Dimensionless Technologies Private Limited
Visit us at: www.dimensionless.in
- info@dimensionless.in
- 9923170071, 8108094992

DIMENSIONLESS TECHNOLOGY

Problem Set- Lesson 9

Q1.

TRUE OR FALSE	T	F
The alpha level is smaller for smaller critical regions.		
The critical region defines unlikely values if the null hypothesis is true.		
When the z-score is large (e.g. more than 3.00), we accept the null hypothesis.		
A decision to retain the null means that you believe the treatment has no effect, based on your sample.		
An effect that exists is more likely to be detected if n is large.		
An effect that exists is less likely to be detected if σ is large.		

Q2.

Numerous studies have demonstrated that listening to music while studying can improve memory. To demonstrate this phenomenon, a researcher obtains a sample of 36 college students and gives them a standardized memory test while they listen to background music. Under normal circumstances (without any music), the scores on the test form a normal distribution with mean 25 and SD 6. The sample mean is 28. Use $\alpha = 0.05$ for a one-tailed (directional) test.

Which best represents the null hypothesis for this study?

- Listening to music while studying will not impact memory.
- Listening to music while studying may worsen memory.
- Listening to music while studying may improve memory.
- Listening to music while studying will not improve memory and may actually make it worse.

Q3.

Which best represents the alternative hypothesis for this study?

- Listening to music while studying will not impact memory.
- Listening to music while studying will worsen memory.
- Listening to music while studying will improve memory.
- Listening to music while studying will not improve memory and may actually make it worse.

Q4.

What is the standard error for the distribution of sample means?

Q5.

Calculate the z-score for a sample mean of 28 from this population.

Q6.

What is the z-critical value for $\alpha = 0.05$ (one-tailed)?

Q7.

What is your statistical decision?

- Fail to reject the null
- Reject the null

Q8.

What can we conclude?

- Listening to music did not improve memory.
- Listening to music significantly improved memory at $p < 0.05$

Q9.

What would it mean if we had committed a Type I error?

- You conclude that listening to music while studying improves memory, and you're right.
- You conclude that listening to music while studying improves memory, when it actually doesn't.
- You conclude that listening to music while studying does not improve memory, but it actually does.

Q10.

A new training technique is supposed to decrease how long it takes professional sprinters to run 200-meter races (i.e. this training technique will increase their speeds). A trainer takes a random sample of female sprinters and records how long it takes sprinters to run 200 meters after the training.

If the time it takes to run 200 meters is the variable of interest, which of the following symbolizes the null and alternative hypotheses for a one-tailed (directional) test where μ_I is the mean after this intervention?

$H_0: \mu = \mu_I$
$H_A: \mu > \mu_I$

$H_0: \mu \geq \mu_I$
$H_A: \mu > \mu_I$

$H_0: \mu \leq \mu_I$
$H_A: \mu > \mu_I$

$H_0: \mu \geq \mu_I$
$H_A: \mu = \mu_I$

$H_0: \mu \geq \mu_I$
$H_A: \mu < \mu_I$

$H_0: \mu < \mu_I$
$H_A: \mu \geq \mu_I$

Q11.

A new training technique is supposed to decrease how long it takes professional sprinters to run 200-meter races (i.e. this training technique will increase their speeds). A trainer takes a random sample of female sprinters and records how long it takes sprinters to run 200 meters after the training.

The trainer finds that the average time it takes the population of female sprinters to run 200 meters is 22.965 seconds with standard deviation 0.360.

$\mu = 22.965$
$\sigma = 0.360$

The trainer's sample completed the sprint in 22.793 seconds ($n=16$)

What is the standard error for the distribution of sample means?

Q12.

What is the z-score of this sample mean?
What does this mean?

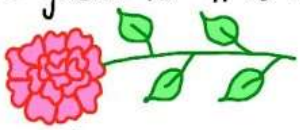
Female sprinters are Significantly / not significantly faster / slower after the training.

Q13.

A flower shop noted that its average sales every Valentine's Day are $7895 with standard deviation $230. The last 5 years, they've implemented a new marketing strategy to hopefully increase sales. Their average sales over the last 5 years is $9640.

$H_0: \mu = \mu_I$

$H_a: \mu \neq \mu_I$



At $\alpha = 0.01$, what is the probability of obtaining at least this mean?
What is the statistical decision? $p =$ ☐

- o Accept the null; the marketing strategy did not have an effect.
- o Reject the null; the marketing strategy had an effect on sales.