Expected Value and Standard Deviation of a Dart Game NAME:

Imagine a game where you throw five darts at a dartboard. Let X be the number of bullseyes hit in a single, five-dart game.

Let's find the expected value and standard deviation for this random variable X.

1. What are the possible values of X ? Look again at how we define it above. Is this random variable discrete or continuous?

2. Let's say we played this game 1000 times (throwing a total of 5000 darts.) Complete the table by finding the experimental probabilities. Do *not* round your answers.

X	***Number of games***	***P*(*x*)**
0	190	
1	330	
2	309	
3	135	
4	35	
5	1	
	total = 1000	

$$probability = \frac{number\ of\ successes}{number\ of\ trials}$$

The third row means that we scored exactly 2 bullseyes in 309 of the 1,000 total games.

3. Calculate the expected value of X or μ_X . Do *not* round. Show your work. Include units.

We simply multiply each value of X by its probability, and then add those up.

4. Complete the table and use the formulas to find the variance and then the standard deviation for this random variable. Round the standard deviation to the nearest tenth. Include units.

X	$P(x)$	$x^2 \cdot P(x)$
0		
1		
2		
3		
4		
5		
total = $\sum\left[x^2 \cdot P(x)\right]$ =		
variance = $\sum\left[x^2 \cdot P(x)\right] - \mu_X^2$ =		
standard deviation = $\sqrt{\sum\left[x^2 \cdot P(x)\right] - \mu_X^2}$ =		

Copy the probabilities from the last page.

Do *not* round any intermediate answers.

What was your value of μ_X ? You'll need it in *unrounded* form.

5. Considering this dart game, what meaning can you give to the expected value you found in question 3? Again, keep in mind that X is the number of bullseyes hit in a single, five-dart game.

Over many of these five-dart games, what can we expect?

6. Considering this dart game, what meaning can you give to the standard deviation you found in question 4?

Standard deviation is akin to average distance from mean.