Notes Section 11.3 Probability of Multiple Events

Definition: Two events are **INDEPENDENT** if the occurrence or non-occurrence of one event has no effect on the likelihood of the occurrence of the other event. For example, rolling a number cube and then spinning a spinner. The two events do not effect each other, so they are independent. (An example of two events that are not independent (i.e. dependent) is picking one flash card, then another flash card from a stack of 30 flash cards. Picking the first card affects the possible outcomes of picking the second card.)

**If A and B are independent events, then P(A and B)= P(A) X P(B)

Example 1: Find the probability of Joe flipping a heads on a coin and rolling a 6 on a die.

$\frac{1}{2} \cdot \frac{1}{6} = \frac{1}{12}$

Example 2: What is the probability that both Mark and Mary will attend the dance given that there is a 75% chance Mark will be there and a 90% chance Mary will be there?

$= (.75)(.90)$
$= .675$

67.5%

Example 3: Michelle has 6 quarters and 4 dimes in her pocket. Darryl has two nickels, 1 quarter, and 5 pennies in his pocket. Find the probability that Michelle selects 1 dime from her pocket and Darryl selects 1 penny from his pocket.

$P(\text{dime}) \cdot P(\text{penny})$
$\frac{4}{10} \cdot \frac{5}{8} = \frac{20}{80} = \frac{1}{4}$

Example 4: What is the probability of getting 4 tails in 4 tosses of a coin?

4 independent events

$P(\text{tail}) \cdot P(\text{tail}) \cdot P(\text{tail}) \cdot P(\text{tail})$
$= \frac{1}{2} \cdot \frac{1}{2} \cdot \frac{1}{2} \cdot \frac{1}{2} = \frac{1}{16}$

Example 5: What is the probability of **NOT** getting 2 heads in two tosses of a coin? (Hint: Use the complement---what's this????)

$1 - P(\text{2 heads})$
$1 - 1/4 = 3/4$

$P(\text{2 heads}) = P(\text{head}) \cdot P(\text{head})$
$= \frac{1}{2} \cdot \frac{1}{2} = \frac{1}{4}$

Example 6: A and B are independent events. Find P(A and B).

a) $P(A) = \frac{2}{5}$, $P(B) = \frac{1}{7}$

$P(A \text{ and } B) = P(A) \cdot P(B)$
$= \frac{2}{5} \cdot \frac{1}{7}$
$= 2/35$

b) $P(A) = \frac{2}{9}$, $P(B) = \frac{3}{8}$

$\frac{1}{3}\frac{2}{9} \cdot \frac{3}{8_4} = \frac{1}{12}$

Find the probability:

Example 7: that after spinning the spinner 2 times, both numbers are 5 or greater than 6.

$$P(\text{both}) = P(=5 \text{ or } >6) \cdot P(=5 \text{ or } >6)$$
$$= \frac{3}{8} \cdot \frac{3}{8}$$
$$= \boxed{\frac{9}{64}}$$

Example 8: when spinning it 3 times, all are 8 or less than 5.

$$P(\text{all}) = P(=8 \text{ or } <5) \cdot P(=8 \text{ or } <5) \cdot P(=8 \text{ or } <5)$$
$$= \frac{5}{8} \cdot \frac{5}{8} \cdot \frac{5}{8} = \frac{125}{512}$$