

Topic: Least squares line

Question: What is the least squares line for the given data set?

x	-2	-1	0	1	2	3
y	-3	2	3	0	-1	4

Answer choices:

A $y = \frac{23}{35}x + \frac{53}{105}$

B $y = \frac{23}{35}x - \frac{53}{105}$

C $y = \frac{53}{105}x + \frac{23}{35}$

D $y = \frac{53}{105}x - \frac{23}{35}$



Solution: A

To solve for the least squares line from a given data set, the slope-intercept form of a line $y = mx + b$ is used, where

$$m = \frac{n(\sum xy) - (\sum x)(\sum y)}{n(\sum x^2) - (\sum x)^2}$$

$$b = \frac{(\sum y) - m(\sum x)}{n}$$

Counting the value pairs from the data set gives us $n = 6$.

We can start by finding the slope m .

$$m = \frac{(6)(6 + (-2) + 0 + 0 + (-2) + 12) - ((-2) + (-1) + 0 + 1 + 2 + 3)((-3) + 2 + 3 + 0 + (-1) + 4)}{(6)(4 + 1 + 0 + 1 + 4 + 9) - ((-2) + (-1) + 0 + 1 + 2 + 3)^2}$$

$$m = \frac{(6)(14) - (3)(5)}{(6)(19) - (3)^2}$$

$$m = \frac{84 - 15}{114 - 9}$$

$$m = \frac{69}{105}$$

$$m = \frac{23}{35}$$

Then we'll solve for the y -intercept b .

$$b = \frac{((-3) + 2 + 3 + 0 + (-1) + 4) - \left(\frac{23}{35}\right)((-2) + (-1) + 0 + 1 + 2 + 3)}{6}$$



$$b = \frac{(5) - \left(\frac{23}{35}\right)(3)}{6}$$

$$b = \frac{5 - \frac{69}{35}}{6}$$

$$b = \frac{\frac{175 - 69}{35}}{6}$$

$$b = \frac{106}{210}$$

$$b = \frac{53}{105}$$

Finally we can substitute $m = -23/35$ and $b = 53/105$ into $y = mx + b$ to get the least squares line for this data.

$$y = \frac{23}{35}x + \frac{53}{105}$$



Topic: Least squares line

Question: What is the least squares line for the given data set?

x	-2	0	2	4	6	8
y	0	4	-3	2	1	-4

Answer choices:

A $y = \frac{36}{35}x + \frac{12}{35}$

B $y = -\frac{36}{35}x - \frac{12}{35}$

C $y = \frac{12}{35}x + \frac{36}{35}$

D $y = -\frac{12}{35}x + \frac{36}{35}$



Solution: D

To solve for the least squares line from a given data set, the slope-intercept form of a line $y = mx + b$ is used, where

$$m = \frac{n(\sum xy) - (\sum x)(\sum y)}{n(\sum x^2) - (\sum x)^2}$$

$$b = \frac{(\sum y) - m(\sum x)}{n}$$

Counting the value pairs from the data set gives us $n = 6$.

We can start by finding the slope m .

$$m = \frac{(6)(0 + 0 + (-6) + 8 + 6 + (-32)) - ((-2) + 0 + 2 + 4 + 6 + 8)(0 + 4 + (-3) + 2 + 1 + (-4))}{(6)(4 + 0 + 4 + 16 + 36 + 64) - ((-2) + 0 + 2 + 4 + 6 + 8)^2}$$

$$m = \frac{(6)(-24) - (18)(0)}{(6)(124) - (18)^2}$$

$$m = \frac{-144 - 0}{744 - 324}$$

$$m = -\frac{144}{420}$$

$$m = -\frac{12}{35}$$

Then we'll solve for the y -intercept b .

$$b = \frac{(0 + 4 + (-3) + 2 + 1 + (-4)) - \left(-\frac{12}{35}\right)((-2) + 0 + 2 + 4 + 6 + 8)}{6}$$



$$b = \frac{(0) - \left(-\frac{12}{35}\right)(18)}{6}$$

$$b = \frac{\frac{216}{35}}{6}$$

$$b = \frac{216}{210}$$

$$b = \frac{36}{35}$$

Finally we can substitute $m = -12/35$ and $b = 36/35$ into $y = mx + b$ to get the least squares line for this data.

$$y = -\frac{12}{35}x + \frac{36}{35}$$

