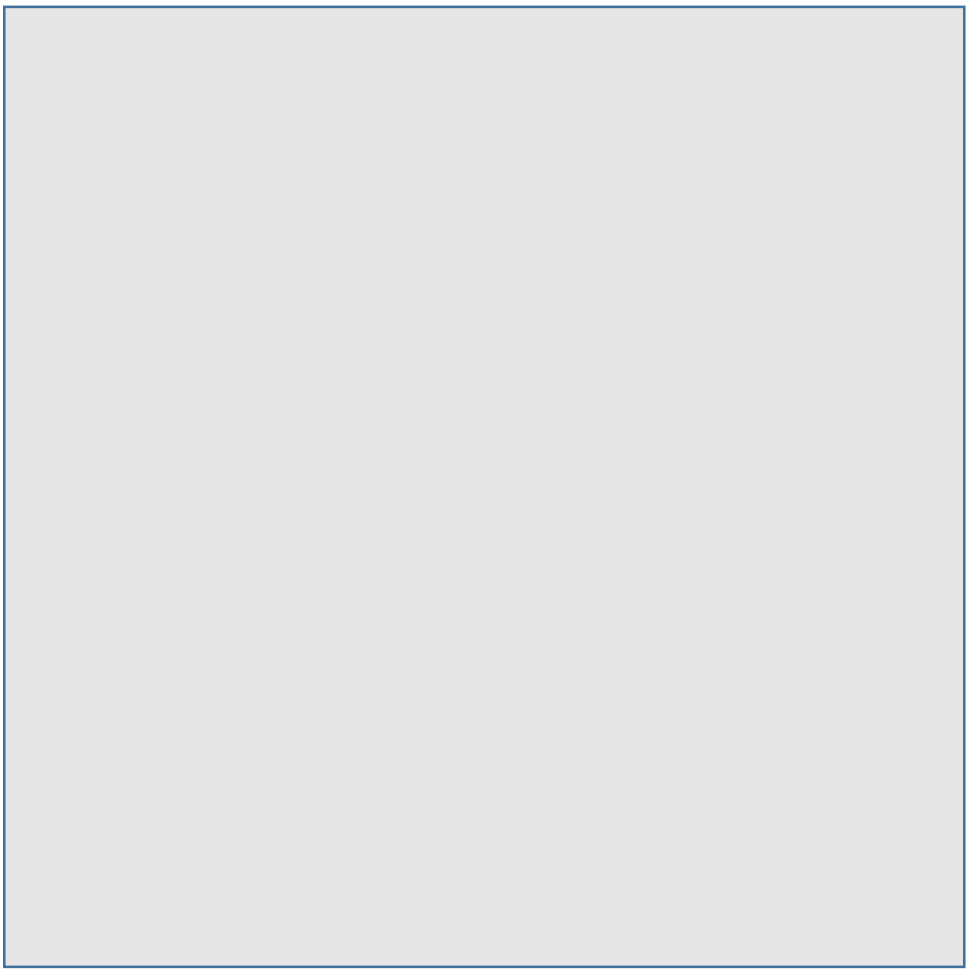
Geometry, Probability, and Computation of π

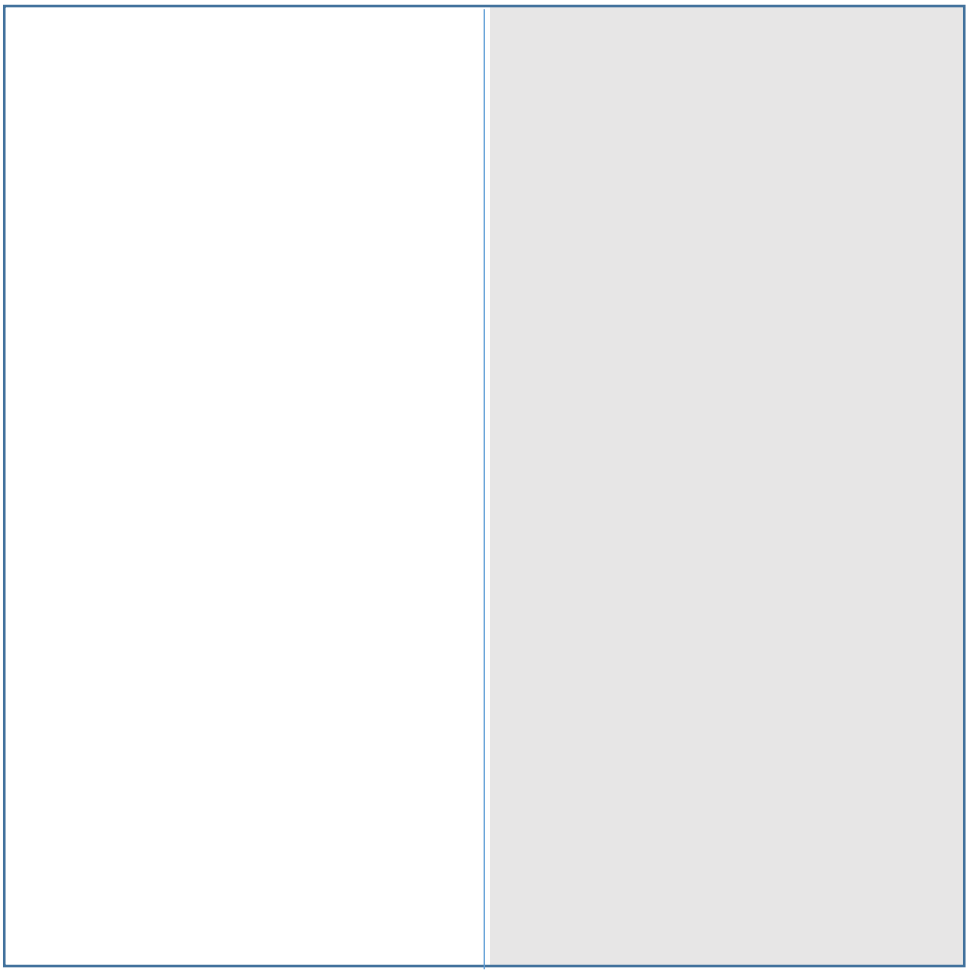
Experiment One



Hits in Shaded Region: _____
Misses of Shaded Region: _____
Total Number of Events: _____

Ratio of Hits to Total: _____

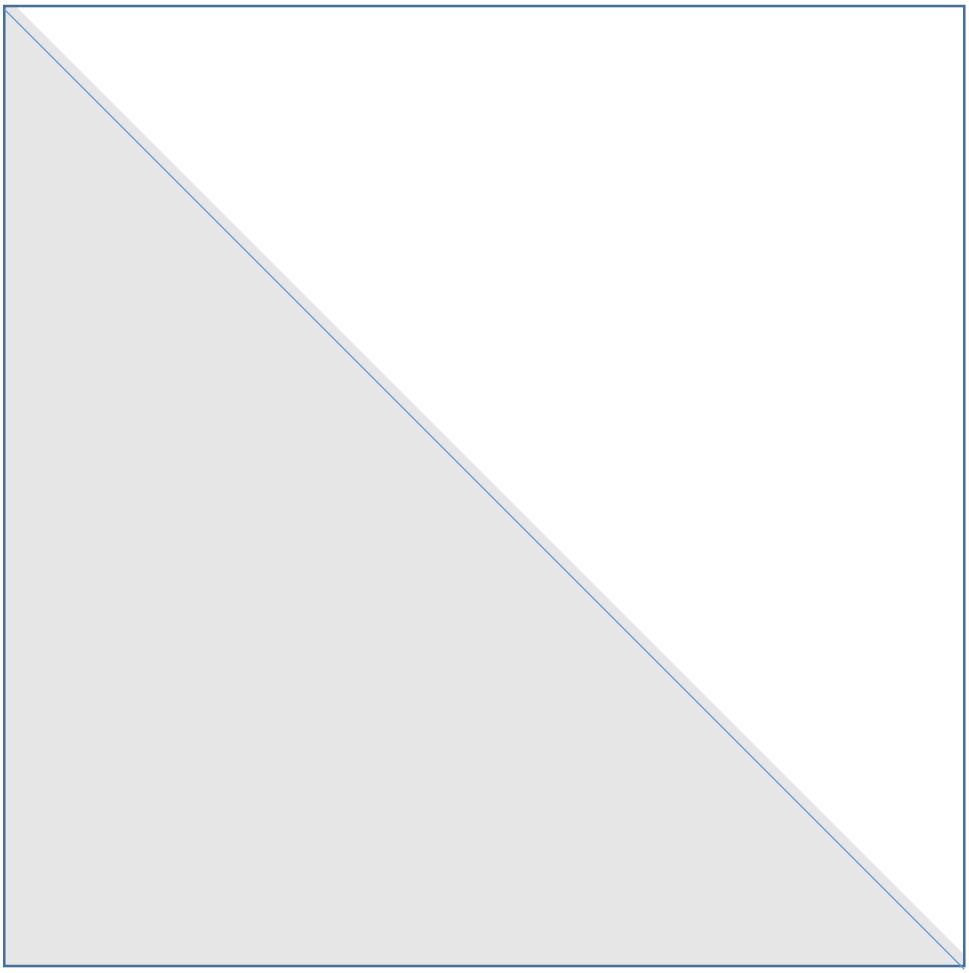
Experiment Two



Hits in Shaded Region: _____
Misses of Shaded Region: _____
Total Number of Events: _____

Ratio of Hits to Total: _____

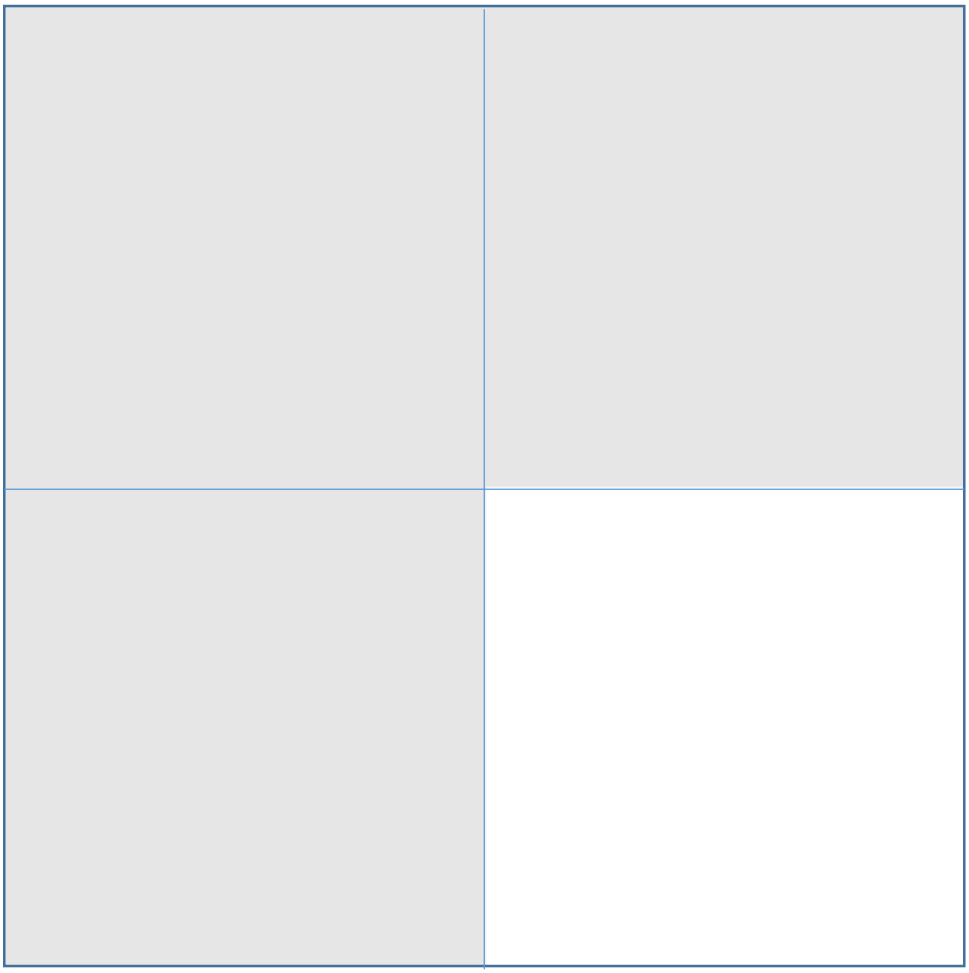
Experiment Three



Hits in Shaded Region: _____
Misses of Shaded Region: _____
Total Number of Events: _____

Ratio of Hits to Total: _____

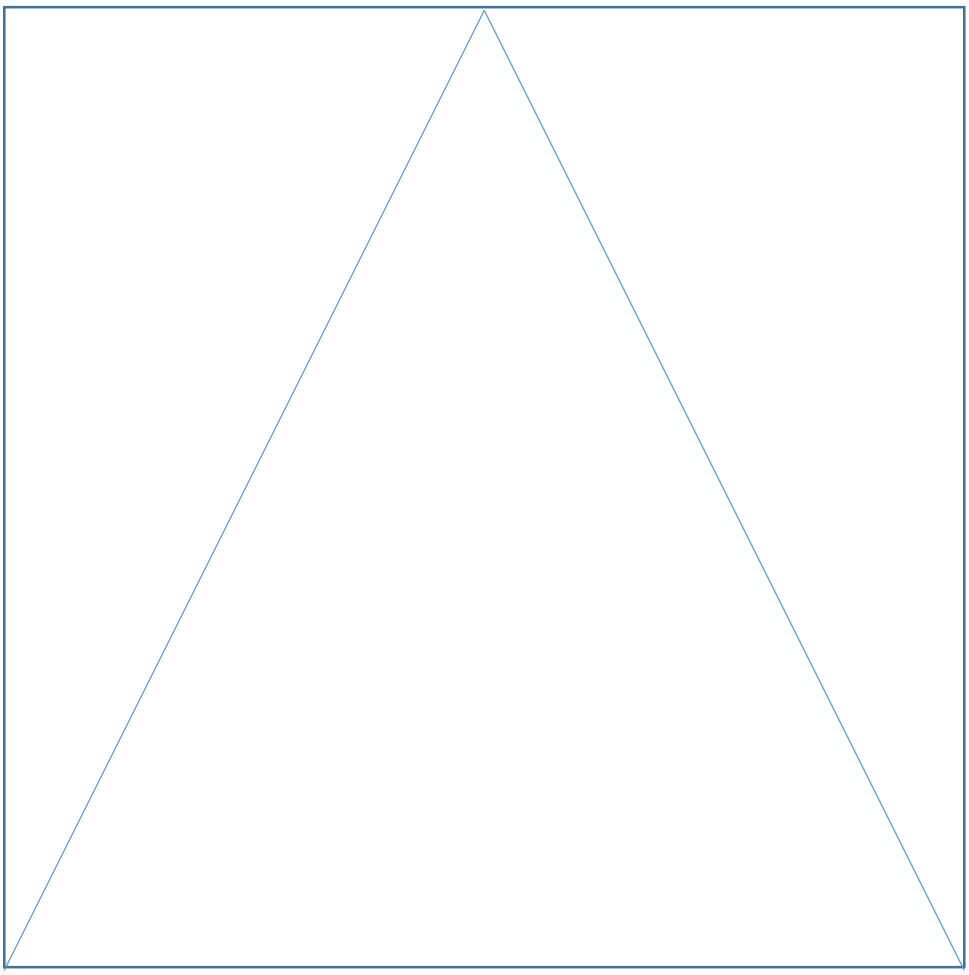
Experiment Four



Hits in Shaded Region: _____
Misses of Shaded Region: _____
Total Number of Events: _____

Ratio of Hits to Total: _____

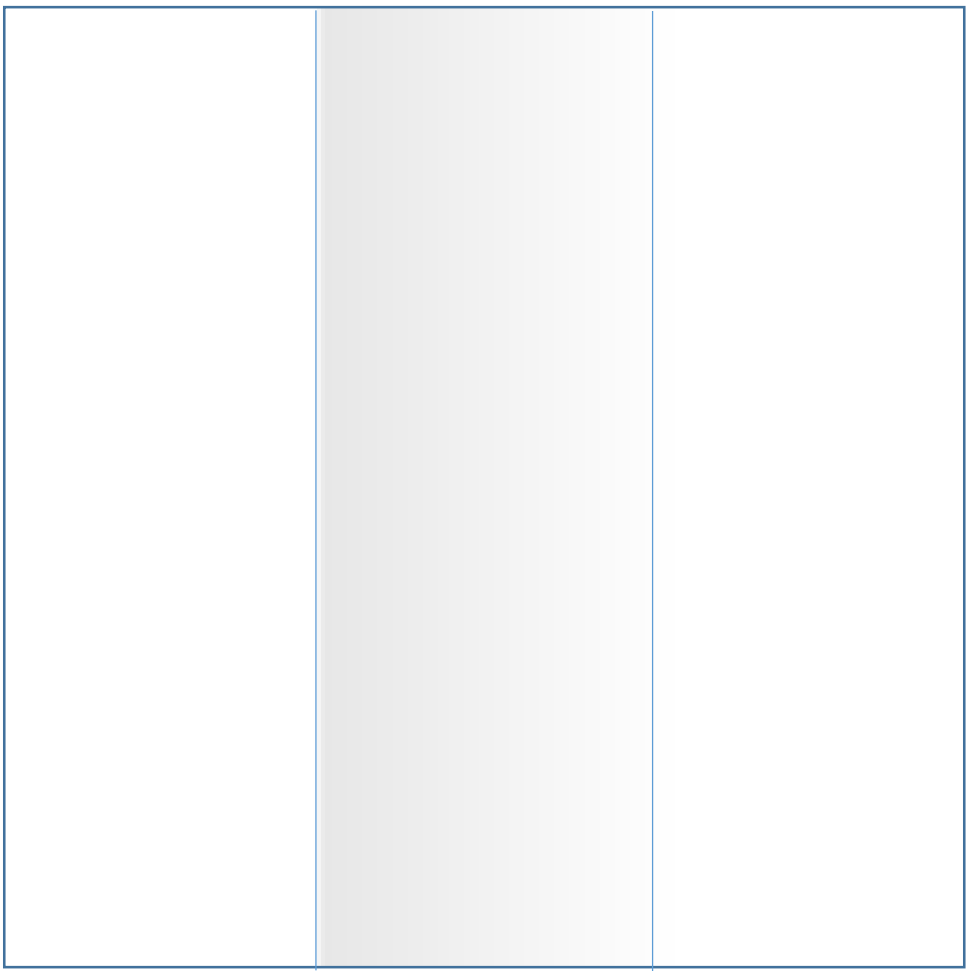
Experiment Five



Hits in Shaded Region: _____
Misses of Shaded Region: _____
Total Number of Events: _____

Ratio of Hits to Total: _____

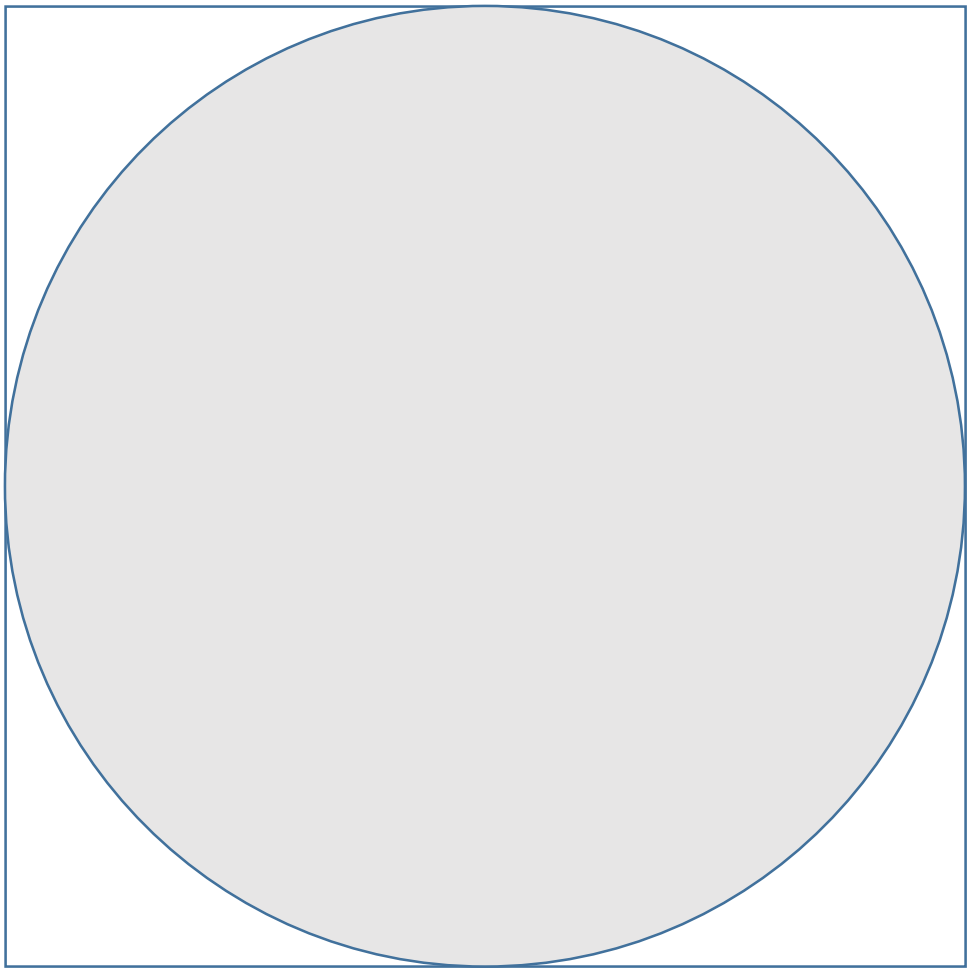
Experiment Six



Hits in Shaded Region: _____
Misses of Shaded Region: _____
Total Number of Events: _____

Ratio of Hits to Total: _____

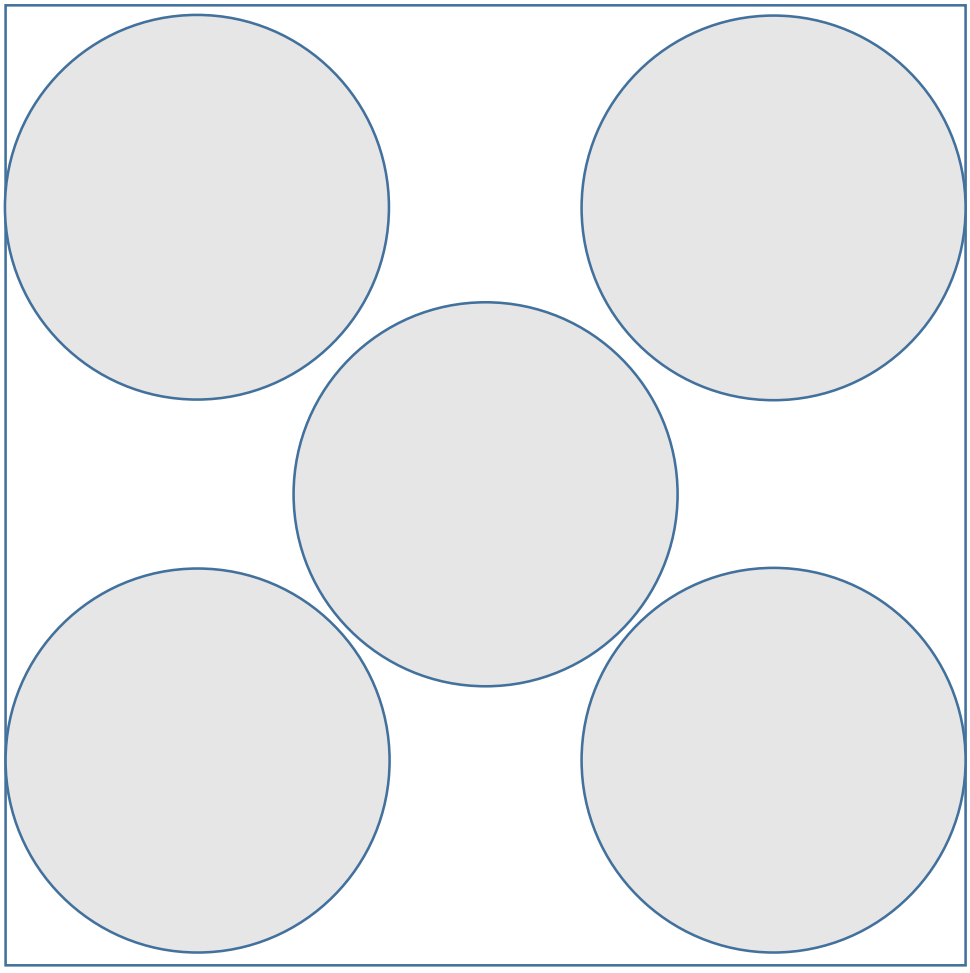
Experiment Seven



Hits in Shaded Region: _____
Misses of Shaded Region: _____
Total Number of Events: _____

Ratio of Hits to Total: _____

Experiment Eight



Hits in Shaded Region: _____
Misses of Shaded Region: _____
Total Number of Events: _____

Ratio of Hits to Total: _____

Computation of the Areas of the Shaded Regions:

For each of the experiments carried out before go back and compute the actual area of the shaded region and the area of the square that contains it.

For the computations, the square has dimensions of 5 inches by 5 inches.

For Experiment 8, each circle has a diameter of 2 inches.

Area from Experiment One: _____

Area from Experiment Two: _____

Area from Experiment Three: _____

Area from Experiment Four: _____

Area from Experiment Five: _____

Area from Experiment Six: _____

Area from Experiment Seven: _____

Area from Experiment Eight: _____

Questions to ask:

Are these areas close to the numbers obtained from the experiments?

Is this to be expected?

Is this surprising?

Mathematical Explanations:

Probability:

Probability is the measure that the likelihood an event will occur. Probability is quantified as a number between 0 and 1. The higher the probability of an event, the more certain we are that the event will occur.

When dealing with experiments that are random and well-defined in a purely theoretical setting (like tossing a fair coin), probabilities can be numerically described by the number of desired outcomes divided by the total number of all outcomes. In our setting, the event is the marking of the region with the pencil.

Law of Large Numbers:

In probability theory, the **Law of Large Numbers** is a theorem that describes the result of performing the same experiment a large number of times. According to the law, the average of the results obtained from a large number of trials should be close to the expected value, and will tend to become closer as more trials are performed.

Heuristic: For enough experiments, the experimental answer will approach the expected answer.

Observations About Our Experiments:

Questions to ask:

What are our experiments measuring?

Did we perform enough experiments to see that the Law of Large Numbers is holding?

Can we notice anything interesting about the result from Experiment 7? Does it say anything about the number π?