

Today's agenda:

1. Brief wrap-up / review of Sec. 11.4 & 11.5
2. Begin probability (Sec. 12.1)
 - Note: We'll cover more of 11.5 ideas as part of 12.2

Return Quizzes (ans.doc)

Homework for the weekend:

- * Finish up HW assigned from 11.4 and 11.5.
- * And from 12.1:
 - #1, 5-21 odd, 24-29 all, 43, 49, 53

Sep 11-8:02 AM

Warm-up:

Four math faculty are boarding a plane that has only 10 empty seats, three of which are aisle seats. In how many ways can the four people arrange themselves in available seats so that at least one of them sits on the aisle?

$$\begin{array}{l} \text{(total arrangements)} - \text{(arrangements with no aisle seat)} = \text{(arrangements with at least 1 aisle seat)} \\ C(10,4) - C(7,4) = 175 \\ 210 - 35 = 175 \end{array}$$

Follow-up: If the faculty are *randomly* assigned to seats, what is the probability that at least one of them sits on the aisle?

$$P = \frac{\text{favorable}}{\text{total}} = \frac{175}{210} = .83\bar{3}$$

Sep 10-9:02 AM

Basic Probability Terminology

- An **experiment** is any observation or measurement of a random phenomena
- **Outcomes** are the possible results of an experiment.
- The **sample space, S**, is the set of all possible outcomes of an experiment.

Sep 11-8:15 AM

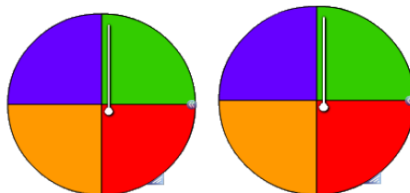
Basic Terminology

- **Experiment 1:** Roll a single die

$$S = \{1, 2, 3, 4, 5, 6\}$$

- **Experiment 2:** Spin both spinners

$$S = \{(1,1), (1,2), (1,3), (1,4), (2,1), (2,2), (2,3), (2,4), (3,1), (3,2), (3,3), (3,4), (4,1), (4,2), (4,3), (4,4)\}$$



Sep 11-8:15 AM

Basic Terminology

- An **event** is a particular collection of the possible outcomes. It is a subset of the sample space.

- **EXP 1:** Let **E** be the event that the die is odd.

$$E = \{1, 3, 5\}$$

- **EXP 2:** Let **F** be the event that the sum is odd.

$$F = \{(1, 2), (1, 4), (2, 1), (2, 3), (3, 2), (3, 4), (4, 1), (4, 3)\}$$

Sep 11-8:15 AM

Probability Terminology

- If two (or more) events have the same chance of occurring, then the events are equally likely.

Thought experiment:

1. If a six-sided die is thrown, are all 6 outcomes equally likely? *Yes.*

2. What if a marshmallow (or gumdrop) is tossed? Are the events

E = "lands on side" and

F = "lands standing up"

equally likely? *2 Probably not.*

Sep 11-8:15 AM

Theoretical Probability

- The **Theoretical Probability** is the chance of an event, E, happening as determined by calculating results that would occur under ideal circumstances.
- If all outcomes in a sample space are equally likely, and E is an event within the sample space, then the theoretical probability of event E is given by:

$$P(E) = \frac{\text{number of favorable outcomes}}{\text{total number of outcomes}} = \frac{n(E)}{n(S)}$$

Sep 11-8:15 AM

Theoretical Probability

- **EXP 1:** Let E be the event that the die is odd.

$$P(E) = \frac{n(E)}{n(S)} = \frac{3}{6} = .5$$

- **EXP 2:** Let F be the event that the sum is odd.

$$P(F) = \frac{n(F)}{n(S)} = \frac{8}{16} = .5$$

Sep 11-8:15 AM

Empirical Probability

- The **Empirical Probability** is the chance of an event, E, happening, based on repeated testing and observing results.

$$P(E) = \frac{\text{number of times event E occurred}}{\text{number of times the experiment was performed}}$$

Find the empirical probability that a marshmallow (or gumdrop) tossed into the air lands on its side.

First, make a prediction. Will the probability be:
A) 30% B) 40% C) 50% D) 60% E) 70%

Sep 11-8:15 AM

Law of Large Numbers

- The law of large numbers states that if you repeat a random experiment, such as tossing a coin or rolling a die, many, many, many times, your empirical probability should tend ever closer to the theoretical probability of the event.

(In some cases, the theoretical probability is extremely difficult to calculate... in that case we must rely on the law of large numbers and use empirical probability as an estimate.)

Sep 11-8:15 AM

A company places a 6-symbol code on each unit of product. The code consists of 4 distinct digits followed by two letters, what is the probability that a randomly selected code will have the first number even and the first letter NOT a vowel?

$$P(E) = \frac{n(E)}{n(S)} = \frac{8 \cdot 7 \cdot 6 \cdot 5 \cdot 26 \cdot 26}{2 \cdot 10 \cdot 9 \cdot 8 \cdot 26 \cdot 26} = \frac{21}{52} \approx 40.38\%$$

Sep 11-8:15 AM

Today's reflection (come prepared to discuss & share your responses on Monday):

There are two possible outcomes for tossing a Hershey's Kiss:

A = "it lands on its bottom,"

B = "it lands on its side"

Can you predict P(A)? Explain.



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Sep 11-8:26 AM