


TOPIC: MULTIPLICATION RULE: DEPENDENT EVENTS

Multiplication Rule for Dependent Events

- ◆ Recall: For *independent* events, find the probability of events A and B occurring by multiplying their probabilities.
 - ▶ For *dependent* events, multiply $P(A)$ by the **Conditional Probability**: prob. of event B _____ A occurred.

EXAMPLE

A bag contains 2 red and 4 blue marbles. Find each probability.

Recall	Independent Events	New	Dependent Events
	<p>(A) Drawing a blue marble from the bag, replacing it, then drawing a red marble.</p> $\frac{4}{6} \cdot \frac{2}{6} = \frac{8}{36} = \frac{2}{9}$ <p>$P(A \cap B) = P(A) \cdot P(B)$</p>		<p>(B) Drawing and <i>keeping</i> a blue marble from the bag, then drawing a red marble.</p> <p>$P(A \cap B) = P(A) \cdot P(\quad)$</p>

PRACTICE

What is the probability that a card player draws two aces from a standard deck of 52 cards if they keep the first card after drawing it?

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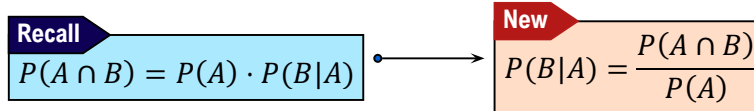
PRACTICE

A library has chosen to select the two monthly book club reads by randomly choosing two books from a list of top 100 adult reads posted in the local newspaper. On the list, 62 books are fiction and 38 books are nonfiction. What is the probability of choosing two nonfiction books for this month's book club meeting?

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Conditional Probability

◆ Rearrange the multiplication rule to get conditional probability:


$$\begin{array}{|l} \text{Recall} \\ P(A \cap B) = P(A) \cdot P(B|A) \end{array} \longrightarrow \begin{array}{|l} \text{New} \\ P(B|A) = \frac{P(A \cap B)}{P(A)} \end{array}$$

EXAMPLE

You conduct a survey of your statistics class with 40 students. 20 students have a math major, 15 have a science major, 10 have a business major, and 8 students have a double major in math & science. What is the probability that a randomly selected student has a math major, given that the student has a science major?

given event (A) =

other event (B) =

$P(A)$ =

$P(A \cap B)$ =

$P(B|A)$ =

PRACTICE

About 15% of people in a town have both a cat and a dog. As 64% of residents have a dog, what is the probability that someone in the town owns a cat, given they have a dog?

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EXAMPLE

A company is hiring software developers and data analysts. Out of all the applicants, 6 applied for the software developer position and 4 applied for the data analyst position. 4 of the software developer applicants have a degree in computer science and 2 of the analyst applicants have a degree in computer science. What is the probability that a randomly selected candidate with a degree in computer science applied for the software developer position?

given event (A) =

other event (B) =

$P(A)$ =

$P(A \cap B)$ =

$P(B|A)$ =