2-SAMPLE T TEST

This test is used to compare 2 means from 2 separate (independent) samples.

To compare the strength of Bounty paper towels to generic paper towels, 30 of each were randomly selected. Each paper was uniformly soaked with 4 ounces of water and while holding opposite edges of the towel, the number of quarters each paper towel could hold before ripping was counted. Here are the results:

Bounty	106	111	106	120	103	112	115	125	116	120	126
	125	116	117	114	118	126	120	115	116	121	113
	111	128	124	125	127	123	115	114			
Generic	77	103	89	79	88	86	100	90	81	84	84
	96	87	79	90	86	88	81	91	94	90	89
	85	83	89	84	90	100	94	87			

Determine if Bounty paper towels are stronger than the generic brand at the $\alpha = .01$ level.

P) STATE POPULATION PARAMETERS:

μ_B = the mean number of quarters a wet Bounty paper can hold

μ_G = the mean number of quarters a wet generic paper towel can hold

H) STATE HYPOTHESES:

$H_0 : \mu_B = \mu_G$ $\qquad$ $H_a : \mu_B > \mu_G$

A) VERIFY CONDITIONS REQUIRED FOR TEST:

a) Random

Random samples were taken

b) Normal sampling distribution

Since $n_B \geq 30$ *and* $n_G \geq 30$ *, the Central Limit Theorem applies*

c) Independent

The samples were independently taken and:

$N_B > 10(30) > 300$ sheets of Bounty paper towels ✓

$N_G > 10(30) > 300$ sheets of generic paper towels ✓

T) PERFORM TEST USING:

a) T DistributionTable:

i) Put data into lists and calculate x-bars/standard deviations (if necessary)

$\bar{x}_B = 117.6$ $s_B = 6.64$

$\bar{x}_G = 88.1$ $s_G = 6.30$

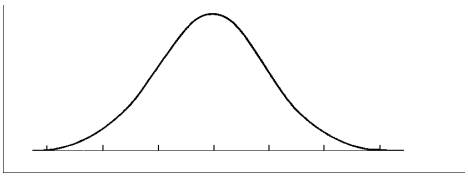
ii) Calculate t-statistic:

$$t = \frac{\bar{x}_1 - \bar{x}_2}{\sqrt{\frac{s_1^2}{n_1} + \frac{s_2^2}{n_2}}} = \frac{117.6 - 88.1}{\sqrt{\frac{6.64^2}{30} + \frac{6.30^2}{30}}} = 17.64$$

iii) Determine degrees of freedom:

Using smaller of n_B or n_G; df = 30 – 1 = 29

iv) Locate critical *t*-value and estimate *P*-value



From Table (df = 29 and α = .01), the critical t value is 2.539

Since 17.64 > 2.539, the *P*-value < .01.

b) CALCULATOR:

STAT ⟶ TESTS ⟶ 2-Samp T Test ⟶ *P*-value = $2.98 \times 10^{-25} = 0$

DISTR ⟶ *tcdf* (min, max, df) = (17.64, 100, 29) = $2.39 \times 10^{-17} = 0$

S) STATE CONCLUSION IN CONTEXT:

There is very convincing evidence (*P*-value < .01) to reject H_0 and conclude that that wet Bounty paper towels can hold more weight, on average, than wet generic paper towels.

CONFIDENCE INTERVAL:

Calculate a 99% confidence interval for the mean difference in the number of quarters that a wet Bounty paper towel can hold compared to a wet generic paper towel.

P) See above

A) See above

I) Construct Interval:

a) Using Formula

$$CI = (\bar{x}_B - \bar{x}_G) \pm t^* \sqrt{\frac{(s_B)^2}{n_B} + \frac{(s_G)^2}{n_G}}$$

$$CI = (117.6 - 88.1) \pm 2.861 \sqrt{\frac{(6.64)^2}{30} + \frac{(6.30)^2}{30}}$$

$$CI = (24.7, 34.3)$$

b) Using Calculator

STAT ⟶ TESTS ⟶ 2-Samp T Int = (25.0, 33.9)

S) State Conclusion (Use *less* or *more*)

We are 99% confident that wet Bounty paper towels hold between 25 and 34 more quarters than wet generic paper towels.