

Name: Solutions

Math 130

Date: 4/7/2025

Quiz 12

Some formulas you may need:

$$E = t_{\alpha/2} \frac{s}{\sqrt{n}} \quad df = n - 1 \quad s = \sqrt{\frac{\sum (x - \bar{x})^2}{n - 1}} = \sqrt{\frac{\sum x^2 - \frac{(\sum x)^2}{n}}{n - 1}}$$

1. (1, 1, 1, 1, 4, 2 points) A new employee has just been hired at the McDonald's in Montebello. In order to evaluate his efficiency, the manager wants to know the average amount of time it takes the new employee to fill orders from customers during his second day of work. Because the manager doesn't want to waste his whole day collecting data, instead of keeping track of every order the employee filled, data was only collected for his first 12 orders. The data is given in the table below.

Order Fill Times (in seconds)

103	174	136	75	91	119
144	121	205	76	174	111

a) What is the population? What is the sample?

Population = All orders filled by this new employee on his 2nd day of work

Sample = The 1st 12 orders filled by this employee on his 2nd day of work

b) What is the population parameter (give the symbol and the description)?

μ = The average order fill time for all orders filled by this employee on his 2nd day of work

c) What is the sample statistic (give the symbol, description and value)?

$\bar{x}$ = The average order fill time for the 1st 12 orders this employee filled on his 2nd day of work

$$= \frac{103 + 174 + \dots + 111}{12} = 127.42 \text{ sec.}$$

d) What is the best point estimate for the average amount of time it takes the new employee to fill orders from customers during his second day of work?

Best $\bar{x} = 127.42 \text{ sec.}$

e) Construct a 99% confidence interval for the average amount of time it takes the new employee to fill orders from customers during his second day of work

$$t_{\alpha/2} = ?$$

$$\alpha = 1 - \text{confidence level}$$

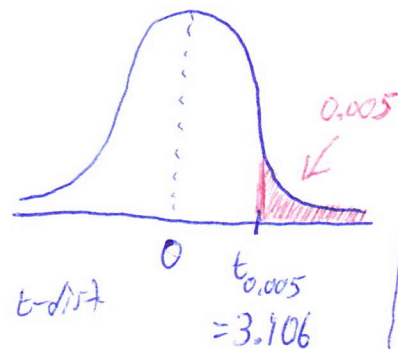
$$= 1 - 0.99$$

$$= 0.01$$

$$\frac{\alpha}{2} = \frac{0.01}{2} = 0.005$$

$$df = n - 1 = 12 - 1 = 11$$

$$t_{\alpha/2} = t_{0.005} = 3.106$$



$$s = ?$$

$$\sum x^2 = 103^2 + 174^2 + \dots + 111^2$$

$$= 213223$$

$$\sum x = 103 + 174 + \dots + 111$$

$$= 1529$$

$$s = \sqrt{\frac{\sum x^2 - \frac{(\sum x)^2}{n}}{n - 1}}$$

$$= \sqrt{\frac{213223 - \frac{(1529)^2}{12}}{12 - 1}}$$

$$= 40.90223006$$

$$E = ?$$

$$E = t_{\alpha/2} \frac{s}{\sqrt{n}}$$

$$= (3.106) \frac{40.90223006}{\sqrt{12}}$$

$$= 36.67 \text{ sec.}$$

Interval

$$\bar{x} - E < \mu < \bar{x} + E$$

$$127.42 - 36.67 < \mu < 127.42 + 36.67$$

$$90.75 \text{ sec.} < \mu < 164.09 \text{ sec.}$$

f) What does the 99% mean in a 99% confidence interval?

If you take many samples and use them to build many 99% confidence intervals, about 99% of the intervals will contain the correct answer for μ and about 1% of the intervals will not contain the correct answer for μ .