A company that produces bricks needs to know that the bricks are within spec. Instead of testing the dimensions, they assume a brick is too large if a bricks weight is too large. A brick is expected to weigh 5 lbs. The quality control manager *randomly selects* a pallet (n=256) of bricks and finds the sample mean weight of the bricks to be 5.01 lbs, and the sample standard deviation to be .08 lbs. Do a test at the 5% level to see if the mean weight of the selected brinks is greater than 5 lbs. Should he reject the lot (or even worse, assume the process is out of control and stop production.) ?

$\mu_0 = 5$
$\bar{x} = 5.01$ lbs
$s = .08$ lbs
$n = 256$
$df = n-1 = 255$

What is the parameter of interest? mean weight of bricks

What is the null hypothesis? $H_0: \mu = 5.0$ lbs

What is the alternative hypothesis? $H_A: \mu > 5.0$ lbs

Are the technical conditions satisfied? $n \geq 30$, Randomly selected

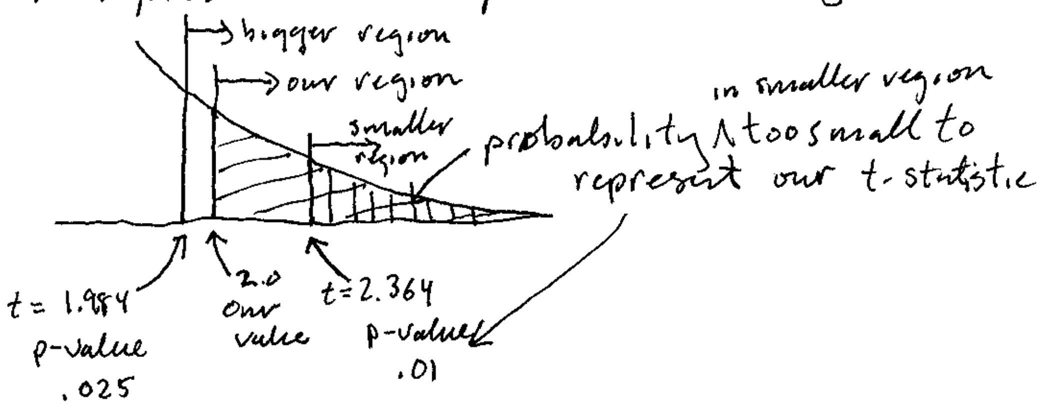
Calculate the test statistic. $t = \frac{\bar{x} - \mu}{s/\sqrt{n}} = \frac{5.01 - 5}{.08/\sqrt{256}} = \frac{.01}{.08}\sqrt{256} = .125(16) = 2.00$

find ~~Calculate~~ the p-value. p-value $< .025$

Summarize with a statement about whether the test should be ~~accepted or~~ rejected.

Since the p-value $< .025$ is less than the test level (.05), reject the null hypothesis. STOP PRODUCTION! (or just reject the lot)

Note: The p-value is $< .025$ because we can't find the precise probability associated with the t-statistic 2.00. For 255 degrees of freedom, the two values closest are $t_{.025,100} = 1.984$ and $t_{.01,100} = 2.364$ ($t_{x,500}$ would be too many df). So we choose the 1.984 value because it represents a larger critical region



Let's say a publisher claimed that 62% of children in the U.S. between the ages of 15-17 have read at least one harry potter book.

A random survey of 501 children age 15-17 from 25 major cities around the US found that 58% of these children had read at least one Harry Potter book.

Is he overstating the actual amount. Do a test of proportions at the 5% level.

a) What is the parameter of interest? π - proportion of U.S. 15-17 yr old who have read at least one H. Potter book.

b) What is the null hypothesis? $H_0: \pi = .62$

c) What is the alternative hypothesis? $H_A: \pi < .62$

d) Are the technical conditions satisfied?

e) Calculate the test statistic.

f) Calculate the p-value.

g) Summarize with a statement about whether the null hypothesis should be rejected. (ie whether the agent was exaggerating)

Build a 95% confidence interval for the sample proportion. (the final form should appear as (#,#)). Is .62 in that interval?

$$\hat{p} \pm z_{\alpha/2}(SE)_{\hat{p}} \qquad \hat{p} = .58$$

$$z_{.025} = 1.96 \qquad \alpha = 1 - .95 = .05 \quad \frac{\alpha}{2} = .025$$

$$\hat{p} \pm z_{.025}\sqrt{\frac{\hat{p}(1-\hat{p})}{n}} \qquad (SE)_{\hat{p}} = \sqrt{\frac{\hat{p}(1-\hat{p})}{n}}$$

$$.58 \pm 1.96\sqrt{\frac{.58(.42)}{501}}$$

$$.58 \pm 1.96(.022)$$

$$.58 \pm .043$$

$(.537, .623)$ yes! It (.62) is in the interval.

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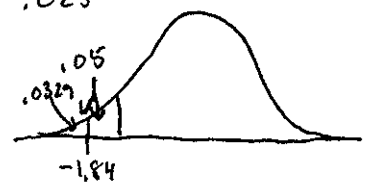
d) i) $n\pi \geq 10$ and $n(1-\pi) \geq 10$ $\quad n(1-\pi) = 501(.38) \geq 10$ so ok

ii) Random Survey, so ok

e) $$z = \frac{\hat{p} - \pi}{\sqrt{\frac{\pi(1-\pi)}{n}}} = \frac{.58 - .62}{\sqrt{\frac{.62(.38)}{501}}} = \frac{-.04}{\sqrt{.2356/501}} = \frac{-.04}{.025} = -1.84$$

f) $\Phi(-1.84) = .0329$ $\quad$ p-value $= .0329$



g) Since the p-value of .0329 is less than the test level of .05, reject the null hypothesis that $\pi = .62$. The agent is likely exaggerating.