Single Sample Hypothesis Tests

H_0 - null hypothesis; status quo; nothing new happenin'
Assumed to be true; innocent until proven guilty

H_a - alternate hypothesis; burden of proof falls here

Let's talk notation

Note #3: H_0 ALWAYS gets an = ...even if the wording in the problem sounds like it shouldn't

H_0 : parameter = #

Note #1: Use colons

$\neq$

H_a : parameter < #

$>$

Note #2: Use only PARAMETERS in your hypothesis...although there will be some problems where we'll use words/sentences

Note #4: The symbol used in the alternate will come from the context of the problem

Single Sample Hypothesis Tests

Liam is convinced that the Titans will go 12-4 in 2020 (largely due to the delusion that they're getting Tom Brady). Ronan begs to differ and says that they won't even come close. Jackson decides to put this all to the (hypothesis) test.

H_0 - The Titans win 12 games in 2020

H_a - The Titans win fewer than 12 games in 2020

Important Semantics!
Jackson will find evidence that will allow us to either:

1) Reject the null hypothesis if we see evidence that Liam is wrong
2) Fail to reject (NOT accept) the null hypothesis if we find evidence that Liam is right

H_0 : wins = 12

H_a : wins < 12

It should be noted that IRL the null hypothesis tends to be the consensus or at least the accepted default truth

If Jackson can statistically infer (a process we will explore later) that the Titans will win less than 12, we will reject the null hypothesis

Errors - We make them, even though we're awesome

	Fail to reject H_0	Reject H_0
H_0 **true**	Hooray!	Type I error
H_a **true**	Type II error	Hooray!

Analogous to finding an innocent person guilty

Type I error - reject H_0 when H_0 is true

Type II error - fail to reject H_0 when H_0 is false

Analogous to finding a guilty person 'not guilty'

OR

Type I error - 1st equation correct and you pick the 2nd "equation"

Type II error - 2nd "equation" correct and you pick the 1st equation

Errors - We make them, even though we're awesome

	Fail to reject H_0	Reject H_0
H_0 **true**	Titans win 12!	Ronan is wrong but Jackson thinks he's right
H_a **true**	Jackson thinks Liam is right but Titans win less than 12	Ronan is right

Jackson has evidence that the Titans won't win 12 but finds he's wrong.

Type I error - Reject Titans winning 12 but they do

Type II error - Fail to reject Titans winning 12 but they don't

Jackson has evidence that the Titans will win 12 but finds that he's wrong

Errors - We make them, even though we're awesome

	Fail to reject H_0	Reject H_0
H_0 **true**	Hooray!	Type I error
H_a **true**	Type II error	Hooray!

Type I error - reject H_0 when H_0 is true

Type II error - fail to reject H_0 when H_0 is false

Discuss errors AND consequences in FRQs.

ALWAYS discuss your errors/ consequences in terms of H_a

$\equiv$

we have evidence of H_a or we don't have evidence of H_a

α vs β

$P\left(\text{Type I error}\right) = \alpha$

$P\left(\text{Type II error}\right) = \beta$

Also called 'level of significance' or 'significance level'.

If α goes up, then β goes down.

If α goes down, then β goes up.

Game plan - determine which error is worse, then choose the appropriate α and β.

In other words, Jackson needs to find which is more likely and go with that regardless of how Liam or Ronan will feel about it.