Counting Worksheet 1 (order matters)

1. Consider lists with symbols from the list $\{S, B, U, C, \heartsuit, I\}$

   (a) How many lists of length 6 are there, assuming repetition is allowed?

   (b) How many lists of length 6 are there, assuming repetition is not allowed?

   (c) How many lists of length 4 are there, assuming repetition is allowed?

   (d) How many lists of length 4 are there, assuming repetition is not allowed?

   (e) How many lists of length 7 are there, assuming repetition is not allowed?

2. In this year's Preakness Stakes horserace, 11 horses ran. How many ways could we have seen 1st, 2nd and 3rd place finishers?

3. Calculate $\frac{101!}{98!}$ (no calculators allowed).

4. How many ways are there to write a list of length r, choosing from a set of n elements, not allowing repetition?

5. How many ways are there to write a list of length r, choosing from a set of n elements, allowing repetition?

6. In this problem we will make lists of letters from the English alphabet (26 letters, 5 of which are vowels).
   (a) How many ways are there to list the entire alphabet?

   (b) How many ways are there to list the entire alphabet if the vowels must all come at the end?

7. A combination lock has 4 wheels, containing the letters $\{a, b, c, d, e, f\}$.
   (a) How many codes are there?

   (b) How many codes are there that have no duplicate?

   (c) How many codes are there that have no two consecutive letters repeated?

8. Take a standard card deck (number cards 2, 3, 4, 5, 6, 7, 8, 9, 10, face cards J, Q, K, A, each of those 13 options showing up in each of the four suits $\heartsuit, \spadesuit, \clubsuit, \diamondsuit$, for a total of 52 cards). Shuffle the deck and deal 5 cards, laying them down in order. Call this a "hand"

   (a) How many different hands are there?

   (b) How many of those hands have all the same suit?

   (c) How many contain 4-of-a-kind?

9. Take a standard deck, but this time draw a random card and write down what you draw. Return the card, shuffle again, and draw again, etc., until you have a list of 5 cards.

   (a) How many possible outcomes are there?

   (b) How many outcomes are there for which the 1st and 2nd card is an Ace?

(c) How many outcomes are there for which the 1st card is an Ace or the 2nd card is an Ace?

(d) How many outcomes are there that include a 4-of-a-kind?

10. Consider 7-digit phone numbers.

(a) How many possibilities are there?

(b) How many possibilities are there that have at least one repeated digit?

(c) How many possibilities are there that have at least one repeated digit, and don't start with a 0 or a 1?