

ECE 341 - Homework #13

t-Tests with Two Populations. Summer 2023

Let

- $X = 5d_{10}$ (the sum of five 10-sided dice) plus 0.5 (X wins on ties)
- $Y = 2d_4 + 3d_6 + 4d_8$

In Matlab:

```
d4 = ceil(4*rand(1,2));  
d6 = ceil(6*rand(1,3));  
d8 = ceil(8*rand(1,4));  
d10 = ceil(10*rand(1,5));  
  
X = sum(d10) + 0.5;  
Y = sum(d4) + sum(d6) + sum(d8);  
if(X > Y) WIN = WIN + 1; end
```

Monte-Carlo Simulation

1) Run a Monte-Carlo simulation with 100,000 rolls for X and Y. From this, determine the probability that X will win any given game.

t-Test: Sample Size = 4

- 2) Take four measurements of X and Y. From this data, determine
- The mean and standard deviation of X
 - The mean and standard deviation of Y
 - The probability that X will win any given game using a student-t test.

t-Test: Sample Size = 20

- 3) Take twenty measurements of X and Y. From this data, determine
- The mean and standard deviation of X
 - The mean and standard deviation of Y
 - The probability that X will win any given game using a student-t test

t-Test: Sample Size = 100

- 4) Take 100 measurements of X and Y. From this data, determine
- The mean and standard deviation of X
 - The mean and standard deviation of Y
 - The probability that X will win any given game using a student-t test

Over

Reaction Time

5) Go to the Human Benchmark Dashboard

<https://humanbenchmark.com/tests/reactiontime>

(population A): Record your reaction time with both eyes open

(population B): Record a different reaction time

- one eye open
- use your non-dominant hand
- have else taking the test

6) From your results, determine the probability that

- A's time will be less than B's time next time you run the experiment
- A's average time is less than B's average time

Aim Trainer

7) Go to the Human Benchmark Dashboard

<https://humanbenchmark.com/tests/aim>

(population A): Record your time to hit 30 targets with both eyes open

- repeat to get at least two measurements

(population B): Record your time to hit 30 targets with a different condition (different person, one eye closed, opposite hand, your pick)

- repeat to get at least two measurements

8) From your results, determine the probability that

- A's time will be less than B's time next time you run the experiment
- A's average time is less than B's average time