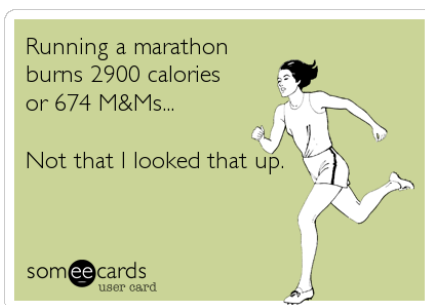


Challenge Problems: Unit Conversions

You will be divided up into teams to work one of these problems. Teams will present the problem and answer during lab (2:40-5:20) tomorrow.

1. According to a study published last December in *Medicine & Science in Sports & Exercise*, a group of Syracuse University researchers measured the actual calorie burn of 12 men and 12 women while running and walking 1,600 meters on a treadmill. Result: The men burned an average of 124 calories while running, and just 88 while walking; the women burned 105 and 74. A bag of M&M's has 230 calories per bag (regular sized bag of plain M&M's). A bag contains 1.69 oz on average. And, one M&M has a mass of about 0.85 grams. A marathon has an official race length of 42.195 km.



- a. How many calories are actually burned during a marathon (use your gender here!)
 - b. How many M&M's is that?
2. A penny has a diameter of 0.75 in and a width of 0.0625 in. Before 1982, a penny was made from pure copper. Today's copper value is \$3.1587 per pound, and the density of copper is 8.96 g/cm^3 . How much is a penny worth if I melt it down and sell it as scrap copper?
 3. Let's say that I trade all my money to pennies at the bank, and I can sort the pennies at a rate of 4 pennies per second. About 20% of the pennies in circulation are older than 1982, so about 20% of the ones I get from the bank should be pure copper. How much money can I make per hour if I make this my job? (You will need some of the information from problem 2)
 4. Codeine, a powerful narcotic, is often given after a surgical procedure. The codeine you obtain from the drug cabinet is 2.5 mg/mL. How many mL would you administer to a patient if they needed to receive only 1.75 mg of codiene?

5. Disclaimer: This problem does NOT account for your metabolism and is based on averages! Individual physiology and other drugs taken with caffeine drastically change these numbers!

DO NOT TRY THIS IN YOUR DORM!

The lethal dose of caffeine in humans is about 150 mg caffeine per kg of body weight. The actual number depends on how fast your body metabolizes caffeine. Red Bull has about 80 mg caffeine per can (250 mL). Caffeine is absorbed from your small intestine. An average small intestine is about 7.0 meters long and about 2.5 cm in diameter.

- a. How many Red Bull's would you have to drink to reach a lethal dose of caffeine?
- b. Is your small intestine able to hold that much?

This was an exam problem from my first exam last semester...

6. (12 Points) You found a pot of gold at the end of the rainbow. The volume of the pot is 23.2 quarts (qts). One mole of pure gold has a volume of 10.2 cm³. The current gold price is \$1768 per troy ounce of gold. (A troy ounce is a common measure of mass for a precious metal. One troy oz is 30.1 grams.) How much is the pot of gold worth? Report your answer to two sig figs.