

Bring: bicycle, chart of bike gear ratios

7:45 Put warm-up on the board:

- 1) Turn in homework, have a delicious and satisfying donut.
- 2) Today is lesson 7 out of 21. After today, what % complete are we?
A: $7/21 = 33\%$
- 3) Opinion survey: How would you estimate a 15% tip on \$22? A: \$4.20
 - a) Do 10% then add half again that amount to get 15%.
 - b) Look at sales tax (typ. 8%) and double it.
- 4) I'm improving the efficiency of my car's engine that gets 20 miles/gallon.

New hybrid engine improves it by 50%.
 Special high-octane fuel improves it by 30%.
 Low-loss tires improves it 20%.
 Special car wax improves it 10%.
 This is 110%! So will it produce gas for each mile driven?
 What is the real percent improvement?
 Write the problem with the % amount in a column, to suggest they add up.
 Of course this is misleading. This problem shows that % improvement from one item is multiplied by the previous item.

Incorrect: Mileage = $20\text{mpg} \times 0.5 \times 0.3 \times 0.2 \times 0.1 = \0.06mpg ?
 A: No, mileage = $20\text{mpg} \times (1+0.5) \times (1+0.3) \times (1+0.2) \times (1+0.1) = 51.48\text{mpg}$
- 5) What is 2^0 ? 3^0 ? 4^0 ? 10^0 ? n^0 A: 1
 backup questions:
- 6) $\frac{1}{2}$ is one third of it. What number is it? A: $1\frac{1}{2}$
- 7) License plates have three letters and three numbers. How many possible license plates are there? AAA000 / ZZZ999
 A: $26^3 \times 10^3 = 17,576,000$

42.7 percent of all statistics are made up on the spot.

99 percent of lawyers give the rest a bad name.

"Math illiteracy strikes 8 out of 5 people."

5 out of 4 people have trouble with ratios

When she missed the #44 bus, so she took the #22 bus twice

If the #2 pencil is the most popular, why is it still #2?

My new work philosophy: Always give 100% at work:

20%	on Monday
20%	on Tuesday
30%	on Wednesday
20%	on Thursday
10%	on Fridays

8:05 Hand out corrected homework

8:10 Discuss warm-ups
 Circulate attendance sheet

8:25 Discuss top 3 homework problems
 Cover the mathematics of rounding!

Prob 1 & 2) Don't write trailing zeros when you round.

(Number of places shows significance)

7.05 rounded to nearest tenth is 7.1 not 7.10

19.005 rounded to nearest tenth is 19.0 not 19.000

27.391 rounded to nearest tenth is 27.4 not 27.400

29.999 rounded to nearest hundredth is 30.00 not 30.000

Prob 4b) Don't need to align decimal when you multiply. (Saves you time)

Ex: 12.48×3.2 versus 12.48×3.20

Prob 6b) Do the rounding after everything else. $24.32 \times 5 = 121.6 \rightarrow 122$ pounds,

Compared to $24.3 \rightarrow 24 \times 5 = 121.5$ pounds

The difference is the amount removed by rounded becomes multiplied by 5, which makes the "error" bigger and throws off the result.

8:35 Lecture

8:55 As time permits, choose one of these topics that seem interesting:

Powers-of-2 guessing game (see attachment)

Discuss "what is bigger, the sun or moon?" *Compare the apparent size, by computing the ratio of distance to diameter. Through a cosmic accident, their ratios are almost exactly the same! The sun is 400x wider than the moon, and 400x farther away.*

Discuss bicycle gear ratios

Discuss power-to-weight ratios. *My car has a 2.0 liter engine. My motorcycle has a 1.2 liter engine. But my motorcycle out-performs the car! Its ratio of power-to-weight is much higher.*

What material can you fold $>10\times?$ $>20\times?$ Forever? *This is an interesting puzzle to let them think about for a week. It goes like this... Take any sheet of paper, and count the number of times you can fold it in half. From tiny post-it notes to newspaper to a bed sheet, they can only be folded 8 or 9 times. What material can be folded more? The solution anything soft like play-dough or silly putty.*

9:05 Hand outs

Start homework if time permits

9:10 Done