

## 7.4.1: Exercises

1. Maryam is curious about the average number of days for COVID-19 symptoms to develop in people ages 70 and older. The average time it takes for someone to develop COVID-19 symptoms is 5 days. She randomly samples 32 people with COVID-19 who are 70, and records the number of days it takes for each subject to develop symptoms. Use the data to test the claim that COVID-19 symptoms develop later than average in people 70 and older. Use the significance level of 1% to test the claim.

2	8	6	15	14	15	2	6
14	7	9	1	3	13	14	7
16	5	12	10	13	1	2	7
2	15	6	5	2	1	6	4

- $\mu$  represents the average number of:
- $H_0$ :
- $H_a$ :
- What test should you use to find the P-value? Justify your answer.
- Explain why the sampling distribution of sample means is approximately normal.
- Compute all sample statistics:

$$\bar{x} = \text{mean}(a) \approx \text{_____ days}$$

$$s = \text{stdev}(a) \approx \text{_____ days}$$

$$n = \text{_____}$$

$$df = n - 1 = \text{_____} = \text{_____}$$

g. Compute the T-score for the sample mean.

h. Use desmos to find the P-value from the T-distribution. Sketch a graph and shade the area that represents the P-value.

i. Make a decision about the null and alternative hypotheses. Justify your answer.

j. State the conclusion in context.

2. A physician claims that jogger's average maximal volume oxygen uptake is greater than that of all adults. Assume that the maximal volume oxygen uptake is approximately normal. A random sample of 40 joggers has a mean of 38.6 ml/kg and a standard deviation of 8 ml/kg. If the average of all adults is 36.7 ml/kg, is there enough evidence to support the physician's claim at a 5% level of significance?

a. Step 1

b. Step 2

c. Step 3

d. Step 4

3. The Medical Rehabilitation Foundation reports that the average cost of rehabilitation for stroke victims is \$24,672. To see if the average cost of rehabilitation is different at a large hospital, a researcher selected a random sample of 35 stroke victims and found that the average cost of their rehabilitation was \$25,266 with a standard deviation of \$3,251. Can we conclude that the average cost at a large hospital is different at a 1% level of significance?

a. Step 1

b. Step 2

c. Step 3

d. Step 4

4. A researcher wishes to test the claim that the average age of lifeguards in Ocean City is greater than 24 years. She selects a random sample of 26 guards and finds the mean of the sample to be 24.7 years, with a standard deviation of 2 years. Is there evidence to support the claim at a 5% level of significance? Assume that the age of lifeguards is approximately normal.

5. Randall solves the following problem. There is at least one error in each step. Explain to Randall where he made mistakes, and how to fix them.

A teacher claims that the boys in her classes are taller than the average 69 inches for boys in this age group. The sample of 31 boys had an average height of 69.7 in. If the sample standard deviation is 2.75 inches, is there enough evidence to support the teacher's claim at a 5% level of significance?

Step 1:  $\mu$  represents the heights of boys in the teacher's classes.

$$H_0 = 69$$

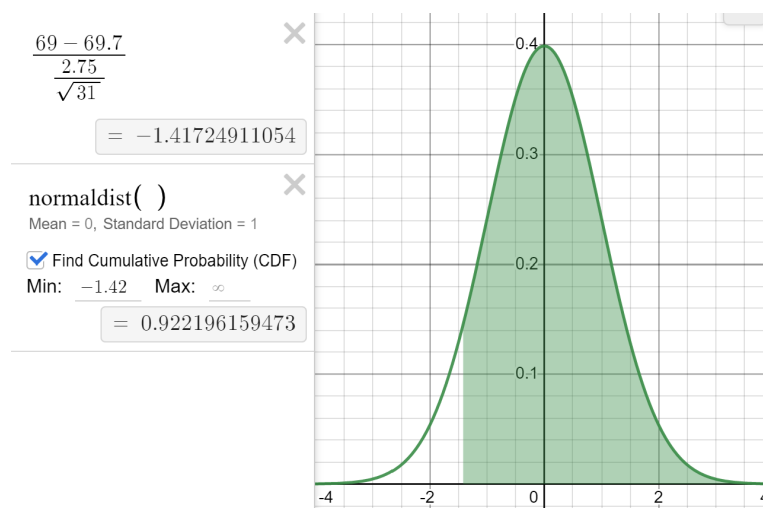
$$H_a > 69$$

We do a right-tailed test because there is a greater than inequality in the alternative hypothesis.

Step 2: The sample size is 31 which is more than 30 so the population is normal.

$$n = 31, \bar{x} = 69.7, s = 2.75$$

$$\text{Step 3: } Z = \frac{69 - 69.7}{\frac{2.75}{\sqrt{31}}} = -1.42 \text{ so the P-value is } 0.922$$



Images are created with the graphing calculator, used with permission from Desmos Studio PBC.

Step 4: The P-value is greater than the level of significance 0.05 so we support the null hypothesis and reject the alternative hypothesis. There is enough evidence to support the claim that the height of boys in the teachers class is 69 inches.