Dice
Cards

5.2 Compound Events

Open ① What is the probability of rolling snake eyes?

$\frac{1}{6} \cdot \frac{1}{6} = \frac{1}{36}$ independent

② What is the probability of drawing a pair of aces from a deck?

$\frac{4}{52} \cdot \frac{3}{51} = \frac{12}{2652} = \frac{1}{221}$ dependent

Independent Events - two events are independent if the occurrence/nonoccurrence of one does not change the probability of the other

$P(A \text{ and } B) = P(A) \cdot P(B)$

Dependent Events - occurrence/nonoccurrence of one changes the probability of the other

$P(A \text{ and } B) = P(A) \cdot P(B, \text{ given } A \text{ has occurred})$

$= P(A) \cdot P(B|A)$

↑ "Probability of B given A"

Conditional probability - probability of dependent events

Example 1 A selection of 50 apples contains 10 rotten apples.

Ⓐ What is the probability of choosing 2 rotten apples if the first rotten apple is not replaced?

$\frac{10}{50} \cdot \frac{9}{49} = \frac{90}{2450} = \frac{9}{245}$ Dependent

(B) What is the probability of choosing a good apple, then a rotten one without replacement

$$\frac{40}{50} \cdot \frac{10}{49} = \frac{400}{2450} = \frac{8}{49}$$ = Dependent

Multiplication rule - use when trying to find the probability of two or more events occurring together.

either/or events

Mutually exclusive (disjoint) - events that cannot occur together.

Addition rule for mutually exclusive events

$$P(A \text{ or } B) = P(A) + P(B)$$

General addition rule

$$P(A \text{ or } B) = P(A) + P(B) - P(A \text{ and } B)$$

* no $P(A \text{ and } B)$ for mutually exclusive events because $P(A \text{ and } B) = 0$

Example 2 Given a standard deck of 52 cards

(A) What is the probability of drawing a Jack or a 7?

Cannot have a 7 and a J ⇒ mutually exclusive

$$P(\text{Jack or } 7) = P(\text{Jack}) + P(7)$$

$$= \frac{4}{52} + \frac{4}{52}$$

$$= \boxed{\frac{8}{52}}$$

* Summary pg 187