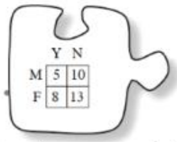
7.2.3

Monday, October 18, 2021 8:22 AM

IM 2 Classwork...



7.2.3 How can I pull it all together?

Applications of Probability

Probability has uses far beyond its origins in games of chance. Often, probabilities are based on survey data or data taken from a sample population. Today, you will learn a new probability rule and a new way to determine independence, and at the end of the lesson you will summarize the probability rules that you know.

7-98. In a recent survey of college freshman, 35% of students checked the box next to "Exercise regularly", 33% checked the box next to "Eat five servings of fruits and vegetables a day", and 57% checked the box next to "Neither".

a. Create a two-way table to represent this situation. Include row and column totals.

	Exercise	don't exercise	Totals
Eat Fruits/ Veggies	.35-.10 .25	.65-.57 .08	.33
don't eat fruits/ veggies	.67-.57 .10	.57	.67 (1-.33)
Totals	.35	.65 (1-.35)	1 (100%)

b. What is the probability that a freshman in this study exercises regularly *and* eats five servings of fruits and vegetables each day?

.25 = 25%

c. What is the probability that a freshman in this study exercises regularly *or* eats five servings of fruits and vegetables each day?

P(exercise OR Eat f/v) = .25 + .08 + .10
= .43 = 43%

P(exercise) + P(f/v) − P(exercise AND f/v)
.35 + .33 − .25 = .43 = 43%

d. Do you think that freshmen who eat five servings of fruit and vegetables per day are more likely to exercise? In other words, are exercising and eating associated?

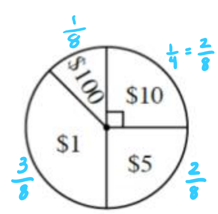
A, B

P(A) ≟ P(A Given B)
P(f/v) ≟ P(f/v Given exercise)
$.33 \overset{?}{=} \frac{.25}{.35}$
$.33 \neq .714$

$\boxed{\text{Associated}}$

7-99. DOUBLE SPIN

Remember Double Spin, the game at the fair from Chapter 3? The player gets to spin a spinner twice, but only wins if the same amount comes up both times. The $100 sector is $\frac{1}{8}$ of the circle. Nick is currently playing the game.



a. Draw a diagram to show the sample space of every possible outcome for two spins.

Spin #1

3/8 $1 2/8 $5 $10 2/8 $100 1/8

Spin #2 \ Spin #1	$\frac{3}{8}$ \$1	$\frac{2}{8}$ \$5	\$10 $\frac{2}{8}$	\$100 $\frac{1}{8}$
$\frac{3}{8}$ \$1	$\frac{9}{64}$			
$\frac{2}{8}$ \$5		$\frac{4}{64}$		
$\frac{2}{8}$ \$10			$\frac{4}{64}$	
$\frac{1}{8}$ \$100				$\frac{1}{64}$

b. What is the probability that Nick wins?

$$P(\text{win}) = \frac{9}{64} + \frac{4}{64} + \frac{4}{64} + \frac{1}{64} = \frac{18}{64} = 28.1\%$$

c. When Nick comes home from the fair, he tells Zack that he won the Double Spin game. Knowing that Nick won, what are the chances that he won \$100?

$$P(\underset{A}{\$100} \text{ Given } \underset{B}{\text{he won}}) = \frac{P(\$100 \text{ AND he wins})}{P(\text{he wins})} = \frac{1/64}{18/64} = \frac{1}{\cancel{64}} \cdot \frac{\cancel{64}}{18} = \boxed{\frac{1}{18}} \; \boxed{\begin{array}{c} .056 \\ \hline 5.6\% \end{array}}$$

d. A mathematical way to express the conditional probability relationship is: $P(A \text{ given } B) = \dfrac{P(A \text{ and } B)}{P(B)}$.

$$\frac{1 \cdot \cancel{64}}{\cancel{64} \cdot 18} \quad \begin{array}{l} \div 64 \\ \div 64 \end{array}$$

This relationship is called the **Multiplication Rule**. Verify your answer to part (c) using the Multiplication Rule. Be sure to define events A and B.

7-101. The local sports shop is having a sale on bats and balls, with a limit of one bat and one ball per customer. The owner of the store, Mr. Blake, thinks that a customer who purchases a bat is more likely to purchase a ball than a customer who does not purchase a bat. He analyzes the sales from the last week and finds that a total of 240 customers came into the store. He counts 180 customers who purchased bats and 96 customers who purchased balls. Mr. Blake then counts the number of sales that include both a bat and a ball and finds that 72 customers purchased both.

Is there an association between the purchase of bats and balls? Explain and show your reasoning using the relationships that you have learned in this lesson.

***7-102.** SHIFTY SHAUNA
Shauna has a bad relationship with the truth—she doesn't usually tell it! In fact, whenever Shauna is asked a question, she rolls a dice. If it comes up 6, she tells the truth. Otherwise, she lies.

a. If Shauna flips a fair coin and you ask her which side has landed up, what is the probability that she says "heads" *and* is telling the truth? Choose a method to solve this problem and carefully record your work.

b. Suppose Shauna flips a fair coin and you ask her whether it came up heads or tails. What is the probability that she says "heads"? (Hint: The answer is not $\frac{1}{12}$!)

c. Suppose Shauna tells you that the coin has come up heads. What is the probability that she really did flip heads?

d. Is whether Shauna lies or tells the truth independent of whether the coin lands on heads or tails?