

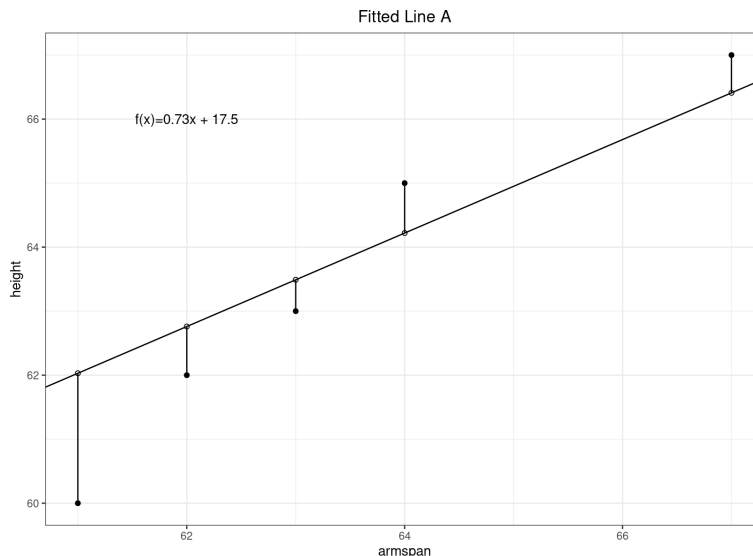
Name: \_\_\_\_\_

Date: \_\_\_\_\_

## Which is the better fit?

### Instructions:

A random sample of 5 observations was taken from the arm\_span data. Calculate the Mean Squared Error (MSE) for each of the fitted lines by using the distances between the actual heights (the points) and their predicted heights (the points on the line). This will help you determine which of the linear models is the better fit.



Fitted Line A:

| (armspan, height) | Actual height (observed) | Predicted height          | Actual – Predicted   | (Actual – Predicted) <sup>2</sup> | MSE   |
|-------------------|--------------------------|---------------------------|----------------------|-----------------------------------|-------|
| (61, 60)          | 60                       | $0.73(61) + 17.5 = 62.03$ | $60 - 62.03 = -2.03$ | $(-2.03)^2 = 4.1209$              |       |
| (62, 62)          | 62                       |                           |                      |                                   |       |
| (63, 63)          | 63                       |                           |                      |                                   |       |
| (64, 65)          | 65                       |                           |                      |                                   |       |
| (67, 67)          | 67                       |                           |                      |                                   |       |
|                   |                          |                           |                      | Sum =                             | ÷ 5 = |

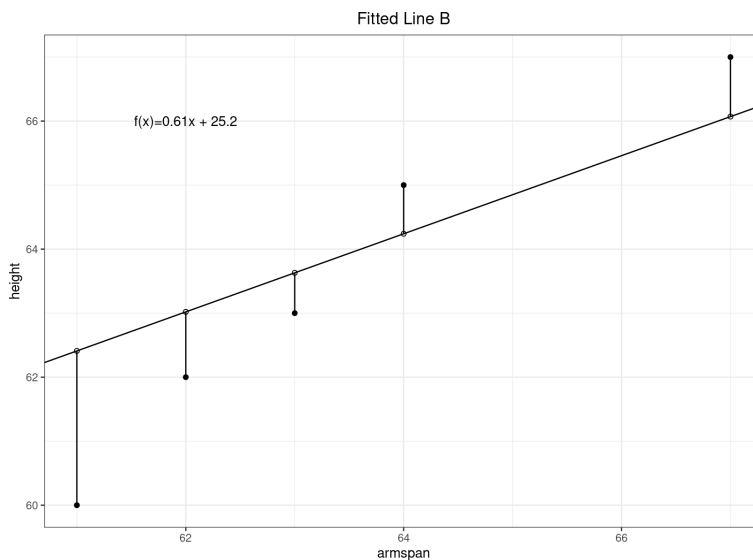
**Remember:** We square our values when using MSE, which means that our units are now inches<sup>2</sup>, so you need to take the square root to get back to inches as the units.

$$\sqrt{MSE} = \sqrt{\quad} = \quad \text{inches}$$

Interpretation: When using arm span to predict height with Fitted Line A, our predictions will typically be off by \_\_\_\_\_ inches.

Name: \_\_\_\_\_

Date: \_\_\_\_\_

**Which is the better fit?**

Fitted Line B:

| (armspan, height) | Actual height (observed) | Predicted height          | Actual – Predicted   | (Actual – Predicted) <sup>2</sup> | MSE   |
|-------------------|--------------------------|---------------------------|----------------------|-----------------------------------|-------|
| (61, 60)          | 60                       | $0.61(61) + 25.2 = 62.41$ | $60 - 62.41 = -2.41$ | $(-2.41)^2 = 5.8081$              |       |
| (62, 62)          | 62                       |                           |                      |                                   |       |
| (63, 63)          | 63                       |                           |                      |                                   |       |
| (64, 65)          | 65                       |                           |                      |                                   |       |
| (67, 67)          | 67                       |                           |                      |                                   |       |
|                   |                          |                           |                      | Sum =                             | ÷ 5 = |

**Remember:** We square our values when using MSE, which means that our units are now inches<sup>2</sup>, so you need to take the square root to get back to inches as the units.

$$\sqrt{MSE} = \sqrt{\quad} = \quad \text{inches}$$

Interpretation: When using arm span to predict height with Fitted Line B, our predictions will typically be off by \_\_\_\_\_ inches.

**Conclusion:**

1. Which linear model is the better fit? How do you know?

Name: \_\_\_\_\_

Date: \_\_\_\_\_

**Which is the better fit?****Answer Key**

Fitted Line A:

| (armspan, height) | Actual height (observed) | Predicted height          | Actual – Predicted   | (Actual – Predicted) <sup>2</sup> | MSE           |
|-------------------|--------------------------|---------------------------|----------------------|-----------------------------------|---------------|
| (61, 60)          | 60                       | $0.73(61) + 17.5 = 62.03$ | $60 - 62.03 = -2.03$ | $(-2.03)^2 = 4.1209$              |               |
| (62, 62)          | 62                       | $0.73(62) + 17.5 = 62.76$ | $62 - 62.76 = -0.76$ | $(-0.76)^2 = 0.5776$              |               |
| (63, 63)          | 63                       | $0.73(63) + 17.5 = 63.49$ | $63 - 63.49 = -0.49$ | $(-0.49)^2 = 0.2401$              |               |
| (64, 65)          | 65                       | $0.73(64) + 17.5 = 64.22$ | $65 - 64.22 = 0.78$  | $(0.78)^2 = 0.6084$               |               |
| (67, 67)          | 67                       | $0.73(67) + 17.5 = 66.41$ | $67 - 66.41 = 0.59$  | $(0.59)^2 = 0.3481$               |               |
|                   |                          |                           |                      | Sum = 5.8951                      | ÷ 5 = 1.17902 |

**Remember:** We square our values when using MSE, which means that our units are now inches<sup>2</sup>, so you need to take the square root to get back to inches as the units.

$$\sqrt{MSE} = \sqrt{1.17902} = \underline{1.086} \text{ inches}$$

Interpretation: When using arm span to predict height with Fitted Line A, our predictions will typically be off by 1.086 inches.

Fitted Line B:

| (armspan, height) | Actual height (observed) | Predicted height          | Actual – Predicted   | (Actual – Predicted) <sup>2</sup> | MSE           |
|-------------------|--------------------------|---------------------------|----------------------|-----------------------------------|---------------|
| (61, 60)          | 60                       | $0.61(61) + 25.2 = 62.41$ | $60 - 62.41 = -2.41$ | $(-2.41)^2 = 5.8081$              |               |
| (62, 62)          | 62                       | $0.61(62) + 25.2 = 63.02$ | $62 - 63.02 = -1.02$ | $(-1.02)^2 = 1.0404$              |               |
| (63, 63)          | 63                       | $0.61(63) + 25.2 = 63.63$ | $63 - 63.63 = -0.63$ | $(-0.63)^2 = 0.3969$              |               |
| (64, 65)          | 65                       | $0.61(64) + 25.2 = 64.24$ | $65 - 64.24 = 0.76$  | $(0.76)^2 = 0.5776$               |               |
| (67, 67)          | 67                       | $0.61(67) + 25.2 = 66.07$ | $67 - 66.07 = 0.93$  | $(0.93)^2 = 0.8649$               |               |
|                   |                          |                           |                      | Sum = 8.6879                      | ÷ 5 = 1.73758 |

**Remember:** We square our values when using MSE, which means that our units are now inches<sup>2</sup>, so you need to take the square root to get back to inches as the units.

$$\sqrt{MSE} = \sqrt{1.73758} = \underline{1.318} \text{ inches}$$

Interpretation: When using arm span to predict height with Fitted Line B, our predictions will typically be off by 1.318 inches.

**Conclusion:**

Which linear model is the better fit? How do you know? *Fitted Line A is the better fit because our MSE value is 0.55856 lower, which means that the overall error is less than Fitted Line B's error.*