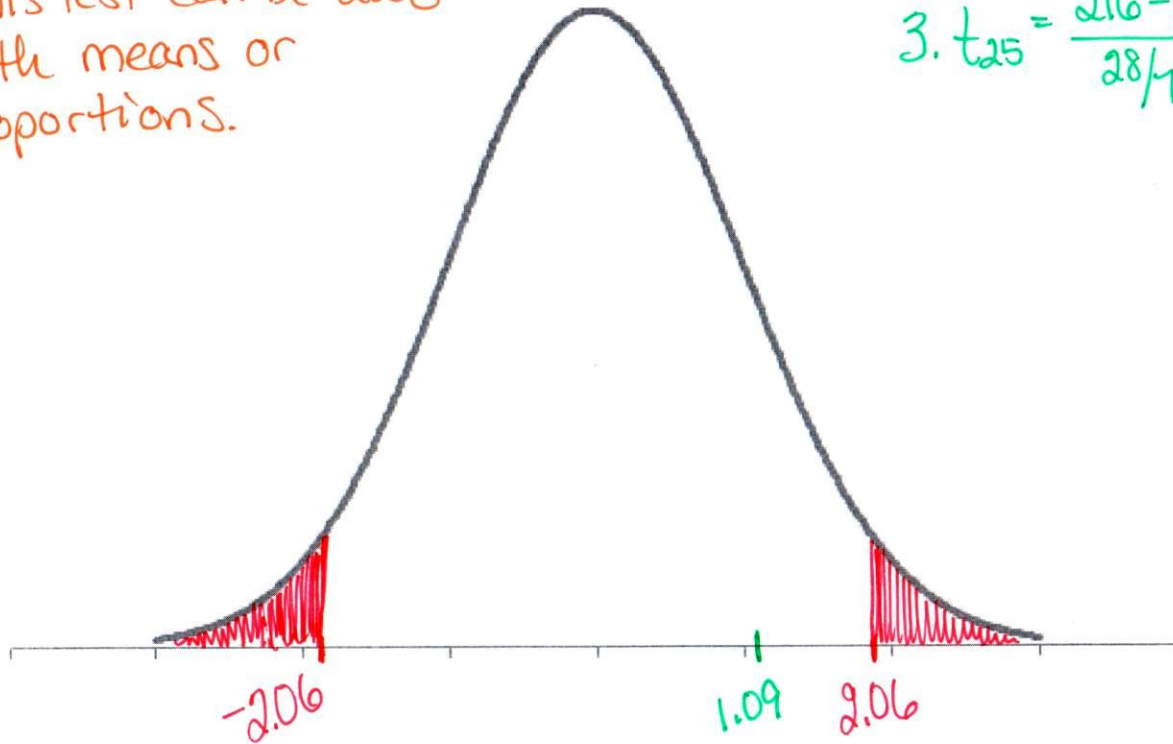


### Two-Tailed Hypothesis Test

This test can be used with means or proportions.



1.  $H_0: \mu = 210$   
 $H_A: \mu \neq 210$

2.  $\alpha = 0.05$

$t_{0.025, 25}^* = 2.06, -2.06$

3.  $t_{25} = \frac{216 - 210}{28/\sqrt{26}} = 1.09$

1.09 is less extreme than 2.06

1.09 is not in the critical region marked by 2.06

### The Critical Value Approach

1. State the Null and Alternative Hypotheses
2. Specify the Significance Level and Find the Critical Value(s)  $\alpha = 0.05$
3. Calculate the Test Statistic  $\bar{X} = 216$   $S = 28$   $n = 26$
4. Report the Results in a Conclusion

Fail to reject the null hypothesis. There is not enough evidence at a 5% level of significance to conclude that the population mean is not equal to 210.

### Two-Tailed Hypothesis Test

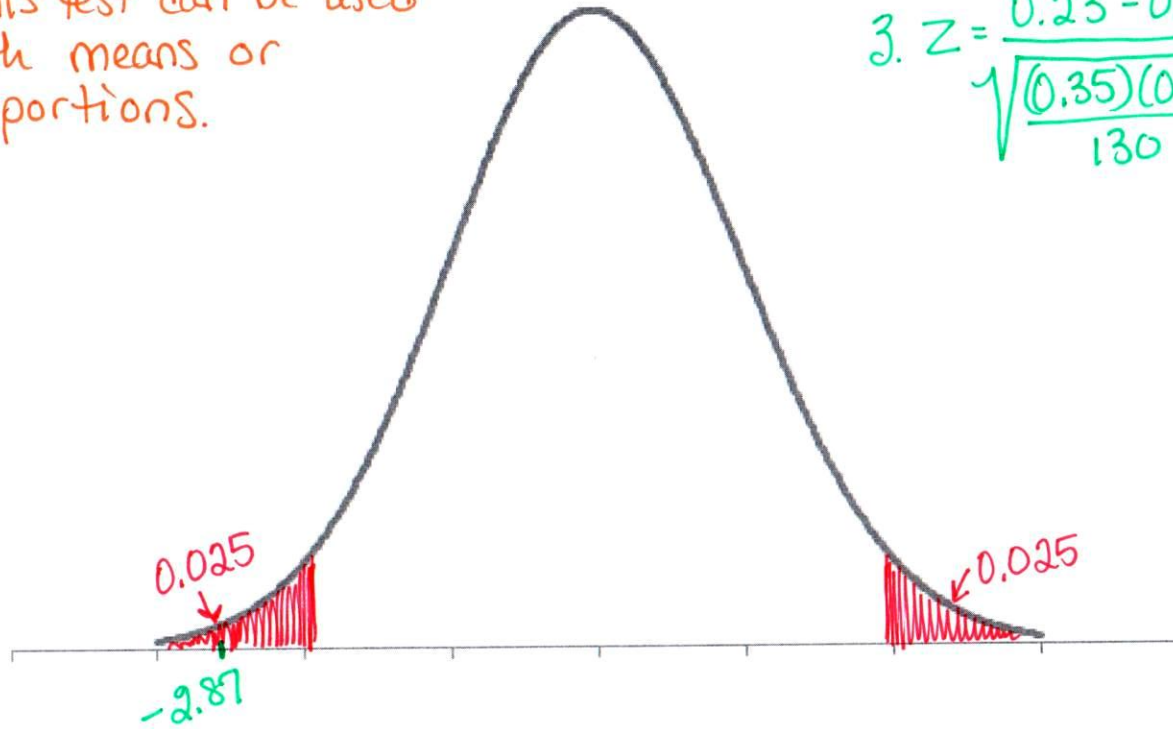
This test can be used with means or proportions.

1.  $H_0: p = 0.35$

2.  $\alpha = 0.05$

$H_A: p \neq 0.35$

3.  $Z = \frac{0.23 - 0.35}{\sqrt{\frac{(0.35)(0.65)}{130}}} = \frac{-0.12}{0.0418} = -2.87$



$= \text{NORM.S.DIST}(-2.87, 1)$

The P-Value Approach

Double 0.0021 to compare to  $\alpha = 0.05 \rightarrow (0.0021)(2) = 0.0042$   
 $0.0042 < 0.05$

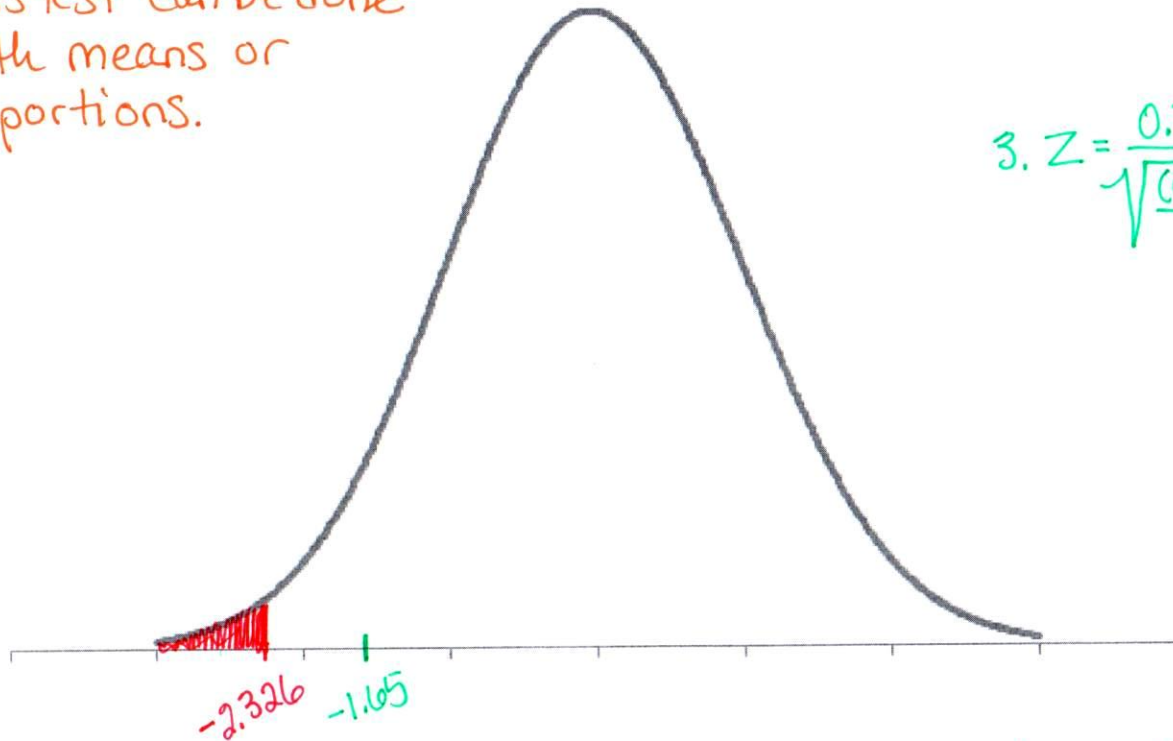
1. State the Null and Alternative Hypotheses
2. Specify the Significance Level  $\alpha = 0.05$
3. Calculate the Test Statistic and P-value  $\bar{p} = 0.23$   $n = 130$
4. Report the Results in a Conclusion

Reject the null hypothesis. There is enough evidence at a 5% level of significance to conclude that the population proportion is not equal to 0.35.

### One-Tailed Hypothesis Test

Right or Left tail

This test can be done with means or proportions.



$$1. H_0: p \geq 0.38$$
$$H_A: p < 0.38$$

$$2. \alpha = 0.01$$

$$Z_{0.01}^* = 2.326$$

left tailed test

use  $-2.326$

$$3. Z = \frac{0.34 - 0.38}{\sqrt{\frac{(0.38)(0.62)}{400}}} = \frac{-0.04}{0.0243} = -1.65$$

$-1.65$  is less extreme than  $-2.326$   
 $-1.65$  is not in the critical region marked by  $-2.326$

### The Critical Value Approach

1. State the Null and Alternative Hypotheses
2. Specify the Significance Level and Find the Critical Value(s)  $\alpha = 0.01$
3. Calculate the Test Statistic  $\bar{p} = 0.34$   $n = 400$
4. Report the Results in a Conclusion

Fail to reject the null hypothesis. There is not enough evidence at a 1% level of significance to conclude that the population proportion is less than 0.38.



### One-Tailed Hypothesis Test

Right or left Tail

This test can be used with means or proportions.

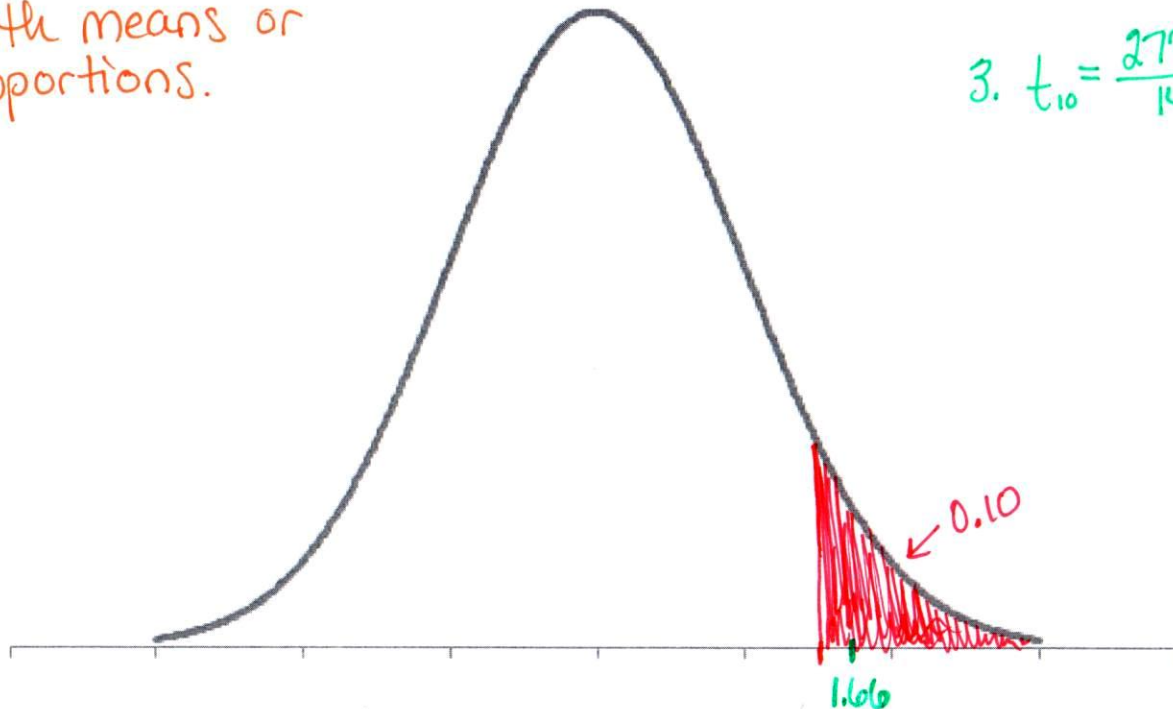
$$1. H_0: \mu \leq 270$$

$$H_A: \mu > 270$$

$$2. \alpha = 0.10$$

Right tailed test

$$3. t_{10} = \frac{277 - 270}{14 / \sqrt{11}} = \frac{7}{4.22} = 1.66$$



$$\text{0.064} \rightarrow = \text{T.DIST.RT}(1.66, 10)$$

$$0.064 < 0.10$$

### The P-Value Approach

1. State the Null and Alternative Hypotheses
2. Specify the Significance Level  $\alpha = 0.10$
3. Calculate the Test Statistic and P-value  $\bar{x} = 277$   $s = 14$   $n = 11$
4. Report the Results in a Conclusion

Reject the null hypothesis. There is enough evidence at a 10% level of significance to conclude that the population mean is greater than 270.