

COSC 341: Exercises on Hypothesis Testing

Q1. A randomly selected individual, after going through an experimental treatment to control smoking behaviour, has a score of 27 on an addiction scale. The scores of people in general on this measure are normally distributed with a mean of 19 and a standard deviation of 4. The researcher predicts an effect of the treatment, but does not predict a particular direction of effect. Using the 5% significance level, what should you conclude?

In your solution, be sure to identify each of the following:

- Population 1:
- Population 2:
- Research Hypothesis:
- Null Hypothesis:
- Is test one or two tailed? One / Two
- Which test to use?
 - Z-test for single score
 - Z-test for means of sample
 - T-test for means of sample
 - T-test for dependent means
- Info given in the problem:
- Cutoff value(s):
- Computed sample score (show formula(s) used, show all intermediate steps):
- Is your sample score more extreme than cutoff? Yes / No
- Do you reject H_0 ? Yes / No
- interpretation:

Q2. What is the effect of going through a natural disaster on the attitude of police chiefs about the goodness of the people in their city? A researcher studying this expects a more positive attitude (because of many acts of heroism and helping of neighbours), but a more negative attitude is also possible (because of looting and scams). It is known that in general police chiefs' attitudes about the goodness of people in their cities is normally distributed, with a mean of 6.5 and a standard deviation of 2.1. A major earthquake has just occurred in an isolated city, and shortly afterwards, the researcher is able to give the attitude questionnaire to the police chief of that city. The chief's score is 8.2 Using the 0.05 significance level, what should the researcher conclude?

In your solution, be sure to identify each of the following:

- Population 1:
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- Research Hypothesis:
- Null Hypothesis:
- Is test one or two tailed? One / Two
- Which test to use?
 - Z-test for single score
 - Z-test for means of sample
 - T-test for means of sample
 - T-test for dependent means
- Info given in the problem:
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- Is your sample score more extreme than cutoff? Yes / No
- Do you reject H_0 ? Yes / No
- interpretation:

Q3. A large number of people were shown a particular film of an automobile collision between a moving car and a stopped car. Each person then filled out a questionnaire about how likely it was that the driver of the moving car was at fault, on a scale from 0 = not at fault to 10 = completely at fault. The distribution of ratings under ordinary conditions follows a normal curve with a mean of 5.5 and a standard deviation of 0.8. Sixteen randomly selected individuals are tested in a condition in which the wording of the question is changed so the question asks, "How likely is it that the driver of the car who crashed into the other was at fault?" Using the changed instruction, these 16 participants gave a mean at-fault rating of 5.9. Did the changed instructions significantly increase the rating of being at fault?

In your solution, be sure to identify each of the following:

- Population 1:
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- Is test one or two tailed? One / Two
- Which test to use?
 - Z-test for single score
 - Z-test for means of sample
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 - T-test for dependent means
- Info given in the problem:
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- Is your sample score more extreme than cutoff? Yes / No
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- interpretation:

Q4. Eight participants are tested after being given an online learning tool to practice calculus. Their scores are 14, 8, 6, 5, 13, 10, 10, and 6. The population of people not given this learning tool is normally distributed with a mean of 6. Does the learning tool make a difference in the students' scores?

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- Is test one or two tailed? One / Two
- Which test to use?
 - Z-test for single score
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 - T-test for dependent means
- Info given in the problem:
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- Is your sample score more extreme than cutoff? Yes / No
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- interpretation:

Q5. Suppose a researcher was studying the psychological effects of a devastating flood in a small rural community. Specifically, the researcher was interested in whether people felt more or less hopeful after the flood. The researcher randomly selected 10 people from this community to complete a short questionnaire. The key item on the questionnaire asked how hopeful they felt, using a 7-point scale from extremely unhopeful (1) to neutral (4) to extremely hopeful (7). The researcher wanted to know whether the responses would be consistently above or below the midpoint on the scale (4). Their scores from the 10 people are 3, 2, 3, 6, 1, 3, 4, 2, 6 and 6. The population of people not having experienced the flood is normally distributed with a mean of 4.8. Does the experience make a difference in the people's helpfulness scores?

In your solution, be sure to identify each of the following:

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- Null Hypothesis:
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 - Z-test for single score
 - Z-test for means of sample
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 - T-test for dependent means
- Info given in the problem:
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- interpretation:

Q6. A researcher tests 10 students on their sleepiness levels before and after a COSC class. The results are given in the table below. Is there a difference in their sleepiness levels?

Participant ID	Before Class	After Class
1	10.4	10.8
2	12.6	12.1
3	11.2	12.1
4	10.9	11.4
5	14.3	13.9
6	13.2	13.5
7	9.7	10.9
8	11.5	11.5
9	10.8	10.4
10	13.1	12.5

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- interpretation:

Q7. A team of researchers examined the brain systems involved in human romantic love. One issue was whether romantic love engages a part of the brain called the caudate. Thus, the researchers recruited individuals who had recently fallen “madly in love”. Participants brought a picture of their beloved with them, plus a picture of a neutral person, then went in to the fMRI machine where their brain was scanned while they looked at the two pictures. They were given 30 seconds at the neutral person’s picture, 30 seconds at their beloved, 30 seconds at the neutral person, and so forth. The table below shows the average brain activations in the caudate area of interest during the two kinds of pictures. Based on this data, was the caudate activated at higher levels when participants looked at the picture of their beloved?

Participant ID	Brain Activation Level: Beloved’s Photo	Brain Activation Level: Neutral Person’s Photo
1	1487.8	1487.2
2	1329.4	1328.1
3	1407.9	1405.9
4	1236.1	1234.0
5	1299.8	1298.2
6	1447.2	1444.7
7	1354.1	1354.3
8	1204.6	1203.7
9	1322.3	1320.8
10	1388.5	1386.8

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- Is your sample score more extreme than cutoff? Yes / No
- Do you reject H_0 ? Yes / No
- interpretation: