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Lesson 4: I Will Survive!

Solidify Understanding

Learning Focus

Represent probabilities with Venn diagrams.

Use conditional probability to draw conclusions.

Understand the definition of conditional probability.

What does it mean for events to be independent?

How does the Venn diagram connect to probability statements?

Open Up the Math

Launch, Explore, Discuss

You may have heard of the *Titanic*, the biggest, fanciest cruise ship of its day. It sank in the North Atlantic after hitting an iceberg on its very first voyage. There were not enough lifeboats for all the passengers, so many people died, but some were rescued. There are many stories to be told of the *Titanic*, but we'll save them for another day. We're going to look at the data and see what relationships we can find.

1. Passengers on the *Titanic* purchased different classes of tickets. Passengers with first-class tickets spent more to get fancier rooms and nicer food. When the ship sank, some of the passengers were saved and some perished. The following data represents the number of passengers aboard the *Titanic* with first- and second-class tickets and whether or not they survived. Fill in the blanks for this table:

	Survived	Did Not Survive	Total
First Class	202		325
Second Class		167	285
Total			610

2. Use the data from the previous table to create a Venn diagram for each of the following:

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a. First class and second class.

b. Second class and survived.

3. Find each probability:

a. $P(\text{Survival})$

b. $P(\text{Not Survival})$

c. $P(\text{Not Survival}|\text{First Class})$

d. $P(\text{Second}|\text{Survive})$

e. $P(\text{First or Second})$

f. $P(\text{First and Second})$

g. $P(\text{Survival}|\text{First})$

h. $P(\text{Survival and First})$

i. $P(\text{First})$

4. Jack and Rose are looking at these last few probabilities and notice a relationship:

$$P(\text{Survive}|\text{First}) = \frac{P(\text{Survive and First})}{P(\text{First})}$$

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Use the probabilities you found to check their conjecture. Show your work here:

5.
- Complete a similar conjecture for: $P(\text{Survive}|\text{Second}) =$ _____
- Verify this conjecture with the appropriate probabilities and show your work here:

6. As Rose and Jack are examining these probabilities, they are starting to feel a little glum. Rose says, "I think our survival depends on the class of ticket we bought." Would you agree? Write three probability statements to support your claim.

7. How would you expect the $P(\text{Survival}|\text{First class})$ to compare to $P(\text{Survival})$ if survival did not depend on the class of ticket? What would you expect of the $P(\text{Survival}|\text{Second class})$ if survival did not depend on the class of ticket?

Ready for More?

Mrs. Tuffexam gave a test that had two hard problems on it. 35% of students solved problem 1 and 15% of students solved both problems. What is the probability that a student who solved the first problem also solved the second one?

Takeaways

Mutually exclusive, disjoint events:

Joint events:

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Definition of conditional probability:

Events A and B are independent if:

Vocabulary

- **disjoint**
- **independent event / dependent event**
- **joint events**
- **mutually exclusive**
- two-way table

Bold terms are new in this lesson.

Lesson Summary

In this lesson, we learned the definition of conditional probability and the relationship with the union of two events. We discussed two events that cannot occur together and learned that they are called mutually exclusive. Finally, we were introduced to the idea of independent events, events that may occur together, but the probability of one event does not change if the other occurs.

Retrieval

Find the product or quotient.

1. $\frac{1}{3} \cdot \frac{2}{5}$

2. $\frac{3}{7} \div \frac{9}{14}$

3. $\frac{\frac{3}{4}}{\frac{9}{16}}$

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4. Fill in the missing values of the two-way table and then write a conditional probability statement.

	Potato Chips	**French Fries**	**Total**
9th Grade	74		
10th Grade		48	64
Total		90	

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