Quiz Pink

① $\hat{p} = \frac{108}{400} = .27$ 90% $\alpha = .1$

$\frac{\alpha}{2} = .05$

$\hat{q} = 1 - .27 = .73$

a) $E = z\, s_{\hat{p}}$

$s_{\hat{p}} = \sqrt{\frac{\hat{p}\hat{q}}{n}} = \sqrt{\frac{.27(.73)}{400}}$

$\approx .022198$

$z = -\text{invNorm}(.05)$

$= 1.6449$

$E = 1.6449(.022198)$

$\approx .036512$

$E \approx .0366$

$.27 + .0366 = .3066$

$.27 - .0366 = .2334$

interval notation

$(.2334, .3066)$ 90% c.i.

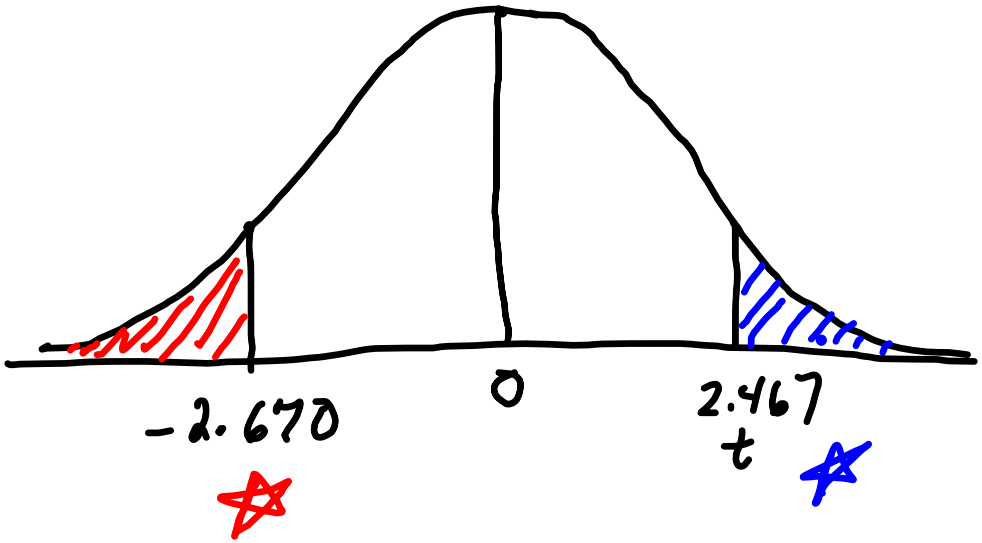
b) $\frac{E}{2} = \frac{.0366}{2} = .0183$

$n = \frac{z^2 \hat{p}\hat{q}}{E^2} = \frac{(1.6449)^2(.27)(.73)}{(.0183)^2}$

≈ 1592.44

$n = 1593$

② Green



a) $t = 2.467$ $df = 28$

low high df

$P(t > 2.467) = \text{tcdf}(2.467, E99, 28)$

$\approx .0100$

b) $t = -2.670$ $n = 55$

$P(t < -2.670) = \text{tcdf}(-E99, -2.67, 54)$

$\approx .0050$

④ Green

$n = 36$ 99% c.i.

$\bar{x} = 26.4$ $\alpha = .01$

$s = 2.3$ $\frac{\alpha}{2} = .005$

☆ $t = \text{invT}(.005, 35) \approx 2.7238$

☆ $s_{\bar{x}} = \frac{2.3}{\sqrt{36}} \approx .3833$

$E = t\, s_{\bar{x}} = 2.7238(.3833)$

≈ 1.0440

≈ 1.05

$26.4 + 1.05 = 27.45$

$26.4 - 1.05 = 25.35$

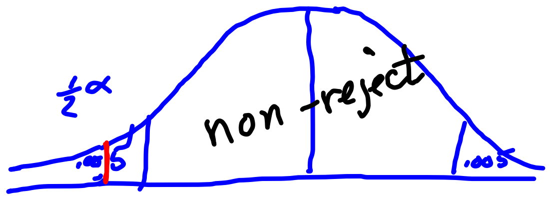
$(25.35, 27.45)$ 99% c.i.

$\alpha = .01$ $\qquad \frac{\alpha}{2} = .005$

two tailed test

$H_0: \mu = \mu_0$

$H_a: \mu \neq \mu_0$



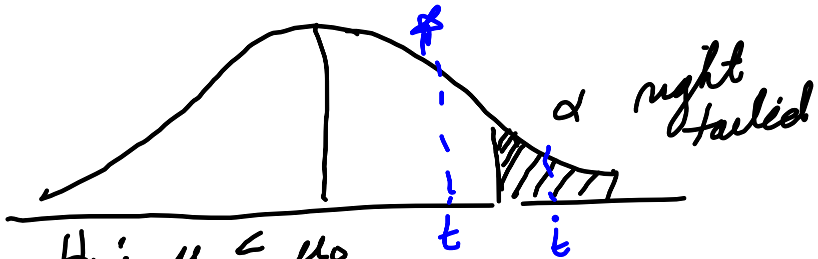
$$t = \frac{\bar{x} - \mu}{s_{\bar{x}}}$$

$$z_{\hat{p}} = \frac{\hat{p} - p_0}{\sigma_{\hat{p}}}$$

$$z = \frac{\bar{x} - \mu}{\sigma_{\bar{x}}}$$

$\frac{1}{2}$ p-value = tcdf(-E99, t, df)

$\frac{1}{2} p < \frac{1}{2} \alpha$ reject



$H_0: \mu \le \mu_0$

$H_a: \mu > \mu_0$

left tail

$H_0: \mu \ge \mu_0$

$H_a: \mu < \mu_0$

(3)

$n = 40$ $\quad H_0: \mu \leq 30$ calories

$\bar{x} = 32$ $\quad H_a: \mu > 30$ calories

$s = 2.8$

→ Let μ be the overall average number of calories per can

$$t = \frac{\bar{x} - \mu_0}{s_{\bar{x}}} \qquad s_{\bar{x}} = \frac{2.8}{\sqrt{40}} \approx .442719$$

$$= \frac{32-30}{.442719} \approx 4.5175$$

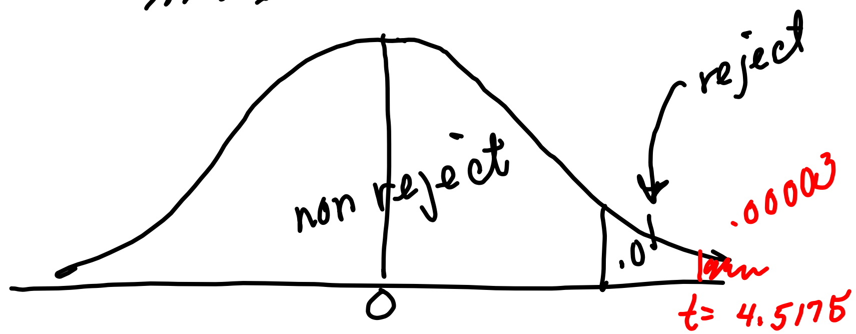
p-value $= P(t > 4.5175)$

$= \text{tcdf}(4.5175, E99, 39)$

$\approx .000028$

$.00003 < .01$ ∴ Reject H_0

We have strong evidence the cans contain on average more than 30 calories.



$t_{df} = \dfrac{\bar{x} - \mu_0}{s_{\bar{x}}}$

$n = 9$ $\mu_0 = 40$

$\bar{x} = 37.5$

I

① What are assumptons

– the sample is a simple random sample

– the population is normally distributed

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② $H_0: \mu \geq 40$ mi/gal

$H_a: \mu < 40$ mi/gal

left tailed test.

$s_{\bar{x}} = \dfrac{4.5}{\sqrt{9}} = 1.5$

③ $t = \dfrac{37.5 - 40}{1.5} \approx -1.6667$

④ Find the p-value

p-value $= P(t < -1.6667)$

$= \text{tcdf}(-E99, -1.6667, 8)$

$\approx .0671$

$\alpha = .01$
$= .02$
$= .05$

→ There is not enough evidence to claim that their cars get less 40 mi/gal.

P-values

.10 weak

.05 moderate

.02 fairly strong

.01 strong

.005 very strong

.0001 extremely strong

OR compare to α

$t = \frac{\bar{x}-\mu}{s_{\bar{x}}}$, $z = \frac{\bar{x}-\mu}{\sigma_{\bar{x}}}$, $z_{\hat{p}} = \frac{\hat{p}-p_0}{\sigma_{\hat{p}}}$

sample statistics

find area above or below t, z value

compare to α

area $< \alpha$ reject

area $> \alpha$ do not reject

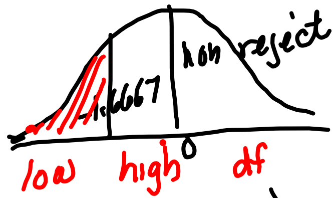
If $n=9$, $\bar{x} = 37.5$, $s = 4.5$ and $\mu = 40$

show $\mu < 40$

$s_{\bar{x}} = \frac{4.5}{\sqrt{9}} = \approx 1.5$

$t = \frac{\bar{x}-\mu_0}{s_{\bar{x}}}$

$t = \frac{37.5-40}{1.5} \approx -1.6667$



$P(t < -1.6667) =$ tcdf$(-E99, -1.6667, 8)$

$\approx .0671$

not strong evidence

$P(Z \geq \text{ or } \leq \#) =$ normalcdf(low, high)