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Lesson 3: Fried Freddy's

Solidify Understanding

Learning Focus

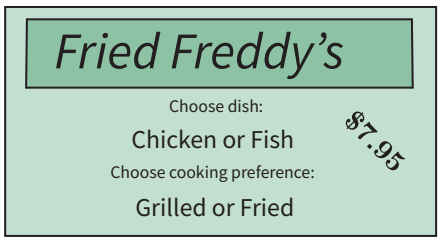
Use Venn diagrams to find probabilities.

What connections exist between the Venn diagram and probability notation?

Open Up the Math

Launch, Explore, Discuss

Freddy loves fried food. His passion for the perfect fried food recipes led to him opening the restaurant Fried Freddy's. His two main dishes are fish and chicken. Knowing he also had to open up his menu to people who prefer to have their food grilled instead of fried, he created the following menu board:



After being open for six months, Freddy realized he was having more food waste than he should because he was not predicting how much fish and chicken he should prepare in advance. His business friend, Tyrell, said he could help.

1. What information do you think Tyrell would need?

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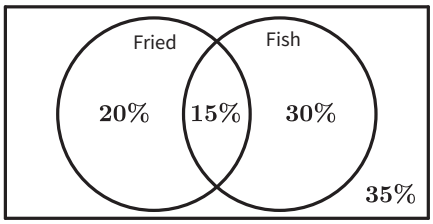
2. Luckily, Freddy uses a computer to take orders each day so Tyrell had lots of data to pull from. After determining the average number of customers Freddy serves each day, Tyrell created the following Venn diagram to show Freddy the food preference of his customers:



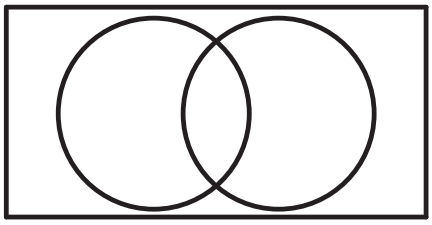
How is this Venn diagram different than the one you made in the previous lesson? What do all the percentages add up to on this diagram? Why?

To learn more about what the Venn diagram tells him about his business, Freddy computed the following probabilities:

3. What is the probability that a randomly selected customer would order fish?

Shade the part of the diagram that models this solution.

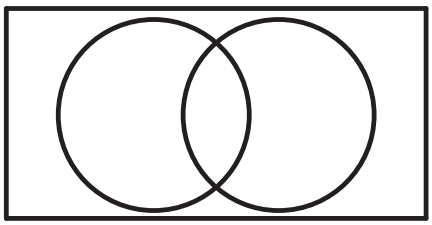
$P(\text{Fish}) =$ _____



4. What is the probability that a randomly selected customer would order fried fish?

Shade the part of the diagram that models this solution.

$P(\text{Fried} \cap \text{Fish}) = P(\text{Fried and fish}) =$ _____



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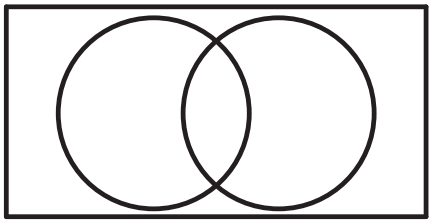
5. What is the probability that a person prefers fried chicken?

Shade the part of the diagram that models this solution.

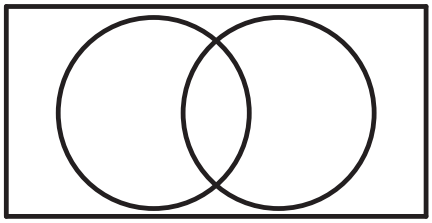
$P(\text{Fried} \cap \text{Chicken}) = P(\text{Fried and chicken}) =$ _____



6. What is the estimated probability that a randomly selected customer would order fish and want it grilled?

Shade the part of the diagram that models this solution.

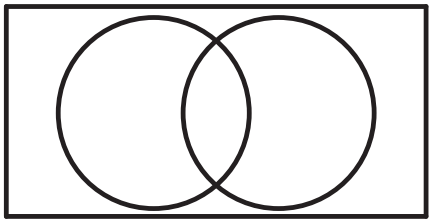
$P(\text{Grilled and fish}) = P($_____$) =$ _____



7. What is the probability that a randomly selected person would choose fish or something fried?

Shade the part of the diagram that models this solution.

$P(\text{Fried} \cup \text{Fish}) = P(\text{Fried or fish}) =$ _____



8. What is the probability that a randomly selected person would NOT choose fish or something fried?

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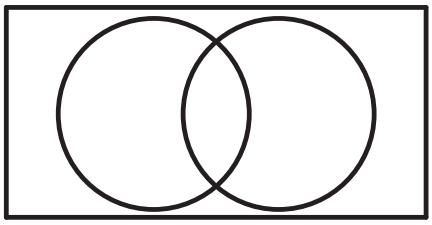
Shade the part of the diagram that models this solution.

What other probability would describe the same space on the Venn diagram in this context?



9. If Freddy serves 100 meals at lunch on a particular day, how many orders of fish should he prepare with his famous fried recipe?

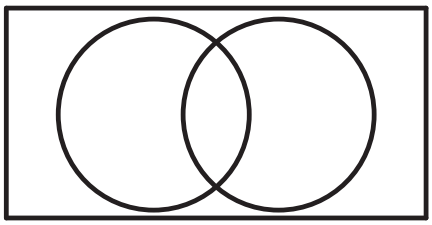
10. Just as Freddy hoped, messing around with the diagrams makes him think he discovered a relationship. Here's his theory:

$$P(\text{Fried or fish}) = P(\text{Fish}) + P(\text{Fried}) - P(\text{Fish and fried})$$

Check out Freddy's theory with numbers from his Venn diagram.

11. Unfortunately for Freddy, the statisticians of the world beat him to the theorem. (Freddy needs to keep on fryin'.) Statisticians call his idea the **Addition Rule**. (Freddy might have found a more creative name.) Label the Venn diagram below and use it to show:

$$P(A \text{ or } B) = P(A) + P(B) - P(A \text{ and } B)$$



Ready for More?

The two-way table below shows preferences for chocolate and vanilla ice cream among 9th and

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10th grade students.

a. Write a statement of the Addition Rule for $P(\text{Prefers Chocolate or 10th grade})$:

b. Use the two-way table to show the statement is true:

	Chocolate	Vanilla	Total
9th Grade students	23	10	33
10th Grade students	6	8	14
Total	29	18	47

Takeaways

Addition Rule for the union of two events A and B:

Adding Notation, Vocabulary, and Conventions

Term	Notation	Meaning	Additional Information
The complement of A			
Intersection of A and B			
Union of A and B			

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Vocabulary

- **complement (in probability)**
- **intersection of sets**
- **union**

Bold terms are new in this lesson.

Lesson Summary

In this lesson, we used Venn diagrams to find the probability of the complement of an event, the union of two events, and the intersection of two events. We learned that the probability of the union of two events can be found using the Addition Rule, $P(A \text{ or } B) = P(A) + P(B) - P(A \text{ and } B)$.

Retrieval

If one action affects the next, then the actions or events are dependent. If one action has no effect on the next, then the actions are considered independent. For each scenario, determine whether the actions or events are dependent or independent, and justify your choice.

1. Waking up when the alarm clock goes off and being on time to school.

A. dependent **B.** independent

2. Rolling a standard six-sided die and tossing a coin.

A. dependent **B.** independent

Create a proportion and use it to answer the problem.

3. If a basketball player makes 4 out of 10 shots, how many total shots would you predict they need to take in order to make 30 shots?