

Chapter 10

Probability

10.1 Sample Spaces and Probability

10.2 Independent and Dependent Events

10.3 Two-Way Tables and Probability

10.4 Probability of Disjoint and Overlapping Events

10.5 Permutations and Combinations

10.6 Binomial Distributions

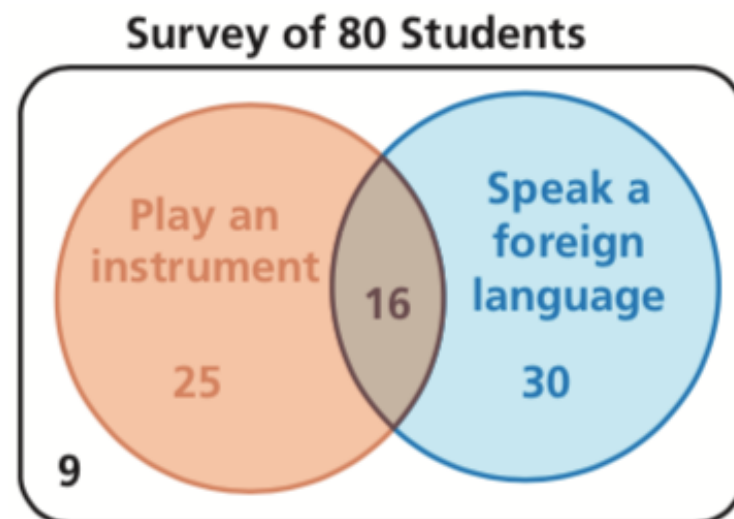


10.3 Two-Way Tables and Probability

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Two-way Table

- The Venn diagram shows the results of a survey of 80 students. Using the information in the diagram, fill in the table below.
- Using the table, how many students speak a foreign language?
- How many do not play an instrument?



| | Play an Instrument | Do Not Play an Instrument | Total |
|---------------------------------|--------------------|---------------------------|-------|
| Speak a Foreign Language | | | |
| Do Not Speak a Foreign Language | | | |
| Total | | | |

10.3 Two-Way Tables and Probability

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Vocabulary

- **Two-way table** - A frequency table that displays data collected from one source that belong to two different categories.
- **Joint frequency** - Each entry in the table.
- **Marginal frequency** - Sums of the rows and columns.

| | | Attendance | | Total |
|-------|--------|------------|---------------|-------|
| | | Attending | Not Attending | |
| Class | Junior | 42 | 64 | 106 |
| | Senior | 77 | 37 | 114 |
| Total | | 119 | 101 | 220 |

10.3 Two-Way Tables and Probability

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Vocabulary

- **Joint relative frequency** - The ratio of a joint frequency (one entry) to the total number.

$$\frac{42}{220} \approx 0.191$$

About 19.1% of the students in survey are Juniors attending

| | | Attendance | | Total |
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| Total | | 119 | 101 | 220 |

10.3 Two-Way Tables and Probability

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Vocabulary

- **Joint relative frequency** - The ratio of a joint frequency (one entry) to the total number.
- **Marginal relative frequency** - The sum of the joint frequencies in a row or column.

$$\frac{42}{220} + \frac{64}{220} \approx 0.482$$

About 48.2% of the students surveyed were Juniors

| | | Attendance | | Total |
|-------|--------|--------------------------------|--------------------------------|-------|
| | | Attending | Not Attending | |
| Class | Junior | $\frac{42}{220} \approx 0.191$ | $\frac{64}{220} \approx 0.291$ | 0.482 |
| | Senior | $\frac{77}{220} = 0.35$ | $\frac{37}{220} \approx 0.168$ | 0.518 |
| Total | | 0.541 | 0.459 | 1 |

10.3 Two-Way Tables and Probability

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Vocabulary

- **Conditional relative frequencies** - The ratio of the marginal frequency (one entry) over the total in each row or column.

| | | Attendance | |
|-------|--------|-------------------------------------|-------------------------------------|
| | | Attending | Not Attending |
| Class | Junior | $\frac{0.191}{0.482} \approx 0.396$ | $\frac{0.291}{0.482} \approx 0.604$ |
| | Senior | $\frac{0.35}{0.518} \approx 0.676$ | $\frac{0.168}{0.518} \approx 0.324$ |

| | | Attendance | | Total |
|-------|--------|--------------------------------|--------------------------------|-------|
| | | Attending | Not Attending | |
| Class | Junior | $\frac{42}{220} \approx 0.191$ | $\frac{64}{220} \approx 0.291$ | 0.482 |
| | Senior | $\frac{77}{220} = 0.35$ | $\frac{37}{220} \approx 0.168$ | 0.518 |
| Total | | 0.541 | 0.459 | 1 |

Given that a student is a Junior, the conditional relative probability that he/she is not attending is about 60.4%.



10.3 Two-Way Tables and Probability

Finding Conditional Probabilities

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A satellite TV provider surveys customers in three cities. The survey asks whether they would recommend the TV provider to a friend. The results, given as joint relative frequencies, are shown in the two-way table.

| | | Location | | |
|----------|-----|----------|--------------|------------|
| | | Glendale | Santa Monica | Long Beach |
| Response | Yes | 0.29 | 0.27 | 0.32 |
| | No | 0.05 | 0.03 | 0.04 |

- a) What is the probability that a randomly selected customer who is located in **Glendale** will **recommend** the provider?

$$P(\text{response yes} \mid \text{Glendale}) = \frac{0.29}{0.29 + 0.05} = 85.3\%$$

10.3 Two-Way Tables and Probability

Finding Conditional Probabilities

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A satellite TV provider surveys customers in three cities. The survey asks whether they would recommend the TV provider to a friend. The results, given as joint relative frequencies, are shown in the two-way table.

| | | Location | | |
|----------|-----|----------|--------------|------------|
| | | Glendale | Santa Monica | Long Beach |
| Response | Yes | 0.29 | 0.27 | 0.32 |
| | No | 0.05 | 0.03 | 0.04 |

- What is the probability that a randomly selected customer who is located in **Glendale** will **recommend** the provider?
- What is the probability that a randomly selected customer who will **not recommend** the provider is located in **Long Beach**?

$$P(\text{Long Beach} \mid \text{response no}) = \frac{0.04}{0.05 + 0.03 + 0.04} = 33.3\%$$

10.3 Two-Way Tables and Probability

Finding Conditional Probabilities

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A satellite TV provider surveys customers in three cities. The survey asks whether they would recommend the TV provider to a friend. The results, given as joint relative frequencies, are shown in the two-way table.

| | | Location | | |
|----------|-----|----------|--------------|------------|
| | | Glendale | Santa Monica | Long Beach |
| Response | Yes | 0.29 | 0.27 | 0.32 |
| | No | 0.05 | 0.03 | 0.04 |

- c) Determine whether recommending the provider to a friend in Long Beach and living in Long Beach given recommending are independent events?

$$P(\text{Long Beach}) = \frac{0.32 + 0.04}{1} = 36\%$$

$$P(\text{Long Beach} \mid \text{response yes}) = \frac{0.32}{0.29 + 0.27 + 0.32} = 36.36\%$$

Approximately equal means INDEPENDENT!!!!

