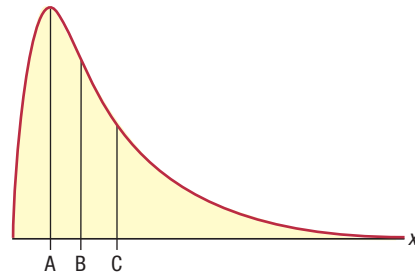


Example 3.1.9

Determining Mean, Median, and Mode from a Graph

Determine which letter represents the mean, the median, and the mode in the graph to the right.



Solution

Mode: The mode is always located at the peak of a distribution, so it is line A.

Median: The median is the value that divides the area of the distribution in half. Here it is represented by line B.

Mean: This distribution is skewed to the right, so the mean will be the measure of center farthest to the right. Here it is represented by line C.

Table 3.1.1 Properties of Mean, Median, and Mode

Mean	Median	Mode
“Average”	“Middle value”	“Most frequent value”
Isn’t necessarily a data value	Isn’t necessarily a data value	Must be a data value
Single value	Single value	Could be one value, multiple values, or not exist
Affected by outliers	Not affected by outliers	Not affected by outliers
Use for quantitative data with <i>no</i> outliers	Use for quantitative data with outliers	Use for qualitative data

3.1 Section Exercises

Mean, Median, and Mode

Find the mean, median, and mode for each of the given data sets, and state whether the data set is unimodal, bimodal, multimodal or has no mode.

- 10, 1, 5, 9, 4, 1
- 190, 219, 160, 250, 175, 180, 240, 290
- 5, 5, 5, 5, 5, 5
- 8, 9, 10, 12, 4, 3, 5, 7, 10
- 4.25, 8.3, 6.0, 3.2, 1.9, 4.4, 4.9, 5.9, 5.1
- 36, -76, 36, -20, 100, 98, 18, 100
- 22, -83, 77, -79, -2, -42, 98, -66, -42
- 0.5, 0.6, 1.7, 0.5, 1.3, 1.0, 1.3, 0.5
- The following data set gives the cellular data coverage fees for a group of 9 smart phone customers one month: \$25.00, \$42.00, \$15.00, \$6.16, \$194.73, \$60.00, \$16.00, \$6.40, \$1.10

10. The following data represent batting averages for a sample of professional baseball players.

.275	.265	.333	.244	.279
.250	.288	.292	.370	.243
.236	.321	.305	.292	.250

11. The following data represent average numbers of Tweets per day posted on Twitter for 16 high school students.

0.8	42.2	20.6	2.8
36.7	18.6	23.3	11.5
3.7	14.9	9.4	1.5
14.9	31.1	23.5	9.5

12. The following data represent the ages of 20 American entrepreneurs (in years).

28	39	43	53
35	32	34	29
33	31	32	31
25	22	30	29
41	36	23	47

13. The following data represent high temperatures for cities in the Southeast (in degrees Fahrenheit).

High Temperatures for Cities in the Southeast

Stem	Leaves
7	
7	7 9
8	2 3 4
8	5 5 7 8 8 9 9
9	0 0 1 1 2 2 3
9	5

Key: 7 | 7 = 77 °F

14. The following data represent weights of newborn babies (in pounds).

Weights of Newborn Babies

Stem	Leaves
5	4 9
6	5 6 8
7	3 3 5 5 8
8	2 5 7
9	1 3

Key: 5 | 4 = 5.4 pounds

Using the Mean to Find a Data Value

Use the given information to determine the unknown value.

15. The mean cost for items in a bag of groceries is \$1.96. There are 12 items in the bag, and the following are the prices for 11 of those items. Determine the price of the 12th item in the bag.

\$2.69, \$1.88, \$2.18, \$1.99, \$0.99, \$1.99, \$0.97, \$3.49, \$1.97, \$2.48, \$0.52

16. A plane that ferries visitors to a small resort island has strict guidelines on the weight allowed for passenger luggage. Consequently, the six passengers are limited to a maximum average luggage weight of 35 pounds (lb). The following are the weights of four out of six pieces of luggage: 39 lb, 22 lb, 35 lb, and 37 lb. The two pieces of luggage that haven't been weighed will have to split the remaining weight allowance. If the remaining weight allowance is split evenly between the bags, determine the maximum possible weight allowance for each remaining bag.

Weighted Mean

Calculate the weighted mean as described in each exercise.

17. Marquis is calculating his cumulative GPA. His grades are as follows: A (15 hours), B (18 hours), C (8 hours), and D (3 hours). Note that an A is equivalent to a 4.0, a B is equivalent to a 3.0, a C is equivalent to a 2.0, and a D is equivalent to a 1.0. What is Marquis' GPA?
18. Beth is calculating her cumulative GPA. Her grades are as follows: A (12 hours), B (22 hours), C (14 hours), and F (3 hours). Note that an A is equivalent to a 4.0, a B is equivalent to a 3.0, a C is equivalent to a 2.0, a D is equivalent to a 1.0, and an F is equivalent to 0. What is Beth's GPA?
19. The following table gives the average balances for one bank customer for the months of October through December.

Average Monthly Balances for a Bank Customer (October through December)	
Month	Average Balance
October	\$2251.33
November	\$2490.51
December	\$1478.27

Calculate the average monthly balance for the three-month period of October through December. Note that, since each month contains a different number of days, the average balance for each month must be weighted by the number of days in that month.

20. The following table gives the average balances for one bank customer for the months of July through September.

Average Monthly Balances for a Bank Customer (July through September)	
Month	Average Balance
July	\$402.45
August	\$322.97
September	\$298.64

Calculate the average monthly balance for the three-month period of July through September. Note that, since each month contains a different number of days, the average balance for each month must be weighted by the number of days in that month.

21. Susan is calculating her final grade in biology. The grade is broken down as follows: tests (50%), lab (30%), and final exam (20%). Susan's category averages are the following.

Tests:	82
Lab:	78
Final Exam:	86

What is her final grade?

22. Demarcus is calculating his final grade in biochemistry. The grade is broken down as follows: tests (40%), homework (10%), labs (20%), and final exam (30%). Demarcus's category averages are listed below.

Tests:	93
Homework:	98
Labs:	85
Final Exam:	89

What is Demarcus's final grade?

23. At the end of the semester, Jeffrey knows all of his grades in his psychology class except for the final exam. The breakdown of his grades and how much each category counts toward the final grade is shown below.

Tests (30%):	84
Homework (20%):	75
Semester Project (25%):	80
Final Exam (25%):	?

What grade must Jeffrey make on his final exam to finish the course with a B (80%)?

24. At the end of the semester, Brietta knows all of her grades in her anatomy and physiology class except for the final exam. The breakdown of her grades and how much each category counts toward the final grade is shown below.

Tests (40%):	88
Homework (15%):	85
Semester Project (25%):	94
Final Exam (20%):	?

What grade must Brietta make on her final exam to finish the course with an A (90%)?

25. Let's extend the concept of weighted mean to include the mean for a frequency distribution. The following frequency distribution gives the hourly wage for a person's first job.

Hourly Wage at First Job (in Dollars)	
Class	Frequency
7.50 – 8.49	12
8.50 – 9.49	50
9.50 – 10.49	48
10.50 – 11.49	45
11.50 – 12.49	34

Since we do not know the exact value of each person's hourly wage, we will estimate that each value in a class is equal to the midpoint of that class. To calculate the mean of the frequency distribution by hand, we can use the formula for a weighted mean, with the data values equal to the class midpoints and the weights equal to the class frequencies. To use a TI-83/84 Plus calculator to find the mean of the frequency distribution, we can use the same procedure outlined in Example 3.3, again with the data values equal to the class midpoints and the weights equal to the class frequencies. Estimate the mean hourly wage for the given data.

26. The following frequency distribution shows water level readings for the Mississippi River at New Orleans over a period of 90 days.

Water Level Readings of the MS River at NOLA (in Feet)	
Water Level	Frequency
14.5 - 15.49	19
15.5 - 16.49	19
16.5 - 17.49	18
17.5 - 18.49	20
18.5 - 19.49	14

If flood stage is 17 feet, is the average river level over this period of time above flood stage? Explain your answer. Use the instructions given in exercise 25 to help find the solution.

Determining the Most Appropriate Measure of Center

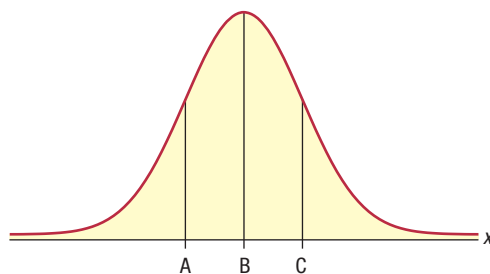
Determine the most appropriate measure of center for the described data set.

27. Hairstyles of students on a given college campus (length, color, straight/curly, and so forth)
28. Prices of used cars on a lot including the following models: Buick LaCrosse, Toyota 4Runner, Honda Prelude, Ford Escape, Dodge Grand Caravan, Ford Explorer, and Ferrari F430
29. Number of minutes students spend completing a homework assignment for an honors class
30. Prices of similar sofas at different furniture stores
31. B, C, D, B, D, B, D, A, B, A, D, C, A, B
32. A popular website rates vacation resorts using the following scale.
 - ★★★★★ = Excellent
 - ★★★★ = Above average
 - ★★★ = Average
 - ★★ = Below average
 - ★ = Terrible

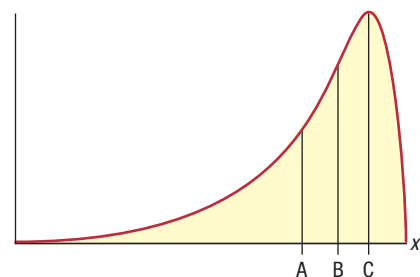
Graphs and Measures of Center

For each graph, determine which letter represents the mean, the median, and the mode.

33.



34.



35. Given the following measures of center for a data set, describe the most likely shape of the distribution.

$$\text{Mean} = 121.89, \quad \text{Median} = 163.5, \quad \text{Mode} = 165.2$$

36. Given the following measures of center for a data set, describe the most likely shape of the distribution.

$$\text{Mean} = 31.5, \quad \text{Median} = 31.5, \quad \text{Mode} = 31.5$$