

Two-Way Frequency Tables

**Return
to Table of
Contents**

Goals and Objectives

Students will be able to recognize trends with and interpret different association of data in a two-way frequency table.

Why do we need this?

All of us are marketed to on a regular basis. Television, the Internet and magazines are different ways that businesses get us to buy their product or use their service. It is vital to be able to interpret information that is given to us and make smart choices.

Remember from Algebra 1...

Frequency Table

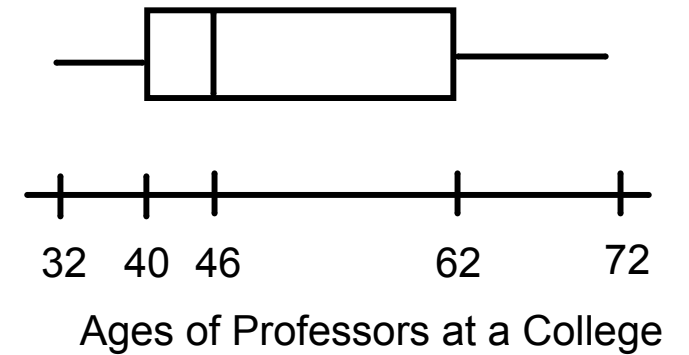
Favorite Ice Cream	Frequency
Vanilla	
Chocolate	
Strawberry	
Mint	
Rocky Road	

Stem-and-Leaf Plot

Ages of people at the gym

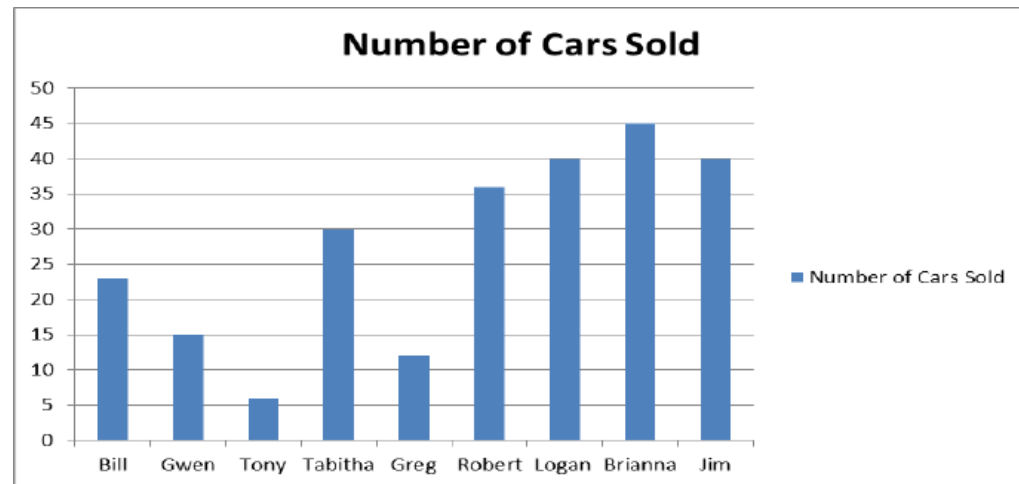
Stem	Leaf
1	2 2 6 7 8 9 9
2	1 1 3 4 4 4 5 5 6 8 8 9
3	0 1 3 6 9
4	3 4 8
5	1 4 6
7	2 5

Box-and-Whisker Plot

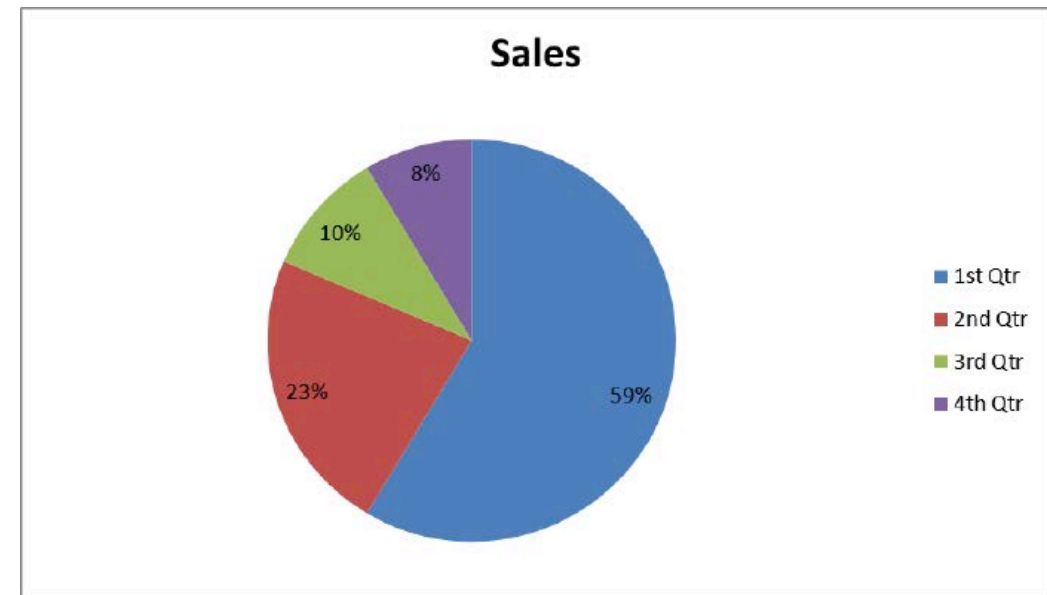


*These are all ways to display a collection of data.

Remember from Algebra 1...

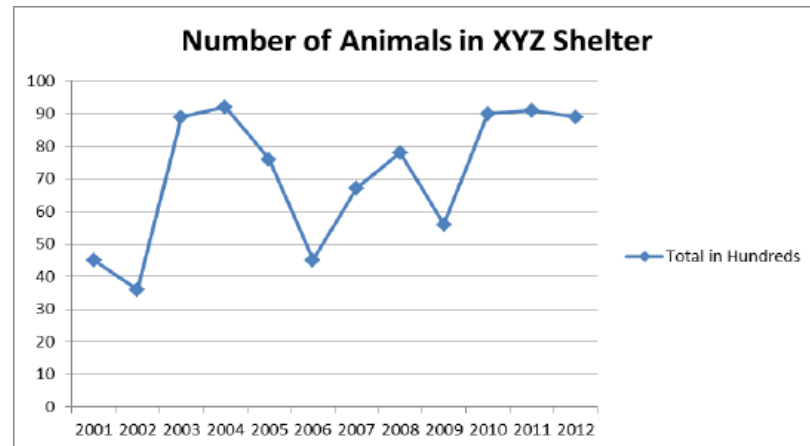


Bar Graphs

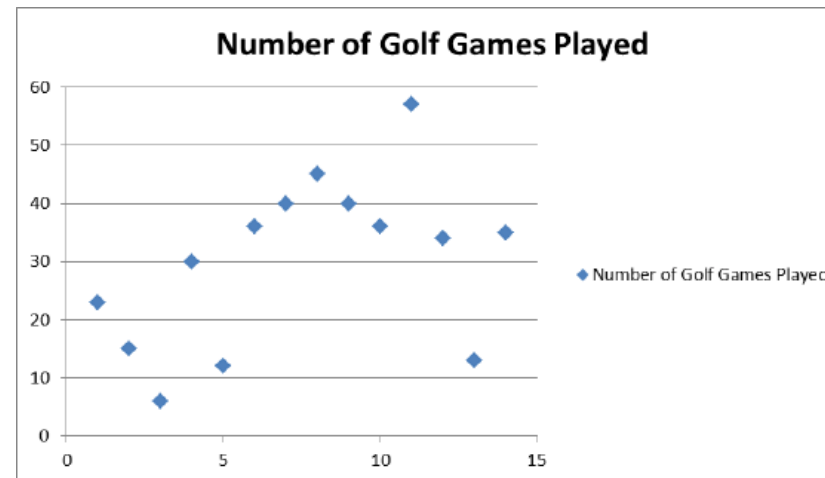


Pie Graphs

Remember from Algebra 1...



Line Plots



Scatter Plots

Two-Way Frequency Tables

In this section, we are going to study Two-Way Frequency Tables. These displays allow us to study situations that have more than one variable such as how many men and women that exercise regularly. The chart below shows a survey of 100 people.

	Exercise Regularly	Do not Exercise Regularly	Total
Men	18	28	46
Women	32	22	54
Total	50	50	100

Two-Way Frequency Tables

Two-Way Frequency Tables connect the collection of data with probability. Using these tables, we can calculate three different frequencies that are very useful when discussing results:

1. Joint Relative Frequency
2. Marginal Relative Frequency
3. Conditional Relative Frequency

Two-Way Frequency Tables

The yellow boxes represent Joint Relative Frequency and the pink boxes represent Marginal Relative Frequency.

	Exercise Regularly	Do not Exercise Regularly	Total
Men	0.18	0.28	0.46
Women	0.32	0.22	0.54
Total	0.5	0.5	1

Joint Relative Frequency is found by dividing the number in that category by the total observations or outcomes.

Marginal Relative Frequency is found by totaling the rows and columns.

Two-Way Frequency Tables

These relative frequencies directly translate into quantitative statements. Such statements mirror those that are reported in the media.

	Exercise Regularly	Do not Exercise Regularly	Total
Men	0.18	0.28	0.46
Women	0.32	0.22	0.54
Total	0.5	0.5	1

- 18% of the men surveyed exercise regularly.
- 22% of the women surveyed did not exercise regularly.
- 54% of the people surveyed were women.

Two-Way Frequency Tables

A teacher asked their class if they had been to an amusement park before or not. Out of 36 students, there were 22 boys and 14 girls. 16 of the boys and 10 of the girls answered that they had been to an amusement park before. Create a relative frequency table from the data collected.

	Have been to an Amusement Park	Have NOT been to an Amusement Park	Total
Boys			
Girls			
Total			

Answer

Two-Way Frequency Tables

Together, write some quantitative statements about the information.

	Have been to an Amusement Park	Have NOT been to an Amusement Park	Total
Boys	0.44	0.17	0.61
Girls	0.28	0.11	0.39
Total	0.72	0.28	1

Answer

Two-Way Frequency Tables

At a vet clinic over the month of July, the vets saw a total of 150 animals. Out of those animals, 105 were dogs and 45 were cats. 70 of the dogs that were seen needed blood work. 20 of the cats needed blood work. Create a relative frequency table for the information. You will use your table to answer some questions.

Answer

63 From the relative frequency table you created, find the joint relative frequency for the dogs that did not need blood work.

Answer

64 What is the marginal relative frequency of cats that came to the clinic?

Answer

65 What is the percentage of dogs that came in that needed blood work?

Answer

66 Find the marginal relative frequency for the number of animals which came in and needed blood work?

Answer

Two-Way Frequency Tables

From these frequencies, you can also find a useful comparison called Conditional Relative Frequency which is directly correlated to Conditional Probability. To find Conditional Relative Frequency, divide the joint relative frequency by the appropriate marginal relative frequency.

For example, use the table to find the probability that if a cat was brought in to the clinic, it would not need blood work.

$$\frac{\text{Cats that did not need blood work.}}{\text{Cats that came in.}} \longrightarrow \frac{0.17}{0.30} \longrightarrow 57\%$$

Conditional Relative Frequency and Conditional Probability

Conditional Relative Frequency and Conditional Probability go hand in hand. In fact how statistics are reported usually involves some probability.

Two-Way Frequency Tables

Using the table, find the probability that if a pet was brought into the clinic that needed blood work, it would be a dog.

	Needs Blood Work	Does NOT need Blood Work	Total
Dogs	0.47	0.23	0.7
Cats	0.13	0.17	0.3
Total	0.6	0.4	1

Answer

Two-Way Frequency Tables

Using the table, find the probability that if you brought in a cat, it would NOT need blood work?

	Needs Blood Work	Does NOT need Blood Work	Total
Dogs	0.47	0.23	0.7
Cats	0.13	0.17	0.3
Total	0.6	0.4	1

Answer

67 From the table, find the probability that a girl has gone to an amusement park.

	Have been to an Amusement Park	Have NOT been to an Amusement Park	Total
Boys	0.44	0.17	0.61
Girls	0.28	0.11	0.39
Total	0.72	0.28	1

Answer

68 Find the conditional probability that out of the girls, the person has been to an amusement park.

	Have been to an Amusement Park	Have NOT been to an Amusement Park	Total
Boys	0.44	0.17	0.61
Girls	0.28	0.11	0.39
Total	0.72	0.28	1

Answer

69 What is the probability that if a person has been to an amusement park, it was a boy?

	Have been to an Amusement Park	Have NOT been to an Amusement Park	Total
Boys	0.44	0.17	0.61
Girls	0.28	0.11	0.39
Total	0.72	0.28	1

Answer

70 Find the probability that out of the people that have not gone to an amusement park, it would be a girl.

	Have been to an Amusement Park	Have NOT been to an Amusement Park	Total
Boys	0.44	0.17	0.61
Girls	0.28	0.11	0.39
Total	0.72	0.28	1

Answer

Two-Way Frequency Tables

Information summarized like this can easily be analyzed when studying certain situations.

At the same vet clinic during July, 42 of the same dogs that came in needed an x-ray. 10 of the cats needed an x-ray. Create a frequency table that displays this information. Find joint and marginal relative frequencies.

Answer

Two-Way Frequency Tables

	Needed x-ray	Did not need x-ray	Total
Dogs	0.28	0.42	0.7
Cats	0.07	0.23	0.3
Total	0.35	0.65	1

Find the probability that:

- a) if you brought in a dog, it would need an x-ray,
- b) if you brought in a cat, it would need an x-ray.

Answer

Two-Way Frequency Tables

	Needed x-ray	Did not need x-ray	Total
Dogs	0.28	0.42	0.7
Cats	0.07	0.23	0.3
Total	0.35	0.65	1

Answer

Out of all of the animals x-rayed, calculate the percentages that were a) dogs and b) cats.

Two-Way Frequency Tables

Using the information from both tables, what trends can you find in the data? Use quantitative statements to justify your answers.

	Needs Blood Work	Does NOT need Blood Work	Total
Dogs	0.47	0.23	0.7
Cats	0.13	0.17	0.3
Total	0.6	0.4	1

	Needed x-ray	Did not need x-ray	Total
Dogs	0.28	0.42	0.7
Cats	0.07	0.23	0.3
Total	0.35	0.65	1

Answer

Two-Way Frequency Tables

At USA High School, 300 seniors went on to a 4-year college or university. A survey collected the following data on whether they chose an in-state or an out-of-state school. Use this information to answer the following questions.

	In-State College or University	Out-of-State College or University	Total
Male	98	38	136
Female	134	30	164
Total	232	68	300

- 71 Based on the data, which of the following is a plausible quantitative statement?
- A 58% of the students that chose an in-state college or university are female.
 - B 56% of the students that chose an out-of-state college or university are female.
 - C 73% of females chose an in-state college or university.

	In-State College or University	Out-of-State College or University	Total
Male	0.33	0.12	0.45
Female	0.45	0.10	0.55
Total	0.78	0.22	1

72 Based on the data, which of the following would be a plausible quantitative statement from the information displayed below?

- A 27% of the females surveyed chose an out-of-state college or university.
- B 45% of the females surveyed chose an out-of-state college or university.
- C 18% of the females surveyed chose an out-of-state college or university.

	In-State College or University	Out-of-State College or University	Total
Male	0.33	0.12	0.45
Female	0.45	0.10	0.55
Total	0.78	0.22	1

73 The marginal relative frequency of in-state students is:

- A 0.33
- B 0.78
- C 0.45
- D 0.22

	In-State College or University	Out-of-State College or University	Total
Male	0.33	0.12	0.45
Female	0.45	0.10	0.55
Total	0.78	0.22	1

Answer

74 The joint relative frequency that a female would choose an out-of-state college or university is:

- A 0.12
- B 0.45
- C 0.22
- D 0.10

Answer

	In-State College or University	Out-of-State College or University	Total
Male	0.33	0.12	0.45
Female	0.45	0.10	0.55
Total	0.78	0.22	1