

10.1 ~ Randomness and Probability

Daily Objectives:

1. Learn about randomness.
2. Define experimental and theoretical probability.
3. Simulate experimental probability on a calculator.
4. Define and calculate geometric probability.

Example A: The chart on the right shows the soda preference for this class. If you randomly pick a student in class, what is the probability that:

- a. You pick someone who prefers coke? _____
- b. You pick someone who prefers sprite or orange soda? _____
- c. You pick someone who did *not* pick Pepsi? _____

Coca-Cola	
Pepsi	
Mountain Dew	
Orange Soda	
Dr. Pepper	
Sprite	
Other	

Random Processes: A process in which no individual outcome is predictable.

Fair: Describes a coin that is equally likely to land heads or tails. Can also apply to dice and other objects.

Random Numbers: A number that is as likely to occur as any other random number within a given set.

Experimental Probability: A probability calculated based on trials and observation, given by the ratio of the number of occurrences of an event to the total number of trials.

How to generate a list of random numbers:

1. MATH
2. Arrow over to PRB
3. Select (5) randInt(
4. Type in lowest number you want, highest number, how many numbers)

How to put a list of random numbers into a list:

1. Generate list of random numbers (see above).
2. STO→
3. Select the list you want the random numbers in
4. ENTER

How to sort a list of random numbers from smallest to largest:

1. Generate list of random numbers.
2. Enter random numbers in list.
3. STAT
4. Select (2) SortA(
5. Select list you want sorted
6. ENTER

Example 1: Use a random-number generator to generate 50 random numbers from 1 – 6. What is the probability of getting a 4?

Example 2: Use a random number generator to generate 75 numbers from 1 – 10. What is the probability of getting a 2?

Simulation: A procedure that uses a chance model to imitate a real situation.

Outcomes: A possible result of one trial of an experiment.

Event: A specified outcome or set of outcomes.

Simple Event: An event consisting of just one outcome.

Compound Event: An event consisting of more than one outcome.

Theoretical Probability: A probability calculated by analyzing a situation, rather than by performing an experiment.

Experimental Probability

If $P(E)$ represents the probability of an event, then

$$P(E) = \frac{\text{number of occurrences of an event}}{\text{total number of trials}}$$

Theoretical Probability

If $P(E)$ represents the probability of an event, then

$$P(E) = \frac{\text{number of different ways the event can occur}}{\text{total number of equally likely outcomes possible}}$$

Example 4: Find the theoretical probability of rolling a sum of 6 with a pair of dice.

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

$$\frac{5}{36} = .13\bar{8}$$

Example 5: Find the theoretical probability of rolling a sum of 3 with a pair of 5-sided die?

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

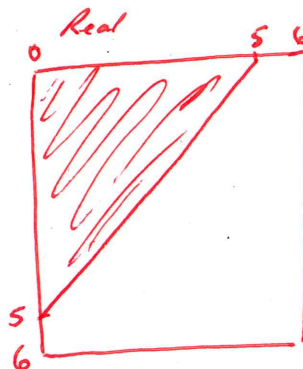
$$\frac{2}{36} = \frac{1}{18} = .05\bar{5}$$

Geometric Probability: A probability that is found by calculating a ratio of geometric characteristics, such as lengths or areas.

Example 5: What is the probability that any two real numbers you select at random between 0 and 6 have a sum that is less than or equal to 6? $\frac{5}{6}$

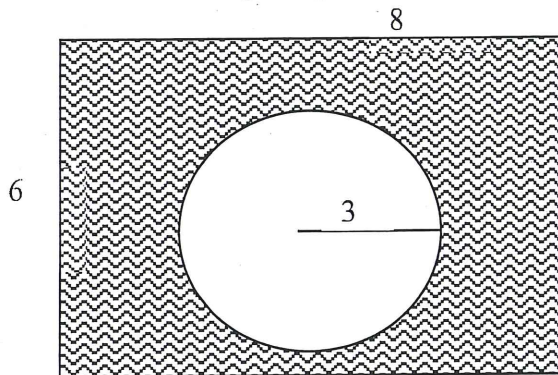
Integers

	0	1	2	3	4	5	6
0	0	1	2	3	4	5	6
1	1	2	3	4	5	6	7
2	2	3	4	5	6	7	8
3	3	4	5	6	7	8	9
4	4	5	6	7	8	9	10
5	5	6	7	8	9	10	11
6	6	7	8	9	10	11	12



$$\frac{\frac{1}{2}bh}{s^2} = \frac{\frac{1}{2}(5)(5)}{6^2} = \frac{12.5}{36} = .347\bar{2}$$

Example 6: What is the probability that a dart thrown randomly at the image below will land in the shaded region. [Hint: The area of a circle equals πr^2].



$$A_{\square} - A_{\circ}$$

$$6 \cdot 8 - \pi(3)^2$$

$$48 - 9\pi$$

$$19.73 \text{ units}^2$$