A Horse Race Probability

Name ______________________________

Period _____ Date ________________

12 horses are about to "race." But in this race, the winner will not be decided by who crosses the finish line first. Instead, you will roll two die, and the sum of the rolls will determine the winner. For example, if you roll a 1 and a 4, then horse 5 is the winner.

1. Choose a horse (1-12) to bet on. Write your choice below.

Working with a partner, roll two die to determine the winner of the race.

2. Which horse won? Place a dot ● above that horse's number on the dot plot below.

1 2 3 4 5 6 7 8 9 10 11 12

3. Repeat this process *at least* 20 times, placing a dot on the dot plot to record the winner.
Remember, if there's already a dot there, just "stack" the new dot on top.
For example, if horse 9 wins twice, place two dots above 9, like this:

●
●
9

4. You selected a horse at the beginning of this task.

a. How many times did your horse win?

b. What is the *experimental* probability that your horse would win?

$$\frac{\text{\# of times my horse won in the experiment}}{\text{total \# of races in the experiment}} =$$

5. Calculate the *experimental* probabilities of each horse winning. Write your answers as fractions *and* as decimals rounded to two decimal places.

	horse #	1	2	3	4	5	6	7	8	9	10	11	12
exp. prob.	fraction												
	decimal												

6. Based on the experimental probabilities…

a. Which horse(s) was/were the *most* likely to win?

b. Which horse(s) was/were the *least* likely to win?

Now let's calculate the *theoretical* probabilities. These are *not* based on your experiment, but on the mathematical principles we've been studying.

7. One of the horses can *never* win. Which horse is it, and why can he never win?

8. Remember, you rolled two dice to determine the winner.

a. How many possible outcomes are there for the first die?

b. How many possible outcomes are there for the second die?

c. Based on parts **a** and **b**, how many possible outcomes are there for the event "roll the first die and then roll the second die"?

9. Let's calculate the theoretical probability that horse 4 will win.

a. There are three ways for horse 4 to win. List them below:

- Roll a _____ on the first die and a _____ on the second die
- Roll a _____ on the first die and a _____ on the second die
- Roll a _____ on the first die and a _____ on the second die

b. So what is the theoretical probability horse 4 will win? (Refer to **#8c** and **#9a**.)

$$\frac{\text{\# of ways horse 4 can win}}{\text{total \# of possible outcomes}} =$$

10. Calculate the *theoretical* probabilities of each horse winning. Write your answers as fractions *and* as decimals rounded to two decimal places.

	horse #	1	2	3	4	5	6	7	8	9	10	11	12
theo. prob.	fraction												
	decimal												

(Space for scratchwork)

11. What should your probabilities add up to? Make sure that they do (the fractions, not the decimals, because of rounding errors). If they don't add up correctly, fix your answers to **#10**.

12. Based on the theoretical probabilities, which horse should you bet on?

13. In three or four full sentences, describe any similarities or differences you notice between the *experimental* probabilities you found in **#5** and the *theoretical* probabilities you found in **#10**.