## Section 3.6: Independent Events (Complete before Section 3.5)

In previous grades, we calculated the probability of 2 independent events.

Recall that if one event does not affect the probable outcome of the other event, then the events are independent.

If one event does affect the other, then the events are dependent, and we will use conditional probability in Section 3.5 to calculate the probability of both events occurring.

In a situation with replacement, independent events are created.

In a situation without replacement, dependent events are created.

*Example 1:*

Determine if events A and B are independent or dependent.

a) Event A: drawing a queen from a standard deck of cards

Event B: drawing a king from the remaining cards in the same deck.

b) Event A: rolling a 5 on a die

Event B: rolling a 3 on the same die

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***Your Turn:***

Classify the following events as either independent or dependent.

a) The experiment is rolling a die and flipping a coin. The first event is rolling a six and the second event is obtaining tails.

b) The experiment is rolling a pair of dice. The first event is rolling an odd number on one die and the second event is rolling an even number on the other dice.

c) The experiment is dealing 5 cards from a standard deck. The first event is that the first card dealt is a spade, the second event is that the second card is a spade, and the third event is that the third card is a spade and so on.

*Example 2:*

Determine the probability of rolling a 3 on a die and tossing heads on a coin. (independent events)

Draw a tree diagram to show the probability:

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From the tree diagram, we can see the probability of rolling a 3 and tossing heads P(3 and H) is : $\frac{1}{12}$

• What is the probability of rolling a 3 on a die, (P(3))?

• What is the probability of tossing heads on a coin, (P(H))?

• What is the value of P(3) × P(H)?

• What do you notice about the value P(3) × P(H) and the value from the tree diagram (P(3 and H))?

**Summary:** When events are independent of each other, the probability of event B does not depend on the probability of event A occurring.

In such cases, $P(A \text{ and } B) = P(A) \times P(B)$

*Example 3:*

If you have a pair of dice, what is the probability of rolling an odd number on one die and rolling an even number of the other die?

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*Example 4:*

Jane encounters 2 traffic lights on her way to school. There is a 55% chance that she will encounter a red light at the first light, and a 40% chance that she will encounter a red light on the second light. If the traffic lights operate on separate timers, determine the probability that both lights will be red on her way to school.

*Example 5:*

Tanya estimates that her probability of passing French is 0.7 and her probability of passing Chemistry is 0.6. Determine the probability that Tanya will:

a) Pass both French and Chemistry:

b) Pass French but fail Chemistry:

c) Fail both French and Chemistry:

*Example 6:* (ex. 2, p. 194)

All 1000 tickets for a charity raffle have been sold and placed in a drum. there will be two draws. the first draw will be for the grand prize, and the second draw will be for the consolation prize. After each draw, the winning tickets will be returned to the drum so that it might be drawn again. Max has bought five tickets. Determine the probability, to a tenth of a percent, that he will win at least one prize.

Practice Questions:

P. 198 - 200, #1, 2, 5, 6, 8, 12, 13