4.7 Worksheet – Permutations, Combinations, and Probability
COUNTING EXERCISES **Name:** _____

1) Calculator Exercises. Compute the following. To check, answers are provided.
   a) $7! = 5040$ b) ${}_3P_3 = 6$ c) ${}_{48}C_3 = 17{,}296$

2) Determine which method to use to solve, and solve.
   a) In how many ways can 5 different cars be parked in a row in a parking lot?

   120

   b) In how many different ways can 4 horses be lined up for a race?

   24

   c) Suppose 40 cars start at the Indianapolis 500. In how many ways can the top three cars finish the race?

   59280

   d) **Michigan Lotto**. The state of Michigan runs a 6-out-of-44-number lotto twice a week that pays at least $1.5 million. You purchase a card for $1 and pick any 6 numbers from 1 to 44. If your 6 numbers match those that the state draws, you win.
      i) How many possible 6-number combinations are there for drawing?

      7,059,052

      ii) What is the probability of winning the lotto?

      0.000 000 14

      iii) Suppose it takes 10 minutes to pick your numbers and buy a ticket. How many tickets can you buy in 4 days.

      576

      iv) How many people would you have to hire to buy all the tickets and ensure that you win?

      12,256

   e) **Full House**. Suppose you are dealt 5 cards from a standard 52-card deck. Determine the probability of being dealt a full house (3 of one, 2 of another) by answering the following:
      i) How many ways can 5 cards be selected from a 52-card deck?

      2,598,960

      ii) Each deck contains 4 two's, 4 three's, and so on. How many ways can three of the same card be selected from the deck?

      52

      iii) The remaining 2 cards must be different from the 3 chosen. For example, if we drew three kings, the 4th card cannot be a king. After selecting three of a kind, there are 12 of the same rank of card remaining in the deck that can be chosen. For example, if we have three aces, then we can choose two's, three's and so on. Of the 12 ranks remaining, we choose 1 of them and there are 4 cards in each rank. How many ways can we select the remaining 2 cards?

      72

      iv) Use the Multiplication Rule to compute the probability of obtaining a full house. That is, what is the probability of selecting three of a kind and two cards that are alike?

      0.001 44