LESSON MAKER PRO

Which Line Fits?

Compare lines using squared residuals.

HIGH SCHOOL · MT.CORE.DATA.INT.6.d

MT.CORE.DATA.INT.6.d "Analyze the relationship between two quantitative data distributions in context that have a linear association. This standard should incorporate cultural context relating to Montana Indigenous Peoples and local communities by:..."

NAME _____ DATE _____

THE FIT RULE

A residual is the observed y-value minus the y-value predicted by a line. Square each residual and add the squares. Of the lines you compare, the one with the smaller sum fits the data better.

WORKED EXAMPLE

Which line fits these data better: A, $y = 2x + 1$, or B, $y = 2x + 2$?

OBSERVED DATA

x	y
10	21
20	39
30	62

1. A predicts 21, 41, 61. Its squared residuals are 0, 4, 1.
2. B predicts 22, 42, 62. Its squared residuals are 1, 9, 0.
3. The sums are 5 for A and 10 for B. Choose the smaller sum.

Answer: Line A fits better.

PRACTICE 4 problems

1 For (1, 4), find the residual from $y = x + 2$.

ANSWER _____

2 Find the sum of squared residuals for (0, 3), (1, 3), (2, 5) using $y = x + 3$.

ANSWER _____

3 For (0, 2) and (2, 4), which fits better: A, $y = x + 2$, or B, $y = 2x + 2$? Give its sum of squared residuals.

ANSWER _____

4 For (2, 7), find the squared residual from $y = x + 2$.

ANSWER _____

APPLY IT Show your work

1 At a Montana school event featuring invited Indigenous artists, students track hours spent posting notices and reservations received. These are hypothetical data. Which line fits better: A, $y = 2x + 4$, or B, $y = x + 5$? Find both sums of squared residuals.

EVENT RESERVATIONS

Hours, x	Reservations, y
1	6
2	8
3	9

ANSWER _____

2 A Montana community center plans a youth program led by local Indigenous educators. The table gives hypothetical weeks since the announcement and sign-ups. Which line fits better: A, $y = 2x + 4$, or B, $y = x + 4$? Find both sums of squared residuals.

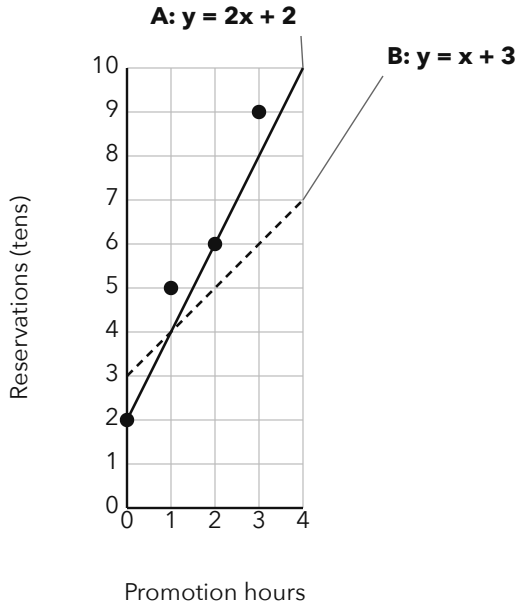
PROGRAM SIGN-UPS

Weeks, x	Sign-ups, y
0	4
1	5
2	8

ANSWER _____

CHALLENGE One step up

A school club tracks promotion hours and art-show reservations, in tens. Find the sum of squared residuals for each line shown. Which line fits better, and why?



WORK SPACE AND ANSWER

ANSWER KEY

Which Line Fits?

PART 1 · PRACTICE

#	PROBLEM	ANSWER
1	For (1, 4), find the residual from y = x + 2.	**1**
2	Find the sum of squared residuals for (0, 3), (1, 3), (2, 5) using y = x + 3.	**1**
3	For (0, 2) and (2, 4), which fits better: A, y = x + 2, or B, y = 2x + 2? Give its sum of squared residuals.	**A; sum = 0**
4	For (2, 7), find the squared residual from y = x + 2.	**9**

PART 2 · APPLY IT

1. **A fits better; A: 1, B: 2.** A predicts 6, 8, 10, giving a sum of 1. B predicts 6, 7, 8, giving a sum of 2.
2. **A fits better; A: 1, B: 4.** A predicts 4, 6, 8, giving a sum of 1. B predicts 4, 5, 6, giving a sum of 4.

CHALLENGE

A: 2; B: 12. A fits better because it has the smaller sum of squared residuals.

Accept residuals written as observed minus predicted. A reversed residual sign is acceptable only when the requested result is a squared residual or a sum of squares.