CHAMP Activity — March 23, 2015

Horse Racing

1. **Race between eleven horses:** We will learn about probability by playing a horse racing game with dice. Get into groups of two to three people.

   Place your bets: Each person bets on two horses. No two people can bet on the same horse.

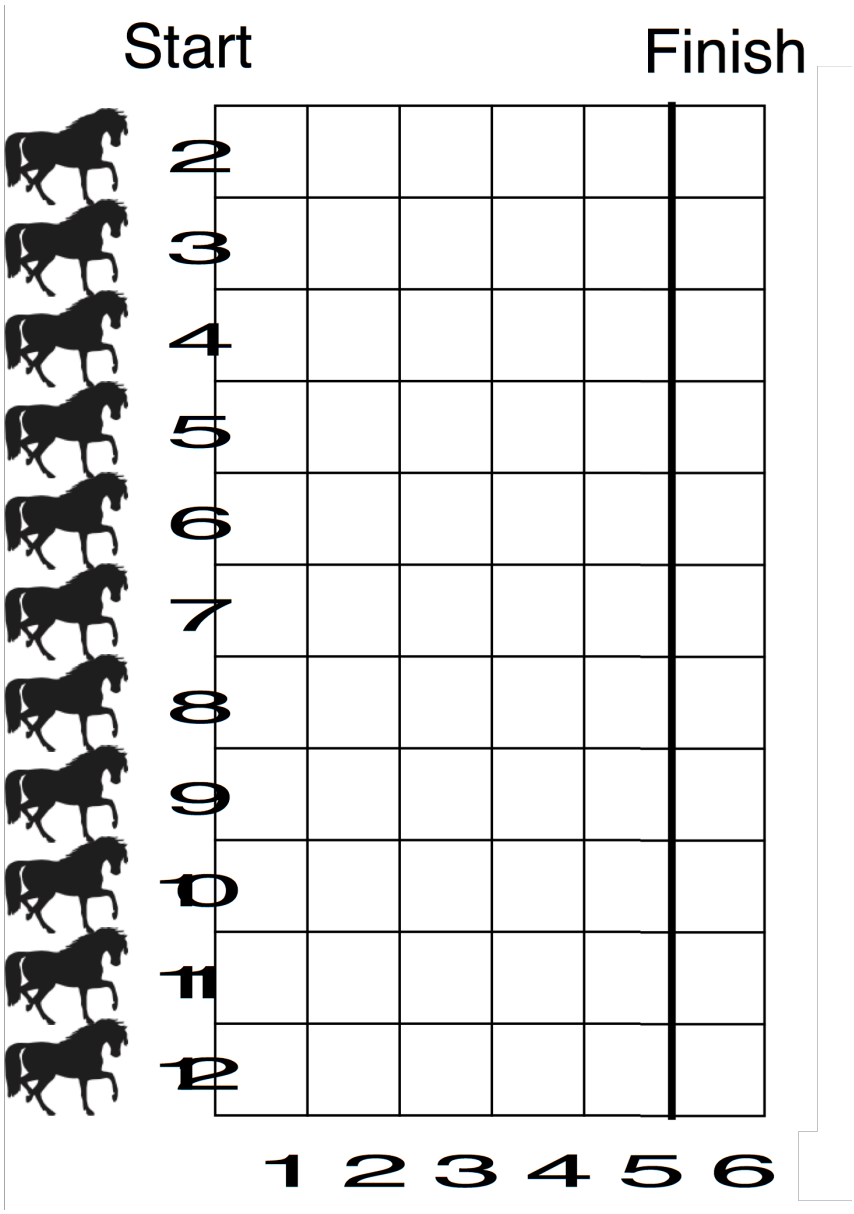
   Set the marks: Place a penny in the 1-slot of each of the horses 2-12.

   Start the race: Roll both dice, add the numbers, and move that horse forward one space. For example, if you roll a 2 and a 6, add $2 + 6 = 8$, and move horse 8 forward.

   Keep rolling: Each turn, roll and add the dice. Move that horse forward one space.

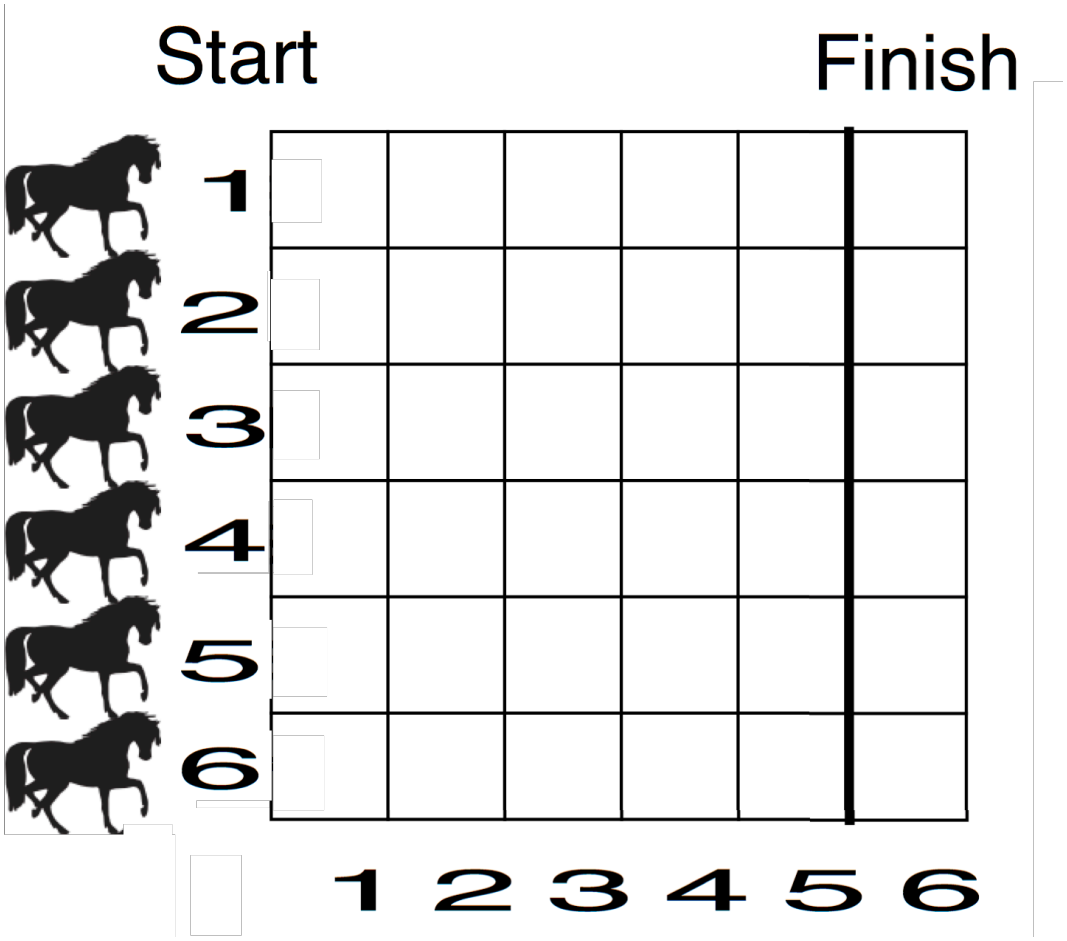
   Finish: Repeat this until a horse crosses the finish line. That player wins!

   Report your findings: Record which horse wins each time to the right of the game board, with a tick mark. Once you have played many games, tell me how many times each horse won.



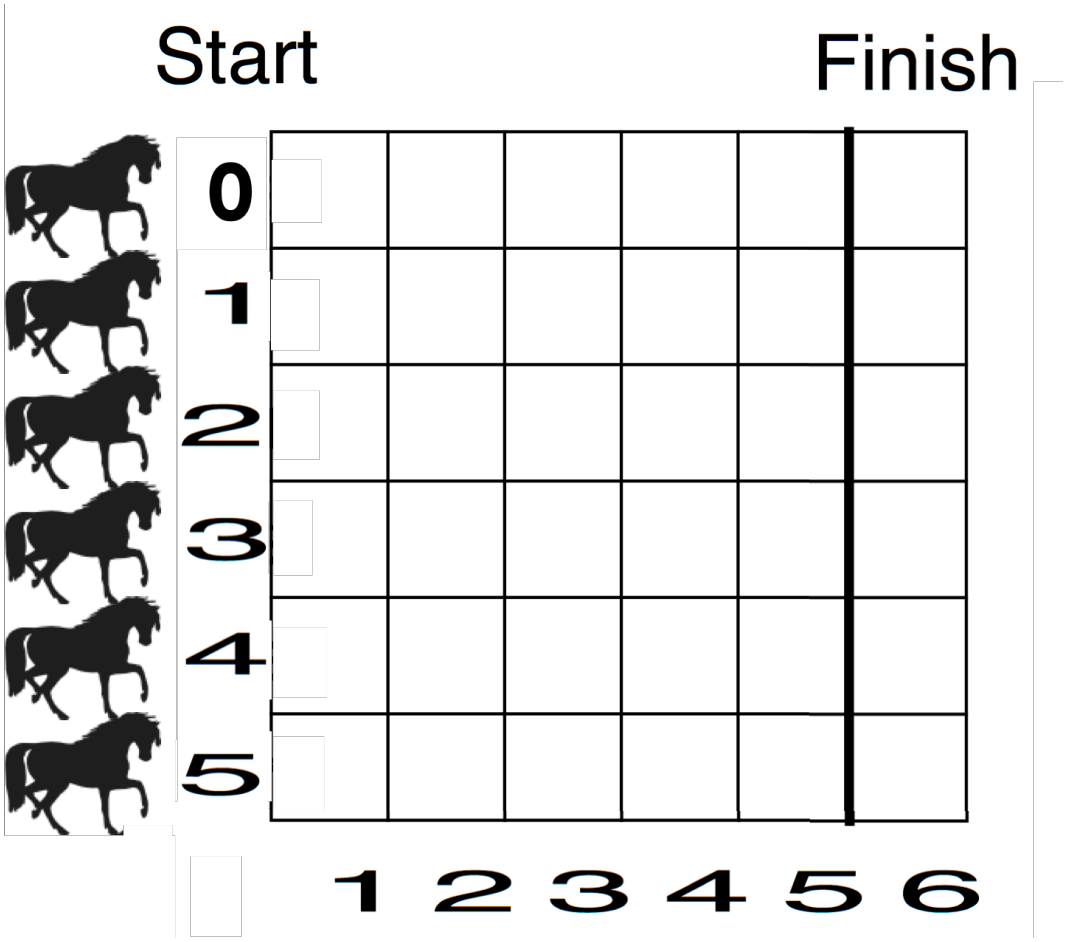
2. What horses win most often? Why? Can you mathematically derive a formula for determining the horse that wins most often?

3. **Six horse race (maximum):** In this version of the game, each time you roll the dice choose the maximum number of the two dice. For example, if you roll 1 and 3, the maximal number is 3, so move horse 3 forward. Otherwise, play the game in a similar way. Record which horse wins each time and tell me your data after you have played many games.



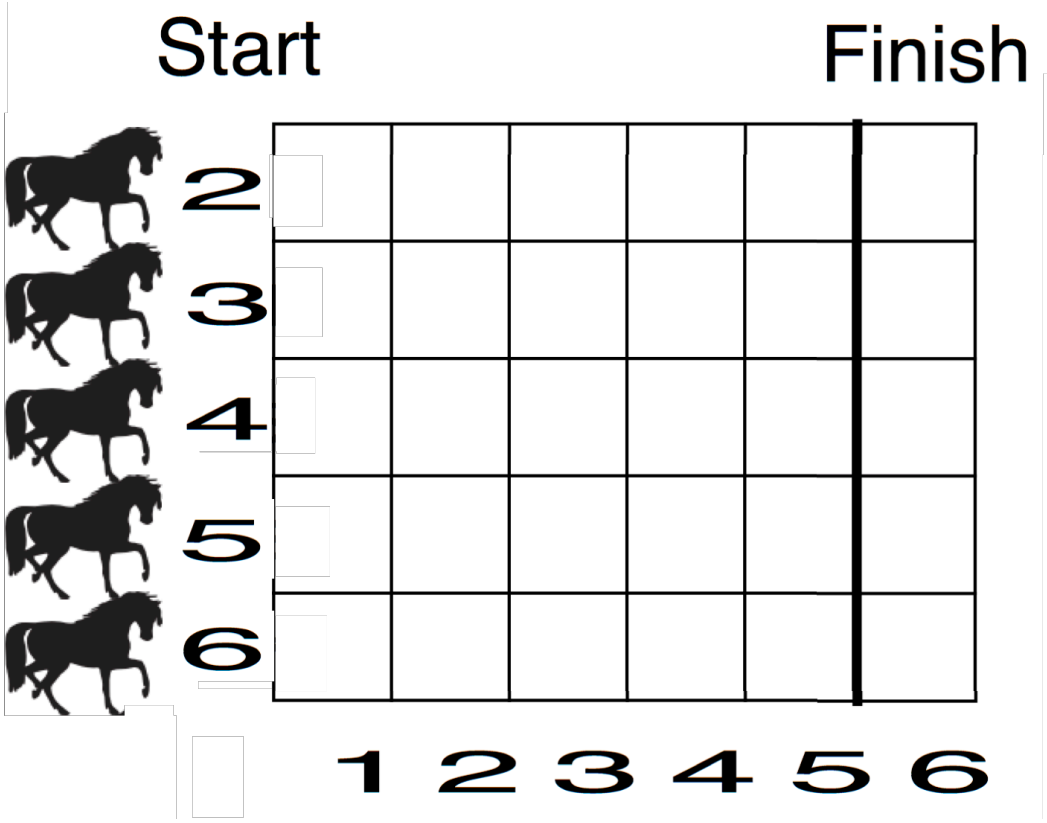
4. Can you determine the horses that will tend to win most often and why?

5. **Six horse race (difference):** Now, each time you roll the dice calculate the difference between the two dice. For example, if you roll 1 and 4, then $4 - 1 = 3$, so move horse 3 forward. Collect data and report it again.



6. What horses win least often? Why is this?

7. **Five horse race (factors):** Now, each time you roll the dice calculate the sum the two dice and determine that numbers that are factors of the sum. For example, if you roll 4 and 6, then $4+6=10$, the factors are 2 and 5, so move horses 2 and 5 forward. Collect data and report it again.



8. What horse should win most often?