STATISTICS WORKSHEET-9

Q1 to Q12 have only one correct answer.

Choose the correct option to answer your question.

1. The owner of a travel agency would like to determine whether or not the mean age of the agency's customers is over 24. If so, he plans to alter the destination of their special cruises and tours.

If he concludes the mean age is over 24 when it is not, he makes a _____ error.

If he concludes the mean age is not over 24 when it is, he makes a _____error.

a. Type II; Type II b. Type I; Type I

c. Type I; Type II d. Type II; Type I

Ans: c. Type I; Type II

Because A type I error occures during hypothesis testing when a null hypothesis testing when are rejected null hypothesis is true

A type II error occures during hypothesis testing when a null hypothesis testing when are rejected null hypothesis is false

2. Suppose we wish to test H0: $\mu = 53$ vs H1: $\mu > 53$. What will result if we conclude that the mean is greater than 53 when its true value is really 55?

a. We have made a Type I error

b. We have made a correct decision

c. We have made a Type II error

d. None of the above are correct

Ans: b. We have made a correct decision

3. The value that separates a rejection region from an acceptance region is called a _____.

a. parameter b. critical value c. confidence coefficient d. significance level

Ans: b. critical value

4. A hypothesis test is used to prevent a machine from under filling or overfilling quart bottles of beer. On the basis of sample, the machine is shut down for inspection. A thorough examination reveals there is nothing wrong with the filling machine. From a statistical point of view: a. Both Type I and Type II errors were made. b. A Type I error was made. c. A Type II error was made. d. A correct decision was made.

Ans: b. A Type I error was made.

5. Suppose we wish to test H0 : μ =21 vs H1 : μ > 21. Which of the following possible sample results gives the most evidence to support H1 (i.e., reject H0)? Hint: Compute Z-score.

a. x = 23 s , = 3 b. x = 19 s , = 4

c. x = 17 s , = 7 d. x = 18 s , = 6

Ans: c. x = 17 s , = 7

6. Given H0: μ = 25, H1: $\mu \neq 25$, and P-value = 0.041. Do you reject or fail to reject H0 at the 0.01 level of significance?

a. fail to reject H0 b. not sufficient information to decide

c. reject H0

Ans: fail to reject H0

7. A bottling company needs to produce bottles that will hold 12 ounces of liquid. Periodically, the company gets complaints that their bottles are not holding enough liquid. To test this claim, the bottling company randomly samples 36 bottles. Suppose the p-value of this test turned out to be 0.0455. State the proper conclusion.

a. At α = 0.085, fail to reject the null hypothesis.

b. At α = 0.035, accept the null hypothesis.

c. At α = 0.05, reject the null hypothesis.

d. At α = 0.025, reject the null hypothesis.

Ans: c. At α = 0.05, reject the null hypothesis.

8. If a hypothesis test were conducted using $\alpha = 0.05$, for which of the following p-values would the null hypothesis be rejected?

a. 0.100 b. 0.041 c. 0.055 d. 0.060

Ans: b. 0.041

9 . For H1: $\mu > \mu 0$ p-value is 0.042. What will be the p-value for Ha: $\mu < \mu o$? a. 0.084 b. 0.021 c. 0.958 d. 0.042

Ans: c. 0.958

10. The test statistic is t = 2.63 and the p-value is 0.9849. What type of test is this? a. Right tail b. Two tail c. Left tail d. Can't tell

Ans: a. Right tail

11. The test statistic is z =2.75, the critical value is z = 2.326. The p- value is …

a. Less than the significance level

b. Equal to the significance level

c. Large than the significance level

Ans: a. Less than the significance level

12. The area to the left of the test statistic is 0.375. What is the probability value if this is a left tail test?

a. 0.750 b. 0.375 c. 0.1885 d. 0.625

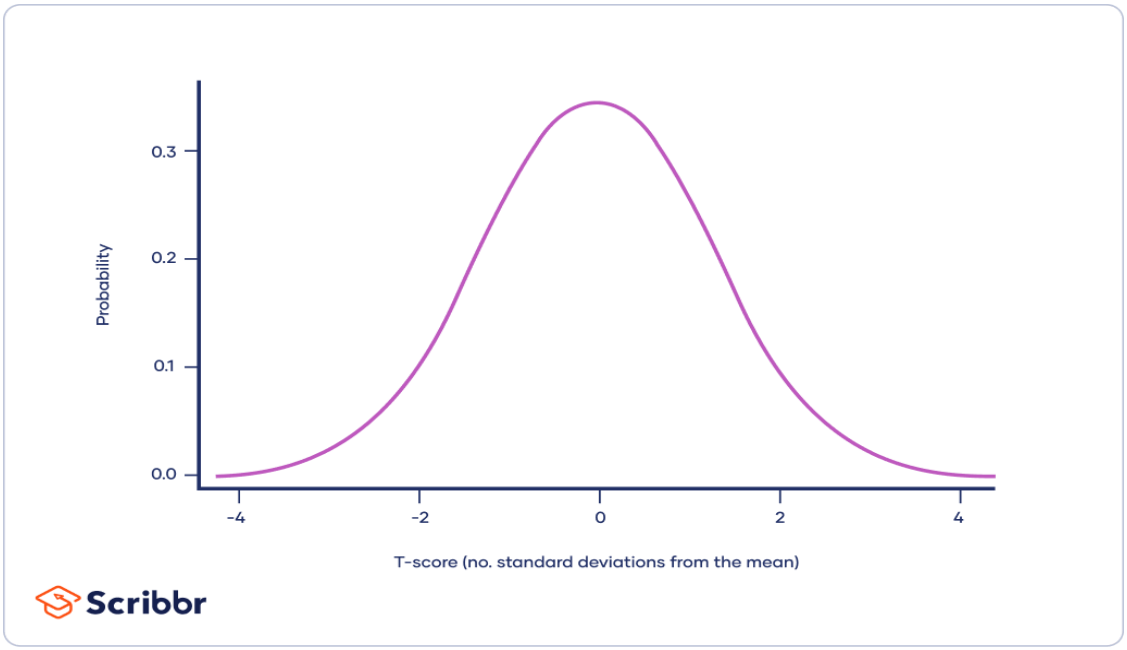
Ans: b. 0.375

Q13 to Q15 are subjective answers type questions, Answers them in their own words briefly.

13.What is T distribution and Z distribution?

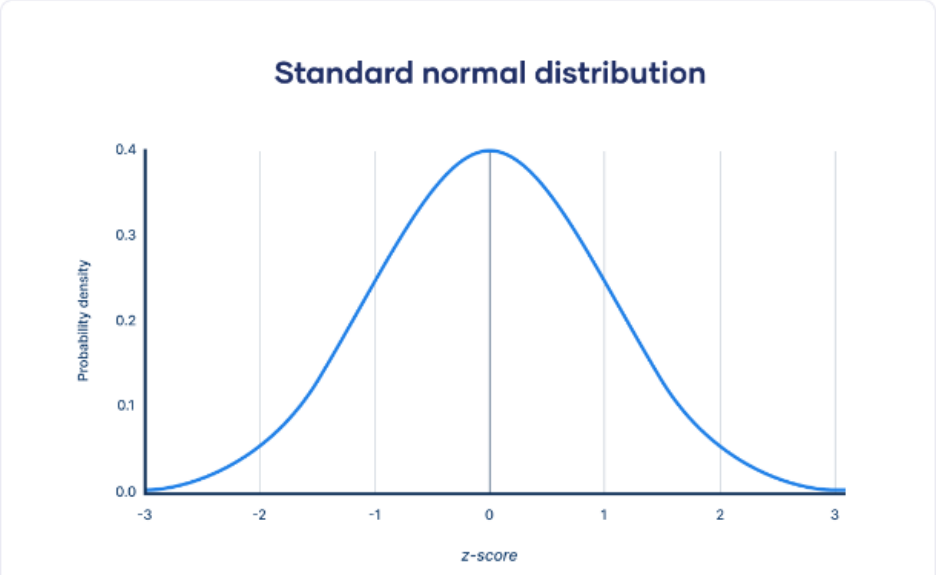
Ans: The t-distribution is **a way of describing a set of observations where most observations fall close to the mean, and the rest of the observations make up the tails on either side**. It is a type of normal distribution used for smaller sample sizes, where the variance in the data is unknown. The *t*-distribution, also known as Student's *t*-distribution, is a way of describing data that follow a bell curve when plotted on a graph, with the greatest number of observations close to the mean and fewer observations in the tails.

It is a type of normal distribution used for smaller sample sizes, where the variance in the data is unknown.



The Z distribution is a special case of the normal distribution with a mean of 0 and standard deviation of 1. The t-distribution is similar to the Z-distribution,but is sensitive to sample size and is used for small or moderate samples when the population standard deviation is unknown. The **standard normal distribution**, also called the ***z*-distribution**, is a special normal distribution where the mean is 0 and the standard deviation is 1.

Any normal distribution can be standardized by converting its values into *z* scores. Z scores tell you how many standard deviations from the mean each value lies.



Difference between t-distribution and Z-distribution+

The **Z** distribution is a special case of the normal distribution with a mean of **0** and standard deviation of **1**. The **t-distribution** is similar to the **Z-distribution**, but is sensitive to sample size and is used for small or moderate samples when the population standard deviation is unknown. At large samples, the **z** and **t samples** are very similar.

The **t-statistic** is used to test hypotheses about an unknown population mean **u** when the value of σ is unknown. The formula for the **t statistic** has the same structure as the **z-score formula**, except that the t statistic uses the estimated standard error in the denominator. The only difference between the **t formula** and the **z-score** formula is that the **z-score** uses the actual population variance, σ2 (or the standard deviation) and the **t formula** uses the corresponding sample variance (or standard deviation) when the population value is not known. Simply put, the basic difference between these two is that the t statistic uses sample variance **(s^2)** and the z-score uses the population variance (σ2). To determine how well a **t-statistic** approximates a **z-score**, we must determine how well the sample variance approximates the population variance. Basically, for small samples, the t-statistic is used.

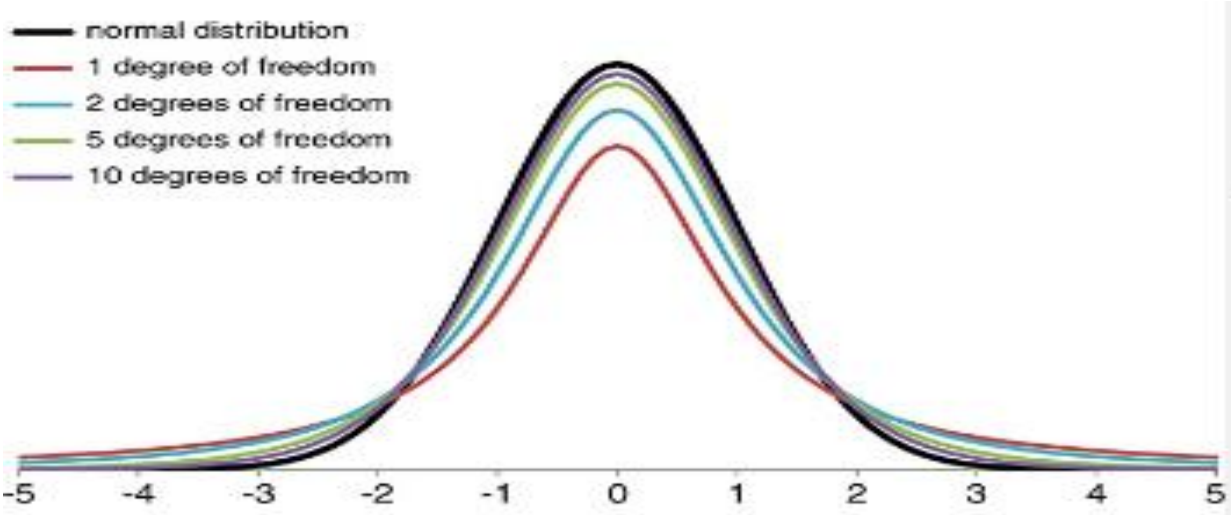
$$Z = \frac{X - \mu}{\sigma} \qquad t = \frac{\bar{x} - \mu_0}{\frac{s}{\sqrt{n}}},$$

The mean must be known prior to computing the sample variance. This places a restriction on sample variability such that only n-1 scores in a sample are free to vary. The value **n-1** is called the **degrees of freedom (df)** for the sample

variance. Degrees of freedom describe the number of scores in a sample that are free to vary. Because the sample mean places a restriction on the value of one score in the sample, there are **n-1** degrees of freedom for the sample.

14.Is the T distribution normal?

Ans: The variance is always greater than 1, although it is close to 1 when there are many degrees of freedom. **With infinite degrees of freedom, the t-distribution is the same as the standard normal distribution**.



The t-distribution and its relationship to the normal...

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15.What does the T distribution tell us?

Ans: The t-distribution describes **the standardized distances of sample means to the population mean when the population standard deviation is not known, and the observations come from a normally distributed population**.

When you use the t-distribution:

You must use the t-distribution table **when working problems when the population standard deviation (σ) is not known and the sample size is small (n<30)**. General Correct Rule: If σ is not known, then using t-distribution is correct.