

Announcements

- Snapshot 3 over percent change and absolute/relative measures
- Lab 3
- Homework 4 due Monday, Jan 28 at 10 pm

pollev.com/msumath

Are these statements possible?

- I've decreased my caloric intake by 115%, which has helped me lose weight.
- Gus's computer is 700% faster than Milo's.
- If sales at your brewery increase by 11% one year and then decrease by 5% the next year, your sales are up 6% over the two years.

Example

- Karl earns 200% more than Mark. What is Karl's income as a percentage of Mark's? How many times as large as Mark's income is Karl's?
- BE careful! 3 times "as much" is different than 3 times "more than"

Example

Kavya earns \$40,000.

- Bo earns 3 times **as much** as Kavya. How much does he earn ?
- Greg earns 3 times **more** than Kavya. How much does he earn?

Lecture 3

Percentage Point Change

+

More Uses of Percents

Relative vs Absolute change again

Absolute change:

Relative Change:

Last week we talked about PERCENT change

Example

According to Pew Research Center polls, the percentage of adults who regularly read a daily newspaper fell from about 54% in 2004 to about 38% in 2017. Choose the correct statement(s):

- A. A drop from 54% to 38% represents a decline of 16 percentage points.
- B. A drop from 54% to 38% represents a decline of 16%.
- C. Readership declined about 30% from 2004 to 2017.

Percentage Point Change

New idea from last week--

Percent change is **relative change**

Percentage Point change is **absolute change**

For Example:

If sales tax in Michigan increases from 6% to 9%...

This would be a 3% percentage point change

OR

This would be a 50% increase!

Example

Assume that 40% of the registered voters in Carson City are Republicans.

- A. The percentage of voters registered as Republicans is 25% higher in Freetown than in Carson City. What percentage of the registered voters in Freetown are Republicans?

Example continued

Assume that 40% of the registered voters in Carson City are Republicans.

- B. The percentage of voters registered at Republicans is 25 percentage points higher in Freetown than in Carson City.

Example

The rate of e-cigarette usage among middle school students was up 36%, to 5.3%.

What was the rate of e-cigarette usage before this rise?

Example

A politician promises: If elected, I will cut your taxes by 20% for each of the first three years of my term, for a total cut of 60%."

Let's evaluate this promise!

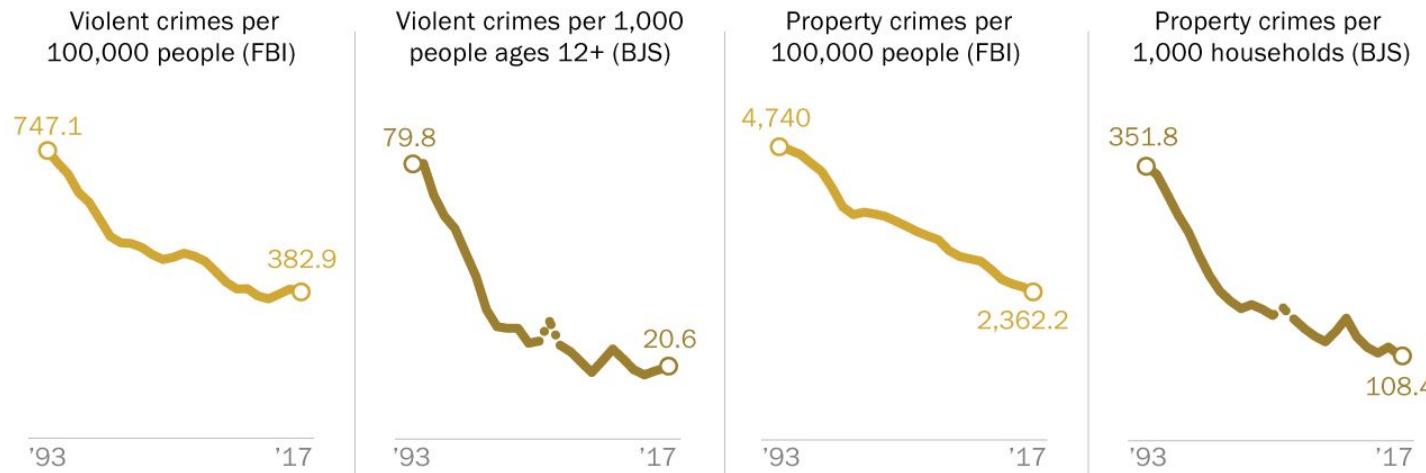
Example

Decide whether each of the following statements make sense!

- A. The price of tuition has tripled since my parents went to school--that's a 200% increase in price!!
- B. If you earn 20% more than I do, I must earn 20% less than you.
- C. If the tax rate increases by 10 percentage points each year, in a decade we'll be paying everything we earn in taxes!
- D. My bank increased the interest rate on my savings account 100%, from 2% to 4%.
- E. The rate of return on our fund increased by 50%, to 15%.

Crime rates have fallen since the early 1990s

Trends in U.S. violent crime and property crime, 1993-2017



Note: FBI figures include reported crimes only. Bureau of Justice Statistics (BJS) figures include unreported and reported crimes. 2006 BJS estimates are not comparable to those in other years due to methodological changes.

Source: FBI, Bureau of Justice Statistics.

Calculate the percent change of violent crimes per 100,000 people from '93 to '17.

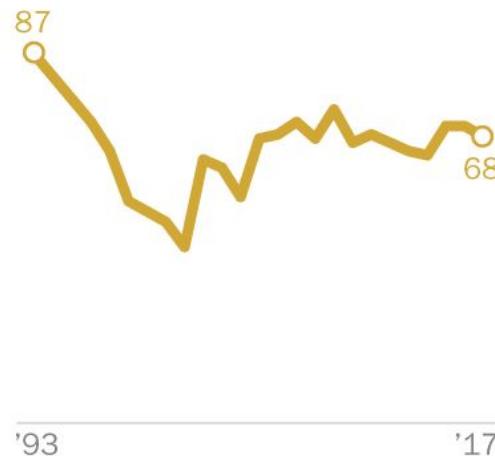
Poll Everywhere L3-Q1

The percent change between '93 and '17 of the left graph is:

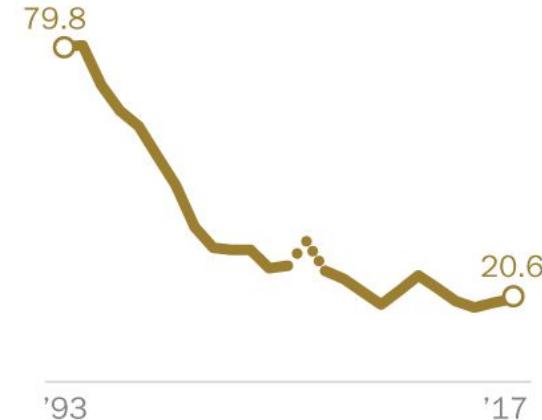
- A. -19%
- B. -21.8%
- C. -27.9%
- D. Can't be calculated

Public perception of crime rate at odds with data

% saying there is more crime in the U.S. than a year ago



Violent crimes per 1,000 people ages 12 and older



Note: 2006 Bureau of Justice Statistics (BJS) estimates are not comparable to those in other years due to methodological changes. To allow for comparisons across the same time period, 2018 public opinion data not shown.

Source: Gallup, Bureau of Justice Statistics.

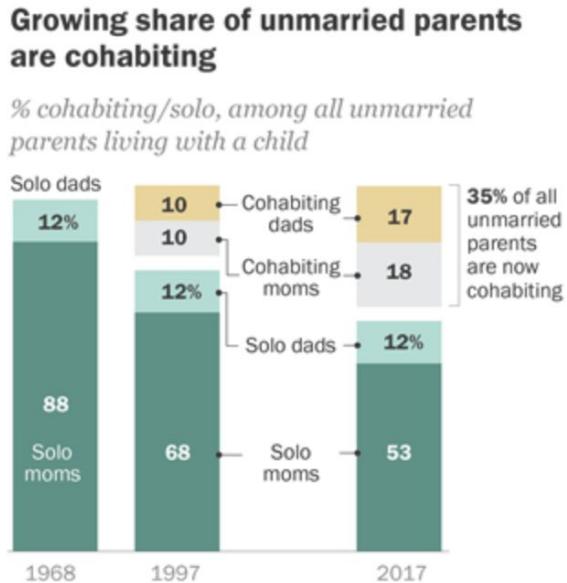
Example

- A BMW costs \$80,000 and a Honda costs \$20,000. How can we compare the quantities?
 - The BMW is \$60,000 more than the Honda.
 - The BMW price is 4 times the price of the Honda.
 - The BMW price is 300% more than the price of the Honda.
 - The BMW price is 400% as much as the price of the Honda.
 - **NEW:** The RATIO of the BMW price to the Honda price is 4:1.
The ratio of the Honda price to the BMW price is 1:4.
The Honda price is 25% of the BMW price.

Averaging Percentages?

- A basketball player with a career free throw shooting average of 80% hits all of his free throws (100% average) in a single game. True or False: His new free throw average is 90%.

PollEverywhere L3-Q2



Note: "Parents" are all U.S. parents living with at least one child younger than 18. Data regarding cohabitation available since 1997 only. Figures may not add to 100% due to rounding.

Source: Pew Research Center analysis of Current Population Survey March Supplement (IPUMS).

"The Changing Profile of Unmarried Parents"

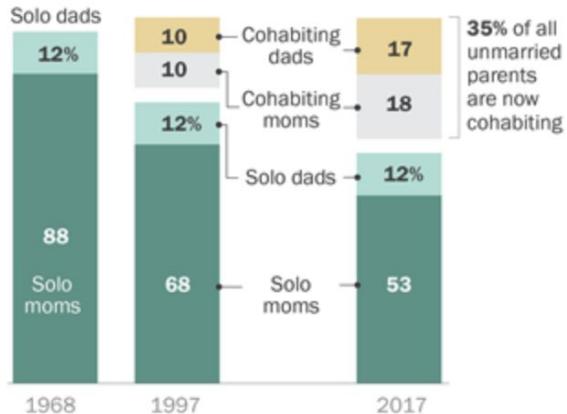
Which of the following is true about the number 53 in Fig. 2? Choose ONE.

- A. In 2017, 53% of parents were solo moms.
- B. In 2017, 53% of unmarried parents living with a child were solo moms.
- C. In 2017, 53% of solo moms were unmarried.
- D. In 2017, 53% of solo moms were living with a child.

PollEverywhere L3-Q3

Growing share of unmarried parents are cohabiting

% cohabiting/solo, among all unmarried parents living with a child



Note: "Parents" are all U.S. parents living with at least one child younger than 18. Data regarding cohabitation available since 1997 only. Figures may not add to 100% due to rounding.

Source: Pew Research Center analysis of Current Population Survey March Supplement (IPUMS).

"The Changing Profile of Unmarried Parents"

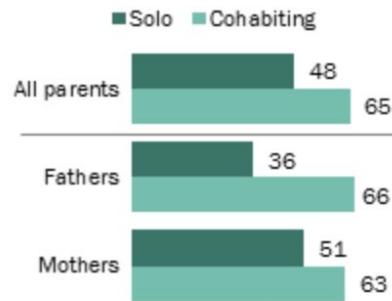
In 1968, 88% of unmarried parents were solo moms and in 2017 only 53% of unmarried parents were solo moms. Does this necessarily mean that the total number of solo moms has declined?

- A. Yes, 53% is less than 88%.
- B. Yes, there are more more solo moms in 2017 than in 1968.
- C. No, we don't know the total number of unmarried parents in either year.
- D. No, because in 1968 being a solo mom was not common.

PollEverywhere L3-Q4

About half of solo parents have never been married

% never married, by parent type



Note: "Parents" are all U.S. parents living with at least one child younger than 18.

Source: Pew Research Center analysis of 2017 Current Population Survey March Supplement (IPUMS).

"The Changing Profile of Unmarried Parents"

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Use the number 36 in a sentence.

- A. 36% of fathers have never been married.
- B. 36% of fathers are solo.
- C. 36% of solo fathers have never been married.
- D. 36% of married fathers are raising children solo.

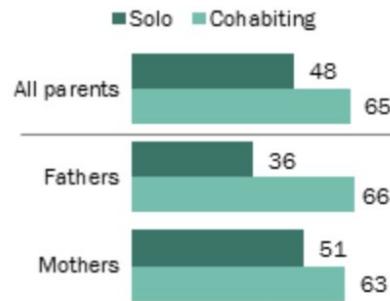
Discuss

True or False:

If 36% of solo fathers have never been married and 51% of solo mothers have never been married, then we can say that of 43.5% of solo parents have never been married.

About half of solo parents have never been married

% never married, by parent type



Note: "Parents" are all U.S. parents living with at least one child younger than 18.

Source: Pew Research Center analysis of 2017 Current Population Survey March Supplement (IPUMS).

"The Changing Profile of Unmarried Parents"

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Example

Between 2000 and 2015, the number of twin births in the United States increased by 13% to approximately 135,000 twin births. About how many twin births were there in 2000?

Example

Since 2008, Jackson Family Wines has reduced its water usage by 31%. By what fraction was the 2008 water usage reduced?