P Value

with

T Distribution

What is **P Value**?

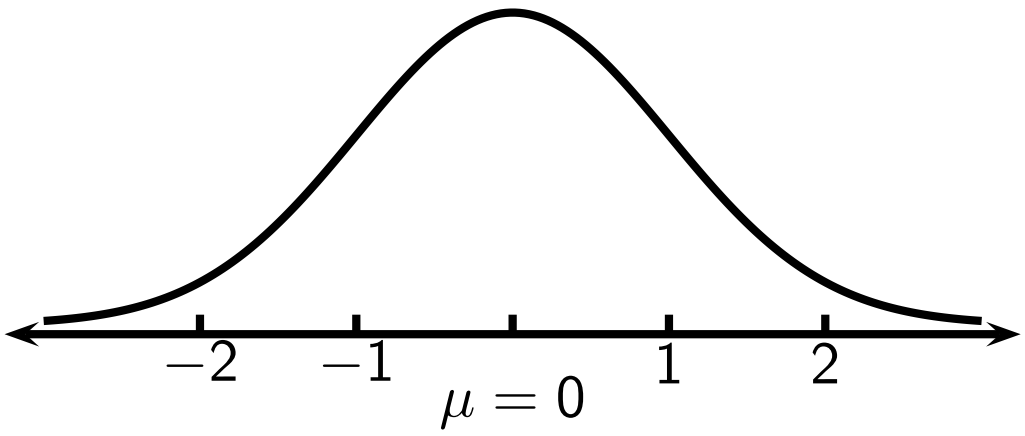
Assuming H_0 is valid, the p-value is is the probability of getting a value of the Computed Test Statistics that is at least as extreme as the one representing the sample data.

What does **P Value** provide?

The p-value provides the smallest level of significance for which the null hypothesis H_0 would be rejected and the alternative hypothesis H_1 would be supported.

What is **T Distribution**?

It is a probability distribution with $\mu = 0$, and unknown σ. The density curve is symmetric and bell-shaped with total area 1. It also comes with degrees of freedom.

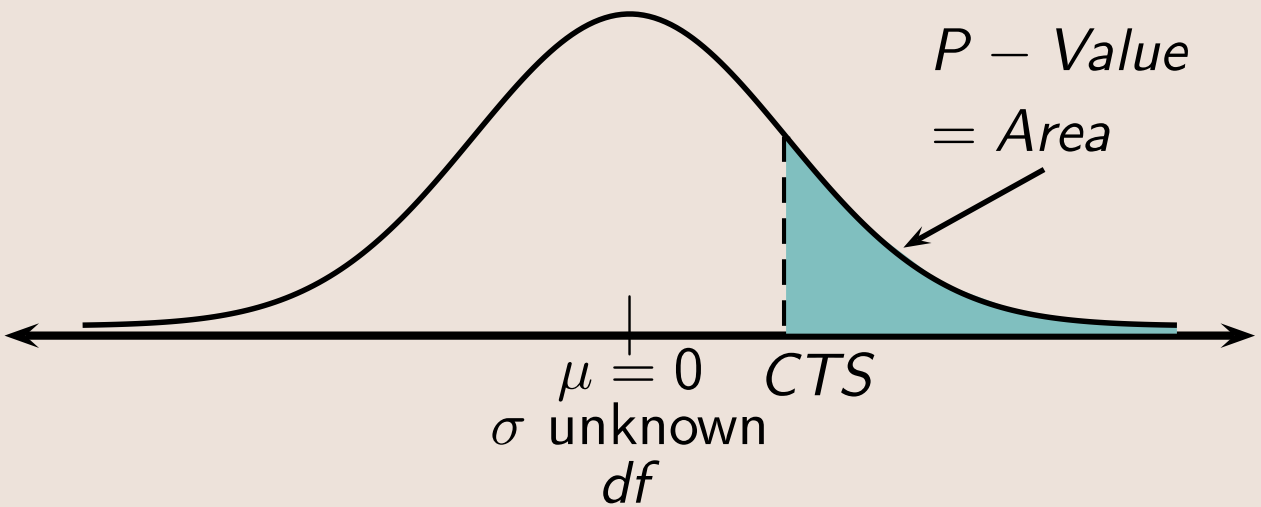


How does **P Value** look on the T Distribution curve?

Solution:

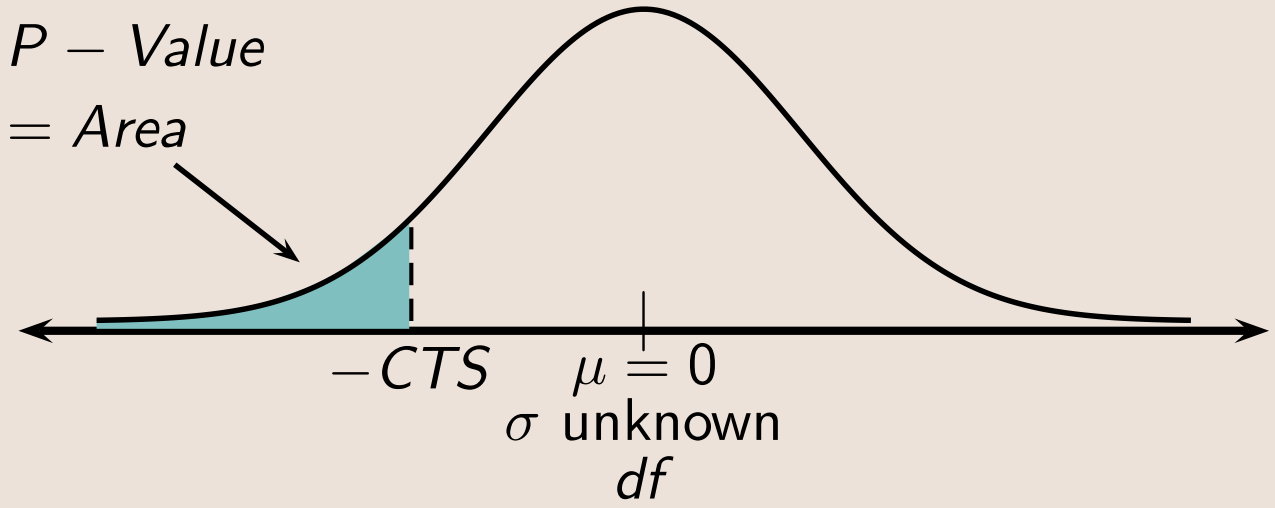
P-Value is the area of the tail marked by CTS. If it is Two-Tail Test, then multiply that area by 2.

- Right-Tail Test (Positive CTS):



Solution Continued:

- Left-Tail Test (Negative CTS):



- Two-Tail Test

Draw the bell curve, then

- Shade the right tail if CTS is positive.
- Shade the left tail if CTS is negative.
- P-Value is twice such shaded area.

P Value & CTS T:

Testing Type	TI Command
Right-Tail Test	$\text{tcdf}(CTS, E99, df)$
Left-Tail Test	$\text{tcdf}(-E99, -CTS, df)$
Two-Tail Test	$\dfrac{2 \cdot \text{tcdf}(CTS, E99, df)}{2 \cdot \text{tcdf}(-E99, -CTS, df)}$

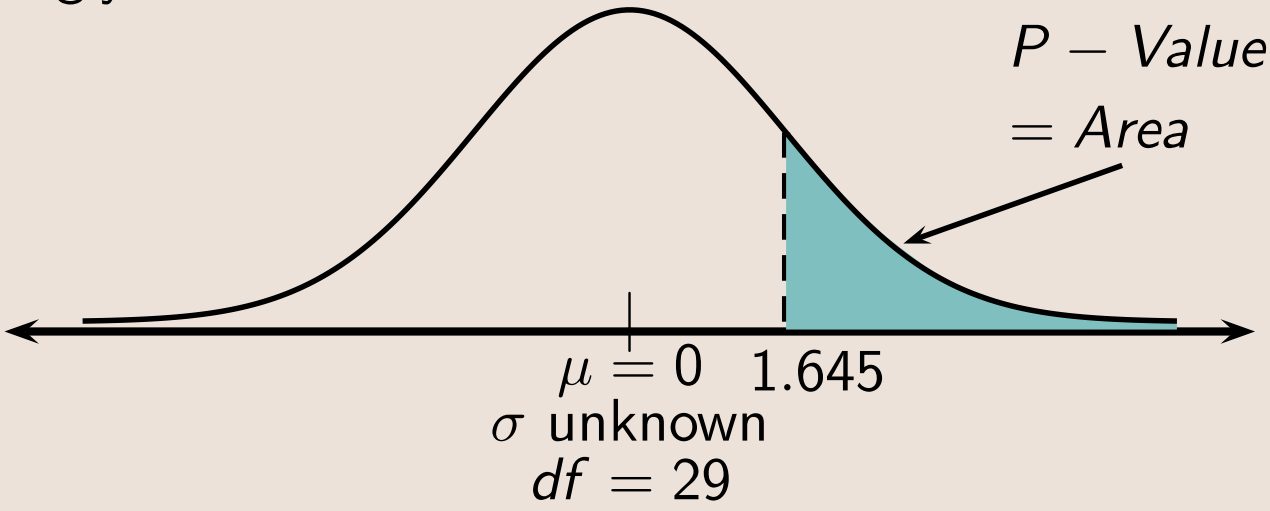
2ND , **VARS** , ↓ , **tcdf**

Example:

Find the corresponding P-Value for a Right-Tail Test with $CTS\ t = 1.645$ with $df = 29$. Round to 3-decimal places.

Solution:

We start by drawing the bell curve, then shade and label accordingly.



Now we can use the TI command,

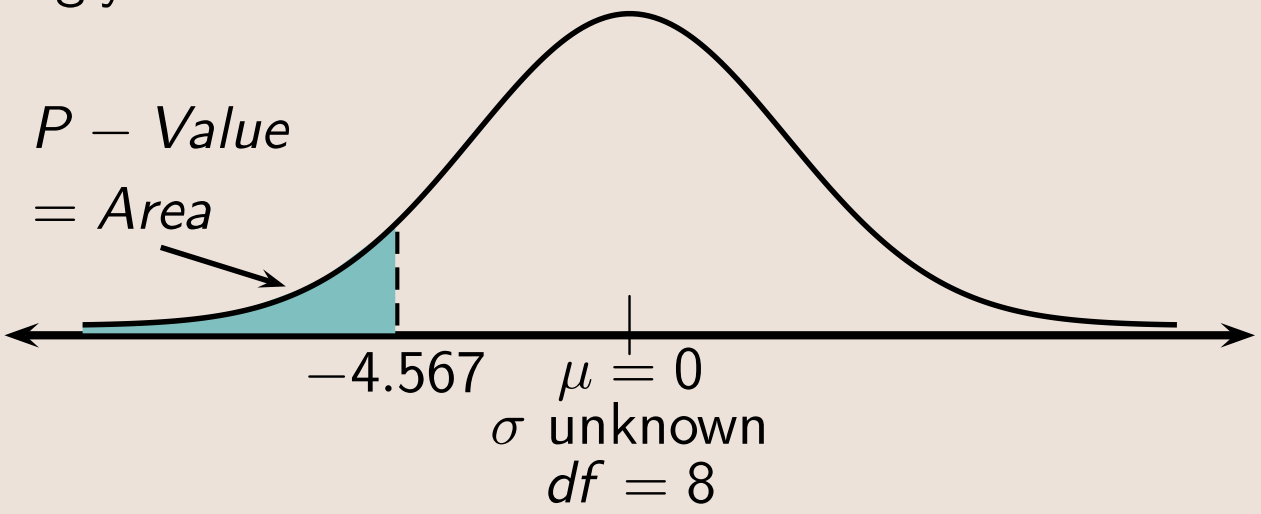
$P - Value = tcdf(1.645, E99, 29) \approx 0.055.$

Example:

Find the corresponding P-Value for a Left-Tail Test with $CTS\ t = -4.567$ and $df = 8$.

Solution:

We start by drawing the bell curve, then shade and label accordingly.



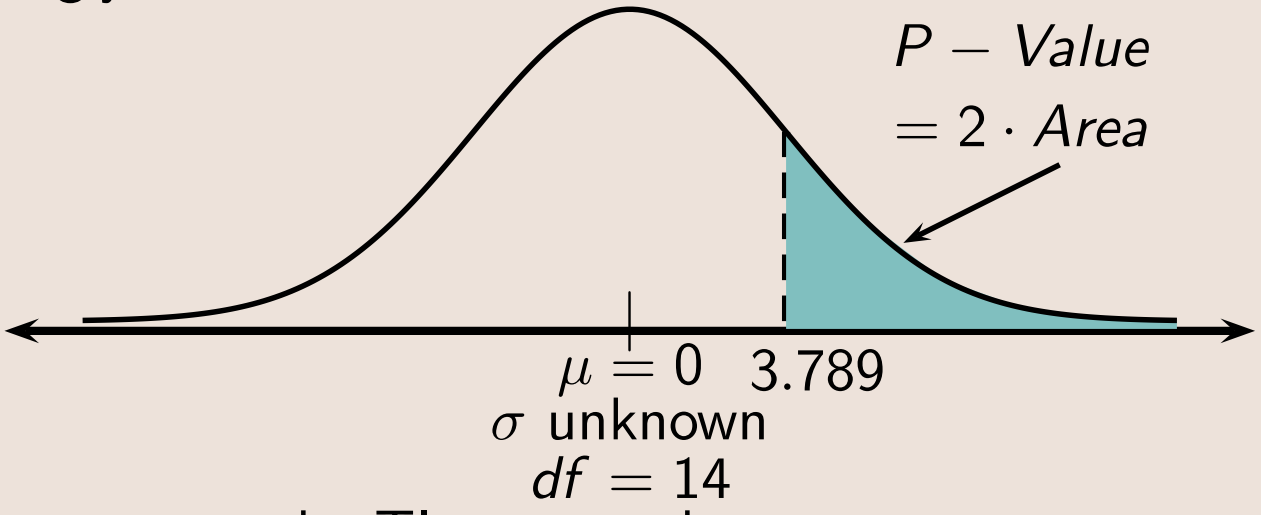
Now we can use the TI command,
$P - Value = tcdf(-E99, -4.567, 8) \approx 9.2 \times 10^{-4}$.

Example:

Find the corresponding P-Value for a Two-Tail Test with $CTS\ t = 3.789$ and $df = 14$.

Solution:

We start by drawing the bell curve, then shade and label accordingly.



Now we can use the TI command,

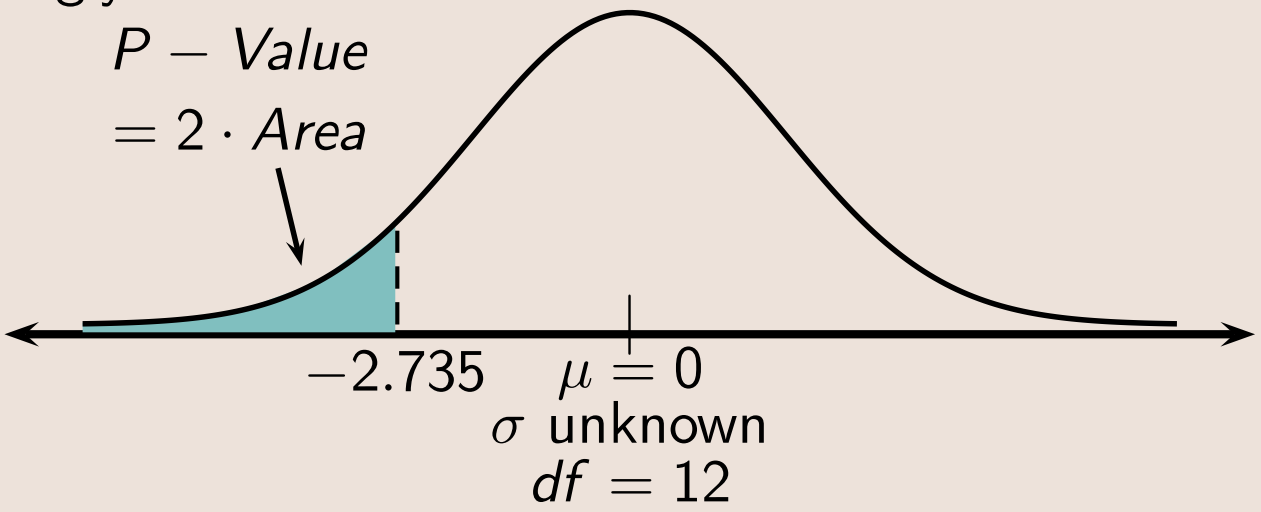
$P - Value = 2 \cdot tcdf(3.789, E99, 14) \approx 0.002.$

Example:

Find the corresponding P-Value for a Two-Tail Test with $CTS\ t = -2.735$ and $df = 12$. Round to 3-decimal places.

Solution:

We start by drawing the bell curve, then shade and label accordingly.



Now we can use the TI command,
$P - Value = 2 \cdot tcdf(-E99, -2.735, 12) \approx 0.018$.