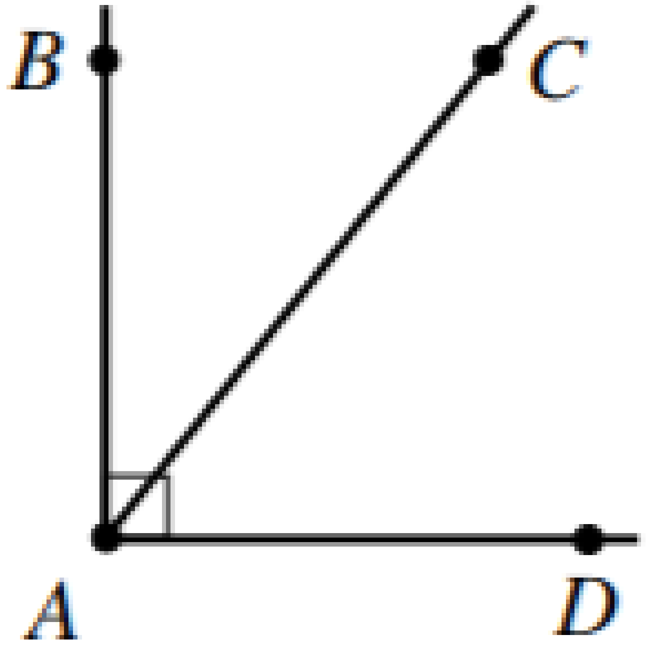
ALGEBRA 4

Day 57

Bell Work

In the figure shown below, the measure of $\angle BAC$ is $(x + 20)°$ and the measure of $\angle BAD$ is $90°$. What is the measure of $\angle CAD$?



F. $(x - 70)°$
G. $(70 - x)°$
H. $(70 + x)°$
J. $(160 - x)°$
K. $(160 + x)°$

For Next Time

page 700 #1-5, 9-17 (odd)

11.4 Conditional Probability

Objective: To find conditional probabilities

Conditional Probability:

For any two events A and B with P(A)$\neq 0$

$$\boldsymbol{P(B|A) = \frac{P(A\ and\ B)}{P(A)}}$$

The probability of B given that A happens

Example

- A utility company asked 50 of its customers whether they pay their bills online or by mail. What is the probability that a customer pays the bill online, given that the customer is male?

<u>Bill Payments</u>

.	*online*	*by mail*
male	12	8
female	24	6

Answer

$$P(male\ and\ online) = \frac{12}{50}$$

$$P(male) = \frac{20}{50}$$

$$P(online|male) = \frac{P(male\ and\ online)}{P(male)} = \frac{\frac{12}{50}}{\frac{20}{50}} = \frac{12}{20} = 0.6$$

The probability that a customer pays online given that the customer is male is 60%.

Think deeper…

- Could we find the probability of customer paying by mail given that she is a female?

- What other scenarios could we attempt to find?

11.5 Probability Models

Objective: To use probabilities to make fair decisions and analyze decisions

In order for a decision to be considered fair the probability of each outcome must be the same.

Are the following situations considered fair? Explain your reasoning?

A teacher wants to pick 2 students at random from the class. The teacher lines them up in order from tallest to shortest and has the first student flip a coin, if they get heads they will be picked, if they get tails they will not. The first two students to flip heads are the two the teacher picks.

Possible Answer

Not fair. The shorter students probably won’t even get a chance to flip the coin because the chances that a taller student flips heads first is greater.

Are the following situations considered fair? Explain your reasoning?

A teacher wants to pick agrees to roll dice. If it is even there will be no homework, and if it is odd then there will be homework.

Possible Answer

Yes. Both situations have a equal chance of happening.

Probability model

A mathematical representation of a situation in which probabilities are assigned to outcomes.

Example:

McDonalds is giving away toys in happy meals. There are six different toys that will be randomly placed with the meal. Create a simulation that could model the chances of getting each toy.

Possible Solution:

You could assign a number from 1-6 to each toy then roll a die and record the results until you have rolled each number at least once. (I did this for you already just to save time, if you want to do it there is a die in the back left cabinet!)

Results on next slide

I rolled the dice until all options showed up at least once… results below

Roll	Frequency:
1:	III
2:	IIII
3:	II
4:	I
5:	II
6:	III

The results of this trial indicate that you would have to buy 3+4+2+1+2+3=15 happy meals in order to get all six different toys.

Expand for Accuracy:

Repeat this exact same simulation multiple times. I did 25 and find the average.

15, 17, 10, 8, 18, 22, 10, 12, 14, 13, 11, 18, 19, 18, 10, 11, 11, 18, 19, 20, 11, 12, 10, 9, 15

$$\boldsymbol{average} = \frac{351}{25} = \mathbf{14.04}$$

On average you'll have to buy 14 happy meals in order to get all six toys.

Using Probability to Analyze Decisions

A company is testing the effectiveness of a new drug. 160 volunteers are split into two groups without their knowledge. 80 are given the drug and 80 given a placebo. They are then asked if they noticed an improvement in their symptoms.

The results are in the table on the next slide.

What is the probability that a volunteer received the placebo given that they did not report a noticeable improvement?

	$Improved$	$Didn't\ \ Improve$	$Total$
$Drug$	67	13	80
$Placebo$	24	56	80
$Total$	91	69	160

Solution

$$\mathbf{P(improvement|drug) =}$$

$$\frac{\#\ \boldsymbol{of\ volunteers\ who\ improved\ with\ drug}}{\#\ \boldsymbol{of\ volunteers\ who\ received\ the\ drug}}$$

$$= \frac{\mathbf{67}}{\mathbf{80}} = \mathbf{0.8375}$$

What is the probability that a volunteer received the placebo given that they did not report a noticeable improvement?

What is the probability that a volunteer received the placebo given that they did not report a noticeable improvement?

$$\boldsymbol{P(placebo|\ not\ improvement) =}$$

$$\boldsymbol{\frac{\#\ of\ volunteers\ took\ placebo\ and\ didn't\ \ improved}{\#\ of\ people\ who\ didn't\ \ improve}}$$

$$\boldsymbol{=\frac{56}{69} = 0.8116}$$

Should they make/distribute the drug? Justify your answer.

Should they make/distribute the drug? Justify your answer.

Yes, 83% of the people who took it improved and 81% of people who had the placebo didn't improve.

What would a result look like that would cause them to not want to distribute the drug? Is there more than one situation?

For Next Time

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