Math 243

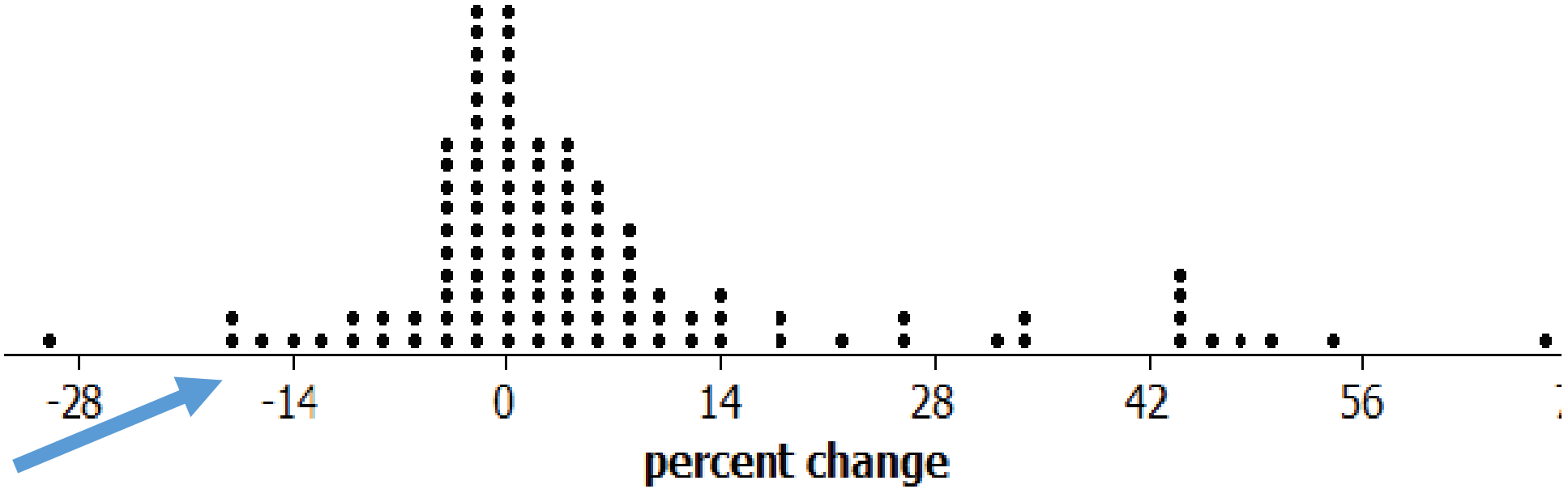
Day 3

Traffic Fatalities – Inv. A

Random Babies – Inv. B

Last Time – Did traffic fatalities decrease after the Federal Speed Limit Law?

- we found the percent change in fatalities dropped by 17.14% after the law was passed.



Is 17.14% a **large** change compared to the changes between other years?

How large is “large”?

When deciding whether particular value is extreme or not, it is helpful to consider the ***distribution*** of all values of the variable.

In particular, consider the ***center, spread*** and ***shape*** of the distribution***.***

Describing ***center, spread*** and ***shape*** of a distribution

Numerical summaries of **center**:

Mean (average) or **Median** (middle value) give us an idea of a "typical value" of the variable.

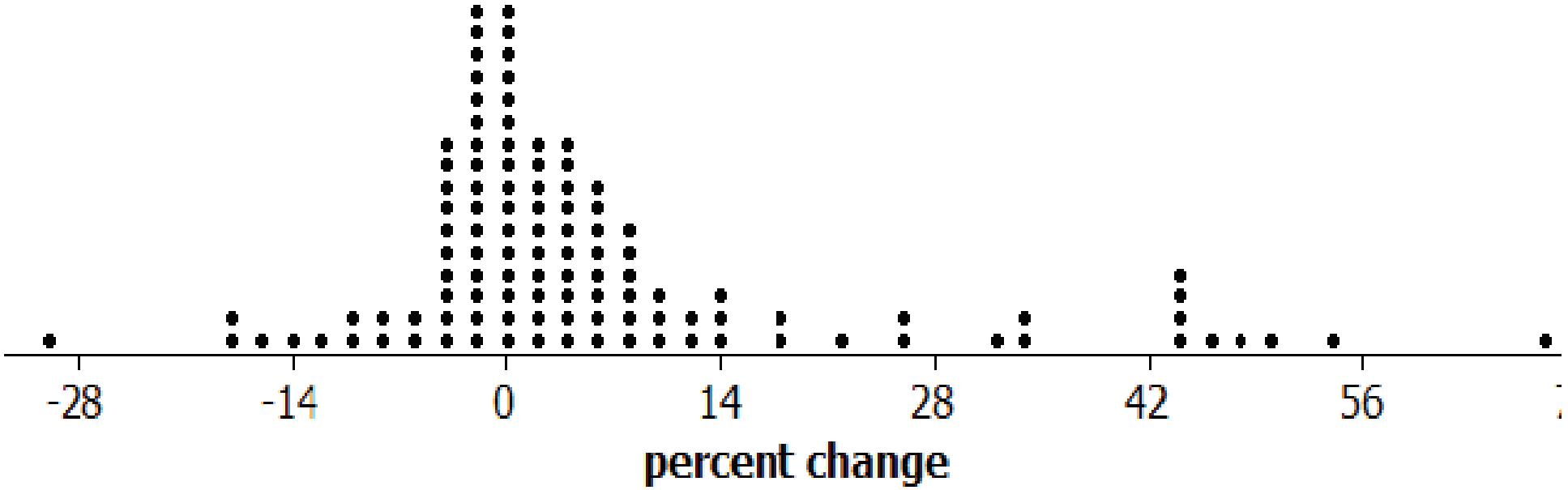
Numerical summary of **spread**:

Standard deviation gives us an idea of a "typical deviation" from the mean of the variable, i.e. how much *variation* there is.

Words to describe **shape:**

- Symmetric, skewed right or skewed left
- Bell shaped (one hill), bimodal (two hills) , uniform (rectangle)….

Visualizing Center, Shape and Spread



3. Describe **the *center*, *shape* and *spread* of a distribution,** from a dotplot or histogram

Traffic Fatalities - Inv. A

Along with me (or at home), try

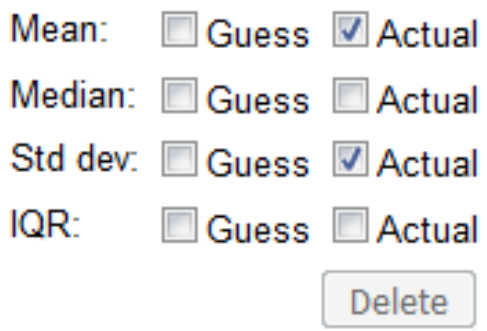
parts i), j), k), and l).

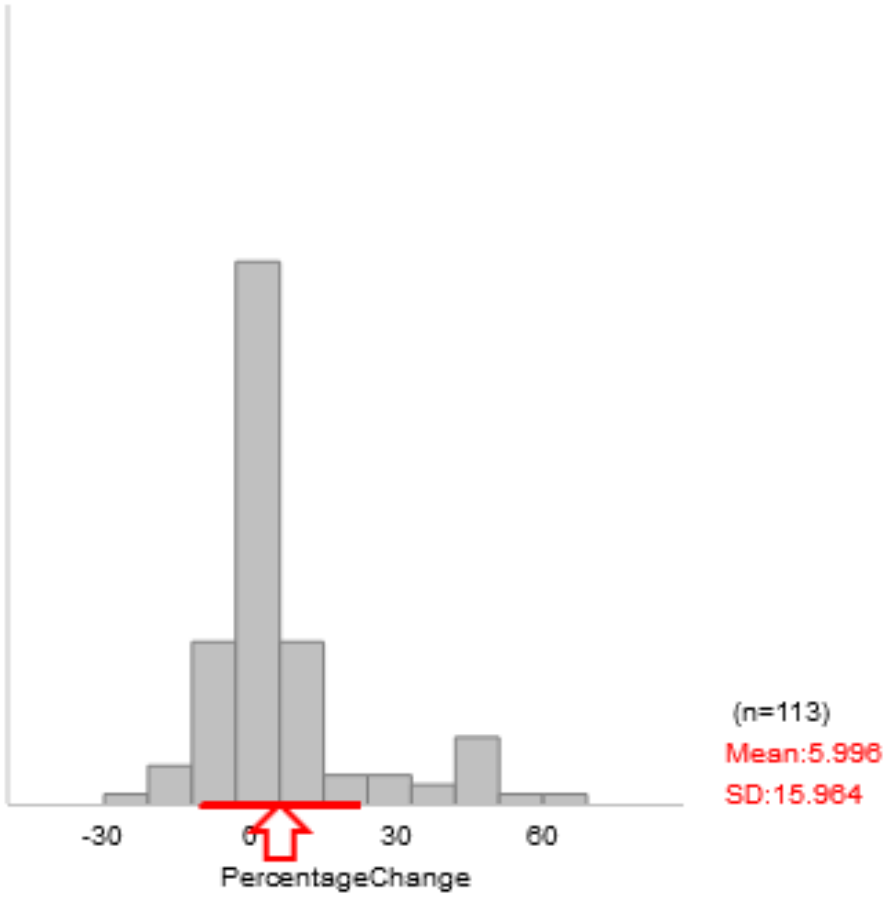
Part m) is on the first homework assignment.

Describing the distribution of percent changes in traffic fatalities

Center: Mean is 5.995
Spread: SD=15.964
Shape: One hill, skewed right

Most percent changes were clustered around 6% with a typical deviation from 6% of about 16%. There are a few extremely large percent changes.



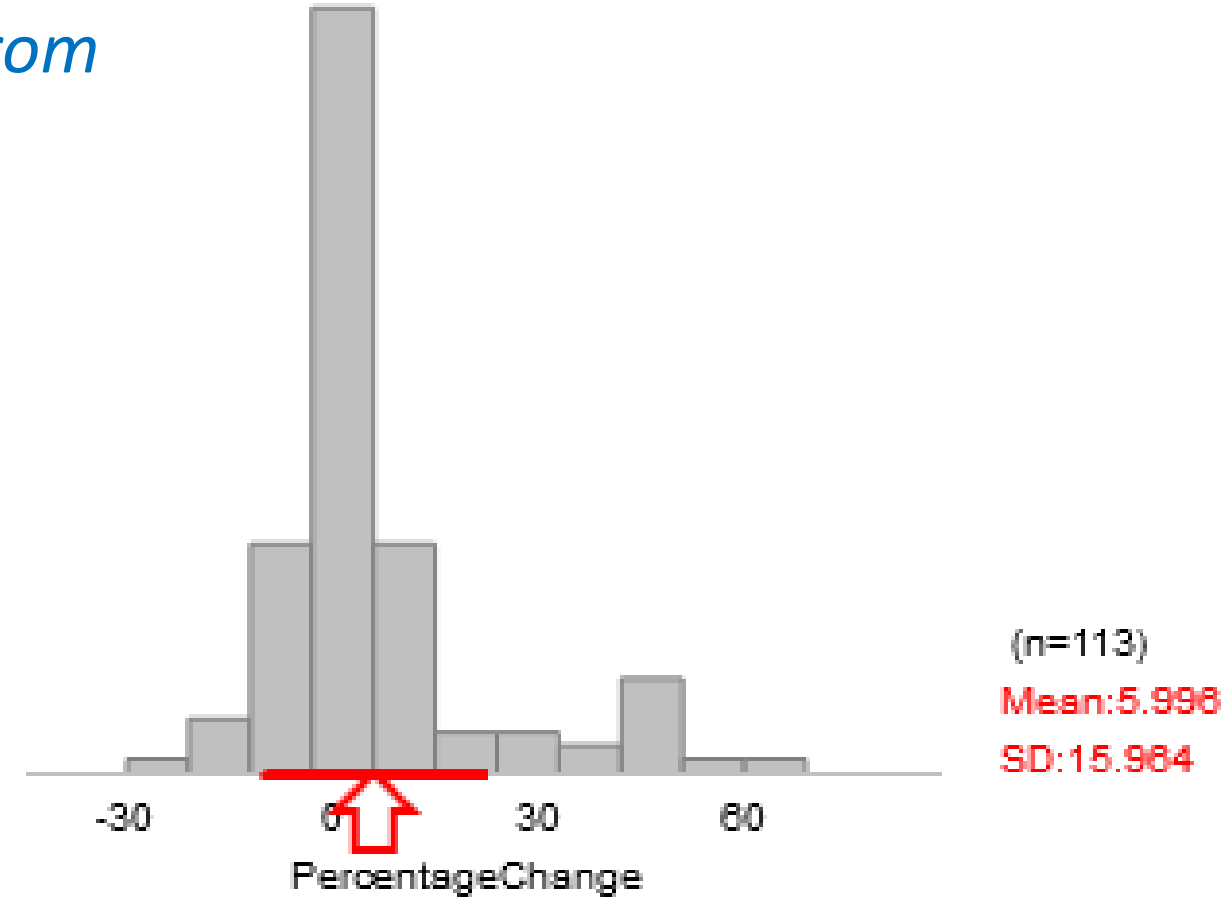


3. Describe **the *center*, *shape* and *spread* of a distribution,** from a dotplot or histogram

Is a change of -17.14% unusual?

Most percent changes were clustered around 6% with a typical deviation from 6% of about 16%. There are a few extremely large percent changes.

Typically changes were between
6-16=-10% and
6+16=24%
*so a change of -17.14% **was** unusual.*



A “big” idea

If the shape of the distribution is roughly bell-shaped, then the **mean** and **standard deviation** (SD) can be used to determine whether a value is “unusual” or not.

A general rule of thumb is that observations that are more than **2 SD from the mean** are “unusual”…

Atypical < **Mean + 2 SD** < typical < **Mean – 2 SD** < Atypical

4. Determine **whether a particular observation is unusual compared to a distribution**

A “big” idea

If the shape of the distribution is roughly bell-shaped, then the **mean** and **standard deviation** (SD) can be used to determine whether a value is “unusual” or not.

A general rule of thumb is that observations that are more than **2 SD from the mean** are “unusual”…

Atypical < **Mean + 2 SD** < typical < **Mean – 2 SD** < Atypical

…but this rule only works well if the distribution is roughly bell-shaped

Learning Objectives again – Inv. A, Day 2 (and Day 3)

1. State **the five steps of using data to answer a question**

2. Calculate **the mean, median, and standard deviation of a dataset**, by hand or with an applet.

3. Describe **the *center*, *shape* and *spread* of a distribution,** from a **dotplot** or **histogram**

4. Determine **whether a particular observation is unusual compared to a distribution**

purple = a statistical term whose definition you should memorize (use the glossary!)

Learning Objectives – Inv. B, Day 3

1. Define the term "**probability**"

2. Estimate a **probability** by simulating a **random process**

purple = a statistical term whose definition you should memorize (use the glossary!)

Random Babies - Inv. B

Suppose 4 babies are randomly returned to their mothers.

What is the probability that at least one mother will receive the correct baby?

This investigation will introduce you to the idea of ***simulating a random process.*** *We'll start today and finish on Friday.*

Random Babies – Inv. B

- Do at least parts a, b, and d now. Report your results from part d to Dr. O. Continue working on parts e, f and g.

Number of matches	0	1	2	3	4
Count					
Proportion					

- Try the applet for part j at home before class on Friday.

2. Estimate a probability by simulating a random process

What is meant by “Probability”?

Notice that we estimated the probability of at least one mother receiving the correct baby by repeatedly

- “shuffling” the babies,
- dealing babies out to mothers, and
- counting the number of times each mother received the correct baby.

The definition of “probability” we’ll use in this class is the **long run relative frequency** of times an event occurs

1. Define the term “**probability**”