

Probability

Activity 2a - Probability

1. A jar contains 15 ping pong balls, 3 are red, 5 are blue, 7 are green. The red balls are numbered 1, 2, 3 to tell them apart. The blue balls are numbered 4, 5, 6, 7, 8. The green balls are numbered 9, 10, 11, 12, 13, 14, 15.
 - (a) Draw one ball. What is the probability that the ball is red?
 - (b) Draw one ball. What is the probability that it is either red OR blue? Do this problem in a second way.
 - (c) Draw two balls. Pick one ball first, then another ball second (without replacing the first ball). In other words, you can't get the same number twice. What is the probability that both balls are blue? Do this problem 3 ways, first by counting combinations, then by using the probability that the first ball is blue AND the second ball is blue, then by counting the possibilities if the order matters.
 - (d) Draw two balls. Pick one ball first, then another ball second (without replacing the first ball). What is the probability that the first is blue AND the second is red? What is the probability that one ball is red and the other blue? Do this problem using the word 'OR', also do this problem by some counting technique.
 - (e) Draw two balls without replacement. What is the probability that at least one ball is green? Do this in as many ways as possible.
 - (f) Draw four balls without replacement. What is the probability that you get two red, one blue, one green?
2. You roll five six-sided dice, that are five different colors, (blue, red, black, yellow, green) so you can tell them apart. Each dice roll will be listed A-B-C-D-E in that color order, so that, for example, 1-3-4-2-6 means the blue die is 1, red = 3, black = 4, yellow = 2, green = 6. Rolling 3-1-6-4-2 would be a different outcome. (Some terminology in this problem comes from the game of *Yahtzee*)
 - (a) How many total outcomes are possible?
 - (b) What is the probability of rolling 5-5-5-5-5?
 - (c) What is the probability of getting the numbers 2, 3, 4, 5, 6 in some order?
 - (d) What is the probability of getting a large straight (a large straight is five numbers in sequence, so either the numbers 1 through 5 OR the numbers 2 through 6?)
 - (e) What is the probability of rolling 6 on three of the dice (and something other than 6 on the other two).
 - (f) What is the probability of getting a full house? (A full house is three of one value and two of another)

MATH 5651 - Day 4 Problems

1. Biathlon is a sport which combines cross-country skiing and rifle shooting. At various intervals, you get five shots to hit five targets. For each shot you miss, you ski a penalty lap, which takes 35 seconds.

When entering the biathlon range, you have two shooting strategies.

- 1) Shoot fast, 10 second per shot, each shot is $Ber(.85)$.
- 2) Shoot controlled, 12 seconds per shot, each shot is $Ber(.9)$

Example: You choose to shoot fast, which takes 50 seconds. You make three of five shots so you need to ski two penalty laps, which takes 70 seconds, so your total time on the range is 120 seconds.

Which strategy has the lower expected value?

2. In order to play a game of basketball, 10 children at a playground divide into two teams of five players each. How many different games are possible?
3. (a) A produce stand has two kinds of fruit, A and B . You wish to buy 12 pieces of fruit and may buy more than 1 of each. For example, you may buy 4A and 8B. How many selections can you make?
(b) A produce stand has two kinds of fruit, A and B . You wish to buy k pieces of fruit and may buy more than 1 of each. How many selections can you make?
(c) A produce stand has three kinds of fruit, A, B , and C . You wish to buy 2 pieces of fruit and may buy more than 1 of each. For example, you may buy AA. How many selections can you make?
(d) A produce stand has three kinds of fruit, A, B , and C . You wish to buy 3 pieces of fruit and may buy more than 1 of each. How many selections can you make?
(e) A produce stand has three kinds of fruit, A, B , and C . You wish to buy 4 pieces of fruit and may buy more than 1 of each. How many selections can you make?
(f) A produce stand has three kinds of fruit, A, B , and C . You wish to buy k pieces of fruit and may buy more than 1 of each. How many selections can you make?
(g) A produce stand has n kinds of fruit. You wish to buy k pieces of fruit and may buy more than 1 of each. How many selections can you make?

MATH 5651 - Day 6 Problems

1. (a) A jar contains 6 red and 2 blue ping pong balls. Balls are drawn one at a time. Let X be the number of the draw when the first blue ball is drawn. Find the distribution of X .
(b) Let Y be the number of the draw when the second blue ball is drawn. Find the distribution of Y .
(c) Explain why the distribution of X and the distribution of Y are the same probabilities in a different order
2. My sock drawer has four distinct pair of socks. Let X be the number of socks drawn until I have a matching pair. Find the distribution of X and find $E(X)$.