Probability

Independent and Dependent Events

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Independent Events

A **occurring does NOT affect the probability of** ***B*** **occurring.**

"*AND*" means to MULTIPLY!

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Independent Event FORMULA

P(A and B) = P(A) • P(B)

also known as

P(A ∩ B) = P(A) ● P(B)

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Example 1

A coin is tossed and a 6-sided die is rolled. Find the probability of landing on the head side of the coin and rolling a 3 on the die. P(Head and 3)

P(A ∩ B) = P(A) ● P(B)

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

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Example 2

A card is chosen at random from a deck of 52 cards. It is then replaced and a second card is chosen. What is the probability of choosing a jack and an eight?

P(Jack and 8)

$$P(A \cap B) = P(A) \bullet P(B)$$

$$\frac{4}{52} \bullet \frac{4}{52} = \frac{1}{169}$$

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Example 3

A jar contains 3 red, 5 green, 2 blue and 6 yellow marbles. A marble is chosen at random from the jar. After replacing it, a second marble is chosen. What is the probability of choosing a green and a yellow marble?

P(Green and Yellow)

$$P(A \cap B) = P(A) \bullet P(B)$$

$$\frac{5}{16} \bullet \frac{6}{16} = \frac{15}{128}$$

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Example 4

A school survey found that 9 out of 10 students like pizza. If three students are chosen at random with replacement, what is the probability that all three students like pizza? P(Like and Like and Like)

$$\frac{9}{10} \bullet \frac{9}{10} \bullet \frac{9}{10} = \frac{729}{1000}$$

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Dependent Events

A occurring AFFECTS the probability of B occurring

Usually you will see the words *"without replacing"*

"*AND*" still means to MULTIPLY!

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Dependent Event Formula

P(A and B) = P(A) • P(B given A)

also known as

$$P(A \cap B) = P(A) \bullet P(B \mid A)$$

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Example 5

A jar contains 3 red, 5 green, 2 blue and 6 yellow marbles. A marble is chosen at random from the jar. A second marble is chosen without replacing the first one. What is the probability of choosing a green and a yellow marble?

P(Green and Yellow)

$$P(A \cap B) = P(A) \bullet P(B \mid A)$$

$$\frac{5}{16} \bullet \frac{6}{15} = \frac{1}{8}$$

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Example 6

An aquarium contains 6 male goldfish and 4 female goldfish. You randomly select a fish from the tank, do not replace it, and then randomly select a second fish. What is the probability that both fish are male? P(Male and Male)

$$P(A \cap B) = P(A) \bullet P(B \mid A)$$

$$\frac{6}{10} \bullet \frac{5}{9} = \frac{1}{3}$$

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Example 7

A random sample of parts coming off a machine is done by an inspector. He found that 5 out of 100 parts are bad on average. If he were to do a new sample, what is the probability that he picks a bad part and then, picks another bad part if he doesn't replace the first? P(Bad and Bad)

$$P(A \cap B) = P(A) \bullet P(B \mid A)$$

$$\frac{5}{100} \bullet \frac{4}{99} = \frac{1}{495}$$

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