

$$H_0: \mu = \mu_0$$

$$H_A: \mu \neq \mu_0$$

$$\mu < \mu_0$$

$$\mu > \mu_0$$

$$z_{\text{calc}} = \frac{\bar{x} - \mu_0}{\sigma_{\bar{x}}} = \frac{\bar{x} - \mu_0}{\frac{\sigma}{\sqrt{n}}}$$

If  $H_0: \mu = \mu_0$  is true  
then  $z \sim Z$  or  $N(0,1)$

If  $z_{\text{calc}}$  is unlikely in  $Z$   
then reject  $H_0$ .

If  $z_{\text{calc}}$  is likely in  $Z$   
then do not reject  $H_0$ .

Where are the unlikely  
values? At what levels?

How likely are data  
at least this extreme  
if  $H_0: \mu = \mu_0$  is true?

If  $H_0$  is rejected data  
supports  $H_A$

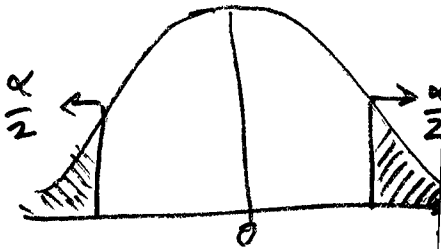
If  $H_0$  is not rejected  
data do not support  $H_A$

Case 1.

$$H_0: \mu = 12$$

$$H_A: \mu \neq 12$$

$$z = \frac{\bar{x} - \mu_0}{\sigma_{\bar{x}}} = \frac{\bar{x} - \mu_0}{\frac{\sigma}{\sqrt{n}}} = \frac{11.6 - 12}{\frac{.6}{\sqrt{36}}} = \frac{-.4}{.1} = -4$$



$$P = 2 \cdot P(Z < -4) = 2 \cdot (1 - .99997) = 2 \cdot (.00003) = .00006$$

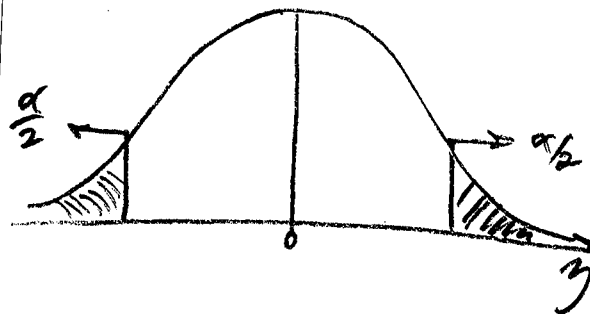
Strongly Reject  $H_0$   
Data support  $H_A$

Case 2.

$$H_0: \mu = 12$$

$$H_A: \mu \neq 12$$

$$z = \frac{\bar{x} - \mu_0}{\sigma_{\bar{x}}} = \frac{\bar{x} - \mu_0}{\frac{\sigma}{\sqrt{n}}} = \frac{12.05 - 12}{\frac{.6}{\sqrt{36}}} = \frac{.05}{.1} = .5$$



$$P = 2 \cdot P(Z > .5) = 2(1 - .69146) = 2(.30854) = .61708$$

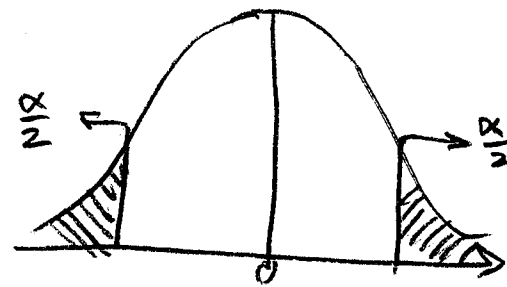
Do not reject  $H_0$ .  
Data do not support  $H_A$

Case 3.

$$H_0: \mu = 12$$

$$H_A: \mu \neq 12$$

$$z = \frac{\bar{x} - \mu_0}{\sigma_{\bar{x}}} = \frac{\bar{x} - \mu_0}{\frac{\sigma}{\sqrt{n}}} = \frac{11.8 - 12}{\frac{.6}{\sqrt{36}}} = \frac{-.2}{.1} = -2$$



$$P = 2 \cdot P(Z < -2) = 2(1 - .97725) = 2(.02275) = .0455$$

Can reject  $H_0$   
at  $\alpha = .05$ .  
Data support  $H_A$  @  $\alpha = .05$