Question 1

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1/1 points

A fitness center claims that the mean amount of time that a person spends at the gym per visit is 33 minutes. Identify the null hypothesis, H_0, and the alternative hypothesis, H_a, in terms of the parameter μ.

That is correct!

H_0: $\mu \neq 33$; H_a: $\mu = 33$

H_0: $\mu = 33$; H_a: $\mu \neq 33$

H_0: $\mu \geq 33$; H_a: $\mu < 33$

H_0: $\mu \leq 33$; H_a: $\mu > 33$

Answer Explanation

Correct answer:

H_0: $\mu = 33$; H_a: $\mu \neq 33$

Let the parameter μ be used to represent the mean. The null hypothesis is always stated with some form of equality: equal ($=$), greater than or equal to ($\geq$), or less than or equal to ($\leq$). Therefore, in this case, the null hypothesis H_0 is $\mu = 33$. The alternative hypothesis is contradictory to the null hypothesis, so H_a is $\mu \neq 33$.

Question 2

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1/1 points

The answer choices below represent different hypothesis tests. Which of the choices are **right-tailed** tests? Select all correct answers.

That is correct!

- ☐
- $H_0: X \geq 17.1, H_a: X < 17.1$
-
- ☐
- $H_0: X = 14.4, H_a: X \neq 14.4$
-
- ☑
- $H_0: X \leq 3.8, H_a: X > 3.8$
-
- ☑
- $H_0: X \leq 7.4, H_a: X > 7.4$
-

-

  $H_0{:}X=3.3, H_a{:}X\neq3.3$
-

Answer Explanation

Correct answer:

$H_0{:}X\leq3.8, H_a{:}X>3.8$
$H_0{:}X\leq7.4, H_a{:}X>7.4$
Remember the forms of the hypothesis tests.

- Right-tailed: $H_0{:}X\leq X_0, H_a{:}X>X_0$.
- Left-tailed: $H_0{:}X\geq X_0, H_a{:}X<X_0$.
- Two-tailed: $H_0{:}X=X_0, H_a{:}X\neq X_0$.

So in this case, the right-tailed tests are:

- $H_0{:}X\leq7.4, H_a{:}X>7.4$
- $H_0{:}X\leq3.8, H_a{:}X>3.8$

Question 3

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1/1 points

Find the Type II error given that the null hypothesis, H_0, is: a building inspector claims that no more than 15% of structures in the county were built without permits.

That is correct!

The building inspector thinks that no more than 15% of the structures in the county were built without permits when, in fact, no more than 15% of the structures really were built without permits.

The building inspector thinks that more than 15% of the structures in the county were built without permits when, in fact, more than 15% of the structures really were built without permits.

The building inspector thinks that more than 15% of the structures in the county were built without permits when, in fact, at most 15% of the structures were built without permits.

The building inspector thinks that no more than 15% of the structures in the county were built without permits when, in fact, more than 15% of the structures were built without permits.

Answer Explanation

Correct answer:

The building inspector thinks that no more than 15% of the structures in the county were built without permits when, in fact, more than 15% of the structures were built without permits.
A Type II error is the decision not to reject the null hypothesis when, in fact, it is false. In this case, the Type II error is when the building inspector thinks that no more than 15% of the structures were built without permits when, in fact, more than 15% of the structures were built without permits.

Question 4

1/1 points

Suppose a chef claims that her meatball weight is less than 4 ounces, on average. Several of her customers do not believe her, so the chef decides to do a hypothesis test, at a 10% significance level, to persuade them. She cooks 14 meatballs. The mean weight of the sample meatballs is 3.7 ounces. The chef knows from experience that the standard deviation for her meatball weight is 0.5 ounces.

- $H_0: \mu \geq 4$; $H_a: \mu < 4$
- $\alpha = 0.1$ (significance level)

What is the test statistic (z-score) of this one-mean hypothesis test, rounded to two decimal places?

That is correct!

Test statistic = minus 2 point 2 4$$
Test statistic = minus 2 point 2 4 - correct

Answer Explanation

Correct answers:

- Test statistic = minus 2 point 2 4 $\text{Test statistic = }-2.24$
-

The hypotheses were chosen, and the significance level was decided on, so the next step in hypothesis testing is to compute the test statistic. In this scenario, the sample mean weight, $\bar{x} = 3.7$. The sample the chef uses is 14 meatballs, so $n = 14$. She knows the standard deviation of the meatballs, $\sigma = 0.5$. Lastly, the chef is comparing the population mean weight to 4 ounces. So, this value (found in the null and alternative hypotheses) is μ_0. Now we will substitute the values into the formula to compute the test statistic:

$$z_0 = \frac{\bar{x} - \mu_0}{\frac{\sigma}{\sqrt{n}}} = \frac{3.7 - 4}{\frac{0.5}{\sqrt{14}}} \approx \frac{-0.3}{0.134} \approx -2.24$$

So, the test statistic for this hypothesis test is $z_0 = -2.24$.

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Question 5

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1/1 points

What is the p-value of a **right-tailed** one-mean hypothesis test, with a test statistic of $z_0=1.74$? (Do not round your answer; compute your answer using a value from the table below.)

z	**1.5**	**1.6**	**1.7**	**1.8**	**1.9**
0.00	0.933	0.945	0.955	0.964	0.971
0.01	0.934	0.946	0.956	0.965	0.972
0.02	0.936	0.947	0.957	0.966	0.973
0.03	0.937	0.948	0.958	0.966	0.973
0.04	0.938	0.949	0.959	0.967	0.974
0.05	0.939	0.951	0.960	0.968	0.974
0.06	0.941	0.952	0.961	0.969	0.975
0.07	0.942	0.953	0.962	0.969	0.976
0.08	0.943	0.954	0.962	0.970	0.976
0.09	0.944	0.954	0.963	0.971	0.977

That is correct!

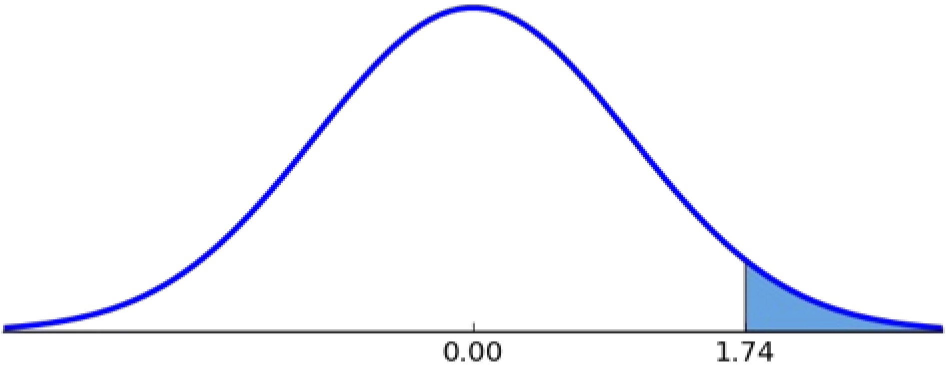
0 point 0 4 1$$
0 point 0 4 1 - correct

Answer Explanation

Correct answers:

- 0 point 0 4 1 0.041
-

The p-value is the probability of an observed value of $\mathbf{z=1.74}$ or greater if the null hypothesis is true, because this hypothesis test is right-tailed. This probability is equal to the area under the Standard Normal curve to the right of $z=1.74$.



A standard normal curve with two points labeled on the horizontal axis. The mean is labeled at 0.00 and an observed value of 1.74 is labeled. The area under the curve and to the right of the observed value is shaded.

Using the Standard Normal Table, we can see that the p-value is equal to 0.959, which is the area to the left of $z=1.74$. (Standard Normal Tables give areas to the left.) So, the p-value we're looking for is $p=1-0.959=0.041$.

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Question 6

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1/1 points

Kenneth, a competitor in cup stacking, claims that his average stacking time is 8.2 seconds. During a practice session, Kenneth has a sample stacking time mean of 7.8 seconds based on 11 trials. At the 4% significance level, does the data provide sufficient evidence to conclude that Kenneth's mean stacking time is less than 8.2 seconds? Accept or reject the hypothesis given the sample data below.

- $H_0: \mu = 8.2$ seconds; $H_a: \mu < 8.2$ seconds

- $\alpha=0.04$ (significance level)
- $z_0=-1.75$
- $p=0.0401$

That is correct!

Do not reject the null hypothesis because the p-value 0.0401 is greater than the significance level $\alpha=0.04$.

Reject the null hypothesis because the p-value 0.0401 is greater than the significance level $\alpha=0.04$.

Reject the null hypothesis because the value of z is negative.

Reject the null hypothesis because $|-1.75|>0.04$.

Do not reject the null hypothesis because $|-1.75|>0.04$.

Answer Explanation

Correct answer:

Do not reject the null hypothesis because the p-value 0.0401 is greater than the significance level $\alpha=0.04$.

In making the decision to reject or not reject H_0, if $\alpha>p$-value, reject H_0 because the results of the sample data are significant. There is sufficient evidence to conclude that H_0 is an incorrect belief and that the alternative hypothesis, H_a, may be correct. If $\alpha\leq p$-value, do not reject H_0. The results of the sample data are not significant, so there is not sufficient evidence to conclude that the alternative hypothesis, H_a, may be correct. In this case, $\alpha=0.04$ is less than or equal to $p=0.0401$, so the decision is to not reject the null hypothesis.

Question 45

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1/1 points

Fill in the following contingency table and find the number of students who both do not play sports AND do not play an instrument.

Studentsplaysportsdonotplaysports Totalplayaninstrument33donotplayaninstrument69Total6267

That is correct!

34$$
34 - correct

Answer Explanation

Correct answers:

- 34 34
-

By using the known totals along the rows and columns you can fill in the rest of the contingency table. For example, looking at the second row in the table, we know that 33 added to the unknown number in the middle is 67, so that unknown number is 34. Continuing in this way, we can fill in the entire table:

Studentsplaysportsdonotplaysports Totalplayaninstrument273360donotplayaninstrument353469Total6267129

From this, we can see that the number of students who both do not play sports and do not play an instrument is 34.

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-
-

Question 46

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1/1 points

The answer choices below represent different hypothesis tests. Which of the choices are **left-tailed** tests? Select all correct answers.

That is correct!

- ☐
- $H_0: X = 17.3, H_a: X \neq 17.3$
- ☑
- $H_0: X \geq 19.7, H_a: X < 19.7$
- ☑
- $H_0: X \geq 11.2, H_a: X < 11.2$
- ☐
- $H_0: X = 13.2, H_a: X \neq 13.2$
-

-

  $H_0: X = 17.8, H_a: X \neq 17.8$

-

Answer Explanation

Correct answer:

$H_0: X \geq 19.7, H_a: X < 19.7$
$H_0: X \geq 11.2, H_a: X < 11.2$
Remember the forms of the hypothesis tests.

- Right-tailed: $H_0: X \leq X_0, H_a: X > X_0$.
- Left-tailed: $H_0: X \geq X_0, H_a: X < X_0$.
- Two-tailed: $H_0: X = X_0, H_a: X \neq X_0$.

So in this case, the left-tailed tests are:

- $H_0: X \geq 11.2, H_a: X < 11.2$
- $H_0: X \geq 19.7, H_a: X < 19.7$

Question 47

1/1 points

Assume the null hypothesis, H_0, is: Jacob earns enough money to afford a luxury apartment. Find the Type I error in this scenario.

That is correct!

Jacob thinks he does not earn enough money to afford the luxury apartment when, in fact, he does.

Jacob thinks he does not earn enough money to afford the luxury apartment when, in fact, he does not.

Jacob thinks he earns enough money to afford the luxury apartment when, in fact, he does not.

Jacob thinks he earns enough money to afford the luxury apartment when, in fact, he does.

Answer Explanation

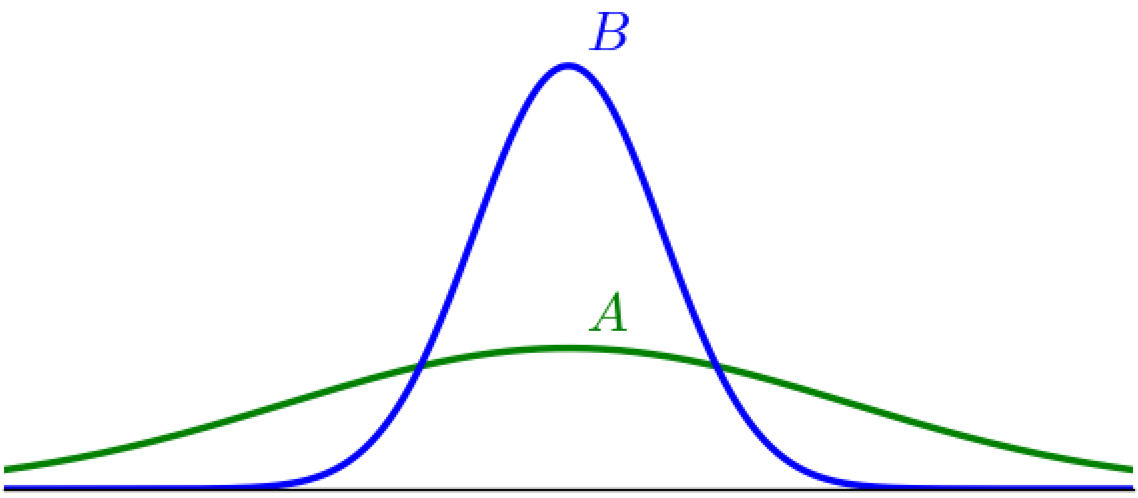
Correct answer:

Jacob thinks he does not earn enough money to afford the luxury apartment when, in fact, he does.
A Type I error is the decision to reject the null hypothesis when it is true. In this case, the Type I error is when Jacob thinks he does not earn enough money when he really does.

Question 48

1/1 points

Given the plot of normal distributions A and B below, which of the following statements is true? Select all correct answers.



A normal bell curve labeled Upper A and a normal elongated curve labeled Upper B are centered at the same point. Normal curve Upper B is narrower and above normal curve Upper A.

That is correct!

-
- A has the larger mean.
-
- B has the larger mean.
-
- The means of A and B are equal.

-
- A has the larger standard deviation.
-
- B has the larger standard deviation.
-
- The standard deviations of A and B are equal.
-

Answer Explanation

Correct answer:

The means of A and B are equal.
A has the larger standard deviation.
Remember that the mean of a normal distribution is the x-value of its central point (the top of the "hill"). Therefore, a distribution with a larger mean will be centered farther to the right than a distribution with a smaller mean.

Because A and B are centered at the same point, their means are equal.

Remember that the standard deviation tells how spread out the normal distribution is. So a high standard deviation means the graph will be short and spread out. A low standard deviation means the graph will be tall and skinny.

Because A is shorter and more spread out than B, we find that A has the larger standard deviation.

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Question 49

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1/1 points

Hugo averages 62 words per minute on a typing test with a standard deviation of 8 words per minute. Suppose Hugo's words per minute on a typing test are normally distributed. Let $X=$ the number of words per minute on a typing test. Then, $X \sim N(62,8)$.

Suppose Hugo types 56 words per minute in a typing test on Wednesday. The z-score when $x=56$ is ________. This z-score tells you that $x=56$ is ________ standard deviations to the ________ (right/left) of the mean, ________.

Correctly fill in the blanks in the statement above.

That is correct!

Suppose Hugo types 56 words per minute in a typing test on Wednesday. The z-score when $x=56$ is $\mathbf{0.75}$. This z-score tells you that $x=56$ is $\mathbf{0.75}$ standard deviations to the **right** of the mean, $\mathbf{62}$.

Suppose Hugo types 56 words per minute in a typing test on Wednesday. The z-score when $x=56$ is $\mathbf{-0.75}$. This z-score tells you that $x=56$ is $\mathbf{0.75}$ standard deviations to the **left** of the mean, $\mathbf{62}$.

Suppose Hugo types 56 words per minute in a typing test on Wednesday. The Z-score when $x=56$ is $\mathbf{0.545}$. This Z-score tells you that $x=56$ is $\mathbf{0.545}$ standard deviations to the **right** of the mean, $\mathbf{62}$.

Suppose Hugo types 56 words per minute in a typing test on Wednesday. The Z-score when $x=56$ is $\mathbf{-0.545}$. This Z-score tells you that $x=56$ is $\mathbf{0.545}$ standard deviations to the **left** of the mean, $\mathbf{62}$.

Answer Explanation

Correct answer:

Suppose Hugo types 56 words per minute in a typing test on Wednesday. The Z-score when $x=56$ is $\mathbf{-0.75}$. This Z-score tells you that $x=56$ is $\mathbf{0.75}$ standard deviations to the **left** of the mean, $\mathbf{62}$.

The Z-score can be found using the formula

$$z=x-\mu\sigma=56-628=-68\approx-0.75$$

A negative value of Z means that that the value is below (or to the left of) the mean, which was given in the problem as $\mu=62$ words per minute in a typing test. The Z-score tells you how many standard deviations the value X is above (to the right of) or below (to the left of) the mean, μ. So, typing 56 words per minute is 0.75 standard deviations away from the mean.

Question 50

1/1 points

The following frequency table summarizes a set of data. What is the five-number summary?

Value	Frequency
1	6
2	2
3	1
4	1
8	1
9	1
10	1
16	6
20	3
21	1
23	1
24	1
25	1
27	1

That is correct!

Min	Q1	Median	Q3	Max
1	2	16	20	27

Min	Q1	Median	Q3	Max
11	33	2020	222 2	27

Min	Q1	Median	Q3	Max
$_1$_	$_2$_	$_6$_	$_20$_	$_27$_

Min	Q1	Median	Q3	Max
$_1$_	$_4$_	$_5$_	$_16$_	$_27$_

Min	Q1	Median	Q3	Max
$_1$_	$_7$_	$_8$_	$_22$_	$_27$_

Answer Explanation

Correct answer:

Min	Q1	Median	Q3	Max
$_1$_	$_2$_	$_16$_	$_20$_	$_27$_

We can immediately see that the minimum value is $_1$_ and the maximum value is $_27$_.

If we add up the frequencies in the table, we see that there are $_27$_ total values in the data set. Therefore, the median value is the one where there are $_13$_ values below it and $_13$_ values above it. By adding up frequencies, we see that this happens at the value $_16$_, so that is the median.

Now, looking at the lower half of the data, there are $_13$_ values there, and so the median value of that half of the data is $_2$_. This is the first quartile. Similarly, the third quartile is the median of the upper half of the data, which is $_20$_.
$_\color{blue}{1}$_, $_1$_, $_1$_, $_1$_, $_1$_, $_1$_, $_\color{blue}{2}$_, $_2$_, $_3$_, $_4$_, $_8$_, $_9$_, $_10$_, $_\color{blue}{16}$_, $_16$_, $_16$_, $_16$_, $_16$_, $_16$_, $_20$_, $_\color{blue}{20}$_, $_20$_, $_21$_, $_23$_, $_24$_, $_25$_, $_\color{blue}{27}$_
So, the five-number summary is

Min	Q1	Median	Q3	Max
$_1$_	$_2$_	$_16$_	$_20$_	$_27$_