion Factors

$$\left(\frac{12 \text{ in}}{1 \text{ ft}}\right) \text{ OR } \left(\frac{1 \text{ ft}}{12 \text{ in}}\right)$$

Conversions are how we change units. 1 foot equals 12 inches: the amount is the same, but how we express the amount is different.

How To Do Conversions

Follow these steps exactly and you will be able to perform any conversion.

**Example 1: Convert 35 m/s to ft/sec.**

**Step 1:** Write what you are given as a fraction with one unit on top and one unit on bottom. → If you have a single unit, just write it over 1.

$$35 \text{ m/s (given) becomes } \frac{35 \text{ m}}{1 \text{ sec}} \qquad 15 \text{ ft becomes } \frac{15 \text{ ft}}{1}$$

**Step 2:** In parenthesis and **WITHOUT NUMBERS**, write the units you want to get rid of diagonal from itself. In the other part of the fraction write what you're converting to. → Why no numbers? Because most mistakes are made by assuming that you will multiply or divide by some number. Let the units guide you **NOT** the numbers.

$$\frac{35 \text{ m}}{1 \text{ sec}} \left( \frac{\text{ft}}{\text{m}} \right) \leftarrow \text{NO NUMBERS YET! Notice: m's are diagonal.}$$

**Step 3:** Put numbers into the parenthesis so that the top equals the bottom.

$$\frac{35 \text{ m}}{1 \text{ sec}} \left( \frac{3.3 \text{ ft}}{1 \text{ m}} \right) \leftarrow \text{Since we know } 3.3 \text{ ft} = 1 \text{ m.}$$

**Step 4:** Cancel out the units **BUT NOT THE NUMBERS!**

$$\frac{35 \cancel{\text{ m}}}{1 \text{ sec}} \left( \frac{3.3 \text{ ft}}{1 \cancel{\text{ m}}} \right) \leftarrow \text{m's cancel because } \text{m/m} = 1$$

**Step 5:** Do the math. Multiply the numbers if they are both on top. Divide if the second one is on the bottom.

$$\frac{35 \cancel{\text{ m}}}{1 \text{ sec}} \left( \frac{3.3 \text{ ft}}{1 \cancel{\text{ m}}} \right) = \frac{35(3.3) \text{ ft}}{1 \text{ sec}} = 115.5 \text{ ft/sec}$$

Ex. 2: Convert 50 mi/hr to mi/min.

Step 1:  $\frac{50 \text{ mi}}{1 \text{ hr}}$  write as a fraction

Step 2:  $\frac{50 \text{ mi}}{1 \text{ hr}} \left( \frac{\text{hr}}{\text{min}} \right)$  hr's are diagonal from each other

Step 3:  $\frac{50 \text{ mi}}{1 \text{ hr}} \left( \frac{1 \text{ hr}}{60 \text{ min}} \right)$  put in #'s

Step 4:  $\frac{50 \text{ mi}}{1 \cancel{\text{ hr}}} \left( \frac{1 \cancel{\text{ hr}}}{60 \text{ min}} \right)$  since hr/hr = 1

Step 5:  $\frac{50 \text{ mi}}{1 \cancel{\text{ hr}}} \left( \frac{1 \cancel{\text{ hr}}}{60 \text{ min}} \right) = \frac{50 \text{ mi}}{60 \text{ min}}$  60 on bottom means ÷  
 $= 50 / 60 = 0.83 \text{ mi/min}$

Multiple Conversions

If you need to perform multiple conversions, you can either do each conversion independently or in one long chain.

Convert: 560 hours to weeks.

Chaining:

$$\frac{560 \cancel{\text{ hr}}}{1} \left( \frac{1 \cancel{\text{ days}}}{24 \cancel{\text{ hr}}} \right) \left( \frac{1 \cancel{\text{ weeks}}}{7 \cancel{\text{ days}}} \right)$$

$$= \left( \frac{560 \text{ weeks}}{24(7)} \right) = 3.33 \text{ weeks}$$

Convert: 560 hours to weeks.

One conversion at a time:

$$\frac{560 \cancel{\text{ hr}}}{1} \left( \frac{1 \cancel{\text{ days}}}{24 \cancel{\text{ hr}}} \right) = 23.33 \text{ days}$$

$$\frac{23.33 \cancel{\text{ days}}}{1} \left( \frac{1 \cancel{\text{ weeks}}}{7 \cancel{\text{ days}}} \right) = 3.33 \text{ weeks}$$

Both ways will give the same answer, but once you master the chaining method, you will find it easier and less prone to mistakes.

1. Prepare these numbers for conversion.

A. Ex. $\frac{12 \text{ in}}{1}$	B. 6 m/sec	C. 4 sec	D. 19 mph	E. 3.7 meters
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2. Find the mistakes in each of the following and write a corrected version underneath.

A. $\frac{4 \text{ mph}}{1} \left( \frac{5,280 \text{ ft}}{1 \text{ mi}} \right)$	B. $\frac{52.2 \text{ m}}{1 \text{ sec}} \left( \frac{1 \text{ min}}{60 \text{ sec}} \right)$	C. $\frac{82 \text{ years}}{1} \left( \frac{320 \text{ days}}{1 \text{ year}} \right)$	D. $42 \text{ in} \left( \frac{1 \text{ ft}}{12 \text{ in}} \right)$
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3. Perform the following functions (do the math).

A. $\frac{6}{1} \left( \frac{4}{3} \right) =$	B. $\left( \frac{\text{km}}{1} \right) \left( \frac{\text{km}}{1} \right) =$	C. $\left( \frac{\text{km}}{1} \right) \left( \frac{1}{\text{km}} \right) =$
D. $\left( \frac{\text{m}}{\text{sec}} \right) \left( \frac{\text{sec}}{\text{min}} \right) =$	E. $\frac{16 \text{ m}}{1 \text{ sec}} \left( \frac{1 \text{ m}}{3.3 \text{ ft}} \right) =$	F. $\frac{220 \text{ sec}}{1} \left( \frac{1 \text{ min}}{60 \text{ sec}} \right) =$

4. Do the following conversions. Given: 1 in = 2.54 cm; 3.3 ft = 1 m; 12 in = 1 ft; 5,280 ft = 1 mi (mile)

A. Convert 3.5 miles to feet

B. Convert 6 ft to meters

C. Convert 2.5 weeks to days

D. Convert 2500 seconds to minutes

E. Convert 18 m/sec to m/min

F. Convert 60 mph (miles) to m/hr (meters)

5. Convert 120 m/min to m/hour.

6. There are 1,000,000 micrometers ( $\mu\text{m}$ ) per meter. How many meters is 48,000  $\mu\text{m}$ ?

7. A. Convert 15 in/min to feet per min

B. Using the above answer, convert to feet per second.

8. A. Convert 540 cm/min to cm/sec

B. Convert to inches per second.

9. Convert 12 mph (miles) to m/s (meters).