A

STT 200 1/20 homework

notes:

- CI for p

  $\hat{p}$ = point estimate of p

  $\hat{p} = {*}/n$

  ESE = standard error = $\sqrt{\hat{p}\hat{q}/n} \times \sqrt{N-n/N-1}$

  EME = margin of error = 1.96 (for 95% CI) × SE

  CI = $\hat{p} \pm EME$ ESTIMATED

- CI for μ

  $\bar{x}$ = estimate for μ

  $\bar{x} = x_1 + \dots x_n/n$ lowercase n

  find standard deviation by hand or w/ calc.

  ES.E. = $S.D./\sqrt{n}$

  EME = 1.96 × SE

  95% CI = $\bar{x} \pm EME$

95% - CI for $p_1 - p_2$

$$(\hat{p}_1 - \hat{p}_2) \pm 1.96 \sqrt{\hat{p}_1(1-\hat{p}_1)/n_1 \times N_1-n_1/N_1-1 + \hat{p}_2(1-\hat{p}_2)/n_2 \times N_2-n_2/N_2-1}$$

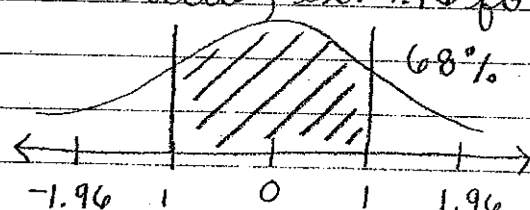
95% - CI for $\mu_1 - \mu_2$

$$(\bar{x}_1 - \bar{x}_2) \pm 1.96 \sqrt{SD_1^2/n_1 \times N_1-n_1/N_1-1 + SD_2^2/n_2 \times N_2-n_2/N_2-1}$$

* every CI is a balance between certainty and precision

claim - 95% of samples of this size will produce confidence intervals that capture the true proportion

* z = critical value, ex. 1.96 for 95% and 1.00 for 68%



* for N large relative to n, $\sqrt{N-n/N-1} \approx 1$

* for $p \approx 0.5$, $\sqrt{p(1-p)} \approx 0.5$

$\hat{p}$ is to p, as
$\bar{x}$ is to μ

solutions:

2. N = whole population = 500 pages
n = sample set = 6
$*$ = special ones = 3
$\{\cancel{226}, 498, 713, 226, 554, 370\}$
✓ ✓ ✓ ✓

cross off duplicate

3. $\{2, 4, 12\}$
$\bar{x}$ = mean = $(2+4+12)/3 = 6$
standard deviation = S.D. =

origional value	deviations	squared deviatio
2	$2-6=-4$	$(-4)^2 = 16$
4	$4-6=-2$	$(-2)^2 = 4$
12	$12-6=6$	$(6)^2 = 36$

1. add up squared deviations: $16+4+36=56$
2. divide by n-1 : $56/3-1 = 56/2 = 28$ (n = # in set)
3. take square root: $\sqrt{28} = 5.2915 =$ S.D.

sample

or SD = $\sqrt{(2-6)^2+(4-6)^2+(12-6)^2/3-1} = \sqrt{28} = 5.2915$
* calculator - stats, edit, enter 2 4 & 12, stats, calc, 1-var stats, 2nd 1, Sx = S.D.

4.

men	women
$N_1 = 7,210$	$N_2 = 8994$
$n_1 = 200$	$n_2 = 316$
$*_1 = 41$	$*_2 = 17$

a. $\hat{p}_1 = 41/200$ $\hat{p}_2 = 17/316$
$\hat{p}_1 = 0.205$ $\hat{p}_2 = 0.054$
① $\hat{p}_1 - \hat{p}_2 = 0.205 - 0.054 = 0.151$ = point estimate of $p_1 - p_2$
ESE ② ~~SD~~ $= \sqrt{0.0008 + 0.00016} \approx \sqrt{\frac{\frac{41}{200}(1-\frac{41}{200})1}{200} + \frac{17/316(1-17/316)1}{316}}$
ESE ~~SD~~ = 0.031
③ EME = $1.96 \times 0.031 = 0.060 = 6\%$
④ 95% CI = 0.151 (which is $\hat{p}_1 - \hat{p}_2$) $\pm$ 0.060 = [0.091, 0.211]

b. 95% CI does not contain 0
c. tend to think p1 is larger, $P_1 - P_2 > 0$ (to R then)
d. it could have been left off because
it was approx. 1

5. a. men | women
$\bar{X}_1 = 2.78$ | $\bar{X}_2 = 1.84$
$SD_1 = 3.42$ | $SD_2 = 3.91$

① $\bar{X}_1 - \bar{X}_2 = 0.94$
② $SD = \sqrt{S_1^2/n_1 \times N_1 - n_1/N_1 - 1 + S_2^2/n_2 + N_2 - n_2/N_2 - 1} =$
$\sim \sqrt{0.058482 \times 1 + 0.04838 \times 1} = \sqrt{0.1068} = 0.3269$
③ $EME = 1.96 \times 0.3269 = 0.6407$
④ 95% CI = 0.94 (which is $\bar{X}_1 - \bar{X}_2$) $\pm 0.6407 =$
$[0.2993, 1.5807]$
b. 95% CI does not contain 0
c. tend to think p1 is larger