Tuesday, June 2, 2020

Probability of Multiple Events: P(A or B)

Yesterday we worked on P(A and B)

AND: In probability AND will mean to MULTIPLY

P(A and B) =
- If events are Independent = P(A) • P(B)
- If events are Dependent = P(A) • P(B after A)

Mutually Exclusive Events:

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

Can these two events happen at the same time?

1. Studying for a test and listening to music.

   YES - so they are NOT mutually exclusive.

2. Reading a book and sleeping.

   NO - so they are ARE mutually exclusive.

Is each pair of events mutually exclusive?

1. Getting an even number or a 5 when you roll a die.

YES - these two CAN'T happen at the same time

2. Getting a multiple of 3 or an even number when you roll a die.

NO - these two CAN happen at the same time. EX: the number 6

3. Getting a prime number or an even number when rolling a die.

NO - these two CAN happen at the same time. EX: the number 2

4. Rolling a 2 or a 3 on a die.

YES - these two CAN'T happen at the same time. No single roll of a die will lead to both a 2 & a 3.

If two events ARE mutually exclusive - meaning they CAN'T happen at the same time then:

$P(A \text{ and } B) = 0$

If two events are NOT mutually exclusive - meaning they CAN happen at the same time then:

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

Finding P(A or B):

If A and B ARE mutually exclusive:

A and B CAN'T happen at the same time (or together).

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

If A and B are NOT mutually exclusive:

A and B CAN happen at the same time (or together).

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

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

Give answers as a percent rounded to the nearest hundredth.

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

P(snows today or car doesn't start) =

1st: Ask yourself, "can these happen at the same time?"

Answer: YES → $P(A \text{ or } B) = P(A) + P(B) - P(A \text{ and } B)$

$P(\text{snows today or car doesn't start}) = \frac{1}{100} + \frac{2}{75} - \frac{1}{100} \bullet \frac{2}{75}$

$= 3.64\%$

2. 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 $\frac{1}{6}$.

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

1st: Ask yourself, "can these happen at the same time?"

Answer: NO → P(A or B)= P(A) + P(B)

Find P(score > 10 points or score 0 points)= $\frac{3}{8} + \frac{1}{6}$

$= 54.17\%$

3. The probability that a certain student cheats on a test is $\frac{4}{9}$ and the probability that the same student fails the test is $\frac{6}{13}$.

Find the probability that on the next test this student cheats or they fail.

P(cheat or fail) =

1st: Ask yourself, "can these happen at the same time?"

Answer: YES → P(A or B)= P(A) + P(B) - P(A and B)

P(cheat or fail) = $\frac{4}{9} + \frac{6}{13} - \frac{4}{9} \cdot \frac{6}{13} = 70.09\%$

You can now do problems 4-6 of Practice #30.

We'll continue this material tomorrow.

Practice #30 will be due on Sunday, June 7 by 10:00 pm