$Z_{\alpha/2}$ is called critical value. 

It is displayed in 3-decimal places.

It is a $Z$-value in standard normal prob. dist. with the right-tail area of $\alpha/2$.

More on $\alpha$ later, but $0 < \alpha < 1$.

To find $Z_{\alpha/2}$, we can use `inv Norm`. 

\[ Z = \frac{X - \mu}{\sigma} \] 
\[ Z_{\alpha/2} \]
Find \( Z_{0.05} \)

\[ 1 - 0.05 = 0.95 \]
\[ \frac{0.05}{2} = 0.025 \]
\[ \alpha = Z(0.025) \]
\[ \alpha = 0.1 \]

To find \( Z_{0.05} \), use the inverse normal distribution:
\[ \text{invNorm}(0.95, 0, 1) = 1.645 \]

Find \( Z_{0.01} \)

\[ 1 - 0.01 = 0.99 \]
\[ \frac{0.01}{2} = 0.005 \]
\[ \alpha = Z(0.005) \]
\[ \alpha = 0.02 \]

To find \( Z_{0.01} \), use the inverse normal distribution:
\[ \text{invNorm}(0.99, 0, 1) = 2.326 \]
Find $Z_{\alpha/2}$ for $\alpha = 0.01$.

\[ \frac{\alpha}{2} = \frac{0.01}{2} = 0.005 \]

Now find $Z_{0.005}$

Area of Right-Tail

\[ \text{invNorm}(0.995, 0, 1) = 2.576 \]

Find $Z_{\alpha/2}$ for 90% confidence level.

\[ Z_{0.05} = 1.645 \]
Find $z_{\alpha/2}$ for $\alpha = 0.12$.

$\alpha/2 = 0.06$

$1 - 0.12 = 0.88$

88% Conf. level

$\text{invNorm}(0.94, 0, 1)$

$t$-distribution
Almost bell-shaped
Symmetric
Total Area = 1

It comes with df:
$\mu = 0$
$\sigma$ unknown

PRGM
TVAL
Find $t_{0.02}$ with $df=14$.

$\mu=0 \quad t_{0.02}=2.264$  
\[ \sigma \text{ unknown} \]

PRGM
TVAL
1: 0.02
2: 0.04
5: 0.96

Find $t_{0.05}$ for $90\%$ C-level with $df=19$.

$\mu=0 \quad t_{0.05}$  
\[ \sigma \text{ unknown} \quad = 1.729 \]

$1 - .9 = .1$  
$.1/2 = .05$

TVAL
1: .05
2: .1
5: .9

Donut example for $df$.

33 people  
33 donuts  
$\text{Last donut is for last person}$  
$df=32$  
$\text{NO selection needed}$
Chi-Square Distribution.
Non symmetric graph, begins at 0, skewed to the right. It also comes with df.

```plaintext
PRG M
χ2VAL
```

Find $\chi^2_L$ and $\chi^2_R$ for $\alpha = 0.04$, $df = 13$

```plaintext
PRG M
χ2VAL
df = 13
3: 0.04
4: 0.96
```
Find $\chi^2_R \leq \chi^2_L$ so $90\%$ C-level $\xi \text{ df}=9$.

$x^2_{0.05} = 3.325$  $x^2_{0.95} = 16.919$

How to use tcdf & $x^2$cdf:

2nd VARS tcdf(Lower, Upper, df)
2nd VARS $x^2$cdf(Lower, Upper, df)