Name: _____

Date: _____

Cornell University
Prison Education Program

Conceptual Physics
Class 2 Questions
Feb 9, 2018

The following table of metric prefixes may be useful:

kilo	(none)	centi	mili	micro	nano
k	(none)	c	m	μ	n
10^3	10^0	10^{-2}	10^{-3}	10^{-6}	10^{-9}
1000	1	0.01	0.001	0.000001	0.000000001

1. You are the manager for a landscaping company, and are comparing 3 different materials suppliers. Each sells the same material, only packaged differently. Your job is to compare the different sellers, and in particular look at how they package sand.

   - Supplier 1 sells sand in *buckets*.
   - Supplier 2 sells sand in *bags*.
   - Supplier 3 sells sand in *crates*.

   Although each supplier packages sand differently, you find out that 1 bag can be split into 10 buckets, and that 10 bags fill 1 crate.

Supplier 1 sells sand in *buckets*	Supplier 2 sells sand in *bags*	Seller 3 sells sand in *crates*
  $= 10 \times$ 		 $10 \times$  $=$ 

   (a) How many buckets does it take to fill 1 crate?

   (b) How many buckets can 3 bags be split into?

   (c) How many bags will 5 crates fill?

   (d) How many bags will 15 buckets fill?

   (e) How many crates will 50 buckets fill?

   (f) How many buckets can 2.5 crates fill?

(g) You compare prices between suppliers.

- Supplier 1 charges 6$ per bucket.
- Supplier 2 charges 70$ per bag.
- Supplier 3 charges 500$ per crate.

Which supplier is selling sand the *cheapest*? Which is charging the *most*?

(h) You discover a fourth supplier, this one selling sand by the *pound*. What do you need to know in order to compare Supplier 1 and Supplier 4?

(i) You weigh 3 bags of sand from Supplier 2, and notice that together they weigh 150 pounds. If Supplier 4 charges 1$ per pound of sand, then what supplier(s) are they cheaper than, if any?

2. A home owner wishes to re-tile their kitchen, which happens to be a perfect rectangle, measuring 12.0 ft by 14.0 ft. The tiles they are interested in using are square 6.0 inches by 6.0 inches. Ignoring spacing for grout, what is the minimum number of tiles they should buy?

3. Convert the following into scientific notation (but leave the units the same):
   (a) 0.020 m

   (b) 36 nm

   (c) 15.6×10^6 mg

   (d) $\frac{4.0\times10^2\ m}{2.0\times10^3\ s}$

   (e) $\frac{4.0\times10^{-2}\ m}{2.0\times10^{-3}\ s}$

4. Convert the following to cm (useful info: 1 inch $\approx$ 2.5 cm, 1 mile $\approx$ 1.5 km):
   (a) 100 m

   (b) 15 nm

   (c) 25 km

   (d) 8.0 miles

(e) 5 inches

5. (Taken from *College Pysics*) Mount Everest, at 29,000 feet, is the tallest mountain on Earth. What is its height in kilometers?

$$1\ m = 3\ feet \tag{1}$$

6. Olympus Mons is the tallest mountain in the solar system (it is actually a volcano). Its diameter is approximately the size of Arizona, and it stand at 25 km tall. How high is its peek in feet? (Let $1\ m = 3\ feet$)

Pause here to work on the speed invention activity.

7. (Taken from *College Pysics*)The speed limit on many Canadian highways is 100 km/h. Use the conversion factor of

$$1\ miles = 1.5\ km \tag{2}$$

   (a) What is this in m/s?

   (b) What is this in miles/hour?

8. You are driving along a highway and pass a mile marker, which reads 81.0. Five minutes later, you pass mile marker 76.0. Assume you neither braked nor accelerated (say, because you are using cruise control).

   (a) What is your speed in miles/hour?

   (b) What is your speed in km/hour?(1 mile = 1.5 km)

9. A car is traveling at a speed of 33 m/s.

   (a) What is its speed in kilometers per hour?

   (b) Is it exceeding the 90 km/h speed limit?