College of Sciences
Department of
Statistics and Operations
Research

Second Midterm Exam

Sunday, 20 Rabee I, 1441	**STAT 105**	**Academic year 1440-1441**
7 : 00 – 8 : 30 pm		**First Semester**
Student's Name	**ID number**	
Section No.	**Serial No.**	
Teacher's Name	**Classroom No.**	

Instructions:	30

- Switch off your mobile and place it under your seat.
- Time allowed is 90 Minutes.
- Do not copy answers from your neighbors. They have different sets of questions.
- Choose the nearest number to your answer.
- Do not use ***pencils*** or ***red pens***.
- For each question, put the code (A, B,⋯ Capital Letters, and ***clear***) of the correct answer in the following table beneath the question number.

1	2	3	4	5	6	7	8	9	10
D	*D*	*C*	*D*	*B*	*D*	*B*	*D*	*D*	*B*
11	12	13	14	15	16	17	18	19	20
D	*D*	*C*	*A*	*C*	*C*	*B*	*D*	*D*	*B*
21	22	23	24	25	26	27	28	29	30
C	*A*	*D*	*B*	*D*	*C*	*C*	*C*	*D*	*A*

Questions (1-3): An experiment reported in *Popular Science* compared fuel economies for two types of similarly equipped diesel mini-trucks. Let us suppose that 31 Volkswagen and 25 Toyota trucks were tested in 90-kilometer-per-hour steady- paced trials. If the 31 Volkswagen trucks averaged 15 kilometers per liter with a standard deviation of 1.5 kilometers per liter and the 25 Toyota trucks averaged 10 kilometers per liter with a standard deviation of 1.0 kilometer per liter. Assume that the distances per liter for the truck models are approximately normally distributed with equal variances.

1) The point estimate of $\left(\frac{\sigma_1}{\sigma_2}\right)^2$ is equal to:

A	B	C	D
1.50	1.75	2.00	2.25

2) The lower bound of the 98% confidence interval of $\left(\frac{\sigma_1}{\sigma_2}\right)^2$ is equal to:

A	B	C	D
0.025	0.125	0.225	0.872

3) The upper bound of the 98% confidence interval of $\left(\frac{\sigma_1}{\sigma_2}\right)^2$ is equal to:

A	B	C	D
3.027	1.675	5.557	4.015

Questions (4-11): Two kinds of thread are being compared for strength. Fifty pieces of Brand *A* and fifty-five of Brand *B* of thread are tested under similar conditions. Brand *A* has an average tensile strength of 80 kilograms with a standard deviation of 6 kilograms, while brand *B* has an average tensile strength of 95 kilograms with a standard deviation of 8 kilograms. To construct a 95% confidence interval for the difference of the population means.

4) The standard error of the mean of Brand B is:

A	B	C	D
1.529	1.635	1.721	1.08

5) The lower bound of 95 % confidence interval for the mean of Brand B is:

A	B	C	D
100.21	92.89	111.12	114.54

6) The upper bound of 95 % confidence interval for the mean of Brand B is:

A	B	C	D
100.12	89.22	92.31	97.11

7) The point estimate of the difference between the two population's means $\mu_B - \mu_A$ equals to:

A	B	C	D
25	15	27	18

8) The tabulated value (critical point) for the 96% ci equals to:

A	B	C	D
1.65	2.58	3.25	2.05

9) The standard error of the difference between the two sample's means $\sigma_{\bar{X}_B - \bar{X}_A}$ equals to:

A	B	C	D
2.45	1.64	3.24	1.37

10) The lower bound of the 95% confidence interval of the difference between the two population's means $\mu_B - \mu_A$ equals to:

A	B	C	D
10.21	12.31	11.12	14.54

11) The upper bound of the 95% confidence interval of the difference between the two population's means $\mu_B - \mu_A$ equals to:

A	B	C	D
15.12	19.22	12.31	17.69

Questions (12-15): A survey of 500 students found that 240 chose professional baseball team *A* as their favorite team. In a similar survey involving 1000 students, 250 of them chose team *A* as their favorite, then:

12) The point estimate of the difference between the two population's proportions equals to:

A	B	C	D
0.15	0.51	0.32	0.23

13) The tabulated value for the 98% confidence interval equals to:

A	B	C	D
2.65	1.96	2.33	1.35

14) The lower bound of the 95% confidence interval of the difference between the two population's proportions is equal to:

A	B	C	D
0.179	1.011	2.125	1.645

15) The upper bound of the 95% confidence interval of the difference between the two population's proportions is equal to:

A	B	C	D
0.064	0.111	0.281	0.325

Questions (16-19): Data are collected from a random sample of 500 subscribers. The results indicate that 100 of the subscribers would upgrade to a new service at a reduced cost. Test p < 0.23 at $\alpha = 0.05$.

16) The critical region (rejection region) is:

A	B	C	D
> -1.645	<1.645	< -1.645	>1.645

17) The alternative hypothesis H_1 is:

A	B	C	D
$p \geq 0.23$	$p < 0.23$	$p > 0.23$	$p \leq 0.23$

18) The test statistic is:

A	B	C	D
-1.645	1.645	1.59	-1.59

19) The decision is:

A	B	C	D
all of them	can not decide	reject H_0	accept H_0

Questions (20-23): The life in hours of a battery is known to be approximately normally distributed, with standard deviation $\sigma = 1.5$ hours. A random sample of 9 batteries has a mean life of $\bar{x} = 41$ hours. Test the claim that battery life exceeds 40 hours, using $\alpha = 0.05$.

20) The alternative hypothesis H_1 is:

A	B	C	D
$\mu \geq 40$	$\mu < 40$	$\mu > 40$	$\mu \leq 40$

21) The critical region (rejection region) is:

A	B	C	D
on the left.	on the right	on the middle.	on both sides.

22) The sampling distribution of $\bar{x}$ is:

A	B	C	D
normal.	F.	Student-t.	chi-square.

23) The decision is:

A	B	C	D
accept H_0	all of them	can not decide	reject H_0

Questions (24-26): Two independent samples were taken from two populations with means $\mu_1 and\ \mu_2$, respectively, resulted in the following :

Sample i	$\bar{x}_i$	n_i	σ_i
1	36	35	6
2	39	40	8

Is μ_1 smaller than μ_2 at $\alpha = 0.05$?

24) The test statistic equals:

A	B	C	D
1.53	-1.85	-1.53	1.85

25) The critical value equals:

A	B	C	D
-2.11	-2.38	-1.96	-1.64

26) The decision is:

A	B	C	D
accept H_0	all of them	reject H_0	can not decide

Questions (27-30): In a random sample of 25 observations, from a normal distribution it was found that the standard deviation equals 7, is it possible at $\alpha = 0.05$, that the standard deviation is less than 9?

27) The critical region (rejection region) equals:

A	B	C	D
< 15.22	> 15.22	< 13.85	> 13.85

28) The $p - value$ is:

A	B	C	D
0.001	0.033	0.066	0.025

29) The test statistic equals:

A	B	C	D
39.67	18.67	30.85	14.52

30) The decision is:

A	B	C	D
accept H_0	reject H_0	all of them	can not decide