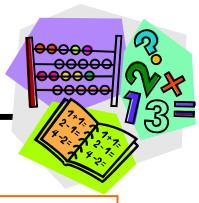
Central Tendency: Mode, Median and Mean



When surveys are conducted or information is gathered, the responses may be in the form of numbers. **Stem and leaf plots** can be used to display numerical data.

A student conducted a survey among some of her classmates to determine the amount of money they earned per week. She recorded the following in dollars:

24	37	20	62	63
57	42	58	53	
41	29	35	42	

To make a stem and leaf plot, the numbers are placed on the chart from smallest to largest.

Digits in the tens place are placed on the chart from smallest to largest.

Digits in the tens place represent the **stems**; digits in the ones place represent the **leaves**.

Example 20, 24 and 29 are placed first, in order from least to greatest.

Amount of Money Earned/Week	
Stem	**Leaf**
2	0, 4, 9
3	5, 7
4	1, 2, 2
5	3, 7, 8
6	2, 3

Stem and leaf plots are useful when identifying mode, median and mean.

Mode is the number that occurs most frequently on a list. → 42

Median is the middle number in an ordered list. Find the median by counting down, beginning with the smallest number. There are 13 numbers in this list, so count down to the 7^{th} number. → 42

Mean (average) is the sum of the numbers divided by the amount of numbers.
→ 563 ÷ 13 = 43.

Identifying mode, median and/or mean may help businesses and other services decide on such things as products to sell or music to play.

Example

The high school basketball coach is taking a look at team statistics. She has made a list of the points scored in each game for the past two seasons. The points are as follows:

25	37	69	97	14
64	72	91	46	70
68	94	34	26	56
54	38	64	18	55

The points were then placed in a stem and leaf plot.

Stem	Leaf
1	4, 8
2	5, 6
3	4, 7, 8
4	6
5	4, 5, 6
6	4, 4, 8, 9
7	0, 2
9	1, 4, 7

Mode: 64
Median: 55 and 56 are in the middle. 55.5 is between both. Using rounding rules, 55.5 will round up to 56. Median is 56.
Mean: (average) 54.6 or 55.

Practice: Identifying Mean, Median and Mode

1. Obtain a list of your math marks. Organize your scores on a stem and leaf plot. Use the data from the stem and leaf plot to identify the mean, mode and median. This information will give you an idea of your overall progress in math so far this year.

2. Record how many minutes or hours you spend on school or at work each weeknight. Organize the data on a stem and leaf plot. Identify the mean, mode and median.

3. Investigate the number of students in each class in your school by visiting classrooms, asking the teacher or talking with a school administrator. Organize the information on a stem and leaf plot. Identify the mean, mode and median.

4. Select a trade, such as welding or plumbing. Locate a business in your community that employs people in the occupation. Ask how many years of experience each employee has. Record these years of experience on a stem and leaf plot. Identify the mean, mode and median.

5. Compare your data with classmates. Examine the information and be prepared to respond to the following questions and statements.
   - Are the mode, median and/or mean low or high compared to other occupations?
   - Give reasons why the mode, median and/or mean may be lower or higher.

Mean

Example Larry's assignments and marks in percent are represented on the table.

Assignment	Mark in percent
Acute angles	82
Obtuse angles	56
Right angles	74
Straight angles	65
Reflex angles	73

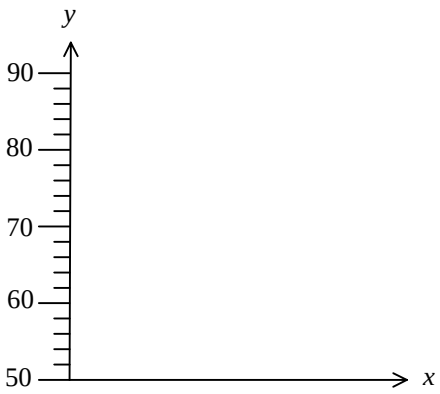
Larry's lowest mark is 56% and his highest mark is 82%. The range is 56 to 82.

Range of Data

The range helps identify the scale to use on the ***y*-axis** of a graph.

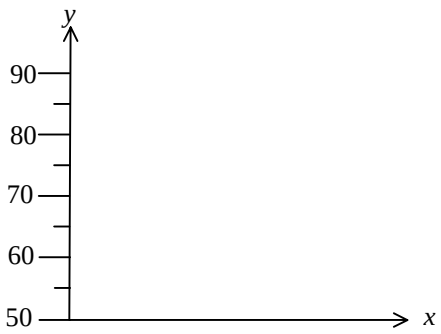
An appropriate scale for this information could increase by multiples of 2 or 5 on the *y*-axis. The lowest mark is 56, so the graph could begin at 50, rather than zero.

Example: Set up the graph using multiples of 2.



Each marker on the *y*-axis represents an increase of 2%.

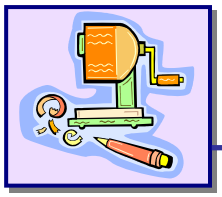
Or, set up the graph using multiples of 5.



Each marker on the *y*-axis represents an increase of 5%.

Calculate the **mean** (average) of Larry's marks.

(82 + 56 + 74 + 65 + 73) ÷ 5 = 70%



Practice: Calculating Mean

1. Sue-Ling wants to buy a new sweater and has seen it in a number of different stores. The prices are indicated in the chart below.

Price of same sweater in four different stores			
Store #1	Store #2	Store #3	Store #4
$14.99	$17.98	$23.46	$18.97

Respond to the following.

a) What is the range for the price of the sweater?

b) Calculate the mean (average cost) for the price of the sweater. (Remember to answer in the form of dollars and cents. Round to the nearest hundredth.)

2. Natasha conducted a poll of students to determine how many wanted a Valentine's Day dance. She polled 9 classes. The following number of students from each class said they wanted a dance:

7(1) – 18	7(2) – 12	7(3) – 25
8(1) – 23	8(2) – 9	9(1) – 17
9(2) – 15	9(3) – 24	9(4) – 9

What is the mean and range of Natasha's data?

3. The table shows the cost of the lunch specials in a school cafeteria.

Monday	Tuesday	Wednesday	Thursday	Friday
$6.28	$7.45	$5.16	$4.76	$9.85

Respond to the following.

a) What is the range for the cost of the lunches?

b) Calculate the mean (average cost) for the price of the lunches. (Remember to answer in the form of dollars and cents. Round to the nearest hundredth.)

Mode

Mode is the number that occurs most often in a set of numbers.

Example

Thuan and his friends compared their results on a math quiz. The scores (out of 10) are as follows:

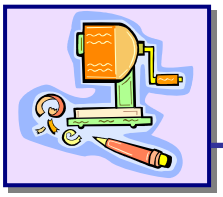
8 8 7 10 6 7 8 6 8

The number that occurs most often in the scores above is 8.
8 is the mode.

There can be more than one mode.

Bowling Scores			
	Game 1	Game 2	Game 3
Week 1	164	178	157
Week 2	212	164	212
Week 3	164	185	129
Week 4	157	143	212

There are two modes in the chart, **164** and **212**.
These are the numbers that appear most often.



Practice: Calculating Mode and Mean

1. Lots of students go to the library during their spare class to study or do homework. The chart below shows the number of students during a 4-week period.

Students in the Library					
	Mon.	Tues.	Wed.	Thurs.	Fri.
Week 1	7	3	5	4	2
Week 2	3	5	4	2	8
Week 3	10	6	4	1	6
Week 4	5	7	6	4	3

   Identify the mode for the four weeks.

   Identify the range.

   Calculate the mean.

2. Use appropriate communication skills to ask a staff member to provide data on the number of students who were absent each day for the past month. Calculate the range, mode and mean of the absences.

3. Use appropriate strategies to find out how many students are in each class. Identify/calculate the range, mode and mean of the numbers.

4. Use appropriate strategies to locate information about how businesses use mean, range and mode.

Median

Median is the middle number in a set of numbers. To find the median, numbers must be placed in order from smallest to greatest.

Example

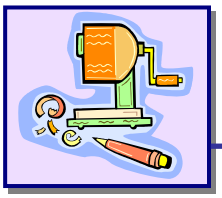
The following is a list of the number of people attending a new movie release in seven theatres:

81, 88, 89, 98, 87, 86, 84

To find the median of the numbers above:

1. Put the numbers in order (from smallest to greatest):
   81, 84, 86, 87, 88, 89, 98
2. Identify the middle number:
   81, 84, 86, **87**, 88, 89, 98.

If there are two middle numbers, add the two middle numbers and divide by 2.



Practice: Calculating Median

1. Identify the median of each of the sets of numbers below.

   a) 2, 8, 6, 9, 12, 4, 9

   b) 12, 9, 18, 6, 14, 8

   c) 18, 20, 15, 10, 12, 16