

Worksheet 10

CS 2210 Discrete Structures

Due 4/9 9pm. Late submissions get grade 0.

* Teams of 3-4 students (must work in group). Follow direction given during discussion.

** This page is double sided. Make sure to do both sides. Show your work.

Name 1: Colin Bliss Name 2: Colin Cano

Name 3: Hongwei Zhao Name 4: _____

Question 1: What is the probability that Bo, Colleen, Jeff, and Rohini win the first, second, third, and fourth prizes, respectively, in a drawing if 50 people enter a contest and

a. no one can win more than one prize.

$P(50, 4)$ - choose order of them out of 50 people

$$\frac{1}{P(50, 4)} \text{ - one combination over the total possible}$$

b. winning more than one prize is allowed.

$\underline{50} \underline{50} \underline{50} \underline{50}$ - total possible

$$\frac{1}{50^4} \text{ - one outcome out of total possible}$$

Question 2: In an urn are 5 blue, 3 red, and 2 yellow marbles. If you draw 3 marbles one at a time, what is the probability to get one of each color?

a. draw without replacement

6 possible combinations for 3 at a time 10 total marbles

$$P(B \text{ first}) = \frac{5}{10}$$

$$\frac{5}{10} \cdot \frac{3}{9} \cdot \frac{2}{8} = \frac{30}{720} = \frac{1}{24} \cdot 6 \text{ combinations} = \frac{1}{4}$$

$$P(R \text{ second}) = \frac{3}{9}$$

$$P(Y \text{ last}) = \frac{2}{8}$$

b. draw with replacement

$$P(B) = \frac{5}{10}, P(R) = \frac{3}{10}, P(Y) = \frac{2}{10}$$

$$\frac{5}{10} \cdot \frac{3}{10} \cdot \frac{2}{10} = \frac{30}{1000} = \frac{3}{100} \cdot 6 \text{ combinations} = \frac{18}{100} = \frac{9}{50}$$

Question 3: In a super lottery, a player selects 7 numbers out of the first 80 positive integers. What is the probability that a person wins the grand prize by picking 7 numbers that are among the 11 numbers selected at random by a computer?

$$\binom{73}{4} - 4 \text{ extra numbers,}$$

$$\binom{80}{11} - \text{possible numbers chosen by computer}$$

$$\frac{\binom{73}{4}}{\binom{80}{11}}$$

Question 4: Given a standard deck of 52 cards.

a. What is the probability that a card selected at random is an ace or a heart?

$$\frac{4}{52} : \text{chance of ace} \quad \frac{13}{52} : \text{chance of heart}$$

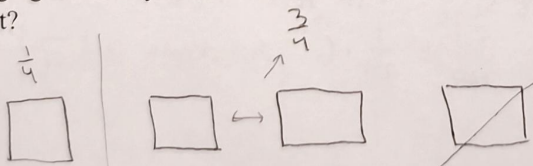
$$\frac{4}{52} + \frac{13}{52} = \frac{17}{52}$$

b. What is the probability that a five-card poker hand contains a flush, that is, five cards of the same suit?

$$\binom{13}{5} \text{ 5 cards of same suit, } \times 4 \text{ four suits, } \binom{52}{5} \text{ possible hands}$$

$$4 \cdot \binom{13}{5} \div \binom{52}{5}$$

Question 5: Watch a video: <https://www.youtube.com/watch?v=4Lb-6rxZxx0> Suppose that instead of three doors, there are four doors in the Monty Hall puzzle. What is the probability that you win by not changing once the host, who knows what is behind each door, opens a losing door and gives you the chance to change doors? What is the probability that you win by changing the door you select to one of the two remaining doors among the three that you did not select?



$$\frac{3}{4} \cdot \frac{1}{2} = \frac{3}{8}$$