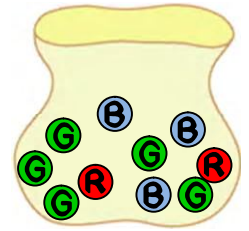


DEPENDENT PROBABILITIES



2. Consider an opaque bag with 5 green marbles, 3 blue marbles, and 2 red marbles.
- a. If two marbles are drawn without replacement what is the probability that they are both green?

PROBABILITY THAT THE FIRST MARBLE IS GREEN
 ↓
 $\left(\frac{5}{10}\right)$

THIS IS THE PROBABILITY THAT THE SECOND MARBLE IS GREEN ASSUMING A GREEN MARBLE WAS REMOVED AFTER THE FIRST DRAW
 ↓
 $\left(\frac{4}{9}\right)$

Decimal: $0.22\bar{2}$

- b. If two marbles are drawn without replacement what is the probability that the first draw is a red marble and the second draw is a blue marble?

PROBABILITY THAT THE FIRST MARBLE IS RED
 ↓
 $\left(\frac{2}{10}\right)$

PROBABILITY THAT THE SECOND MARBLE IS BLUE AFTER REMOVING A RED MARBLE ON THE FIRST DRAW
 ↓
 $\left(\frac{3}{9}\right)$

Decimal: $.0\bar{6}$

- c. ***If two marbles are drawn without replacement what is the probability that the both marbles are the same color?

$P(\text{BOTH MARBLES ARE THE SAME COLOR}) = \underbrace{\left(\frac{5}{10}\right)\left(\frac{4}{9}\right)}_{P(2 \text{ GREEN})} + \underbrace{\left(\frac{3}{10}\right)\left(\frac{2}{9}\right)}_{P(2 \text{ BLUES})} + \underbrace{\left(\frac{2}{10}\right)\left(\frac{1}{9}\right)}_{P(2 \text{ REDS})} = \frac{(5/10)(4/9) + (3/10)(2/9) + (2/10)(1/9)}{1} = .3111111111$

Decimal: $0.3\bar{1}$

3. Consider that 3 consecutive cards are drawn without replacement from a shuffled deck of cards (Dependent probability)

- A. What is the probability that the first two cards drawn are face cards?

$\left(\frac{12}{52}\right)\left(\frac{11}{51}\right) = \frac{(12/52)(11/51)}{.0497737557}$

Decimal: $0.049\bar{8}$

- B. What is the probability that the all three cards are hearts?

$\left(\frac{13}{52}\right)\left(\frac{12}{51}\right)\left(\frac{11}{50}\right) = \frac{(13/52)(12/51)(11/50)}{.0129411765}$

Decimal: $0.012\bar{9}$

- C. What is the probability that all three cards are a King?

$\left(\frac{4}{52}\right)\left(\frac{3}{51}\right)\left(\frac{2}{50}\right) = \frac{(4/52)(3/51)(2/50)}{1.809954751E-4}$

$\approx 1.809 \times 10^{-4}$

Decimal: $\approx .0002$

- D. What is the probability that all three cards are the same (BONUS)?

$P(\text{ALL THREE CARDS ARE THE SAME VALUE}) = P(\text{ALL KINGS}) + P(\text{ALL QUEENS}) + \dots + P(\text{ALL ACES})$

$= \left(\frac{4}{52}\right)\left(\frac{3}{51}\right)\left(\frac{2}{50}\right) + \left(\frac{4}{52}\right)\left(\frac{3}{51}\right)\left(\frac{2}{50}\right) + \dots + \left(\frac{4}{52}\right)\left(\frac{3}{51}\right)\left(\frac{2}{50}\right)$

$= 13 \cdot \left(\frac{4}{52}\right)\left(\frac{3}{51}\right)\left(\frac{2}{50}\right)$

Decimal: $\approx .0024$

