38% # MATH 1030 #5c $17/100$

Use and Abuse of Percentages

Use and Abuse

142% $33\,1/3\%$

Percentage Points vs Percent

Absolute Change is expressed in percentage points.

Relative change is recorded as a percent.

(note: if you see % symbol, it's typically a relative change)

EX 1: The percentage of Republicans in the House of Representatives decreased from 53.3% in 2007 to 46.4% in 2009. Describe this change with percentage points and with a percent.

absolute change $= 53.3 - 46.4 = 6.9$ percentage pts

$\Rightarrow$ Republicans in H.O.R. decreased by 6.9 percentage pts.

relative change $= \dfrac{6.9}{53.3} \approx 12.9\%$

$\Rightarrow$ percentage of Republicans in H.O.R. decreased by 12.9% from 2007 to 2009

EX 2: Given 30% of city employees in Carson City ride the bus to work, explain why the following statements are different.

The percentage of city employees who ride the bus is 10% higher in Freetown than in Carson City.

(relative change)

$\Rightarrow$ in Freetown, 110% of CC, $1.1(0.3)=0.33$
$=33\%$

33% of city employees ride the bus.

The percentage of city employees who ride the bus is 10 percentage points higher in Freetown than in Carson City.

(absolute change)

$\Rightarrow$ in Freetown, 40% of city employees ride the bus

EX 3: Your dinner bill is $42.50. You leave $50.00. What percent was your tip?

$$\text{tip} = 50 - 42.50$$
$$= 7.50$$

$$\underbrace{7.50}_{\substack{\text{part} \\ (\text{tip})}} \text{ is } \underline{}x\% \text{ of } \underbrace{42.50}_{\substack{\text{whole} \\ (\text{dinner bill})}}$$

$$7.50 = x(42.50)$$

$$x = \frac{7.5}{42.5} \approx 17.6\%$$

EX 4: The number of housing foreclosures in 2009 was 3.98 million, up 81% over 2007. How many foreclosures were there in 2007?

$$\underbrace{3.98}_{\text{new}} \text{ is } \underline{181}\% \text{ of } \underbrace{x}_{\text{old}}$$

$$3.98 = 1.81x$$

$$x = \frac{3.98}{1.81} \approx 2.2 \text{ million foreclosures in 2007}$$

EX 5: Determine if these statements are valid.   If not, fix them in
       some way, if possible.

① A politician promises, "If elected, I will cut your taxes by
   10% for each of the first three years of my term, for a
   total cut of 30%."

10% is a rel. change + percents cannot be
   added.

ex   pay $1000 in taxes.
   yr 1: $0.9(1000) = $900 taxes
   yr 2: $0.9(900) = $810 taxes
   yr 3: $0.9(810) = $729 taxes

x = taxes (paid in year 0)

$0.9(0.9(0.9x)) = 0.729x \Rightarrow$ after yr 3, we pay
                              72.9% of start
   $\Rightarrow$ decrease of 27.1% (not 30%)

Replace your standard light bulbs with these new ones
that use 175% less energy.

we cannot decrease by more than
   100%.

Your midterm score was 82% and your final exam score
was 96%, so you answered 89% of the questions on
these exams correctly.

$\dfrac{82 + 96}{2} = 89$ This is okay.

$\Rightarrow$ but if exams are weighted differently,
   then your overall average is not 89%.