

# Math 10 Quiz Ch 9 Winter 2019 Form A KEY

**\*\*\*Keep scrolling through document to find Form B KEY after form A\*\*\***

1. [ 12 points] An insurance company reimburses a hospital for a certain procedure based on the average time needed to perform the procedure. The hospital is currently reimbursed for an average time of 60 minutes, or longer. The insurance company wants to reimburse less money, claiming that the true average time is less than 60 minutes. For a sample of 10 such procedures performed this week the data for time in minutes is

65      63      61      51      48      52      50      52      63      57

The sample data yield a mean of 56.2 minutes and standard deviation of 6.34 minutes.

Use a 3% level of significance to test the insurance company's claim.

(Assume that the distribution of times for individual procedures is approximately normally distributed.)

a. In words, describe what your parameter  $\mu$  or P represents.

$\mu$  = true population average time to complete all procedures of this type

In words, clearly describe what your random variable  $\bar{X}$  or P' represents.

$\bar{X}$  = sample average time to complete a sample of procedures of this type

**b. Hypotheses:**       $H_0: \mu \geq 60$        $H_A: \mu < 60$

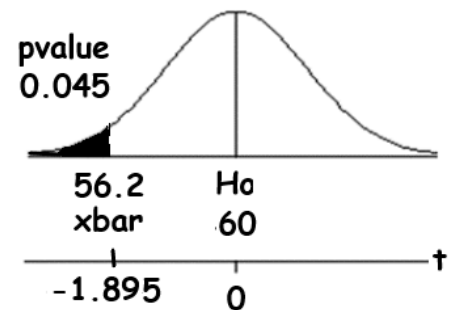
c. Fill in the (**one**) correct distribution to use: ~~Normal  $N(\quad, \quad)$~~  **OR** Student's t with df = 10-1=9

d. Test statistic = -1.893      e. p-value = .043

Answer test statistic and pvalue to 3 decimal places: . . . . . (thousandths) ; rounding incorrectly or using too few decimal places will lose credit

f. Use the previous information to graph this situation.

- Label and scale the horizontal axis showing all important values.
- Shade and label the region(s) corresponding to the p-value.
- 1 point extra credit if you label BOTH axes correctly including all important values at correct locations



g. In a complete sentence, write the interpretation of the p-value for this problem:

If the null hypothesis is true and  $\mu = 60$ , then there is a probability of 0.045 of getting a sample average of 56.2 or less

h. Decision DO NOT REJECT Null Hypothesis Reason for Decision: pvalue >  $\alpha$  since 0.045 > 0.03

i. Conclusion in context of the problem:

At a 3% level of significance, the sample data DO NOT show sufficient evidence to conclude that the population average time for this procedure is less than 60 minutes.

We continue to assume that the population mean time is 60 minutes, or longer

(Note the outcome is that the insurance company can not reduce the amount it reimburses the hospital for this procedure because it can not prove that the true population average time is less than 60 minutes

# Math 10 Quiz Ch 9 Winter 2019 Form A KEY

**Question 2 refers to the “story” for question 1 (repeated below)**

*Form A*

2. [ 4 points] An insurance company reimburses a hospital for a certain procedure based on the average time needed to perform the procedure. The hospital is currently reimbursed for an average time of 60 minutes, or longer. The insurance company wants to reimburse less money, claiming that the true average time is less than 60 minutes. For a sample of 10 such procedures performed this week the data for time in minutes is

65      63      61      51      48      52      50      52      63      57

The sample data yield a mean of 56.2 minutes and standard deviation of 6.34

Use a 3% level of significance to test the insurance company’s claim.

**Hypotheses:             $H_0: \mu \geq 60$              $H_A: \mu < 60$**

**a. Interpret a Type I error for IN THE CONTEXT OF THIS SITUATION:**

**a. Interpret a Type I error for IN THE CONTEXT OF THIS SITUATION:**

A Type I Error would be to conclude that the true population average time to complete all procedures of this type is less than 60 minutes

when in reality the population average time is 60 minutes or longer (at least 60 minutes)

**b. Interpret a Type II error for IN THE CONTEXT OF THIS SITUATION:**

A Type II Error would be to conclude that the true population average time to complete all procedures of this type is 60 minutes or longer (at least 60 minutes)

when in reality the population average time is less than 60 minutes

*Note to get credit in #2, your answer for the Type I and Type II Errors must be written in the context of (using the situation of) this “story” for this problem, not just in terms of generic references to “Ho” and “Ha”*

**3. [ 4 points] Write the hypotheses using correct mathematical notation for the following situations**

a. CableTV Co. claims that at most 55% of people who subscribe to its service also subscribe to FlikX movie streaming service. A hypothesis test is performed to see if this claim is true. In a sample of 500 people, 40% of all people in the sample also subscribe to FlikX movie streaming service.

$H_0: p \leq 0.55$                        $H_A: p > 0.55$

b. A hypothesis test is performed to determine if the average number of students in all Math 10 classes is 37 students.

$H_0: \mu = 37$                        $H_A: \mu \neq 37$

# Math 10 Quiz Ch 9 Winter 2019 Form B KEY

1. [ 12 points] An insurance company reimburses a hospital for a certain procedure based on the average time needed to perform the procedure. The hospital is currently reimbursed for an average time of 45 minutes, or longer. The insurance company wants to reimburse less money, claiming that the true average time is less than 45 minutes. For a sample of 10 such procedures performed this week the data for time in minutes is

50      48      46      36      33      37      35      37      47      43

The sample data yield a mean of 41.2 minutes and standard deviation of 6.25

Use a 3% level of significance to test the insurance company's claim.

(Assume that the distribution of times for individual procedures is approximately normally distributed.)

a. In words, describe what your parameter  $\mu$  or P represents.

$\mu$  = true population average time to complete all procedures of this type

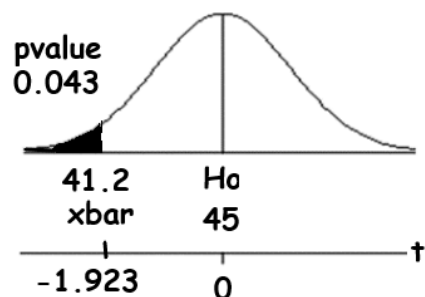
In words, clearly describe what your random variable  $\bar{X}$  or P' represents.

$\bar{X}$  = sample average time to complete a sample of procedures of this type

**b. Hypotheses:**                       $H_0: \mu \geq 45$                        $H_A: \mu < 45$

c. Fill in the (**one**) correct distribution to use: ~~Normal N( )~~ **OR** Student's t with df = 10-1=9

d. Test statistic = -1.923      e. p-value = .043  
 Answer test statistic and pvalue to 3 decimal places: . . . . . (thousandths) ;  
 rounding incorrectly or using too few decimal places will lose credit



- f. Use the previous information to graph this situation.
- Label and scale the horizontal axis showing all important values.
  - Shade and label the region(s) corresponding to the p-value.
  - 1 point extra credit if you label BOTH axes correctly including all important values at correct locations

g. In a complete sentence, write the interpretation of the p-value for this problem:

If the null hypothesis is true and  $\mu = 45$ , then there is a probability of 0.043 of getting a sample average of 41.2 or less

h. Decision DO NOT REJECT Null Hypothesis Reason for Decision: pvalue >  $\alpha$  since 0.043 > 0.03

i. Conclusion in context of the problem:

At a 3% level of significance, the sample data DO NOT show sufficient evidence to conclude that the population average time for this procedure is less than 45 minutes.

We continue to assume that the population mean time is 45 minutes, or longer

(Note the outcome is that the insurance company can not reduce the amount it reimburses the hospital for this procedure because it can not prove that the true population average time is less than 45 minutes

# Math 10 Quiz Ch 9 Winter 2019 Form B

# KEY

**Question 2 refers to the “story” for question 1 (repeated below)**

*Form B*

2. [ 4 points] An insurance company reimburses a hospital for a certain procedure based on the average time needed to perform the procedure. The hospital is currently reimbursed for an average time of 45 minutes, or longer. The insurance company wants to reimburse less money, claiming that the true average time is less than 45 minutes. For a sample of 10 such procedures performed this week the data for time in minutes is

50      48      46      36      33      37      35      37      47      43

The sample data yield a mean of 41.2 minutes and standard deviation of 6.25

Use a 3% level of significance to test the insurance company’s claim.

**Hypotheses:**             $H_0: \mu \geq 45$              $H_A: \mu < 45$

**a. Interpret a Type I error for IN THE CONTEXT OF THIS SITUATION:**

A Type I Error would be to conclude that the true population average time to complete all procedures of this type is less than 45 minutes

when in reality the population average time is 45 minutes or longer (at least 45 minutes)

**b. Interpret a Type II error for IN THE CONTEXT OF THIS SITUATION:**

A Type II Error would be to conclude that the true population average time to complete all procedures of this type is 45 minutes or longer (at least 45 minutes)

when in reality the population average time is less than 45 minutes

*Note to get credit in #2, your answer for the Type I and Type II Errors must be written in the context of (using the situation of) this “story” for this problem, not just in terms of generic references to “Ho” and “Ha”*

**3. [ 4 points] Write the hypotheses using correct mathematical notation for the following situations**

a. A hypothesis test is performed to determine if the average number of sick days per year taken by all employees at XYZ Inc is 6 days per year.

$H_0: \mu = 6$                        $H_A: \mu \neq 6$

b. NetAds Co. claims that at most 40% of people who are shown its ads on websites click out of the ads without actually watching them. A hypothesis test is performed to see if this claim is true. In a sample of 500 people, 55% of all people in the sample clicked out of the ads without actually viewing the ad.

$H_0: p \leq 0.40$                        $H_A: p > 0.40$