

Micron Hypothesis Testing

a) What are the 6 steps in conducting a hypothesis test?

1. Lay out the problem & check tech cond
2. State hypotheses
3. Set Sig-Level
4. Find test statistic (t or z)
5. Find P-value
6. Conclusion – Evidence, Decision, In-Context Summary

b) Syracuse wants to add new subdivisions north of the city in advance of Micron moving in. The city planner thinks that the Central New York area has an average of 30 houses per subdivision. She takes a SRS of 45 subdivisions there and finds that her sample has an average of 38 houses per subdivision, with a standard deviation of 6 houses. Is the true average likely to be significantly higher than 30? Conduct the 6-step hypothesis testing below:

1. Lay out the problem & check tech cond

$$\mu = 30, \bar{x} = 38, n = 45, s = 6$$

Parameter μ = the average number of houses per subdivision

Statistic \bar{x} = the average number of houses in the Central NY sample of subdivisions

Assume SRS. $n = 45$, which is greater than 30, so conditions are met.

2. State hypotheses

$$H_0: \mu = 30, H_1: \mu > 30$$

3. Set Sig-Level.

$$\alpha = 0.05$$

4. Find test statistic (t or z)

$$t = \frac{38 - 30}{\frac{6}{\sqrt{45}}} \approx 8.944$$

5. Find P-value

df=44, so using calculator w/right tail: P = 0.000.

6. Conclusion: Evidence/Decision/In-Context Summary

With a P-value of 0.000 which is less than $\alpha = 0.05$, we reject the null hypothesis ($H_0: \mu = 30$). We have evidence that the true mean of the number of houses per subdivision is greater than 30.

c) Next, she needs to know how many miles of pipes should be laid per subdivision. The city planning board says that on average, in New York, a subdivision requires 260,000 feet of pipes. She reads the blueprints for 32 of the

planned Micron subdivisions and finds that on average they call for 267,000 feet of pipe, with a standard deviation of 15,000 feet. Are the Micron developers designing inefficient water and sewage pipe systems?

1. Lay out the problem

$$\mu = 260000, \bar{x} = 267000, n = 32, s = 15000$$

Parameter μ = the average number of feet of pipe per NY subdivision

Statistic \bar{x} = the average number of feet of pipe in the Micron sample of subdivisions

Assume SRS. $n = 32$, which is greater than 30, so conditions are met.

2. State hypotheses

$$H_0: \mu = 260000, H_1: \mu > 260000$$

3. Set Sig-Level.

$$\alpha = 0.05$$

4. Find test statistic (t or z)

$$t = \frac{267000 - 260000}{\frac{15000}{\sqrt{32}}} \approx 2.640$$

3. Find P-value

df=31, so calculator w/right tail reveals $p = 0.006$.

4. Conclusion

With a p value of 0.006 which is less than $\alpha = 0.05$, we reject the null hypothesis ($H_0: \mu = 260000$). We have evidence that the true mean of feet of pipe per subdivision is greater than 260000. It looks like the Micron subdivisions are a bit wasteful in terms of piping design.

- d) 5. Finally, the building starts. She wants to know how fast the subdivisions are being built, because if they are being built too slowly, the contractor must pay the city back some of their deposit. The developers promised that they could build a house in 12 days, on average. She logged how long it took 15 of the houses to be built, and it was 16 days on average, with a standard deviation of 9 days. Does she have a case for demanding the deposit back?

1. Lay out the problem

$$\mu = 12, \bar{x} = 16, n = 15, s = 9$$

Parameter μ = the average number of days it takes to build a house.

Variable is how long it takes for each home to be built.

Population is all the homes in the subdivision.

Statistic \bar{x} = the average number days it took to build a house in the Micron sample.

We assume SRS. Also, $n = 15$, which is not greater than 30, so we must assume the population is normally distributed.

2. State hypotheses

$$H_0: \mu = 12, H_1: \mu > 12$$

3. Set Sig-Level.

$$\alpha = 0.05$$

4. Find test statistic (t or z)

$$t = \frac{16 - 12}{\frac{9}{\sqrt{15}}} \approx 1.721$$

3. Find P-value

df=14, so calculator w/right tail reveals $p = 0.054$.

4. Conclusion

With a P-value of 0.054 greater than $\alpha = 0.05$, we fail to reject the null hypothesis ($H_0: \mu = 12$). We do not have evidence that the average number of days it takes to build a house is over 12. It looks like the city planner does not have a case to demand the deposit back.