Looking Ahead

In the following example, we will use the Rule for Conditional Probability. This rule will require us to divide probabilities, which can be represented by fractions in many instances.

Example Preview

A high school fundraiser sold 500 tickets for a raffle. 372 tickets were sold to parents of current students and 238 tickets were sold to parents of current students who are also graduates of the high school themselves. What is the probability that a randomly chosen ticket belongs to someone who is a graduate of the high school, given that the ticket holder is a parent of a current student?

Solution

The question asks for $P(\text{graduate} \mid \text{parent of current student})$. Thus, we need to find $P(\text{graduate and parent of current student})$ as well as $P(\text{parent of current student})$.

$$P(\text{graduate and parent of current student}) = \frac{238}{500}$$

$$P(\text{parent of current student}) = \frac{372}{500}$$

We can now calculate the conditional probability as follows.

$$P(\text{graduate} \mid \text{parent of current student}) = \frac{P(\text{graduate and parent of current student})}{P(\text{parent of current student})}$$

$$= \frac{238}{500} \div \frac{372}{500}$$ The probabilities, expressed as fractions, are divided.

$$= \frac{238}{500} \cdot \frac{500}{372}$$

$$= \frac{238}{372} = \frac{119}{186} \approx 0.6398$$

4.R.2 Exercises

Concept Check

True/False. Determine whether each statement is true or false. If a statement is false, explain how it can be changed so the statement will be true. (**Note:** There may be more than one acceptable change.)

1. The reciprocal of 1 is undefined.

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2. The product of a nonzero number and its reciprocal is undefined.

3. The reciprocal of 12 is $\frac{12}{1}$.

4. The result of $\frac{1}{3} \div \frac{1}{6}$ is 2.

Practice

Divide and reduce to lowest terms.

5. $\frac{2}{3} \div \frac{3}{4}$

6. $0 \div \frac{5}{6}$

7. $\frac{5}{6} \div 0$

8. $\frac{14}{15} \div \frac{21}{25}$

Applications

Solve.

9. ***Geology:*** The floor of the Atlantic Ocean is spreading apart at an average rate of $\frac{3}{50}$ of a meter per year. How long will it take for the ocean floor to spread 12 meters?

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10. ***Airplane Capacity:*** An airplane is carrying 180 passengers. This is $\frac{9}{10}$ of the capacity of the airplane.

a. Is the capacity of the airplane more or less than 180?

b. If you were to multiply 180 times $\frac{9}{10}$, would the product be more or less than 180?

c. What is the capacity of the airplane?

11. ***Rolling a Die:*** A six-sided die is rolled. What is the probability of rolling a two, assuming that you rolled an even number?

12. ***Probability:*** Mrs. Harvey's algebra class has 42 students, classified by academic year and method of instruction as follows.

Mrs. Harvey's Algebra Class

	In-Class Instruction	Online Instruction
Freshman	9	13
Sophomore	4	5
Junior	4	2
Senior	2	3

Mrs. Harvey randomly chooses one student's homework to grade first.

a. What is the probability that she selects an in-class student, given that she chooses from only the sophomores?

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b. What is the probability that she selects a junior, given that she chooses an online student?

c. What is the probability that she selects an online student, given that she chooses a junior?

Writing & Thinking

13. Explain why the number 0 has no reciprocal.

14. Is division a commutative operation? Explain briefly and give three examples using fractions to help justify your answer.

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