7.2.2

Monday, October 18, 2021 8:22 AM

IM 2 Classwork...

7.2.2 Is there another way to organize data?

	Y	N
M	5	10
F	8	13

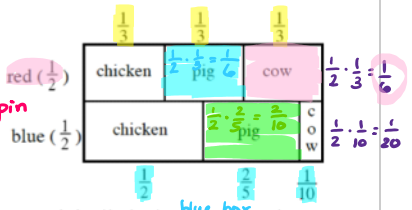
More Conditional Probability

In the previous lesson, you were given the counts (or the frequency) of the number of people or objects in a given situation, and then, from this, you computed conditional probabilities. In this lesson, you will extend your understanding of conditional probabilities by starting from probabilities rather than counts. You will investigate the association of two categorical events.

7-79. BUILD-A-FARM

In the children's game, Build-a-Farm, each player first spins a spinner. Half of the spinner is red and half of the spinner is blue. If the spinner lands on red, the player reaches into the red box. If the spinner lands on blue, the player reaches into the blue box. The red box has ten chicken counters, ten pig counters, and ten cow counters, while the blue box has five chicken counters, four pig counters, and one cow counter.

a. Use a modified area model, as shown at right to represent the sample space. What is the probability of getting a cow counter in one turn?



$P(\text{cow}) = RC \text{ OR } BC$

$= \frac{1}{6}\cdot\frac{20}{20} + \frac{1}{20}\cdot\frac{6}{6} = \frac{20}{120} + \frac{6}{120} = \frac{26}{120} = \boxed{\frac{13}{60}}$

b. If you know a player got a cow counter, what is the probability that player originally had a red spin? That is, what is $P(\text{red given cow})$?

$P(\text{red Given cow}) = \frac{P(\text{red AND cow})}{P(\text{cow})} = \frac{1/6}{13/60} = \frac{1}{6}\cdot\frac{60}{13} = \boxed{\frac{60}{78} = \frac{10}{13} = .769 = 76.9\%}$

c. Are the events {red} and {cow} independent? Explain.

$P(\text{red}) \overset{?}{=} P(\text{red Given cow})$

$\frac{1}{2} \overset{?}{\neq} \frac{10}{13}$

Associated

d. What is the conditional probability that if you got a pig counter, your spin was blue?

$P(\text{blue Given pig}) = \frac{P(\text{blue AND pig})}{P(\text{pig})} = \frac{2/10}{22/60} = \frac{2}{10}\cdot\frac{60}{22}$

$= \frac{120}{220} = \frac{6}{11} = .545 = 54.5\%$

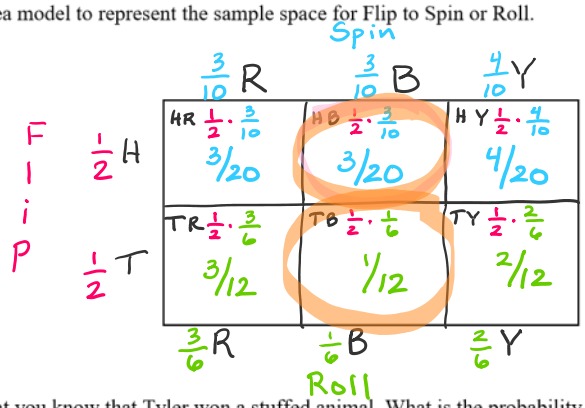
$P(\text{pig}) = RP \text{ OR } BP$

$= \frac{1}{6}\cdot\frac{10}{10} + \frac{2}{10}\cdot\frac{6}{6} = \frac{10}{60} + \frac{12}{60} = \frac{22}{60}$

7-80. FLIP TO SPIN OR ROLL

At the county fair, there are many popular games to play. One of them is Flip to Spin or Roll. First, the player flips a coin. If a head comes up, the player gets to spin the big wheel, which has ten equal sections: three red, three blue, and four yellow. If the coin comes up tails, the player gets to roll a cube with three red sides, two yellow sides, and one blue side. If the player ends up with blue, that player wins a stuffed animal.

a. Draw an area model to represent the sample space for Flip to Spin or Roll.



b. Suppose that you know that Tyler won a stuffed animal. What is the probability that he started off by flipping heads?

$P(\text{heads Given blue}) = \frac{P(\text{heads AND blue})}{P(\text{blue})} = \frac{3/20}{56/240} = \frac{3}{20} \cdot \frac{240}{56} = \frac{720}{1120} = \frac{9}{14} = .642 = 64.2\%$

$P(\text{blue}) = HB \text{ OR } TB = \frac{3 \cdot 12}{20 \cdot 12} + \frac{1 \cdot 20}{12 \cdot 20} = \frac{36}{240} + \frac{20}{240} = \frac{56}{240}$

7-81. Raul is conducting a survey for the school news blog. He surveys 200 senior-class students and finds that 78 students have access to a car on weekends, 54 students have regular chores assigned at home, and 80 students neither have access to a car, nor have regular chores to do. Raul is having a hard time putting the data into a two-way table like the one at right.

	Car	No car	Total
Chores	12	42	54
No chores	66	80	146
Total	78	122	200

200 − 54

200 − 78

a. Complete the two-way table to help Raul figure out the number of students in each situation.

b. Is there an association between car privileges and having regular chores for these students? Explain your answer in the context of the problem.

$P(\text{car}) \stackrel{?}{=} P(\text{car Given Chores})$

$\frac{78}{200} \stackrel{?}{=} \frac{12}{54}$

$.39 \stackrel{?}{\neq} .22$

Associated

7-82. There are 30 students in Mr. Cooper's class; 18 boys and 12 girls. Mr. Cooper chooses a student at random to present his or her solution in front of the class. Four of the boys and three of the girls have already presented.

a. Create a two-way table to display this data.

	Presented	Not Presented	Total
Boys	4	14	18
Girls	3	9	12
Total	7	23	30

b. Sometimes two-way tables have probabilities for entries instead of counts to make it easier to solve problems. Make a new two-way table, but this time use probabilities instead of counts. Include row and column totals.

Not

b. Sometimes two-way tables have probabilities for entries instead of counts to make it easier to solve problems. Make a new two-way table, but this time use probabilities instead of counts. Include row and column totals.

	Presented	Not Presented	Total
Boys	4/30	14/30	18/30
Girls	3/30	9/30	12/30
Total	7/30	23/30	30/30 = 1

c. If Mr. Cooper randomly selects a student, what is the probability he selects a boy who has already presented?

$\frac{4}{30} = 13.3\%$

d. If a student is chosen at random, what is the probability that the student is a girl or is a student who has presented previously? Use the two-way table that you made in part (b).

$\frac{3}{30} + \frac{9}{30} + \frac{4}{30}$

$\frac{16}{30}$

$\frac{12}{30} + \frac{7}{30} - \frac{3}{30}$

$\frac{16}{30}$

e. If a student previously presented, what is the probability that the student is a girl?

$P(\text{girl Given Presented}) = \frac{3}{7} = 42.9\%$

7-83. If Letitia studies for her math test tonight, she has an 80% chance of earning an A. If she does not study, she only has a 10% chance. Whether she can study or not depends on whether she has to work at her parents' store. Earlier in the day, her father said there is a 50% chance that Letitia would be able to study.

a. Draw a diagram for this situation.

b. What is the probability that Letitia gets an A on her math test?

c. What is the probability that Letitia studied, given that she earned an A?