

Lesson 14.4 Real-World Problems: Mean, Median, and Mode

Solve. Show your work.

Example

The table shows the number of software licenses purchased by a group of companies.

Number of Software Licenses Bought

Number of Licenses	Number of Companies
60	2
61	3
62	6
63	5
64	3
65	10
66	7

- a) How many companies are there?

Total number of companies

$$= \underline{2} + \underline{3} + \underline{6} + \underline{5} + \underline{3} + \underline{10} + \underline{7}$$

$$= \underline{36} \text{ companies}$$

The total number of companies is 36.

- b) What is the mean number of licenses purchased? Round your answer to the nearest tenth.

$$\text{Mean} = \frac{\text{total number of licenses}}{\text{total number of companies}}$$

$$\begin{array}{r} 2 \times 60 + 3 \times 61 + 6 \times 62 + 5 \times 63 \\ + 3 \times 64 + 10 \times 65 + 7 \times 66 \\ \hline = \frac{\quad\quad\quad}{36} \end{array}$$

$$= \frac{2,294}{36}$$

$$\approx \underline{63.7} \text{ licenses}$$

The mean is approximately 63.7 licenses.

- c) What is the median number of licenses purchased?

The 18th and 19th company are in the middle.

The median number of licenses is 64 licenses.

Name: _____

Date: _____

- d) What is the modal number of licenses purchased?

Most companies purchased 65 licenses.

The modal number of licenses purchased is 65.

- e) Which measure of central tendency best describes the data set?

The mean is 63.7 licenses. As the number of licenses has to be a whole number, the mean figure 63.7 is not a realistic number for describing the data set.

The median and mode are both whole numbers, and are in the upper range. So, the median and mode best describe the data.

1. Gary recorded the number of hours he spent studying each day at home.

Gary's Studying Time at Home

Number of Hours	Number of Days
0	2
1	4
2	5
3	2
4	1

- a) How many days did Gary spend studying at home?

Total number of days = _____ + _____ + _____ + _____ + _____
= _____ days

The total number of days Gary spend studying at home is _____ days.

- b) What is the mean number of hours Gary studied? Round your answer to the nearest tenth of an hour.

$$\text{Mean} = \frac{\text{total number of hours}}{\text{total number of days}}$$

$$= \underline{\hspace{2cm}}$$

$$= \underline{\hspace{1cm}}$$

$$\approx \underline{\hspace{1cm}} \text{ h}$$

The mean number of hours Gary studied is approximately _____ hours.

Name: _____

Date: _____

c) What is the median amount of time Gary studied?

The _____ and _____ day are in the middle.

The median amount of time is _____ hours.

d) What is the modal amount of time Gary studied?

Gary studied _____ hours on most days.

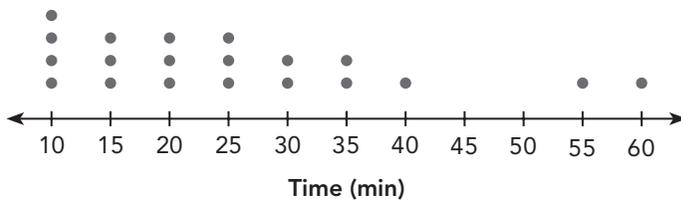
The modal amount of time is _____ hours.

e) Which measure of central tendency best describes the data set?
Justify your answer.

Solve. Show your work.

Example

The dot plot shows the time, in minutes, it takes for numerous people to travel from their homes to the mall. Each dot represents 1 person.



a) What is the mean time of the data?

Total time

$$= \underline{4} \times 10 + \underline{3} \times 15 + \underline{3} \times 20 + \underline{3} \times 25 + \underline{2} \times 30$$

$$+ \underline{2} \times 35 + \underline{40} + \underline{55} + \underline{60}$$

$$= \underline{505} \text{ min}$$

$$\begin{aligned}\text{Mean} &= \frac{\text{total time}}{\text{total number of people}} \\ &= \frac{505}{20} \\ &= \underline{25.25} \text{ min}\end{aligned}$$

The mean is 25.25 minutes.

- b)** What is the median of the data?

The 10th and 11th person are in the middle.

$$\begin{aligned}\text{Mean} &= \frac{20 + 25}{2} \\ &= \underline{22.5} \text{ min}\end{aligned}$$

The median is 22.5 minutes.

- c)** What is the mode of the data?

Most people took 10 minutes to get to the mall.

The modal time is 10 minutes.

- d)** Which measure of central tendency best describes the data set?
Justify your answer.

The mode is 10 minutes, but it represents only 4 of the 20 people. The mean is 25.25 minutes and the median is 22.5 minutes. Both of these numbers might be used to describe this set of data. The mean takes into account the two people who took 55 minutes and 60 minutes to reach the mall, but the median better describes how long it takes for most people to reach the mall.

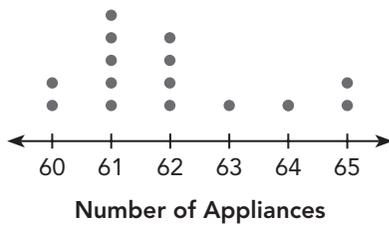
- e)** Relate the measures of center to the shape of the data distribution.

The shape of the data distribution is skewed to the right. The mean gives more weight to the values on the right than the median does. So, the mean is to the right of the median.

Name: _____

Date: _____

2. The dot plot shows the records of the number of appliances recycled from a group of cities in a month. Each dot represents 1 city.



- a) What is the mean number of appliances?

Total number of appliances recycled

$$= \text{_____} \times 60 + \text{_____} \times 61 + \text{_____} \times 62$$

$$+ \text{_____} \times 63 + \text{_____} \times 64 + \text{_____} \times 65$$

$$= \text{_____} \text{ appliances}$$

$$\text{Mean} = \frac{\text{total number of appliances}}{\text{total number of cities}}$$

$$= \text{_____}$$

$$\approx \text{_____} \text{ appliances}$$

The mean number of appliances recycled is _____ appliances.

- b) What is the median of the data set?

The _____ city is in the middle.

The median number of appliances is _____ appliances.

- c) What is the modal number of appliances?

Most cities recycled _____ appliances in the month.

The modal number of appliances is _____ appliances.

Name: _____

Date: _____

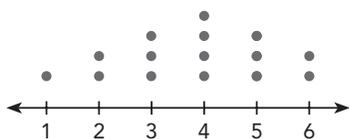
d) Which measure of central tendency best describes the data set?

e) Relate the measure of center to the shape of the data distribution.

Solve. Show your work.

Example

The dot plot shows the transportation expenses of a group of students in a week. Each dot represents 1 student.



Amount of Money Spent on Transportation (\$)

a) Find the mean.

$$\begin{aligned} \text{Mean} &= \frac{\text{total amount of money}}{\text{total number of students}} \\ &= \frac{1 + 2 \times 2 + 3 \times 3 + 4 \times 4 + 3 \times 5 + 2 \times 6}{15} \\ &= \frac{57}{15} \\ &= \$ \underline{3.80} \end{aligned}$$

The mean expense is \$ 3.80.

b) Find the median.

The 8th student is in the middle.

The median expense is \$ 4.

Name: _____

Date: _____

c) Find the mode.

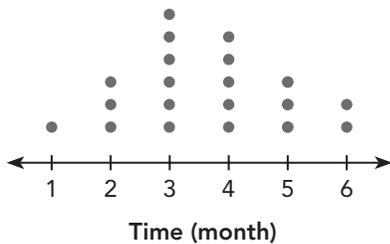
Most students spend \$ 4 on transportation.

The modal expense is \$ 4.

d) Relate the measures of center to the shape of the data distribution.

The data are well spread out and the shape of the data distribution is nearly symmetrical. Because the mode and the median are the same, and the mean is slightly smaller, the data is likely to be more spread out for data smaller than \$3.80. The data has a slight skew to the left.

3. The dot plot shows the time taken, in months, for some apartments to be renovated. Each dot represents one apartment.



a) Find the mean.

$$\text{Mean} = \frac{\text{total time}}{\text{total number of apartments}}$$

$$= \underline{\hspace{2cm}}$$

$$= \underline{\hspace{1cm}}$$

$$= \underline{\hspace{1cm}} \text{ months}$$

The mean is months.

Name: _____

Date: _____

b) Find the median.

The _____ and _____ days are in the middle.

Mean of the two values

= _____

= _____

= _____ months

The median is _____ months.

c) Find the mode.

Most apartments get renovated for _____ months.

The mode is _____ months.

d) Relate the measures of center to the shape of the data distribution.

- The most frequent values are 26°C and 28°C .
The modes of this data set are 26°C and 28°C .
- The most frequent value is 2 candles.
The mode of this data set is 2 candles.
- The most frequent value is 48 employees.
The mode of this data set is 48 employees.

6. Animals in a Shelter

Animal	Frequency
Dogs	<u>5</u>
Cats	<u>4</u>
Hamsters	<u>5</u>
Guinea pigs	<u>2</u>
Rabbits	<u>4</u>

From the table, most of the animals are dogs and hamsters.

The modes of this data set are dogs and hamsters.

7. People Playing in a Beach Volleyball Game

People	Frequency
Men	9
Women	11
Girls	13
Boys	7

From the table, most of the volleyball players are girls.

The mode of this data set is girls.

- The mode of this data set is blueberry.
- The modes of this data set are hotdogs and bottles of water.

Lesson 14.4

- Total number of days
 $= \underline{2} + \underline{4} + \underline{5} + \underline{2} + \underline{1} = 14$ days
 The total number of days Gary spend studying at home is 14 days.
 - Mean = $\frac{\text{total number of hours}}{\text{total number of days}}$
 $= \frac{4 \times 1 + 5 \times 2 + 2 \times 3 + 1 \times 4}{14}$
 $= \frac{24}{14}$
 $\approx \underline{1.7}$ h
 The mean number of hours Gary studied is 1.7 hours.
 - The 7th and 8th day are in the middle.
The median number of hours is 2 hours.
 - Gary studied 2 hours on most days.
The modal number of hours is 2 hours.
 - The mean is 1.7 hours, which is not a realistic number for time as 0.7 of an hour is 42 minutes. So, the mean figure 1.7 hours

may not be a realistic number for describing the data set.

The mode and median are both 2 hours, which is a realistic number for describing the data set. So, the mode and median may describe the data set better.

- Total number of appliances recycled
 $= \underline{2} \times 60 + \underline{5} \times 61 + \underline{4} \times 62$
 $+ \underline{1} \times 63 + \underline{1} \times 64 + \underline{2} \times 65$
 $= \underline{930}$ appliances
 Mean = $\frac{\text{total number of appliances}}{\text{total number of cities}}$
 $= \frac{930}{15} \approx \underline{62}$ appliances
 The mean number of appliances recycled is 62 appliances.
 - The 8th city is in the middle. The median number of appliances is 62 appliances.
 - Most cities recycled 61 appliances in the month. The modal number of appliances is 61 appliances.
 - The mode is 61 appliances, but it represents only 5 of the 15 cities. So, the mode does not describe these data well. The mean and median is 62 appliances. Both of these numbers might be used to describe this set of data.
 - The shape of the data distribution is skewed to the right. The mean and median are the same, so most of the data clusters around 62 appliances.

- Mean
 $= \frac{\text{total time}}{\text{total number of apartments}}$
 $= \frac{1 + 3 \times 2 + 6 \times 3 + 5 \times 4 + 3 \times 5 + 2 \times 6}{20}$
 $= \frac{72}{20} = \underline{3.6}$ months
 The mean is 3.6 months.

- The 10th and 11th days are in the middle.
Mean of the two values
 $= \frac{3 + 4}{2}$
 $= \frac{7}{2}$
 $= \underline{3.5}$ months
 The median is 3.5 months.
 - Most apartments get renovated for 3 months.
The mode is 3 months.
 - The data are well spread out. The mean and median are close to the middle of the range, so the shape of the data distribution is nearly symmetrical.