Section 9-7: Probability of Multiple Events

Independent Events:
When the outcome of the first event does NOT affect the outcome of the second event.

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

Dependent Events:
When the outcome of the first event DOES affect the outcome of the second event.

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

In the refrigerator there are the following drinks:

5 Cokes, 7 Gatorades, 3 Waters.

You reach in and randomly grab a drink. You look at it, decide that's not what you want so you put it back in and randomly grab another drink.

since you put the 1st one back before choosing the 2nd one these are independent events and the second probability is NOT affected by the first.

Find each probability as a fraction without reducing.

1. P(Water then a Coke)

$\frac{3}{15} \cdot \frac{5}{15} = \frac{15}{225}$

2. P(Gatorade and Gatorade)

$\frac{7}{15} \cdot \frac{7}{15} = \frac{49}{225}$

all 15 drinks are still available for the second one.

In your sock drawer are 14 white socks, 6 black socks, and 7 blue socks.

You wake up and don't turn on the lights and randomly grab a sock and put it on. You then randomly grab another sock and put it on your other foot. Find each probability as a fraction.

since you put the 1st on your foot before choosing the 2nd one these are dependent events and the second probability IS affected by the first.

1. P(Blue then a White)

$\frac{7}{27} \cdot \frac{14}{26} = \frac{98}{702}$

2. P(Black and Black)

$\frac{6}{27} \cdot \frac{5}{26} = \frac{30}{702}$

there is one fewer sock to choose from the second time you reach into the drawer.

You still have the following Halloween candy left in a bag:
5 Snickers bars, 3 pieces of gum, and 4 Milky Way bars.

since you eat the 1st one before choosing the 2nd one these are dependent events and the second probability IS affected by the first.

1. You randomly grab one eat it then randomly grab another and eat it. Find this probability as a fraction:

P(Snickers and Milky Way)

$\frac{5}{12} \cdot \frac{4}{11} = \frac{20}{132}$

there are one fewer to choose from for the second candy

2. You grab one at random, decide it's not one you want so you throw it back in and grab another. Find this probability as a fraction:

P(Gum and Gum)

$\frac{3}{12} \cdot \frac{3}{12} = \frac{9}{144}$

since you put the 1st one back into the bag before choosing the 2nd one these are independent events and the second probability is NOT affected by the first.

all 12 candies are still in the bag for the second choice

Mutually Exclusive Events:

When two events CAN'T happen at the same time.

Are studying for a test and listening to music mutually exclusive events? these CAN happen at the same time so they are NOT mutually exclusive. NO

Are reading a book and sleeping mutally exclusive? these CAN'T happen at the same time so they ARE mutually exclusive. Yes

Are being 5'3" tall and being able to dunk a basketball mutually exclusive? these CAN happen at the same time so they are NOT mutually exclusive.

Mugsy Bogues was an NBA player at 5'3" tall and he could dunk the ball. NO

Probability of (A or B)

If A and B are NOT mutually exclusive: P(A and B) usually = P(A) • P(B)

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

In other words, to find P(A or B) when the two events CAN happen at the same time you first add the probabilities then subtract the product of the probabilities.

If A and B ARE mutually exclusive:

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

In other words, to find P(A or B) when the two events CAN'T happen at the same time you simply add the two probabilities.

Find each probability as a percent to the nearest tenth.

a) The probability that it snows today= $\frac{1}{100}$ and the probability that my car doesn't start today = $\frac{2}{75}$

Find P(snows tomorrow or car doesn't start) = these two CAN happen at the same time so you must subtract P(A and B)

$\frac{1}{100} + \frac{2}{75} - \frac{1}{100} \cdot \frac{2}{75}$

$= 3.6\%$

b) The probability that you score more than 10 points in the basketball game is $\frac{3}{8}$ and the probability that you don't score any points is $\frac{1}{6}$.

these two CAN'T happen at the same time so you just add the two probabilities

P(score > 10 points or score 0 points)=

$\frac{3}{8} + \frac{1}{6} = 54.2\%$

The probability that hitter strikes out is 12%
and the probability that they get a hit is 30%.
Find the probability that, in their next
at bat, the hitter strikes out or gets a hit.

these two CAN'T happen at the same time so you just add the two probabilities

P(strike out or get a hit)=

12% + 30% = 42%

The probability that I go to Las Vegas this weekend is $\frac{7}{9}$. The probability that I get sunburned this weekend is $\frac{3}{5}$. Find the following probability as a percent rounded to the nearest tenth.

P(I go to Las Vegas or I get sunburned) =

these two CAN happen at the same time so you must subtract P(A and B)

$$\frac{7}{9} + \frac{3}{5} - \frac{7}{9} \cdot \frac{3}{5}$$

$$= 91.1\%$$

You can now finish Hwk #31. Sec 9-7

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Problems 1-4, 9-12, 20, 22, 36, 39, 48-50