Practice Exam (1)

Q1 If the uric acid values in normal adult males are approximately normally distributed with a mean and standard deviation 5.6 and 1.1 mg percent, respectively. Find the probability that a sample of size 16 will yield a mean greater than 6.2.

Q2 for a population of 17-year-old boys and 17-year-old girls, the means and standard deviations, respectively, of their subscapular skinfold thickness values are as follows: boys, 9.5 and 5.5; girls, 14.6 and 8.5, simple random samples of 50 boys and 40 girls are selected from the populations.

A) What is the standard error of the girls' sample mean?
B) What is the variance of the boys' sample mean?
C) What is the probability that the boys' average is less than 10?

Q3 suppose the number of emergency cases in a hospital normally distributed with mean 5.2 per hour and standard deviation 2.28 per hour. In a sample of 36 hours, what is the probability that the sample mean of the number of cases will be at most 4.8 cases per hour?

Q4 the mean waiting time in a clinic is normally distributed with standard deviation of 8 minutes, a random sample of 18 patients has a waiting time mean 23 minutes. Find 90% confidence interval for the waiting time mean in the clinic.

Q5 A researcher is interested in constructing a 95% confidence interval for the proportion of drug addicts, say p, who recover after a rehabilitation course. He requires his margin of error not exceeding 0.05. find the minimum sample size needed to construct such an interval if there is no prior information about p.

Q6 Suppose a clinical trial is conducted to test the efficacy of a new drug, spectinomycin, for treating gonorrhea in females. Forty-six patients are given a 4-g daily dose of the drug and are seen 1 week later, at which time 6 of the patients still have gonorrhea.

A) What is the best point estimate for p, the probability of a failure with the drug?
B) What is a 95% CI for p?

Q7 The data in table concern the mean triceps skin-fold thickness in a group of normal men and a group of men with chronic airflow limitation.

Group	Mean	*sd*	*n*
Normal	1.35	0.5	40
Chronic airflow limitation	0.92	0.4	32

A) What is the standard error of the mean for each group?
B) Assume that the central-limit theorem is applicable. What does it mean in this context?

Q8 Suppose we want to estimate the concentration (µg/mL) of a specific dose of ampicillin in the urine after various periods of time. We recruit 25 volunteers who have received ampicillin and find they have a mean concentration of 7.0 µg/mL with a standard deviation of 2.0 µg/ml. Assume the underlying population distribution of concentrations is normally distributed. Find a 95% CI for the population mean concentration.

Q9 The mean serum-creatinine level measured in 12 patients 24 hours after they received a newly proposed antibiotic was 1.2 mg/dL.

A) If the mean and standard deviation of serum creatinine in the general population are 1.0 and 0.4 mg/dL, respectively, then, using a significance level of .05, test whether the mean serum-creatinine level in this group is different from that of the general population.
B) What is the p-value for the test?

Q10 compute:

A) The probability that a *t* distribution with 30 df exceeds 2.04.
B) The lower 10th percentile of a *t* distribution with 60 df.
C) Find the upper 1st percentile of a t distribution with 16 df.
D) Find the upper 2.5th percentile of a t distribution with 7 df.

Q11 Suppose the incidence rate of myocardial infarction (MI) was 5 per 1000 among 45- to 54-year-old men in 2000. To look at changes in incidence over time, 5000 men in this age group were followed for 1 year starting in 2010. Fifteen new cases of MI were found.

A) Using the critical-value method with $\alpha = .05$, test the hypothesis that incidence rates of MI changed from 2000 to 2010.
B) Report a p-value to correspond to your answer in part (a)

Q12 Suppose the annual incidence of asthma in the general population among children 0–4 years of age is 1.4% for boys and 1% for girls.

A) If 10 cases are observed over 1 year among 500 boys 0–4 years of age with smoking mothers, then test whether there is a significant difference in asthma incidence between this group and the general population using the critical-value method with a two-sided test. Use α=0.05.
B) Report a p-value corresponding to your answer in part (a).

Q13 Is the difference between the mean annual salaries of entry level software engineers in Raleigh and Wichita is different from zero? To decide, you select a random sample of entry level software engineers from each city. The results of each survey are shown in the figure at the table. Assume the samples' standard deviations are S_1 = \$10,850 and S_2 = \$10,970.

At α = 0.05, what should you conclude?

Raleigh	Wichita
$\bar{X}_1 = 64{,}270$ $n_1 = 32$	$\bar{X}_2 = 62{,}610$ $n_2 = 30$

Q14 One of the following statements if false

A) An alternative hypothesis is a statistical hypothesis that contains a statement of equality.

B) A type II error occurs if the null hypothesis is not rejected when it's false.

C) A type I error occurs if the null hypothesis is rejected when it's true.

D) In a hypothesis test, the level of significance is your maximum allowable probability of making a type I error.

E) If the P-value is greater than the level of significance, then there is no enough evidence to reject the null hypothesis.

Q15 The mean serum-creatinine level measured in 13 patients 24 hours after they received a newly proposed antibiotic was 1.1 mg/dL. If the mean and standard deviation of serum creatinine in the general population are 1.0 and 0.4 mg/dL, respectively, then, using a significance level of 0.05, test whether the mean serum-creatinine level in a group of is different from that of the general population. Then:

A) Test stat = 0.97, Fail to reject H0. There is sufficient evidence to conclude that the mean serum-creatinine level in this particular group of patients is different from that of the general population.
B) Test stat = 1.96, Reject H0. There is insufficient evidence to conclude that the mean serum-creatinine level in this particular group of patients is different from that of the general population.
C) Test stat = 0.90, Fail to reject H0. There is insufficient evidence to conclude that the mean serum-creatinine level in this particular group of patients is different from that of the general population.
D) Test stat =-1.96, Reject H0. There is sufficient evidence to conclude that the mean serum-creatinine level in this particular group of patients is different from that of the general population.

Q16 A population is normally distributed with unknown variance. A researcher claims that the population mean is more than 60. A sample of size 10 showed mean 61 and standard deviation 2. Testing at $\alpha = 0.01$

A) We reject H_0, if the test statistic > 3.250 and the test statistic $= 1.73$

B) We reject H_0, if the test statistic > 2.821 and the test statistic $= 1.58$

C) We reject H_0, if the test statistic > 2.602 and the test statistic $= 1.58$

D) We reject H_0, if the test statistic > 1.833 and the test statistic $= 1.73$

E) We reject H_0, if the test statistic > 1.383 and the test statistic $= 1.58$

Q17 Suppose the annual incidence of asthma in the general population among boys 0–4 years of age is 1.4%. If 11 cases are observed over 1 year among 550 boys 0–4 years of age with smoking mothers, then test whether there is a significant difference in asthma incidence between this group and the general population of boys 0–4 years of age using the critical-value method with a two-sided test. (Use α = 0.05.), then:

A) p-value = 0.1151, Reject H0; based on the results we find that there is sufficient evidence to conclude that there is a significant difference in asthma incidence between the population of boys 0–4 years of age with smoking mothers and the general population.

B) P-value=0.1151, Fail to reject H0; based on the results we find that there is sufficient evidence to conclude that there is a significant difference in asthma incidence between the population of boys 0–4 years of age with smoking mothers and the general population.

C) p-value=0.2302, Fail to reject H0; based on the results we find that there is insufficient evidence to conclude that there is a significant difference in asthma incidence between the population of boys 0–4 years of age with smoking mothers and the general population.

D) p-value=0.2302, Reject H0; based on the results we find that there is insufficient evidence to conclude that there is a significant difference in asthma incidence between the population of boys 0–4 years of age with smoking mothers and the general population.

Q18 The grades of males are normally distributed and the grades of females are normally distributed. A researcher claims that the man of the male grades μ_1 is smaller than the mean of the female grade μ_2. A random sample of 9 males showed a mean 60 and variance 9, another random sample of female 16 showed mean 63 and variance 16 testing at $\alpha = 0.005$

A) The test statistic=-1.95 and there is enough evidence to support the claim.

B) The test statistic=-1.95 and there is not enough evidence to support the claim.

C) The test statistic=$-3.68$and there is enough evidence to support the claim.

D) The test statistic=-2.807 and there is not enough evidence to support the claim.

E) The test statistic=$-2.807$and there is enough evidence to support the claim.

Q19 A random sample of size 16 has mean 54 and standard deviation 4. Assuming that the population is normally distributed. In such a case, the 99% confidence interval for the population mean is:

A) $(52.659, 55.341)$ $B)(52.247, 55.753)$ $C)$ $(51.869, 56.131)$

$D)$ $(51.398, 56.602)$ E) $(51.053, 56.947)$

Q20 Population 1 and population 2 are normally distrusted with equal variances. A sample of size 10 is chosen from population 1 and showed mean 40 and standard deviation 5. A sample of size 15 is chosen from population and showed mean 34 and standard deviation 8. Let $\mu_1$be the man of population 1 and μ_2 be the mean of population 2. Then the 90% confidence interval for $\mu_1 - \mu_2$ is

A) $1.43 < \mu_1 - \mu_2 < 10.57$
B) $1.12 < \mu_1 - \mu_2 < 10.89$
C) $1.03 < \mu_1 - \mu_2 < 10.97$
D) $1.33 < \mu_1 - \mu_2 < 10.67$
E) $1.23 < \mu_1 - \mu_2 < 10.77$

Q21 The weights of newborn babies before and after taking vitamins are given by the following table A =wighet before, B = weight after.

Baby	A	B
1	2	3
2	4	4
3	2	4

A researcher claims that the mean weights is different from zero. Let $d = A - B$, then testing at $\alpha = 0.005$;

A) $H_0: \mu_d = 0$, and the test statistic $= -1.52$
B) $H_0: \mu_d \neq 0$, and the test statistic $= -1.47$
C) $H_0: \mu_d = 0$, and the test statistic $= -1.73$
D) $H_0: \mu_d \neq 0$, and the test statistic $= -1.61$
E) $H_0: \mu_d = 0$, and the test statistic $= -1.38$

Q22 Assuming that the population standard deviation is 3 and a researcher claims that the population mean is different from 40. A random sample of size 36 showed mean 39. Testing at $\alpha = 0.05$

A) The P −Value is 0.0228 and the is enough evidence to reject the claim.

B) The P −Value is 0.0228 and the is not enough evidence to reject the claim.

C) The P −Value is 0.0456 and the is enough evidence to reject the claim.

D) The P −Value is 0.0456 and the is not enough evidence to reject the claim.

E) The P −Value is 0.0321 and the is enough evidence to reject the claim.

Q23 In a given population the mean is 60 and standard deviation is 14. If a sample of size 49 is chosen, then the probability that the sample mean is greater than 59 will be:

A) 0.6915 B) 0.8413 C) 0.9332 D) 0.9772 E) 0.9938

Q24 A researcher claims that the proportion of smokers in a population is different from 40%. A random sample of 100 people, showed 51 smokers. Testing at $\alpha = 0.01$

A) $H_0: p \neq 0.40$, the test statistic= 2.245 and the is enough evidence to support the claim.

B) $H_0: p = 0.40$, the test statistic= 2.041 and the is enough evidence to support the claim.

C) $H_0: p \neq 0.40$, the test statistic= 2.245 and the is not enough evidence to support the claim.

D) $H_0: p \neq 0.40$, the test statistic= 2.041 and the is not enough evidence to support the claim.

E) $H_0: p = 0.40$, the test statistic= 2.021 and the is not enough evidence to support the claim.

* practice exam (1) solutions :-

Q1 $\mu = 5.6$, $\sigma = 1.1$, $n = 16$

$P(\bar{x} > 6.2) = P\left(\frac{\bar{x}-\mu}{\frac{\sigma}{\sqrt{n}}} > \frac{6.2-5.6}{\frac{1.1}{\sqrt{16}}}\right)$

$= P(Z > 2.18) = 1 - P(Z < 2.18) = 1 - 0.9854 = 0.0146$

Q2 Boys : $\mu = 9.5$, $\sigma = 5.5$, $n = 50$

Girls : $\mu = 14.6$, $\sigma = 8.5$, $m = 40$.

1) S.E fo girls $= \frac{\sigma}{\sqrt{n}} = \frac{8.5}{\sqrt{40}} = 1.344$.

2) $\sigma^2_{\bar{x}} = \frac{\sigma^2}{n} = \frac{(5.5)^2}{50} = 0.605$

3) $P(\bar{x} < 10) = P\left(\frac{\bar{x}-\mu}{\frac{\sigma}{\sqrt{n}}} < \frac{10-9.5}{\frac{5.5}{\sqrt{50}}}\right) = P(Z < 0.64)$

$= 0.7389$

Q3 $\mu = 5.2$, $\sigma = 2.28$, $n = 36$.

$P(\bar{x} < 4.8) = P\left(Z < \frac{4.8-5.2}{2.28/\sqrt{36}}\right) = P(Z < -1.05) = P(Z > 1.05)$

$= 1 - P(Z < 1.05) = 1 - 0.8531 = 0.1469$.

Q4 $\sigma = 4$, $n = 18$, $\bar{x} = 23$.

90% CI for μ $\Rightarrow$ $\bar{x} \pm Z_{\alpha/2} \cdot \frac{\sigma}{\sqrt{n}}$.

$Z_{90\%} = 1.65$ $\Rightarrow 23 \pm 1.65 \cdot \frac{(4)}{\sqrt{18}} \Rightarrow (21.44, 24.56)$

Q5 95% for P, $E = 0.05$, Assume $\hat{p} = 0.5$.

↳ $Z_{\alpha/2} = 1.96$.

$n = \left(\frac{Z_{\alpha/2}}{E}\right)^2 \cdot \hat{p}(1-\hat{p}) = \left(\frac{1.96}{0.05}\right)^2 (0.5)(0.5) = 384.16$

≈ 385

Q_6 $n = 64$, $X = 6 \rightsquigarrow \hat{p} = \frac{X}{n} = \frac{6}{64} = 0.09375$

1) The best point estimate is $\hat{p} = 0.09375$.

2) 95% C.I for P. $\rightsquigarrow Z_{\alpha/2} = 1.96$.

$\hat{p} \pm Z_{\alpha/2} \cdot \sqrt{\frac{\hat{p}(1-\hat{p})}{n}} \Rightarrow 0.09375 \pm 1.96 \cdot \sqrt{\frac{0.09375(1-0.09375)}{64}}$

$= (0.022, 0.165)$

Q 7

A) normal $SE = \frac{\sigma}{\sqrt{n}} = \frac{0.5}{\sqrt{40}} = 0.079$

Chronic $S.E = \frac{\sigma}{\sqrt{n}} = \frac{0.4}{\sqrt{32}} = 0.071$

B) normal $\bar{X} \sim N(\mu, \frac{\sigma^2}{n}) = N(1.35, \frac{(0.5)^2}{40})$

Chronic $\bar{X} \sim N(\mu, \frac{\sigma^2}{n}) = N(0.92, \frac{(0.4)^2}{32})$

Both are normally distributed.

Q_8 $n = 25$, $\bar{X} = 7.0$, $S = 2.0$

95% CI for μ. $\rightsquigarrow d.f = n-1 = 25-1 = 24$.

$\bar{X} \pm t_{\alpha/2} \cdot \frac{S}{\sqrt{n}}$ $1-\alpha = 0.95 \to \alpha = 0.05 \to \frac{\alpha}{2} = 0.025$.

$7.0 \pm 2.064 \times \frac{2.0}{\sqrt{25}}$ $0.95 + 0.025 \rightsquigarrow t_{0.975}(24) = 2.06$

$(6.174, 7.826)$

Q_9 $n = 12$, $\bar{X} = 1.2$

A) $\sigma = 0.4$, $\alpha = 0.05$, $H_1: \mu \neq 1.0$

$Z = \frac{\bar{X} - \mu}{\sigma/\sqrt{n}} = \frac{1.2 - 1.0}{0.4/\sqrt{12}} = 1.73 \rightsquigarrow P(Z > 1.73) = 0.0418$

B) P-value $= 0.0418 \times 2 = 0.0836 > 0.05$ $\therefore$ we don't rej H_0.

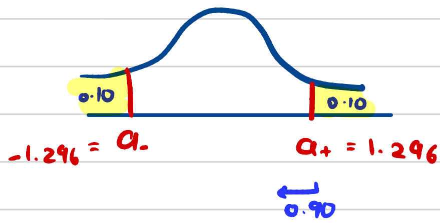
Q_{10}

A) $P(t > 2.04) = 1 - P(t < 2.04)$ with $df = 30$

$= 1 - 0.975 = 0.025$

B) $P(t < P_{10}) = 0.10$, $df = 60$

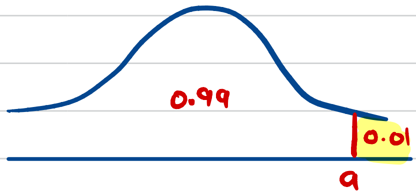
$P_{10} = -1.296$



C) $P(t > a) = 0.01$

$P(t < a) = 0.99$ $\quad d.f = 16$

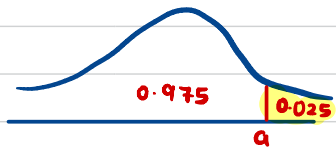
$a = 2.583$



D) $P(t > a) = 0.025$, $d.f = 7.$

$P(t < a) = 0.975$

$a = 2.365$



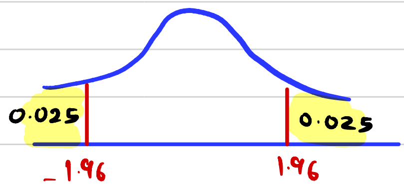
Q_{11} 5 in 1000 represent proportion in the population $\rightarrow P = \frac{5}{1000} = 0.005$

$n = 5000 \quad x = 15 \rightarrow \hat{P} = \frac{x}{n} = \frac{15}{5000} = 0.003$

A) $H_0: P = 0.005$ vs $H_1: P \neq 0.005$, $\alpha = 0.05$

$$Z = \frac{\hat{P} - P_0}{\sqrt{\frac{P_0(1-P_0)}{n}}} = \frac{0.003 - 0.005}{\sqrt{\frac{0.005(0.995)}{5000}}} = -2.01$$

$\frac{\alpha}{2} = \frac{0.05}{2} \rightarrow \alpha/2 = 0.025$



$\therefore$ we rej H_0 $\rightarrow$ we support H_1, means the proportion actually is different from 0.005.

B) $P(Z < -2.01) = P(Z > +2.01) = 0.0222.$

P-Value $= 2 \times 0.0222 = 0.0444.$

$0.0444 < 0.05 \rightarrow$ we rej H_0

Note :- using critical value Method or P-value Method both should lead to the same decision.

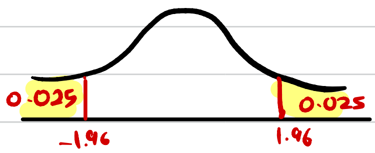
Q12 Boys : $P_1 = 0.014$.
Girls : $P_2 = 0.01$

A) $x = 10$, $n = 500$ $\rightarrow$ $\hat{p} = \frac{x}{n} = \frac{10}{500} = 0.02$.

$H_0: P = 0.014$ vs $H_1: P \neq 0.014$

$$Z = \frac{\hat{p} - P_0}{\sqrt{\frac{P_0(1-P_0)}{n}}} = \frac{0.02 - 0.014}{\sqrt{\frac{0.014(1-0.014)}{500}}} = 1.14$$

$\frac{\alpha}{2} = \frac{0.05}{2} \rightarrow \alpha/2 = 0.025$



$\therefore$ we don't rej Ho, we don't have enough evidence to support that the proportion actually changed from 0.014.

B) $P(Z > 1.14) = 1 - P(Z < 1.14) = 1 - 0.8729 = 0.1271$

P-value $= 2 \times 0.1271 = 0.2542$

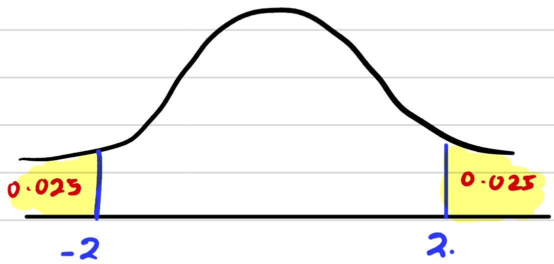
Q13 $H_0: \mu_1 - \mu_2 = 0$ vs $H_1: \mu_1 - \mu_2 \neq 0$

$$t = \frac{\bar{x} - \bar{y}}{s\sqrt{\frac{1}{n} + \frac{1}{m}}} = \frac{64,270 - 62,610}{10,908.16 \cdot \sqrt{\frac{1}{32} + \frac{1}{30}}} = 0.599$$

$$s = \sqrt{\frac{(n-1)s_1^2 + (m-1)s_2^2}{n + m - 2}} = \sqrt{\frac{31(10,850)^2 + 29(10,970)^2}{32 + 30 - 2}} = 10,908.16$$

$\frac{\alpha}{2} = \frac{0.05}{2} \rightarrow \alpha/2 = 0.025$.

$t_{0.975}^{(60)} = 2.000$



$\therefore$ we don't rej Ho

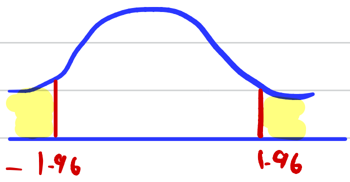
we don't have enough evidence to support the claim. "that the difference between the means is different from zero"

Q14 answer is A.

Q_{15} $\sigma = 0.4$, $n = 13$, $\bar{x} = 1.1$, $\alpha = 0.05$

$H_0 : \mu = 1.0$ vs $H_1 : \mu \neq 1.0$

$z = \frac{\bar{x} - \mu}{\sigma / \sqrt{n}} = \frac{1.1 - 1.0}{0.4 / \sqrt{13}} = 0.90$



$\frac{\alpha}{2} = \frac{0.05}{2} \Rightarrow \alpha/2 = 0.025$

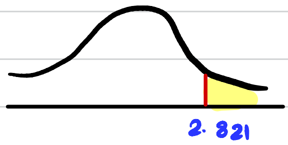
$\therefore$ we fail to rej H_0. $\rightsquigarrow$ C

There's no sufficient evidence to support that the mean $\neq 1.0$

Q_{16} $n = 10$, $\bar{x} = 61$, $S = 2$, $\alpha = 0.01$

$H_0 : \mu = 60$ vs $H_1 : \mu > 60$

$t = \frac{\bar{x} - \mu}{s / \sqrt{n}} = \frac{61 - 60}{2 / \sqrt{10}} = 1.58$



$t_{0.99}^{(9)} = 2.821$

$\rightsquigarrow$ B

Q_{17} $x = 11$, $n = 550$ $\rightsquigarrow$ $\hat{p} = \frac{x}{n} = \frac{11}{550} = 0.02$

$H_0: p = 0.014$ vs $H_1: p \neq 0.014$ $\alpha = 0.05$

$z = \frac{\hat{p} - p}{\sqrt{\frac{p(1-p)}{n}}} = \frac{0.02 - 0.014}{\sqrt{\frac{0.014(0.986)}{550}}} = 1.20$

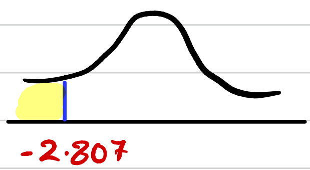
$P(z > 1.20) = 1 - P(z < 1.20) = 1 - 0.8849 = 0.1151$ $\rightsquigarrow$ P-Value $= 0.1151 \times 2 = 0.2302 > 0.05$

$\therefore$ we fail to rej H_0, there's insuff evidence to prove that there's a difference. $\rightsquigarrow$ C

Q_{18} Males : $n = 9$, $\bar{x} = 60$, $S_1^2 = 9$
Females: $m = 16$, $\bar{y} = 63$, $S_2^2 = 16$

$H_0: \mu_1 - \mu_2 = 0$ vs $H_1 : \mu_1 < \mu_2$ $\rightsquigarrow$ $H_1: \mu_1 - \mu_2 < 0$ $\alpha = 0.005$

$s = \sqrt{\frac{(n-1)s_1^2 + (m-1)s_2^2}{n+m-2}} = \sqrt{\frac{8(9) + 15(16)}{9 + 16 - 2}} = 3.683$



$t = \frac{\bar{x} - \bar{y}}{s \cdot \sqrt{\frac{1}{n} + \frac{1}{m}}} = \frac{60 - 63}{3.683 \sqrt{\frac{1}{9} + \frac{1}{16}}} = -1.95$

$t_{0.995}^{(23)} = 2.807$. $\therefore$ we don't rej H_0 , we don't support the claim. $\rightsquigarrow$ B

Q19 $n=16,\ \bar{x}=54,\ S=4$ 99% CI for μ?

$\bar{x} \pm t_{\alpha/2} \cdot \frac{S}{\sqrt{n}}$ $1-\alpha=0.99 \to \alpha=0.01 \to \alpha/2=0.005 \to t^{(15)}_{0.995}=2.947$

$54 \pm 2.947 \cdot \frac{(4)}{\sqrt{16}} = (51.053,\ 56.947)$ → E

Q20 Sample 1: $n=10,\ \bar{x}=40,\ S_1=5$ 90% CI for $\mu_1-\mu_2$.
Sample 2: $m=15,\ \bar{y}=34,\ S_2=8$

$1-\alpha=0.90 \to \alpha=0.10 \to \frac{\alpha}{2}=0.05$
$0.05+0.90=0.95$

$$S=\sqrt{\frac{(n-1)S_1^2+(m-1)S_2^2}{n+m-2}}=\sqrt{\frac{9(5)^2+14(8)^2}{10+15-2}}=6.981$$

$t^{(23)}_{0.95}=1.714.$

$\bar{x}-\bar{y} \pm t_{\alpha/2} \cdot s \cdot \sqrt{\frac{1}{n}+\frac{1}{m}} \Rightarrow 40-34 \pm 1.714 \cdot (6.981) \cdot \sqrt{\frac{1}{10}+\frac{1}{15}}$
$6 \pm 4.885 \Rightarrow (1.115,\ 10.885)$ → B

Q21

Baby	A	B	d_i	d_i^2
1	2	3	-1	1
2	4	4	0	0
3	2	4	-2	4

$\Sigma d_i = -3$
$\Sigma d_i^2 = 5$
$n=3$

$$\bar{d}=\frac{\Sigma d_i}{n}=\frac{-3}{3}=-1,\quad S_d=\sqrt{\frac{\Sigma d_i^2}{n-1}-\frac{(\Sigma d_i)^2}{n(n-1)}}=\sqrt{\frac{5}{2}-\frac{(-3)^2}{3(2)}}=1$$

$H_0: \mu_d=0$ vs. $H_1: \mu_d \neq 0$

$$t=\frac{\bar{d}-\mu_d}{\frac{S_d}{\sqrt{n}}}=\frac{-1-0}{\frac{1}{\sqrt{3}}}=-1.732$$ → C

Q22 $\sigma=3,\ n=36,\ \bar{x}=39,\ \alpha=0.05$
$H_0: \mu=40$ vs $H_1: \mu \neq 40$

$$Z=\frac{\bar{x}-\mu}{\sigma/\sqrt{n}}=\frac{39-40}{3/\sqrt{36}}=-2$$

$P(Z<-2)=P(Z>2)=1-P(Z<2)=1-0.9772=0.0228.$
p-value $=2\cdot(0.0228)=0.0456<0.05$ We rej H_0. → C

Q23 $\mu=60,\ \sigma=14,\ n=49$

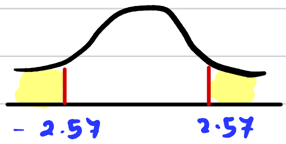
$$P(\bar{x}>59)=P\left(\frac{\bar{x}-\mu}{\sigma/\sqrt{n}}>\frac{59-60}{14/\sqrt{49}}\right)=P(Z>-0.5)=P(Z<0.5)=0.6915$$
→ A

Q24 $H_0: P = 0.40$ vs $H_1: P \neq 0.40$, $\frac{\alpha}{2} = \frac{0.01}{2}$ $\rightarrow \alpha/_2 = 0.005$

$n = 100$, $x = 51$ $\rightarrow \hat{p} = 0.51$

$$z = \frac{\hat{p} - p}{\sqrt{\frac{p(1-p)}{n}}} = \frac{0.51 - 0.40}{\sqrt{\frac{0.40(0.60)}{100}}} = 2.245$$

$\therefore$ we don't rej H_0 $\Rightarrow$ we don't support the claim.



$\rightarrow$ C