Name: _____

Distance, Speed, and Unit Conversion
SPH4C

A **scalar** quantity has _____ (size) only.

Examples of scalars:

$\frac{8}{4}$ _____

$\frac{8}{4}$ _____

$\frac{8}{4}$ _____

$\frac{8}{4}$ _____

$\frac{8}{4}$ _____

Alex walks 2 m [North] and 1 m [South]. What is the total distance he walks?

Distance is a scalar: _____.

Average speed is defined as the distance travelled per interval of time, or

Speed will therefore have units of _____ (typically _____).

Example: Matt runs 180 m in 0.75 min.
What is his average speed in m/s?

First, what is 0.75 minutes in seconds?

To express a measurement in different units, we multiply the measurement by a

_____ that is equal to 1.

Since 1 minute = 60 seconds,

The unit we want to _____ out goes in the _____of the factor.

The unit we want to _____ goes in the _____.

Example: Matt runs 180 m in 0.75 min.
What is his average speed in m/s?

Givens: Select:

Unknown: Solve:

The equation for average speed can be rearranged to solve for distance or time:

$$v_{avg} = \frac{\Delta d}{\Delta t}$$

$$v_{avg}\square = \left(\frac{\Delta d}{\Delta t}\right)\square$$

$$v_{avg}\square = \square$$

$$\frac{v_{avg}\square}{\square} = \frac{\square}{\square}$$

$$\Delta t = \square$$

Another Example: If Megan is running at 4 m/s, how long will it take her to run a 5 km trail?

Givens: Select:

Unknown: Solve:

A metric _____ may be used to indicate a unit that is some _____ larger or smaller than the base unit.

For example,

1 km = _____ or _____

Symbol	Prefix	Multiplication Factor	
E	exa	10^{18}	1,000,000,000,000,000,000
P	peta	10^{15}	1,000,000,000,000,000
T	tera	10^{12}	1,000,000,000,000
G	giga	10^{9}	1,000,000,000
M	mega	10^{6}	1,000,000
k	kilo	10^{3}	1,000
h	hecto	10^{2}	100
da	deka	10^{1}	10
d	deci	10^{-1}	0.1
c	centi	10^{-2}	0.01
m	milli	10^{-3}	0.001
μ	micro	10^{-6}	0.000,001
n	nano	10^{-9}	0.000,000,001
p	pico	10^{-12}	0.000,000,000,001
f	femto	10^{-15}	0.000,000,000,000,001
a	atto	10^{-18}	0.000,000,000,000,000,001

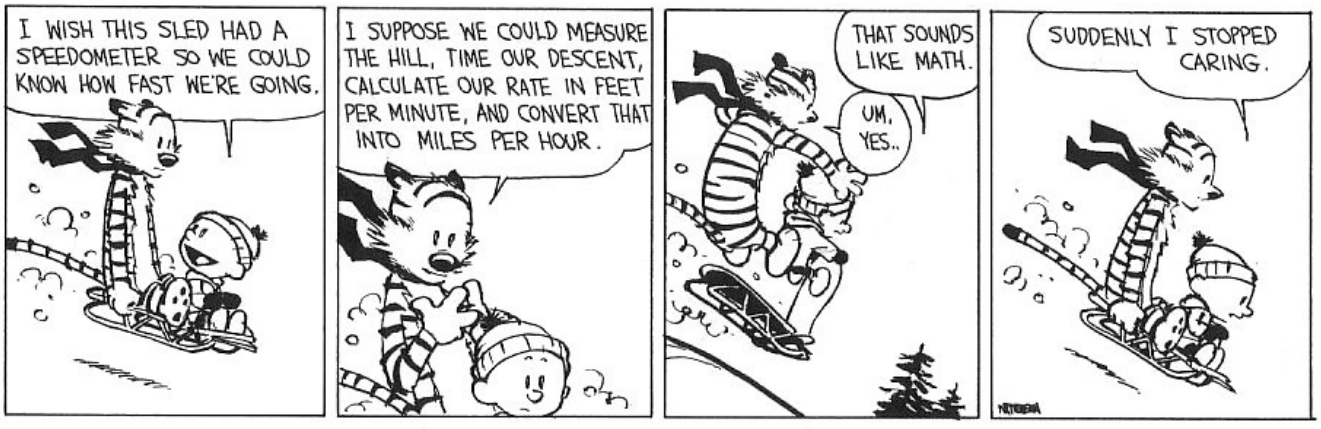
For example,

$\frac{8}{4}$ 2 ms = _____

$\frac{8}{4}$ 2 ns = _____

$\frac{8}{4}$ 20 ns = _____

Finally, converting some units may require multiplying by more than one conversion factor. For example,



More Practice

1. Match each measurement with a metric prefix below with its equivalent:

___ 5 Mm ___ 5 mm ___ 5 nm ___ 5 km ___ 5 μm

A. 5×10^{3} m B. 5×10^{-9} m C. 5×10^{6} m D. 5×10^{-3} m E. 5×10^{-6} m

2. Light from the Sun takes 8.3 min to reach the Earth. Convert this measurement to s:

3. Convert 125 lb to kg given that 1 kg = 2.2 lb.

4. Usain Bolt can run at a speed of 37.6 km/h. Convert this measurement to m/s.

5. Ms. Rosebery takes 0.5 h to drive 30 km. What was her average speed?
(Show a GUSS solution.)

6. The Space Shuttle could travel at an orbital speed of 8000 m/s. How far could it travel in 15 seconds? (Show a GUSS solution.)