

Take Home Midterm 3

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Problem 6

This problem refers to the optical data set, available on Moodle. This set represents a random sample of 43 patients at an optometry clinic. In this problem, we are interested in the eye difference variable. Positive values indicate greater weakness in the left eye.

(a)

Construct a level 90% confidence interval for eye difference in the population from which this sample was drawn using direct calculation. Identify the point estimate, margin of error, and interval endpoints. Make sure your work is clear.

```
point_estimate <- mean(optical$eye_difference)
point_estimate
```

```
[1] -0.3839281
```

```
standard_dev <- sd(optical$eye_difference)

n <- 43

C_level <- qt(.95, df = 42)

Margin_of_Error <- C_level * (standard_dev/sqrt(n))
Margin_of_Error
```

```
[1] 0.4380488
```

```
point_estimate - Margin_of_Error
```

```
[1] -0.8219769
```

```
point_estimate + Margin_of_Error
```

```
[1] 0.05412065
```

- The point estimate is the sample mean which is equal to -0.38
- The Margin of Error is 0.43
- interval end point (-0.81, 0.04)

(b)

Confirm the results of part (a) with a single line of R code. Include both code and output.

```
t.test(optical$eye_difference, conf.level = 0.90)
```

One Sample t-test

```
data: optical$eye_difference
t = -1.4741, df = 42, p-value = 0.1479
alternative hypothesis: true mean is not equal to 0
90 percent confidence interval:
 -0.82197691  0.05412065
sample estimates:
mean of x
-0.3839281
```

(c)

Write a sentence or two interpreting your result using the language from class. Your answer should say something about which eye, if either, tends to require greater correction.

- With 90% Confidence Interval the mean eye difference for the population is between -0.81 to 0.04.
- In this sample the right eye tends to require more correction in the sample (sample mean = -0.38).
- If the population mean were 0 which is in the range $(-0.81, 0.04)$, then there would be ambiguity about which eye needs more correction.