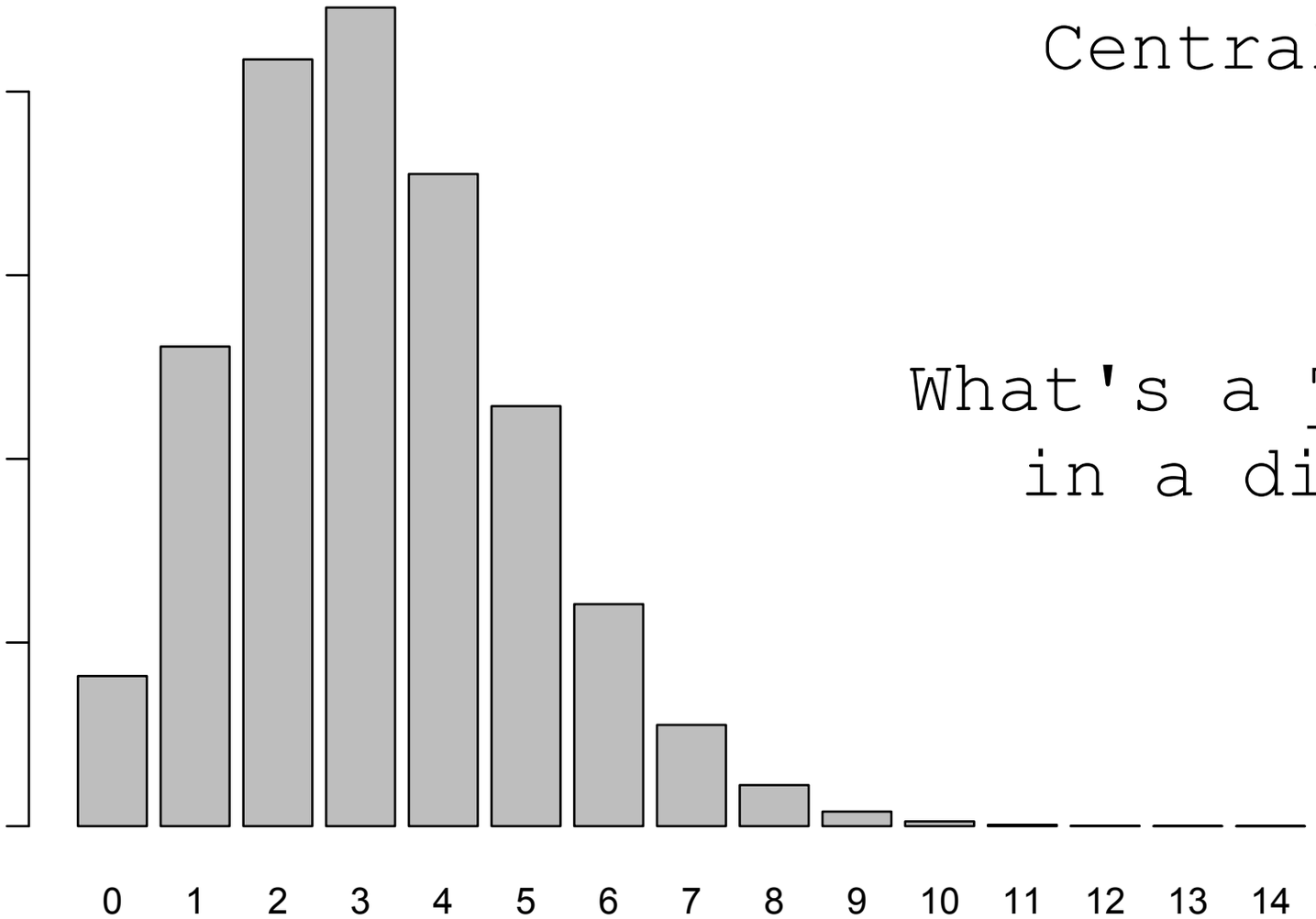
# Lesson 10

Tuesday 2/27/24

# Chapter 4: Measures of Central Tendency



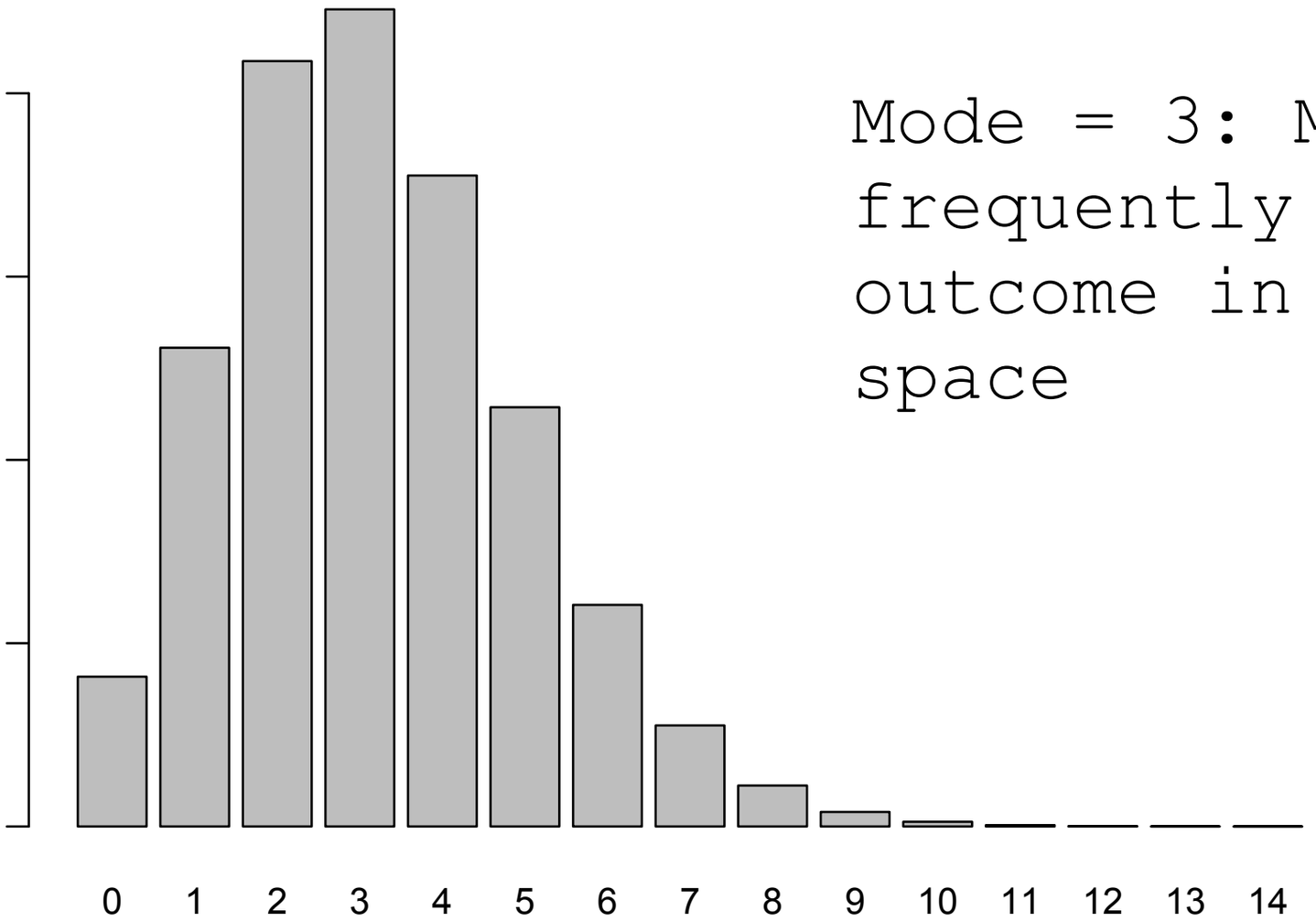

Central Tendency

=

What's a Typical Value
in a distribution

Example variable: people released from prison and followed for 5 years: # of rearrests during that time.

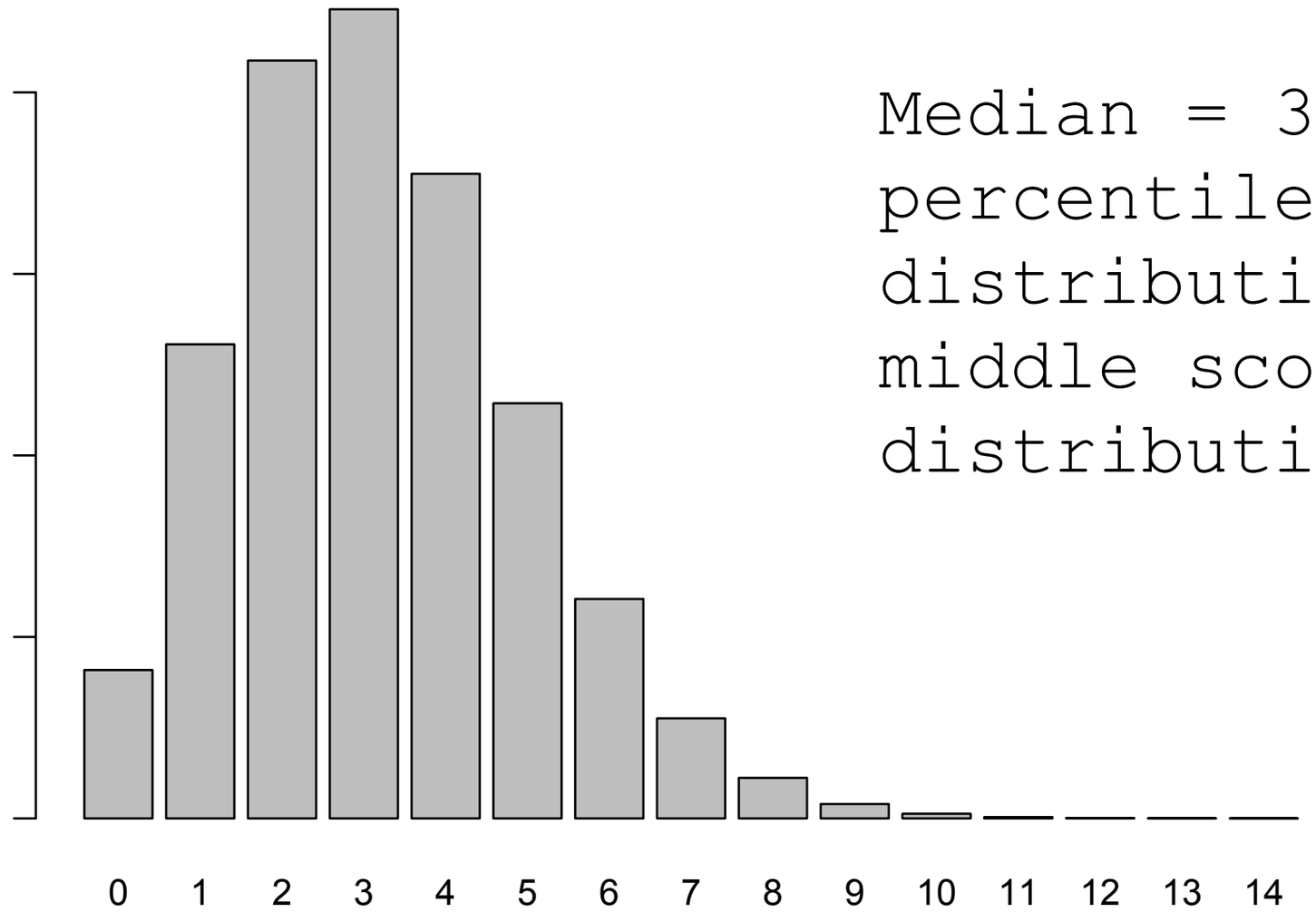
# The Sample Mode




Mode = 3: Most frequently occurring outcome in the sample space

Example variable: people released from prison and followed for 5 years: # of rearrests during that time.

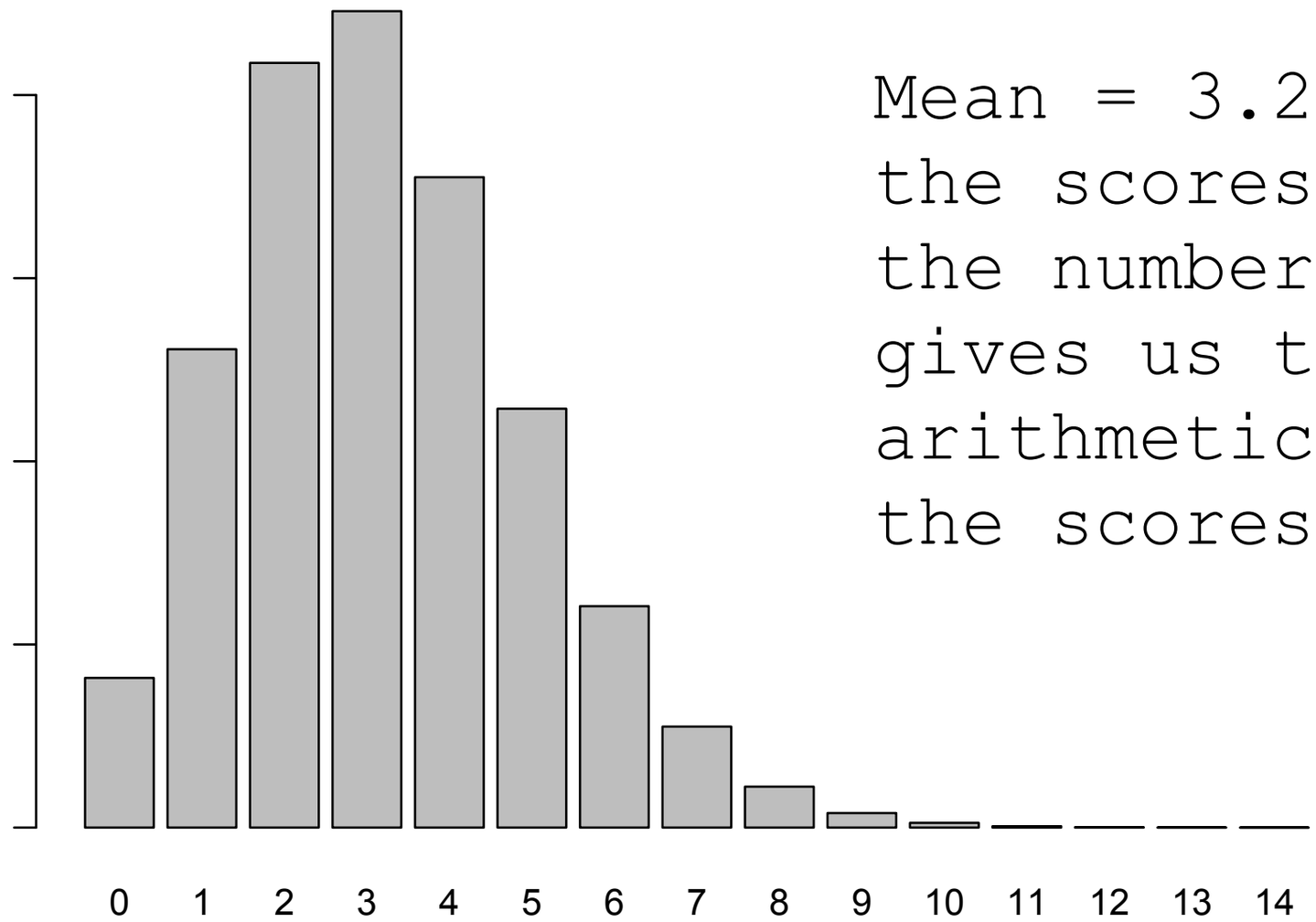
# The Sample Median




Median = 3: The 50th percentile of the distribution; the middle score of the distribution.

Example variable: people released from prison and followed for 5 years: # of rearrests during that time.

# The Sample Mean




Mean = 3.2: The sum of the scores divided by the number of scores gives us the arithmetic average of the scores.

Example variable: people released from prison and followed for 5 years: # of rearrests during that time.

# Practice Question 14

This is a list of every person executed in Florida since the death penalty was reinstated in the mid-1970's. Based on the list, I created a dataset of the execution waiting times for the last 12 people who were executed.

Dataset: 26,16,37,30,33,32,23,34,20,24,26,33

What is the mode for this dataset?

a. 26
b. 32
c. 2
d. it is bimodal

# Practice Question 14 Solution

This is a list of every person executed in Florida since the death penalty was reinstated in the mid-1970's. Based on the list, I created a dataset of the execution waiting times for the last 12 people who were executed.

Dataset: 26,16,37,30,33,32,23,34,20,24,26,33

What is the mode for this dataset?

a. 26
b. 32
c. 2
d. it is bimodal

# Practice Question 15

Dataset: 26,16,37,30,33,32,23,34,20,24,26,33

What is the median for this dataset?

a. 27
b. 28
c. 30
d. 33

Step 1: Sort the observations in ascending order

Sorted Dataset: 16,20,23,24,26,26,30,32,33,33,34,37

# Practice Question 15 (Cont'd)

Sorted Dataset: 16,20,23,24,26,26,30,32,33,33,34,37

Step 2: Count the # of observations → the answer is 12

Step 3: Is the # of observations even or odd? → 12 is an even number

Step 4a: If even, divide the number of observations by 2 → 12/2 = 6

Step 4b: If odd, find the middle observation; the score of that observation will be the median. → NA

# Practice Question 15 (Cont'd)

Sorted Dataset: 16,20,23,24,26,26,30,32,33,33,34,37

Step 5: If the # of scores is even, calculate the average of the number that is in the position you calculated in step 4a AND the number that is immediately above that position.

→ Since 12/2 = 6, the 6th observation has the score of 26.

The 7th observation in the sorted list has the score of 30.

$$\text{Median} = \frac{26 + 30}{2} = \frac{56}{2} = 28$$

# Practice Question 15 Solution

Dataset: 26,16,37,30,33,32,23,34,20,24,26,33

What is the median for this dataset?

a. 27
b. 28
c. 30
d. 33

# Practice Question 16

Dataset: 26,16,37,30,33,32,23,34,20,24,26

What is the median for this dataset?

a. 26
b. 28
c. 32
d. 33

Step 1: Sort the observations in ascending order

Sorted Dataset: 16,20,23,24,26,26,30,32,33,34,37

# Practice Question 16 (Solution)

Sorted Dataset: 16,20,23,24,26,26,30,32,33,34,37

Step 2: Count the # of observations → the answer is 11

Step 3: Is the # of observations even or odd? → 11 is an odd number

Step 4a: If odd, look for the middle observation. → With 11 observations, the middle position is 6 (number of observations + 1)/2

Step 4b: If odd, find the middle observation; the score of that observation will be the median. → 26

# Practice Question 16

Dataset: 26,16,37,30,33,32,23,34,20,24,26

What is the median for this dataset?

a. 26
b. 28
c. 32
d. 33

Step 1: Sort the observations in ascending order

Sorted Dataset: 16,20,23,24,26,26,30,32,33,34,37

# Practice Question 17

Dataset: 26,16,37,30,33,32,23,34,20,24,26

What is the mean for this dataset?

a. 23.2
b. 25.3
c. 27.4
d. 28.7

Step 1: Add up the scores.

$$\sum_{i=1}^{N} x_i = 26 + 16 + 37 + 30 + 33 + 32 + 23 + 34 + 20 + 24 + 26 = 301$$

# Practice Question 17

Dataset: 26,16,37,30,33,32,23,34,20,24,26

What is the mean for this dataset?

a. 23.2
b. 25.3
c. 27.4
d. 28.7

Step 2: Count up the number of scores. → The number of scores is 11

Step 3: Divide the sum of the scores (step 1) by the number of scores (step 2). →

$$\text{Mean} = \overline{X} = \frac{\sum_{i=1}^{N} x_i}{N} = \frac{301}{11} = 27.4$$

# Practice Question 17 (Solution)

Dataset: 26,16,37,30,33,32,23,34,20,24,26

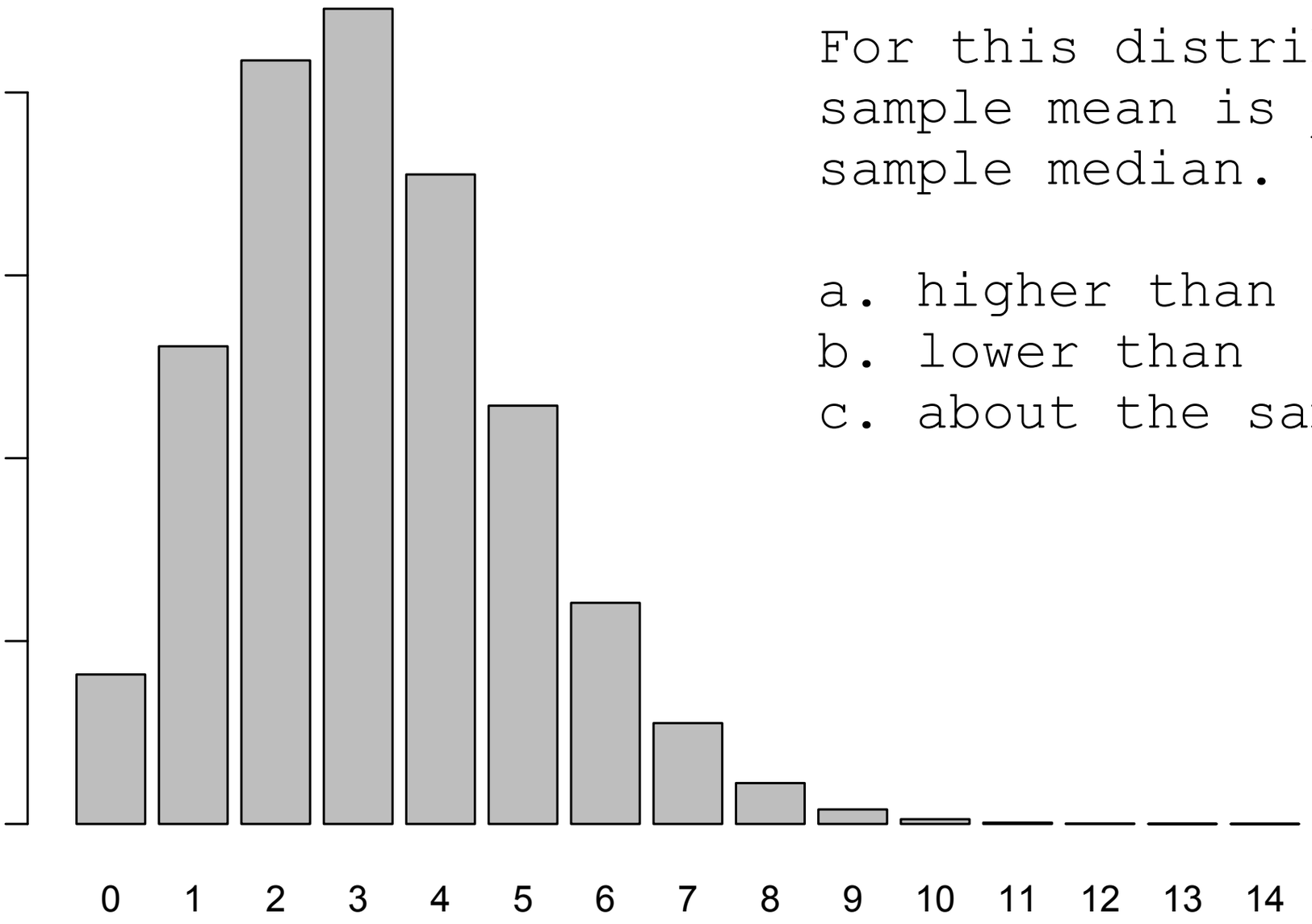
What is the mean for this dataset?

a. 23.2
b. 25.3
c. 27.4
d. 28.7

$$\text{Mean} = \overline{X} = \frac{\sum_{i=1}^{N} x_i}{N} = \frac{301}{11} = 27.4$$

# Practice Question 18

Consider the following distribution:

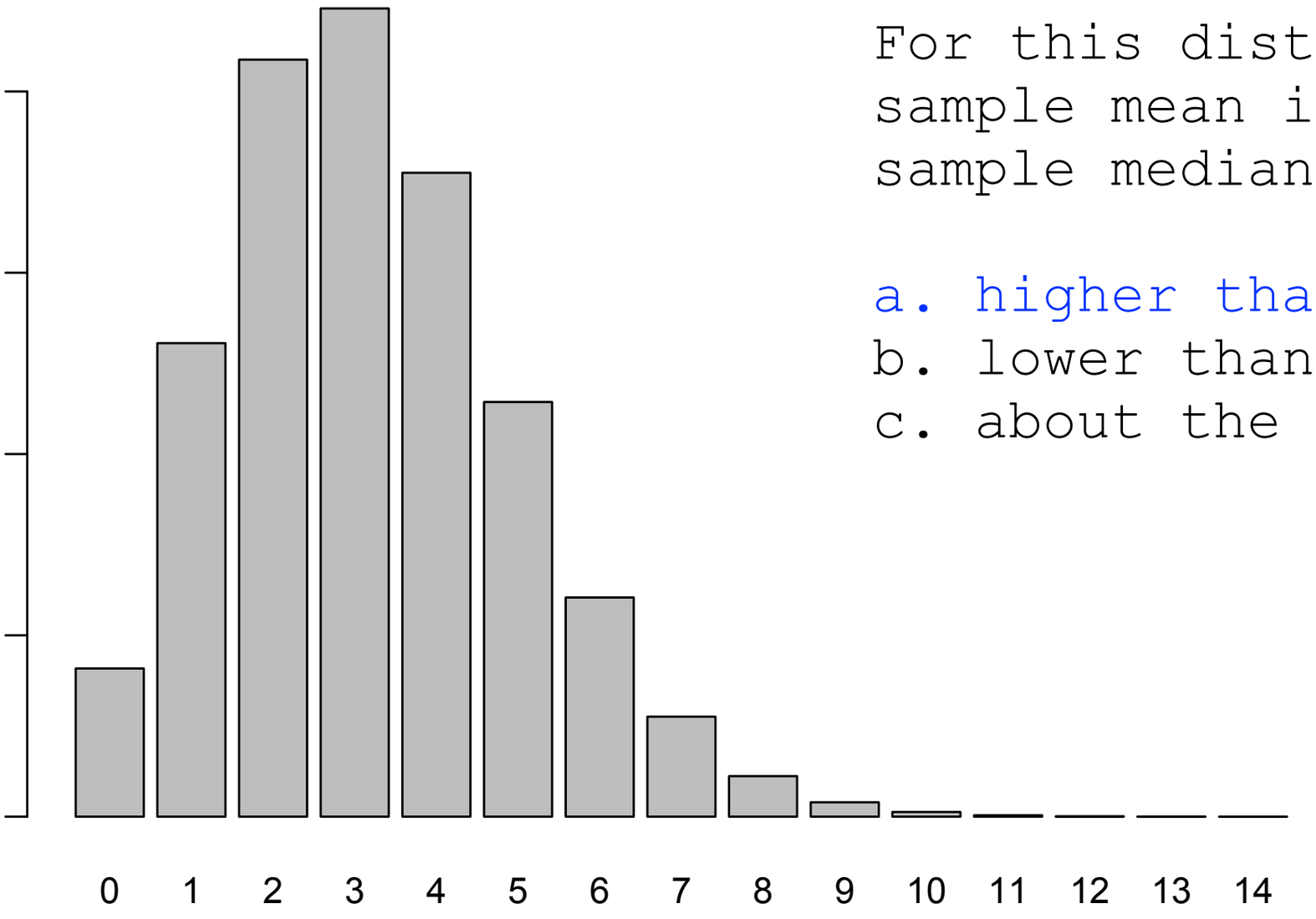



For this distribution, the sample mean is _____ the sample median.

a. higher than
b. lower than
c. about the same as

# Practice Question 18 Solution

Consider the following distribution:

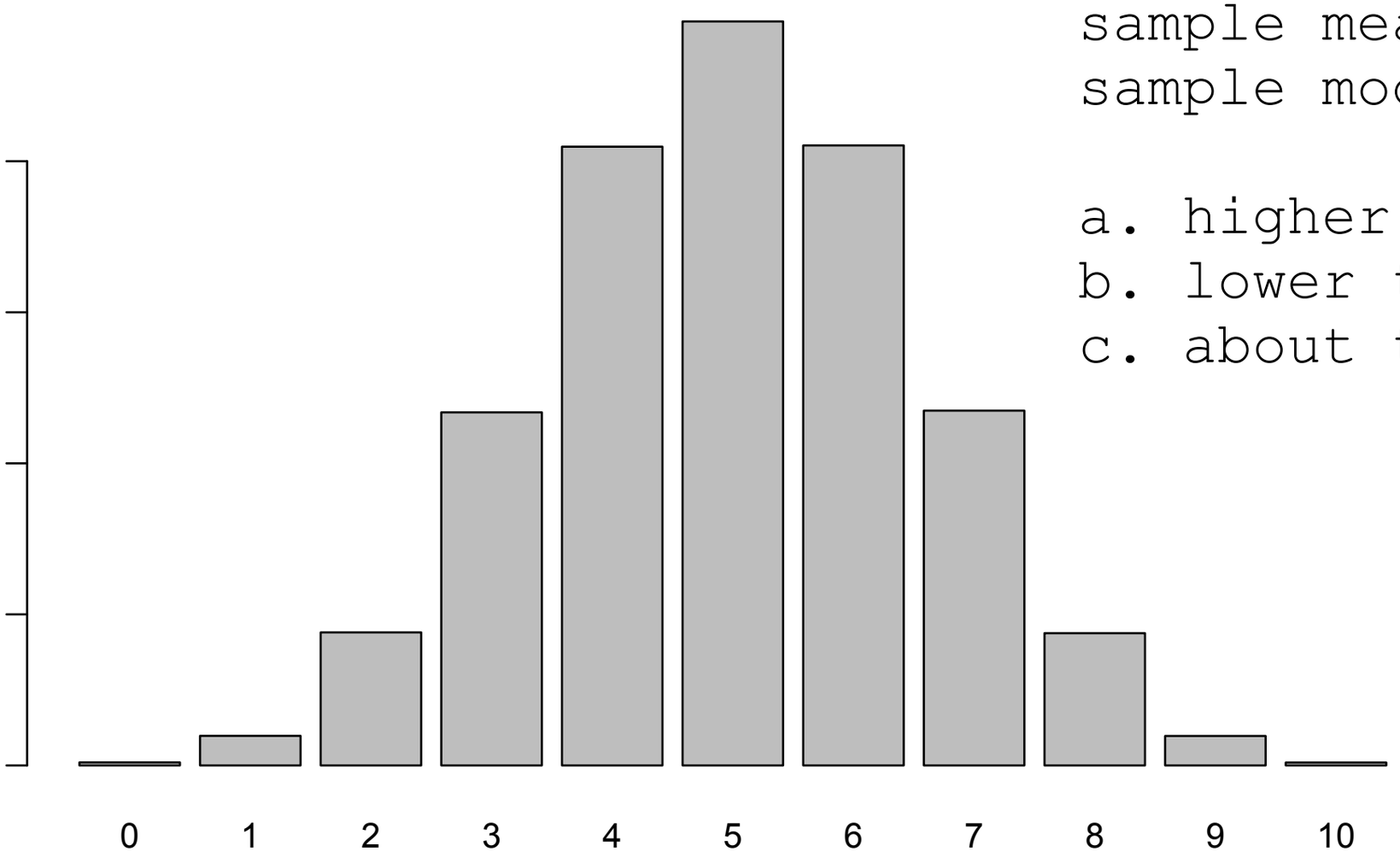



For this distribution, the sample mean is _____ the sample median.

a. higher than
b. lower than
c. about the same as

# Practice Question 19

Consider the following distribution:

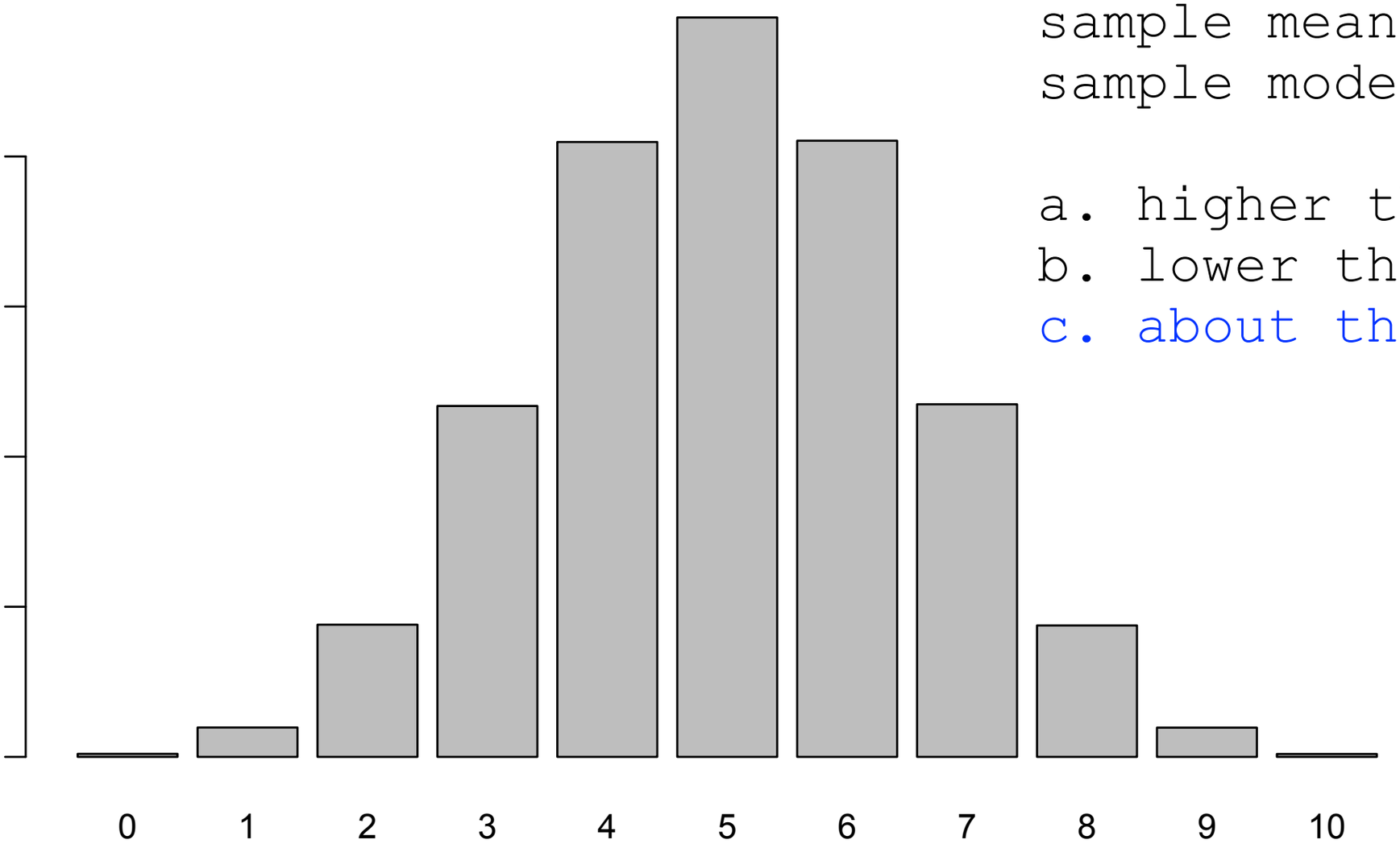



For this distribution, the sample mean is _____ the sample mode.

a. higher than
b. lower than
c. about the same as

# Practice Question 19 (Solution)

Consider the following distribution:




For this distribution, the sample mean is _____ the sample mode.

a. higher than
b. lower than
c. about the same as

# Practice Question 20

We draw a random sample of children from a local middle school. The sample is comprised of 537 people. For each of these people, we look at their administrative records and determine that 18 of them have been suspended from school within the past year.

What is the last-year suspension rate per 1000 kids for this dataset?

a. 17.7
b. 21.0
c. 30.1
d. 34.0

# Practice Question 20 (Solution)

Step 1: Count up the number of scores. → $N = 537$

Step 2: How many zeros? → # of 0's = 537-18 = 519

Step 3: How many ones? → # of 1's = 18

Step 4: Calculate the mean of the 0's and 1's →

$$\overline{X} = \frac{519 \times 0 + 18 \times 1}{537} = \frac{18}{537} = 0.034$$

Step 5: Calculate the rate per 1,000 kids →

$$\text{Rate per 1000 kids} = 0.034 \times 1000 = 34.0$$

# Practice Question 20A (Solution)

Suppose I ask you, "what is the probability that someone drawn at random from our sample of students got suspended?" What would you say?

Step 1: Count up the number of people. → N = 537

Step 2: How many got suspended? → 18

Step 3: Calculate the probability

$$p(\text{suspended}) = \frac{\#\text{ of people who got suspended}}{\text{total }\#\text{ of people}} = \frac{18}{537} = 0.034$$

# Exam Review

- Major administrative and survey datasets.
- Uncertainty in research
- Samples
- Research objectives.
- Validity and Reliability
- Criteria for demonstrating cause-and-effect.
- Variables and sample spaces
- Levels of measurement
- Event counts and binary/ dichotomous variables
- Relative frequency and probability
- Rates, proportions, percentages
- Absolute and percent change statistics
- Measures of central tendency
- Skewness of distributions