Type I + Type II Errors

	H_0 True	H_a True
reject H_0	Type I	Correct
Accept H_0	Correct	Type II

1. $H_0: p \geq 24\%$ $H_a: p < 24\%$ p = proportion of new customers who will return to buy their next car

Type I - You believe that less than 24% of new customers will return but actually 24% or more do.

- You may work harder, hustle more

Type II - You think 24% or more of your customers will return + less do.

- You may overstock

2. $H_0: p \leq 21\%$ $H_a: p > 21\%$ p = prop of U.S. Adults w/ rudimentary literacy skills

Type I - You believe more than 21% of adults in U.S. have rudimentary reading skill. when in fact 21% or less than 21% do.

- New but unnecessary reading programs may be implemented

- Type II error - You believe only 21% or less adults have rudimentary reading skills but more do.
- Needed reading programs may not be implemented

3. $H_0: \sigma \geq 23$ min $H_a: \sigma < 23$ min σ = st. dev for the length of time to play a chess game.

Type I error - You think the spread for time to play a game of chess is less than 23 minutes but it is really more.

worse

You may schedules games too close together

Type II error - you think the spread for time to play a game of chess is 23 minutes or longer but it really take less time.

Wasted time, waiting between games.

4. $H_0: p \geq 0.020$ $H_a: p < 0.020$ p = % of emergency room visits by college undergr for alcohol related problem

Type I error: You believe less than 2% of emergency room visits by college students are for alcohol-related health problems but really more than 2% are.

worse

- medical staff may not check for alcohol / may not have proper medical stuff to treat it

4. Type II error - You believe more than 2% of emergency room visits are for college students with alcohol-related health problems. But it's really less than 2%.

- More alcohol awareness classes may be offered than actually needed.

Staff are more prepared for alcohol-related health problems than necessary

5. $H_0: p \geq .88$ $H_a: p < .88$ p = proportion of college students who own a computer

Type I error - Think less than 88% of student own a computer when really 88% or more own one.

- A teacher might not assign a computer assignment.
- Or may be school buys extra computers

Type II error - You think 88% or more student own a computer when really less than 88% own one.

Worst Teacher may give an computer assignment that not all students can do

6. $H_0: \sigma \leq 5$ months $H_a: \sigma > 5$ months
σ = st. dev. for the life of wristwatch batteries for this manufacturer.

Type I: You think the st. dev. (spread) of the battery life is more than 5 months when it really is less than 5 months.

- You may not buy the batteries because you think there is too much variability in how long it last.
- Or company may look for a new way to make batteries more consistent.

Type II error: You think the st. dev/spread of battery life is less than 5 months but it actually more.

Company may not implement needed change to make batteries more consistent.

worse

customer buys inconsistent batteries + is not happy