Name_____Date_____Per_____

CC Algebra 2H 7-2 Notes

Theoretical and Experimental Probability

Probability is the measure of how likely an event is to occur. Each possible result of a probability experiment or situation is an **outcome.** All of the possible outcomes make up the **sample space**. An **event** is an outcome or set of outcomes.

For outcomes that have the same likelihood of occurring, or equally likely outcomes, the **theoretical probability** of an event, *E*, is defined as follows.

$$P(E) = \frac{\text{number of favorable outcomes}}{\text{number of outcomes in the sample space}}$$

$0 \le P(E) \le 1$

Example 1. A red number cube and a blue number cube each numbered 1–6 are rolled. If all numbers on each cube are equally likely, what is the probability that the sum is 6 or 7?

The sum of all probabilities in the sample space is 1. The **complement** of an event *E* is the set of all outcomes in the sample space that are not in *E*.

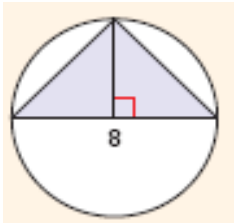
The probability of the complement of an event *E* is

$P(\text{ not } E) = 1 - P(E)$

Example 2. Use the number cubes from Example 1. What is the probability that the sum is not 10?

Geometric probability is a form of theoretical probability determined by a ratio of lengths, volumes, or areas.

Example 3. Find the probability that a point inside the figure chosen at random is inside the unshaded region of the circle.



Example 4. A clerk has 4 different letters that need to go in 4 different envelopes. What is the probability that all 4 letters are placed in the correct envelopes?

Example 5. Five boys and 3 girls are applying for a summer job. Three applicants will be selected. Find the probability that

a) all 3 are boys

b) 2 are girls and 1 is a boy

To find the experimental probability of an event, conduct or observe an experiment for a large number of trials. Then count the number of times the event, *A*, occurs.

The **experimental probability** of the event is found by using the following formula.

$$P(A) = \frac{\text{number of times the event occurs}}{\text{number of trials}}$$

Example 3. The table shows the results of an experiment with a spinner.

Spinner Experiment				
Color	Red	Yellow	Green	Blue
Spins	30	25	12	33

Outcomes

Trials

Find the experimental probability that the spinner lands on red or blue.

Find the probability that the spinner lands on a color other than green.