1. A pair of dice used to play the game of craps in a Lake Tahoe casino is suspected of having been tampered with. Specifically, it is believed that this pair of dice has been "loaded" so as to produce the sum of "7" an exceptional number of times. When the dice were rolled 100 times, they produced a sum of "7" 25 times. $\hat{p} = \frac{25}{100} = .25 \quad n = 100$

   a) Create and interpret a 99% confidence interval to estimate the percentage of times a "7" would be rolled.

* 100 rolls may be treated as SRS of all possible rolls.
* $.25(100) \geq 10 \quad 100(.75) \geq 10$
  $25 \geq 10 \quad 75 \geq 0$
  n is large ✓

$$.25 \pm 2.576\sqrt{\frac{.25(1-.25)}{100}}$$

$$(.138, \ .3615)$$

I am 99% the prop. of times a 7 would be rolled is between .148 and .36.

   b) What would be the probability of rolling a sum of "7" on fair dice?

$$P(X=7) = 6/36 = 1/6$$

   c) Does this sample provide significant evidence that the dice are loaded?

Test

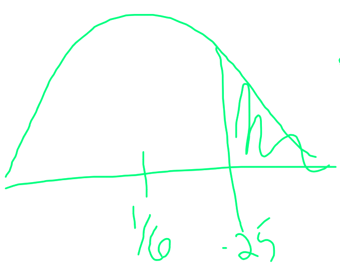
p = prop of times a 7 would be rolled on these dice.

$H_0: p = 1/6$ (fair dice)

$H_a: p > 1/6$ (dice are loaded – 7 shows an exceptional # of times)

$$z = \frac{.25 - 1/6}{.037} = 2.24$$

$$Pr(z > 2.24) = .0127$$



$\hat{p}$ of 7's

* n is large
  $100(1/6) \geq 10 \quad 100(5/6) \geq 10$
  $16.\bar{6} \geq 10 \quad 83.\bar{3} \geq 10$
* 100 rolls are SRS of all possible rolls.

$$\sqrt{\frac{1/6(1-1/6)}{100}} = .037$$

With a p-value of .0127, (prob. of rolling .25 7's if the dice are fair), there is evid. at .05 level to reject H_0.

There is evid. that dice are loaded to show an exceptional # of 7's!

2. A battery manufacturer randomly quality control tests its products. The standard deviation of the operating life of a "D" size battery is 3.0 hours. A sample of 9 batteries has a mean operating life of 20 hours. The manufacturer claims that its batteries have a mean operating life of 22 hours.

s

n

$\bar{x} =$

a) Create and interpret a 95% confidence interval for the mean number of hours a "D" battery will last.

$20 \pm 2.31\left(\frac{3}{\sqrt{9}}\right)$ $(17.69, 22.31)$

I am 95% conf. the mean life of the D batteries is between 17.69 and 22.31 hrs

b) Should the manufacturer be concerned about his claim at the 5% level of significance?

- Samp. dist. is normal if $n \geq 30$ or pop. is normal

$n = 9$:(and I don't know if the pop. is normal AND I don't have the sample data to graph and see if it's reasonable to assume

* assume pop. is normal: proceed w/ caution. :)

* also assume these 9 batt. are an SRS of all the company's D batt.

μ = mean oper. life of D battery

$H_0: \mu = 22$ mean life is as claimed by manuf.

$H_a: \mu < 22$ mean life is less - reason to be concerned.

$$t = \frac{20-22}{3/\sqrt{9}} = -2$$

P-value $= pr(t < -2) = .04$ (calc)

d.f. = 8

between .025 - .05

c) What assumptions are you making in order for this test to be valid?

At the .05 level, the p-value of .04 is sign. and there is evid. against H_0 - reject.

Based on this sample, the manuf. does have reason to be concerned that the batteries are lasting less than the advertised 22 hrs.

$H_0: p = 1/6$ (dice fair)

$H_a: p > 1/6$ (dice are loaded)

$\alpha = .005$

power of the test - 80%

	T	F
rej	I $\alpha = .005$	✓ power = .80
fail to reject	$1-\alpha$ .995	II $\beta = 1 - \text{power}$ .20
	1	1

Type I → reject H_0 / H_0 true ✓
Evid. showed dice are loaded, but they weren't.

II - fail to reject H_0
H_0 is false
Evid. doesn't show dice are loaded, but they were.