

5.1 - Randomness, Probability, & Simulation

Notes provided by **E. Kelly Pendleton** from **Ardrey Kell High School**, including:

- the idea of probability
- myths about randomness
- simulation

adjust as you wish

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if you need the flipchart version***

Warm-Up

1). A single die is rolled one time. First list all possible outcomes and then find the probability that:

a) outcomes:

b) the die lands on 4

c) the roll is an even number

d) the die lands on a number less than 7

e) the number showing is greater than 3 or odd

f) the number showing is greater than 3 and odd

2). Abby, Barbara, Carla, Dan, & Ed work in a firm's public relations office. Their employer must choose 2 to attend a conference. To avoid unfairness, the choice will be made by drawing two names from a hat.

a) Write down all possible outcomes.

b) What is the probability that at least one girl will go?

c) What is the probability that neither of the two men is chosen?

5.1: Probability, Randomness, & Simulation

- **chance behavior** is unpredictable in the short run but has a regular and predictable pattern in the long run (EX. toss a coin)
- a phenomenon is **random** if the outcomes are determined by chance
- The **probability** of any outcome of a random phenomenon is the proportion of times the outcome would occur in a very long series of repetitions; the **long-term relative frequency**

Using Randomness to Determine Probability

- You must have a long series of **independent** trials; the outcome of one trial must not influence the outcome of any other trial.
- The idea of probability is **empirical**; we can estimate a real-world probability by observing many trials.
- Computer simulations are useful to simulate **long run probability**.

Using Simulations to Calculate Empirical Probabilities

simulation - models random events by using random numbers to specify event outcomes with relative frequencies that correspond to the true real-world relative frequencies we are trying to model

trial - what you do for one simulation

outcome - results (how many trials are a success)

Fifty-seven students participated in a lottery for a particularly desirable dorm room - a triple with a fireplace and private bath in a tower. Twenty of the participants were members of the same varsity team. When **all three winners were members of the team, the other students cried foul. Use a **simulation to determine whether an all-team outcome could reasonably be expected to happen if everyone had a fair shot at the room.****

a) State the question of interest using the language of probability .

b) How would you use random digits to imitate one repetition of the process? What variable would you measure?

c) Run 20 trials of the simulation. [Using the calculator.]

d) After the _____ trials of the entire class, what proportion of trials resulted in all 3 winners being from the same team?

e) What do you conclude from this simulation?

-this question can also be answered with **theoretical probability**:

If 20 of 57 people are on the same varsity team, what is the probability that all 3 people chosen are one of the 20 members on the varsity team?

Classwork:
pg. 295 #19, 20, 31-37