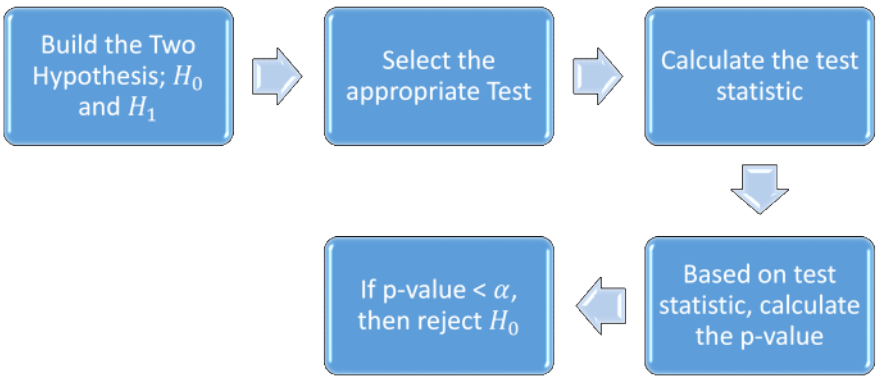
One Sample t

Thursday, November 30, 2023 8:09 AM

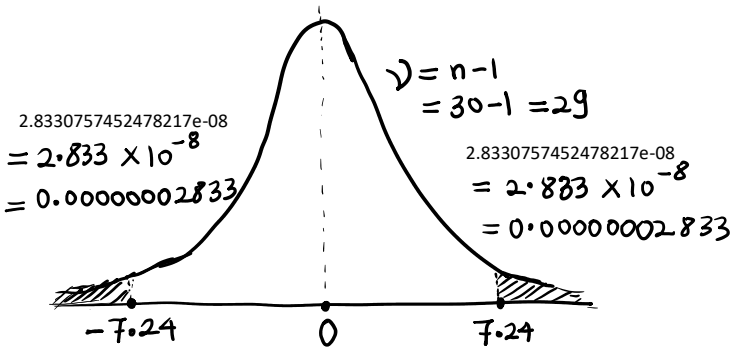


- Given data on plant growth contains weights of dried plants for three different treatment
- We want to test the hypothesis whether the mean weight of the dried plants is 6 for the population

$H_0: \mu = 6$ Vs $H_1: \mu \neq 6$

Hypo. test for one sample mean
(1-sample t-test)

$$\text{test statistic} = \frac{\bar{x} - 6}{s/\sqrt{n}}$$




```
In [25]: result = ttest_1samp(pg['weight'], popmean=6)
    ...: print("Test stat =", result[0])
    ...: print("P-value =", result[1])
Test stat = -7.241082682752038
P-value = 5.6661514904956434e-08
```

p-value = A(▨) = 5.6661514904956434e-08

$= 5.66 \times 10^{-8}$

$= 0.0000000566$

< 0.05

Test stat = -7.241082682752038

$\therefore$ We reject H_0 at 5% level of significance

Conclusion : The mean weight of dried plant may be not equal to 6.

$H_0: \mu \geq 6$ $H_1: \mu < 6$

```
In [29]: result = ttest_1samp(pg['weight'], popmean=6,
    ...:                      alternative="less")

In [30]: if result[1] < 0.05:
    ...:     print("We reject H0 at 5% l.o.s")
    ...:     print("Conclusion: The mean weight may be less than 6")
    ...: else:
    ...:     print("We do not reject H0 at 5% l.o.s")
    ...:     print("Conclusion: The mean weight may be greater than
or equal to 6")
We reject H0 at 5% l.o.s
Conclusion: The mean weight may be less than 6
```

1. The `CO2.csv` dataset has 84 rows and 5 columns of data from an experiment on the cold tolerance of the grass species *Echinochloa crus-galli*.

   plant: an ordered factor with levels `Qn1` < `Qn2` < `Qn3` < ... < `Mc1` giving a unique identifier for each plant.
   type: a factor with levels `Quebec` `Mississippi` giving the origin of the plant
   treatment: a factor with levels `nonchilled` `chilled`
   conc: a numeric vector of ambient carbon dioxide concentrations (mL/L).
   uptake: a numeric vector of carbon dioxide uptake rates (*umol/m*^2 sec).
   Test whether the population mean uptake is less than 30 or not with 5% level of significance

$H_0: \mu \geq 30$ $H_1: \mu < 30$

```
In [36]:
    ...: co2 = pd.read_csv("CO2.csv")
    ...:
    ...: result = ttest_1samp(co2['uptake'], popmean=30,
    ...:                      alternative="less")
    ...: print("Test stat =", result[0])
    ...: print("P-value =", result[1])
    ...:
    ...: if result[1] < 0.05:
    ...:     print("We reject H0 at 5% l.o.s")
    ...:     print("Conclusion: The mean uptake may be less than 30")
    ...: else:
    ...:     print("We do not reject H0 at 5% l.o.s")
    ...:     print("Conclusion: The mean uptake may be greater than
or equal to 30")
Test stat = -2.3618855435932176
P-value = 0.010261893168049612
We reject H0 at 5% l.o.s
Conclusion: The mean uptake may be less than 30
```

12. Using the data in the Excel file *Consumer Transportation Survey*, test the following null hypotheses:

a. Individuals spend at least eight hours per week in their vehicles. $H_0: \mu \geq 8$ $H_1: \mu < 8$

b. Individuals drive an average of 600 miles per week. $H_0: \mu = 600$ $H_1: \mu \neq 600$

c. The average age of SUV drivers is no greater than 35. $H_0: \mu \leq 35$ $H_1: \mu > 35$