

Expected Outcome (Probability)

Introduction

Probabilities can be determined theoretically or experimentally. The probability of an event happening is always between 0 and 1. When probability is used to predict the number of times an event will occur for a certain number of trials, that prediction is known as the expected outcome.

Let's explore probabilities and expected outcomes. Use your web browser to go to the "Area Probability (throw darts)" activity:

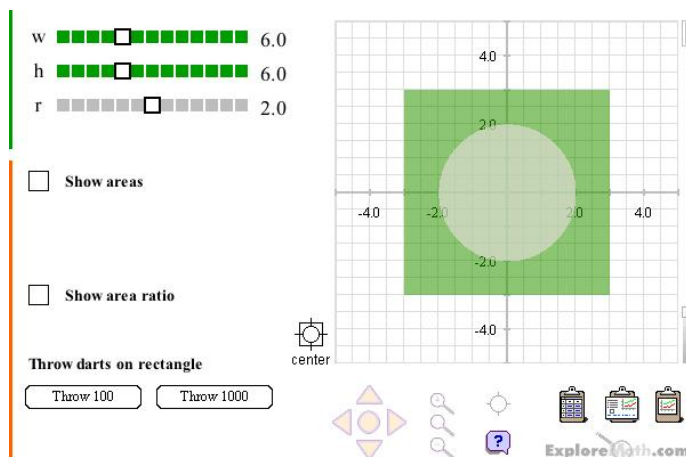
<http://www.explorelearning.com/index.cfm?method=cResource.dspView&ResourceID=59>

Below are several questions designed to get you thinking about the activity. Answer them on a separate sheet of paper.

The Area Probability (throw darts) activity

Theoretical versus Experimental probability

When the activity loads up, it will look like the picture below.



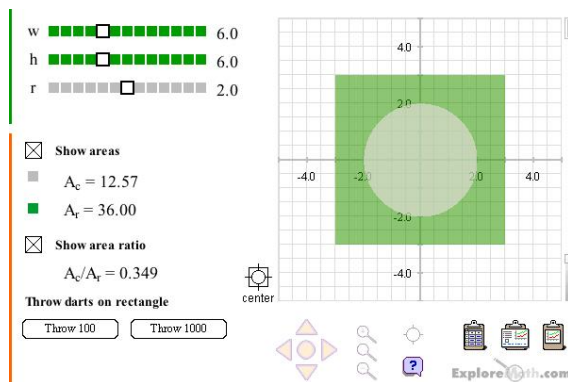
Run an 'experiment' by throwing 1000 darts ten different times. Once this task is completed select the 'calculated data values' clipboard.

Question 1a. What was the mean percentage of darts that landed in the circular region?

Question 1b. What percent chance does one dart have of landing in the circular region according to this experiment?

This is an example of experimental probability. Experimental probability is probability based on previous trails or experiments.

Now select the 'Show area' and the 'Show area ratio' boxes.



Question 2a. What is the significance of the area ratio?

Question 2b. According to the area ratio, what percent chance does one dart have of landing in the circular region?

This ratio is the theoretical probability that a dart will land in the circular region.

Question 2c. What are some differences between experimental and theoretical probabilities?

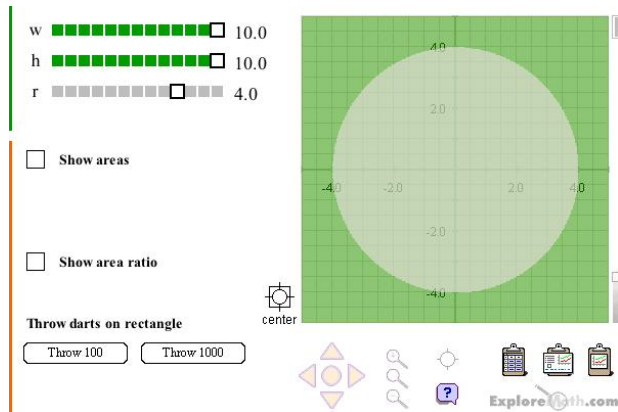
Question 2d. What are some examples where experimental probability is used?

Question 2e. What are some examples where theoretical probability is used?

Question 2f. Which type of probability would be used to determine the probability that a basketball player will get make her next time free throw?

Expected outcome

Set width = 10, height = 10, and $r = 4$.



Question 3a. How many darts out of 100 do you predict will land in the circular region? Why? Test your prediction.

Expected outcome, $E(x)$, is the number of 'successes' or the 'value' of an experiment.

Question 3b. How is expected outcomes calculated?

Set the radius of the circle to 4.5.

Question 3c. What is the expected number of 100 thrown darts that will land in the circular region?

Question 3d. What dimensions could be used in the activity to yield an expected outcome of 30 darts landing in the circular region? Just get close; exact answer may not be possible with the activity.

Probability distributions

Set width = 10, height = 10, and $r = 5$.

Conduct 50 trials of 100 dart throws. Keep track of the number of darts that land in the circular region for each throw.

Question 4a. What would a histogram depicting the results of this experiment look like?

Question 4b. What is the range of data points?

Question 4c. Why are no data points located outside this range?

Question 4d. What data points had the highest frequency? Were these points located near the expected outcome of the experiment? Why?

Conclusion

Expected outcomes of trials can be determined by multiplying the probability of a success of one trial by the number of trials conducted. When several trials are performed, the frequency of the outcomes should be greater near the expected outcome.