College Algebra **Name**_____
Algebra Application Problem - "Roll 'em" **MacMillan**

Questions: 1. When you roll two dice, what is the probability that the sum of the two dice is a two, or a three, or any other number?

2. If the probability P of a certain number x occurring when rolling two six-sided dice can be represented by the function P(x), what is the function P(x), and what does the graph of y=P(x), for this probability function, look like?

1. If you roll two standard six-sided dice and find the sum, what is the range of numbers you expect to get for your result?

Smallest total: _____ Largest total: _____

2. We want to calculate the probability of each possible sum occurring. When rolling two six-sided dice, for every number of the first die, there are 6 different possibilities of the second die. This makes a total of 36 different possible outcomes. Out of these 36 possible outcomes, there are only a certain number of ways that a 2 could come up, or a 3 or a 4, etc. Complete the table below to determine the probability of each occurrence. Write your answer as a fraction in simplest form.

Possible Sums	List ways it could occur	Probability
2	1+1	1/36
3	1+2,2+1	2/36=1/18
4		
5		
6		
7		
8		
9		
10		
11		
12		

3. To check that your numbers above are correct, your <u>fractions</u> in the "Probability" column should add up to 36/36 (or 1). Do they? _____ (If not, find out why not!)

4. We are now ready to start bulding our "probability function". Make a **scatterplot** on your graphing calculator of the "Possible Sums" column (L1) versus the "Probablity" column (L2). Set your window so you get a good picture of the scatterplot. Sketch the graph and state the dimensions of the window used.

Window: Xmin:_____ Xmax: _____

Ymin: _____ Ymax: _____

5. What basic type of function does this look like? _____ We need to find the function that fits the data points where **x** is the "Possible Sum" and **y** is the "Probability". Here's a hint. We see that it is an absolute value function. (I hope that's what you said the type of function it was!)

So, $y = a|x - h| + k$ and we need to find values for **a**, **h**, and **k**.

What is the exact **turning point** of your data? (_____ , _____) If your answer is not a whole number, write it as a fraction, not a decimal.

That tells us **h** is _____ and **k** is _____.

Let's calculate **a** by using algebra. Substitute the values you found for **h** and **k** into the equation $y = a|x - h| + k$, and also substitute one of the ordered pairs from our chart, say (2 , 1/36) in for **x** and **y** respectively. Your only unknown should be **a**, so solve for **a**. Show the work below.

a = _____ From the graph, does it make sense that **a** is negative? Explain. _____

_____

This gives us an equation of the probability function: **P(x) =** _____

6. Graph this equation and, if it doesn't go through the points on the scatterplot, find your mistake!

"Roll 'em" Problem Extension #1: What would happen to the probability function P(x) if two **4-sided** dice were used?

On the paper below, rework the questions of this worksheet assuming the two dice were **4-sided dice** instead of 6-sided dice. Build and show the chart (#2), show the scatterplot (#4) and write the equation of the new probability function (#5).

P(x) = _____

"Roll 'em" Problem Extension #2: What would happen to the probability function if two **n-sided** dice were used? Look for a pattern from your answers to the 6-sided and 4-sided dice. Now our function **P** is a function of two variables, the variable **x** (the number that is occuring on the dice) and **n** (the number of sides on the dice).

In general, if the two dice used had **n-sides** each, the probability function **P(x,n)** would be:

P(x,n) = _____