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afminddepnotes

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AFM
September 7, 2011

WARM-UP

A bag contains 7 pennies, 4 nickels, and 5 dimes. Three coins are selected at random. Find the probability of each selection using only combinations:

a) All 3 pennies example: $\frac{{}_7C_3}{{}_{16}C_3} = \frac{1}{16}$

b) All 3 nickels

c) All 3 dimes

d) 2 pennies, 1 dimes

e) 1 penny, 1 nickel, 1 dime

f) 1 dime, 2 nickels

Review of Odds

Sharon has 8 mystery books and 9 science fiction books.

a) What is the probability Sharon will choose 4 mystery books?

total = 17 books

$\frac{{}_8C_4}{{}_{17}C_4} = \frac{70}{2380} = \frac{1}{34}$

b) What are the odds Sharon will choose 4 mystery books?

$\frac{1}{33}$

c) What is the probability Sharon will choose 2 mysteries and 2 sci-fi?

$\frac{{}_8C_2 \cdot {}_9C_2}{{}_{17}C_4} = \frac{28 \cdot 36}{2380} = \frac{1008}{2380} = \frac{36}{85}$

d) What are the odds Sharon will choose 2 mysteries and 2 sci-fi?

$\frac{36}{49}$

INDEPENDENT EVENTS

If 2 events, A and B, are independent, then the probability of both events occurring is the product of each individual probability.

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

Events with replacement are independent.

DEPENDENT EVENTS

If 2 events, A and B, are dependent, then the probability of both events occurring is found as follows:

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

Events without replacement are dependent.

Example 1: A red, green, and yellow die are tossed. What is the probability that..

a) All three dice show 4?

$$\frac{1}{6} \cdot \frac{1}{6} \cdot \frac{1}{6} = \frac{1}{216}$$

b) None of the three dice shows a 4?

$$\frac{5}{6} \cdot \frac{5}{6} \cdot \frac{5}{6} = \frac{125}{216}$$

c) Red die shows an even, other two show different odds?

$$\frac{3}{6} \cdot \frac{3}{6} \cdot \frac{2}{6} = \frac{1}{12}$$

d) All three show the same number?

$$\frac{6}{6} \cdot \frac{1}{6} \cdot \frac{1}{6} = \frac{6}{216} = \frac{1}{36}$$

Example 2: From a standard deck of 52 cards, 2 are selected. Find the probability that...

a) 2 black cards are selected without replacement?

$$\frac{26}{52} \cdot \frac{25}{51} = \frac{25}{102}$$

b) 2 black cards with replacement?

$$\frac{26}{52} \cdot \frac{26}{52} = \frac{1}{4}$$

c) 1 red, 1 spade, in that order, without replacement?

$$\frac{{}_{26}P_1 \cdot {}_{13}P_1}{{}_{52}P_2} = \frac{338}{2652} = \frac{13}{102}$$

d) 1 red, 1 spade, in any order, without replacement?

$$\frac{{}_{26}C_1 \cdot {}_{13}C_1}{{}_{52}C_2} = \frac{338}{1326} = \frac{13}{51}$$

Example 3: There are 3 nickels, 2 dimes, and 5 quarters in a jar. Three coins are selected in succession at random. Find the probability of choosing 1 nickel, 1 dime, and 1 quarter…

a) In that order with replacement?

$$\frac{3}{10} \cdot \frac{2}{10} \cdot \frac{5}{10} = \frac{30}{1000} = \frac{3}{100}$$

b) In that order without replacement?

$$\frac{{}_3P_1 \cdot {}_2P_1 \cdot {}_5P_1}{{}_{10}P_3} = \frac{30}{720} = \frac{1}{24}$$

c) In any order without replacement?

$$\frac{{}_3C_1 \cdot {}_2C_1 \cdot {}_5C_1}{{}_{10}C_3} = \frac{30}{120} = \frac{1}{4}$$