Hypothesis testing for a single mean:

1. Set the hypotheses: $H_0 : \mu = null\ value$

   $H_A : \mu\ <\ or\ >\ or\ \neq\ null\ value$
2. Calculate the point estimate: $\bar{x}$
3. Check conditions:
   1. ***Independence:*** Sampled observations must be independent (random sample/assignment & if sampling without replacement, n < 10% of population)
   2. ***Sample size/skew:*** n ≥ 30, larger if the population distribution is very skewed.
4. Draw sampling distribution, shade p-value, calculate test statistic $Z = \frac{\bar{x} - \mu}{SE}, \quad SE = \frac{s}{\sqrt{n}}$
5. Make a decision, and interpret it in context of the research question:
   - If p-value < α, reject H_0; the data provide convincing evidence for H_A.

Perform a hypothesis test to evaluate if these data provide convincing evidence of a difference between the average IQ score of mothers of gifted children and the average IQ score for the population at large, which is 100. Use a significance level of 0.01.

1. Set the hypotheses μ = average IQ score of mothers of gifted children

$H_0: \mu = 100$ $\quad H_A: \mu \neq 100$

n	36
min	101
mean	118.2
sd	6.5
max	131

2. Calculate the point estimate

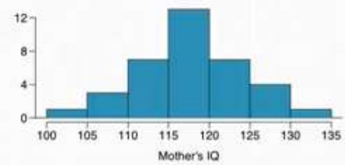
$\bar{x} = 118.2$

3. Check conditions

1. random & 36 < 10% of all gifted children -> independence
2. n > 30 & sample not skewed -> nearly normal sampling distribution

$H_0: \mu = 100$ $\quad \bar{x} = 118.2$

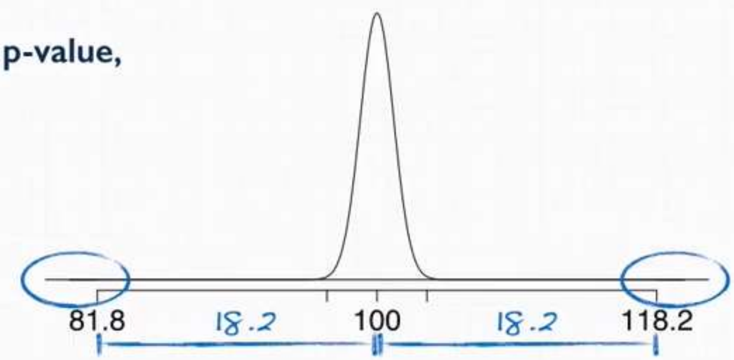
$H_A: \mu \neq 100$



n	36
min	101
mean	118.2
sd	6.5
max	131

$$\bar{X} \sim N\left(\mu = 100, SE = \frac{s}{\sqrt{n}} = \frac{6.5}{\sqrt{36}} \approx 1.083\right)$$

4. Draw sampling distribution, shade p-value, calculate test statistic



$$Z = \frac{118.2 - 100}{1.083} = 16.8$$

p-value ≈ 0

5. Make a decision, and interpret it in context of the research question

p-value is very low -> strong evidence against the null

We reject the null hypothesis and conclude that the data provide convincing evidence of a difference between the average IQ score of mothers of gifted children and the average IQ score for the population at large.