Math 243

Binomial Probabilities – Inv. 1.2 and page 27

Binomial Test – Inv. 1.3

Announcements

- Hw 2 and Quiz 2 Monday, October 8th

  remember to memorize the definitions!

  could use online card deck, e.g. quizlet

Last time – Binomial Process

What are the four characteristics of a Binomial Process?

Last time – Binomial Process

- Each trial has two outcomes (Success, Failure)
- The trials are independent (outcome of one trial doesn't impact outcome of other trials)
- The trials have a constant probability of success (π)
  - Does not have to be 0.5!
- Fixed number of trials (n)

"All models are wrong; but some are useful"

Inv. 1.2: Do you have ESP?

Part (c) Using technology, what is the probability that a guessing subject would get 10 or more cards correct?

We are asked to compute a probability,

$$P(C \geq 10)$$

where C is the number of correct guesses out of 25 cards.

So far, we know two ways of computing probabilities…

P-value via Simulation

Simulation-Based and Exact One Proportion Inference

Probability of success (π): 0.2
Sample size (*n*): 25
Number of samples: 999

☐ Animate

Draw Samples

Total = 999

All Attempts(Last Sample)

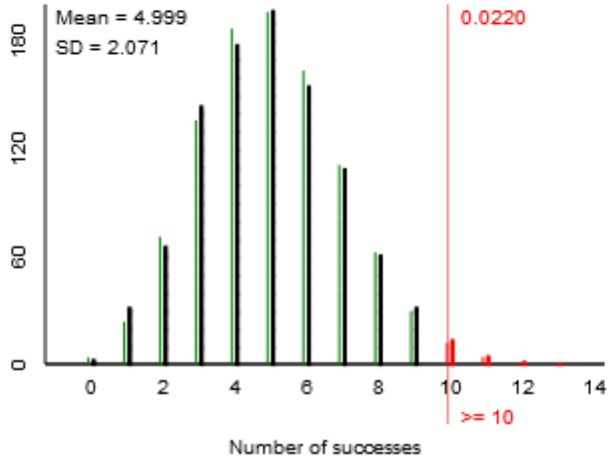
This is our estimate of P(C≥10) using **simulated** coin tosses

◉ Number of successes
○ Proportion of successes

As extreme as ≥ 10 Count

Proportion of samples:
22 / 999 = 0.0220

☑ Summary Stats



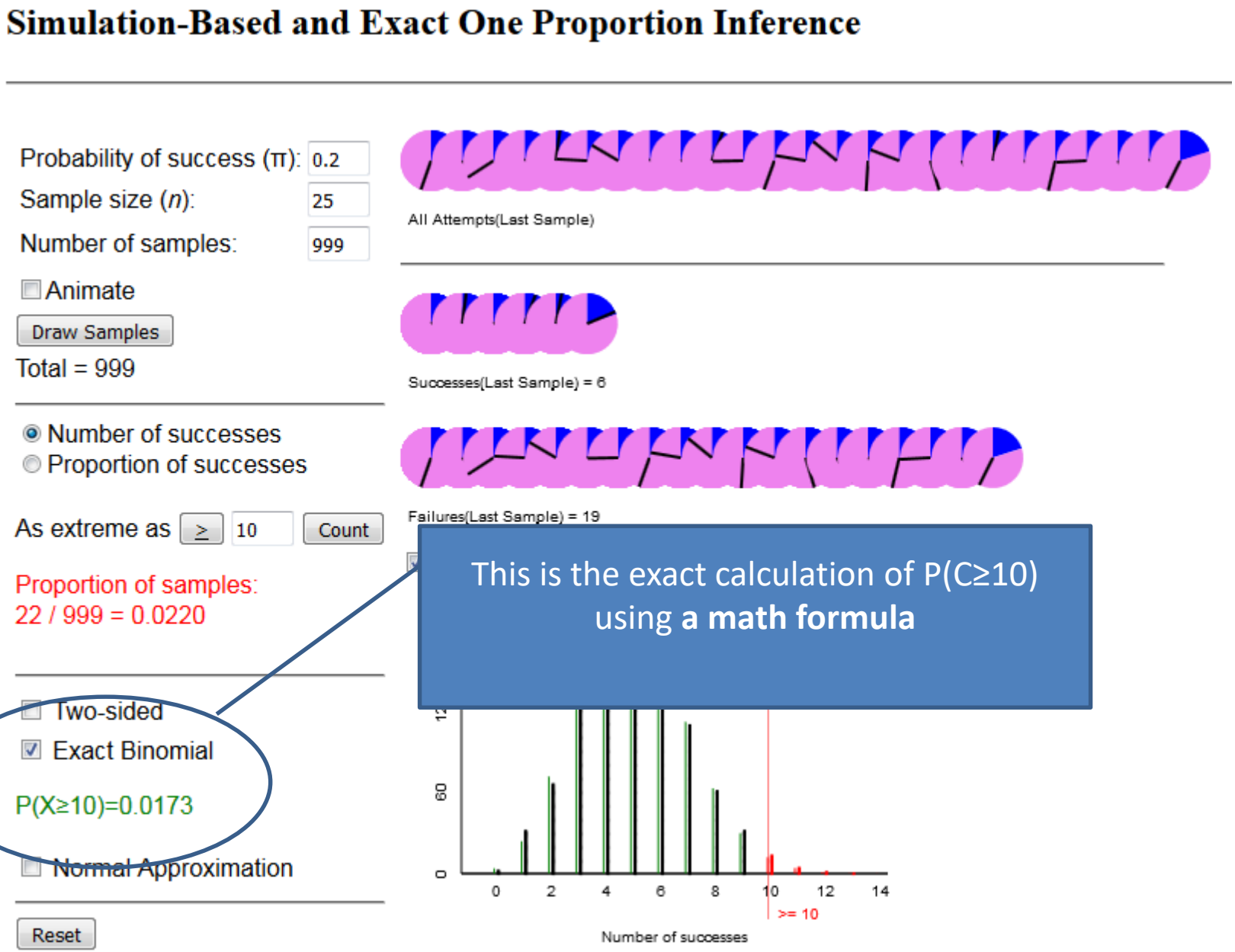
☐ Two-sided
☑ Exact Binomial

P(X≥10)=0.0173

☐ Normal Approximation

Reset

P-value via Exact Mathematical Calculations



Inv. 1.3: Binomial Test

Who is on the left,
Bob
or
Tim?

No discussion of your responses!

Results of Tim/Bob Survey for (c)

Of students, chose Tim as on the left

Inv. 1.3 - In class activity

- Try parts (a), (b), (c), (d), (e)

Inv. 1.3: Binomial Test

(a) Null model: random guessing implies students are equally like to assign names Bob and Tim to either face

(b) Two outcomes, everyone guessing, no discussion/encouragement of your responses, fixed number of students.

Terminology Detour – Tim/Bob Survey

- Observational Units?
- Variable?
- Type of variable?
- Parameter vs. Statistic

  (part f)

Inv. 1.3 – parts (g) and (h)

Question: Do most people identify “Tim” as the guy on the left?

Parameter: let π be the proportion of people who pick “Tim” to be on the left.

Null Hypothesis:

$\pi = 0.5$

i.e. people are just guessing.

Alternative Hypothesis:

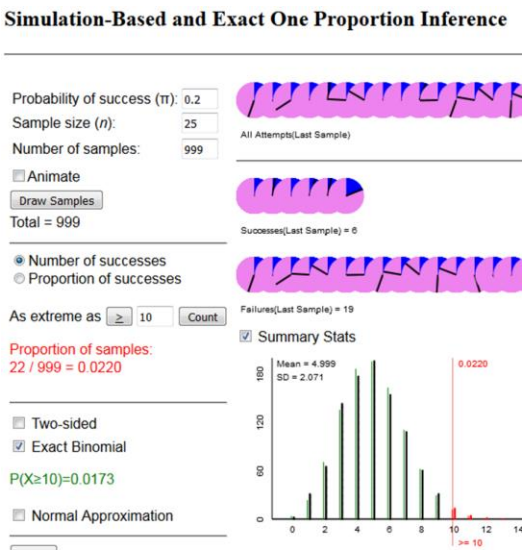
$\pi > 0.5$

i.e. the majority of people pick Tim to be on the left.

P-value

In order to decide whether we believe the null hypothesis, we'll compute a **p-value**.

A **p-value** is the probability of seeing a statistic as extreme as ours if the null model is true.



We can use the exact formula or coin toss simulation from the One-Proportion Applet IF our data collection is a Binomial Random Process

Inv. 1.3 – part (j)

Need to identify n and π to compute the p-value with the **exact Binomial** probability formula