**Lesson 6.1: Simulation**

**Simulation Steps:**

**Step 1: Determine Probabilities/State the assumptions**

**Step 2: Assign digits to represent outcomes.**

**Step 3: Define trial/Statistic of interest**

**Step 4: Simulate many repetitions. (Use table)**

**Step 5: State your conclusion**

EXAMPLE 1: Toss a coin 10 times. What is the likelihood of a run of at least 3 consecutive heads or 3 consecutive tails?

**Step 1: Determine Probabilities/State the assumptions.**

* Assume that a head or tail is equally likely to occur on each toss.
* P(heads) = 0.5 and P(tails) = 0.5
* Tosses are independent of each other.

**Step 2: Assign digits to represent outcomes.**

* One digit simulates one toss of the coin.
* Odd digits represent heads; even digits represent tails.

**Step 3: Define trial/Statistic of interest**

* 1 Trial: Read groups of 10 digits to represent 10 coin flips.
* X = # of trails in which there was a run of at least 3 consecutive heads/tails

**Step 4: Simulate many repetitions. (Use table)**

Let’s do the first **three** repetitions.

|  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- |
| Digits: | 1 9 2 2 3 | 9 5 0 3 4 | 0 5 7 5 6 | 2 8 7 1 3 | 9 6 4 0 9 | 1 2 5 3 1 |

Let’s say that twenty-two additional repetitions were done for a total of 25 repetitions…23 of them **did** have a run of 3 or more heads or tails.

**Step 5: State your conclusion.** We estimate the probability of a run of size 3 is:

**Example #2: Frozen Yogurt Sales**

Orders of frozen yogurt flavors (based on sales) have the following relative frequencies: 38% chocolate, 42% vanilla, and 20% strawberry. How many customers would we expect to order before 3 people order strawberry?

**Step 1: Determine Probabilities/State the assumptions**

**Step 2: Assign digits to represent outcomes.**

**Step 3: Define trial/Statistic of interest**

**Step 4: Simulate many repetitions. (Use table)**

3 8 4 4 8 4 8 7 8 9 1 8 3 3 8 2 4 6 9 7 3 9 3 6 4 4 2 0 0 6

7 6 6 8 8 0 9 8 3 4 8 5 4 6 8 1 6 8 5 4 5 3 3 9 6 3 8 1 5 4

1 2 1 9 3 6 5 3 6 0 0 9 2 4 1 7 8 6 8 2 4 9 4 3 6 1 7 9 0 9

0 6 5 6 8 7 9 6 4 1 8 8 8 3 1 4 8 9 3 0 0 8 1 6 7 6 4 7 5 1

1 2 0 8 0 7 5 7 8 9 0 8 2 7 3 9 6 8 4 1 7 3 5 0

**Step 5: State your conclusion**