8. Maths - Statistics – PART – 8

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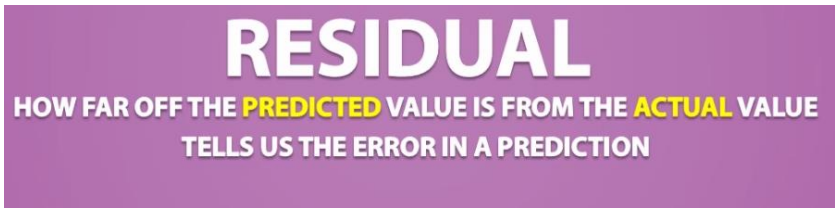
8. Maths - Statistics – PART – 8

- ✓ In this chapter we will discuss about residuals

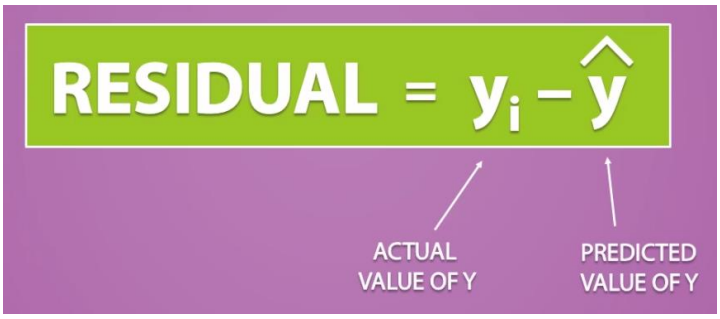
1. Residual

- ✓ It explains about how far the distance in between the predicted value from the actual value
- ✓ It basically tells the error in prediction

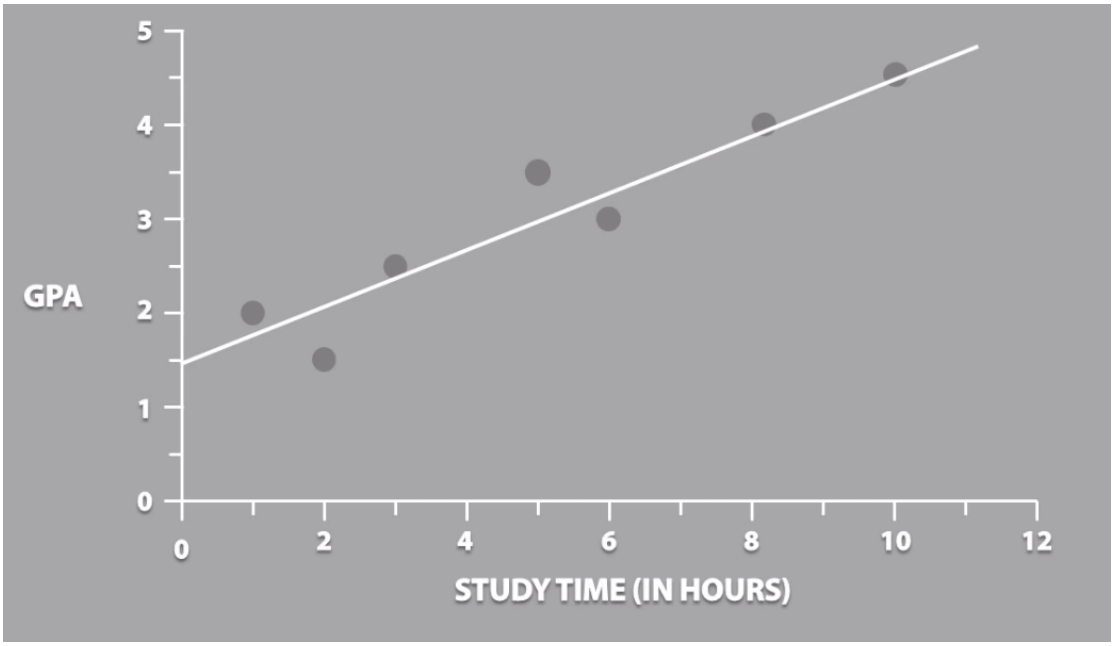


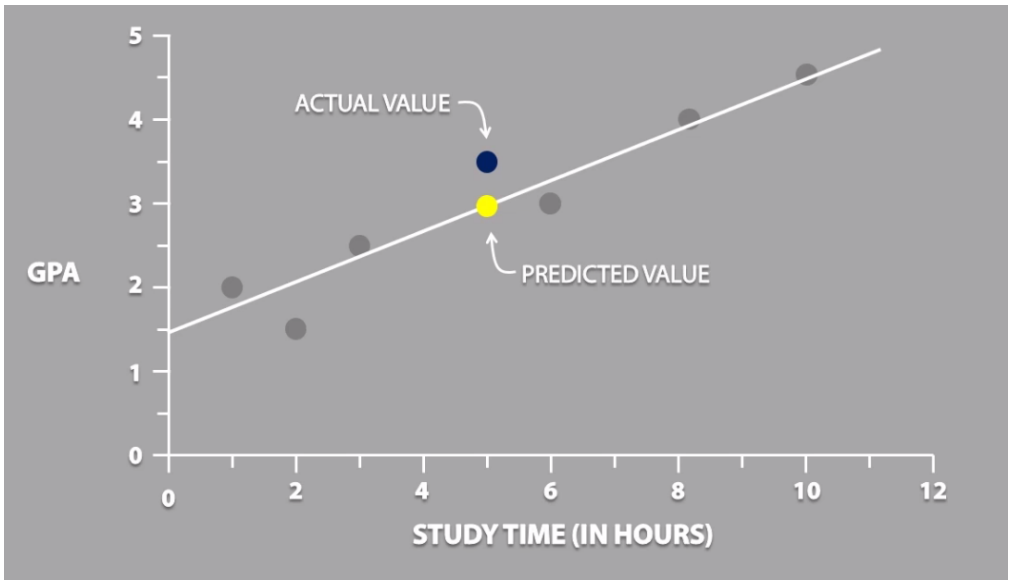
2. Formula

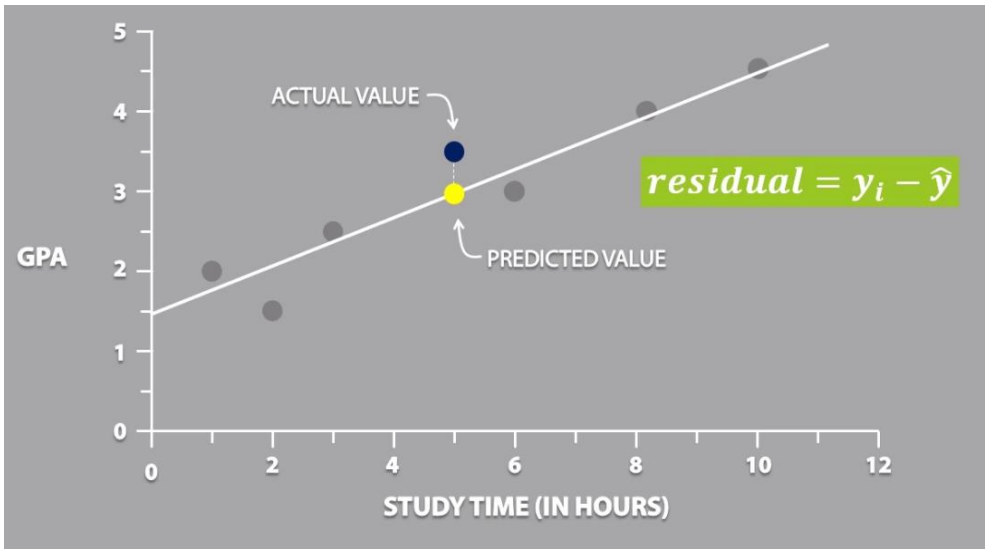
- ✓ The formula is, actual value of Y minus predicted value of Y

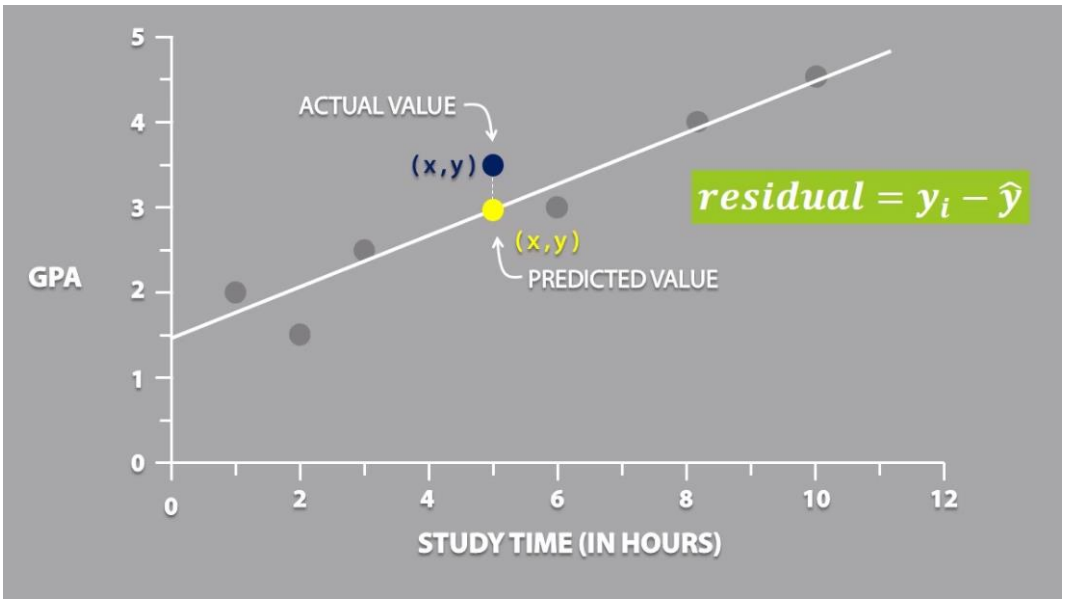


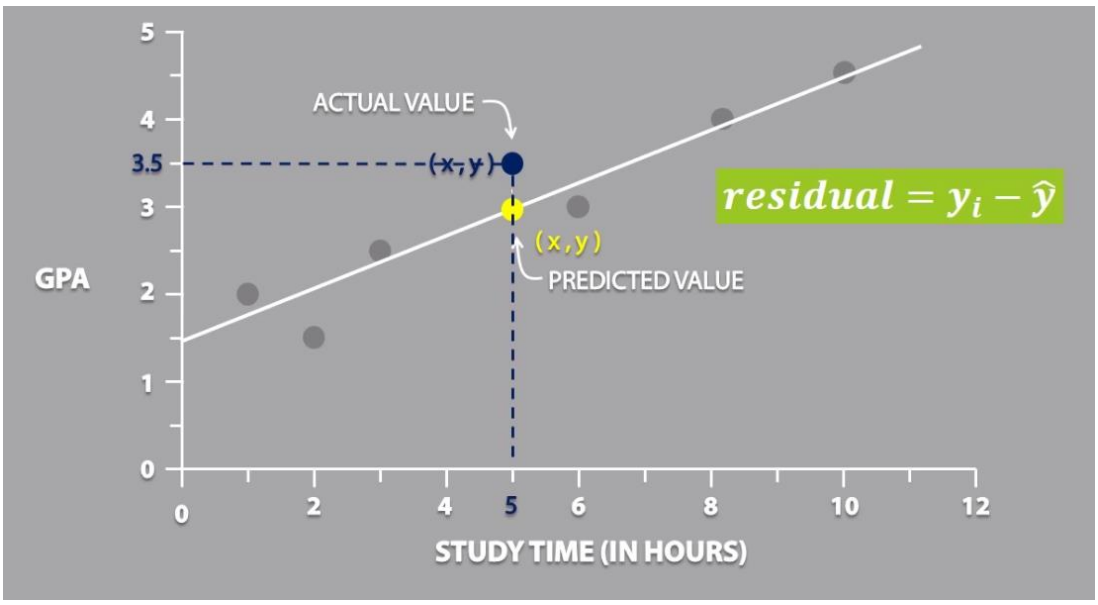
✓ From the previous example, study time on X axis and gpa on Y axis

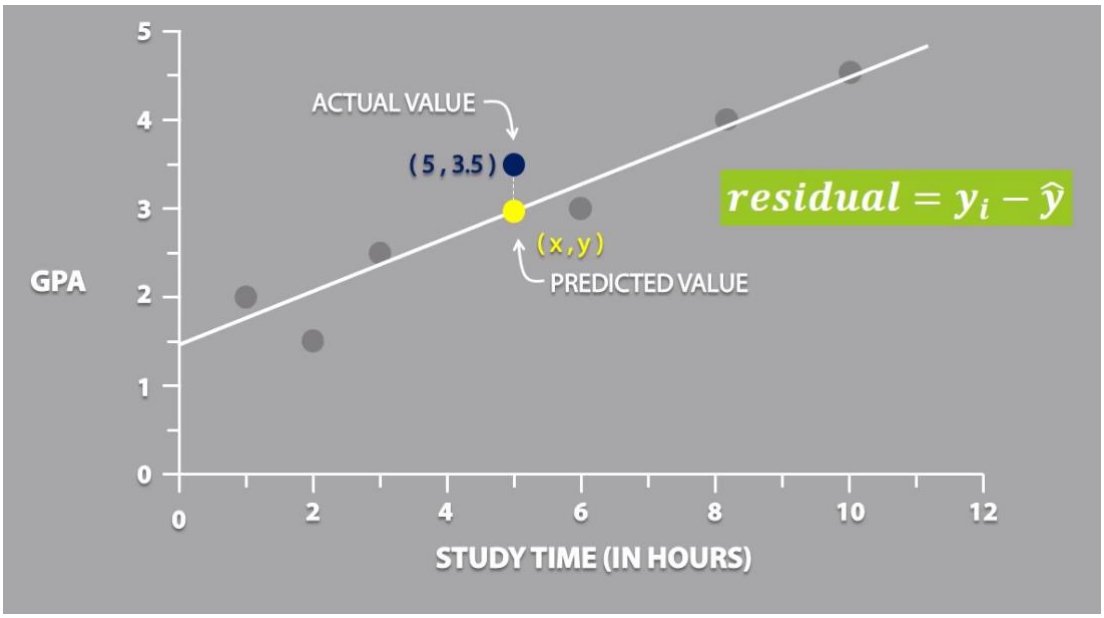


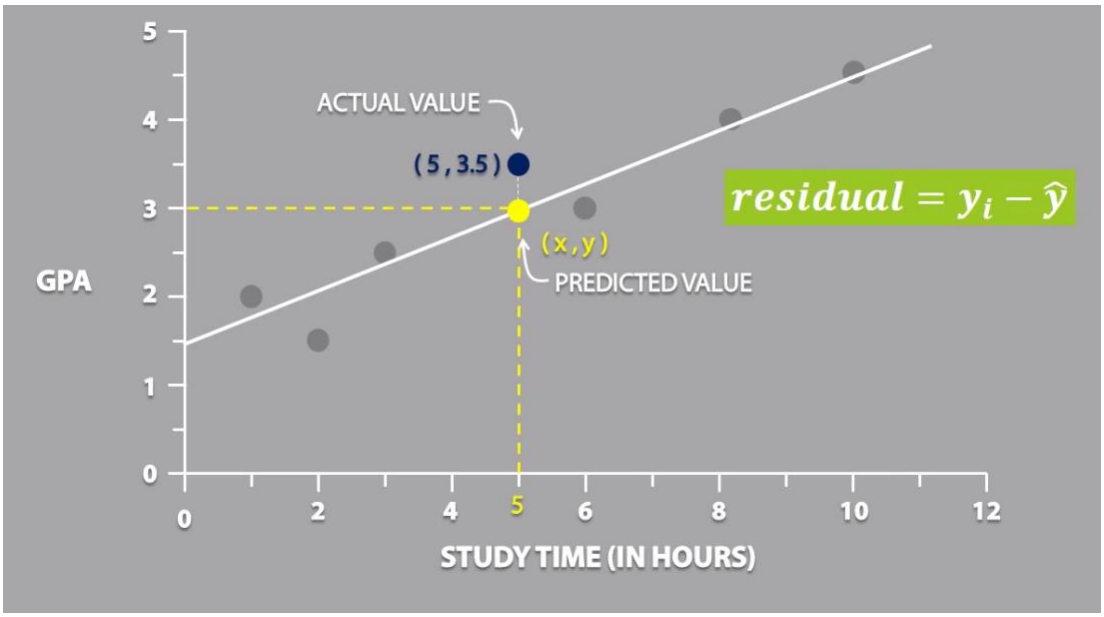

ACTUAL VALUE
PREDICTED VALUE
GPA
STUDY TIME (IN HOURS)
0
1
2
3
4
5
0
2
4
6
8
10
12

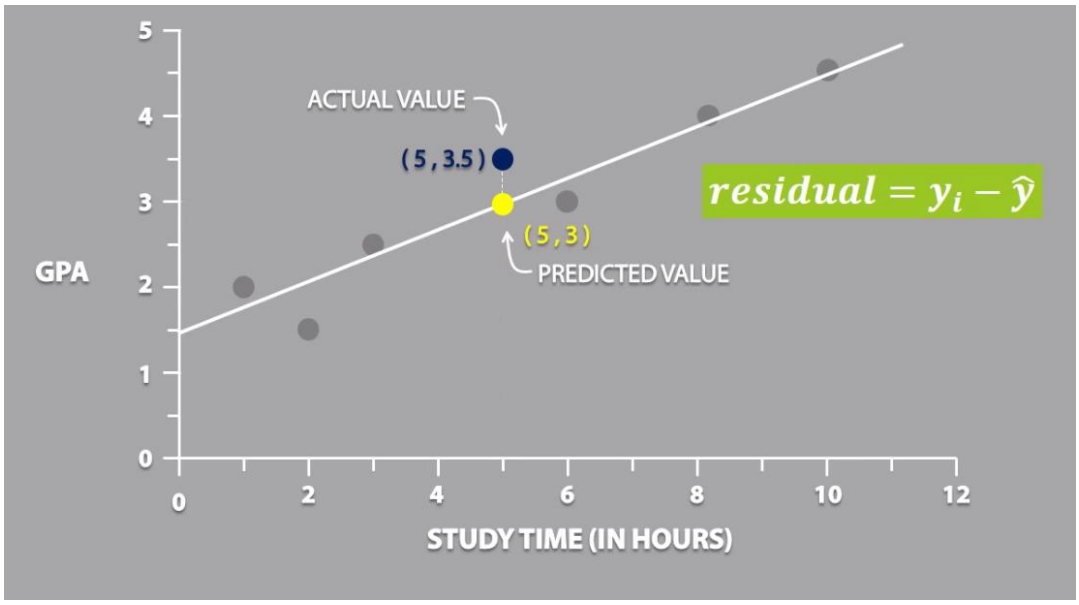

ACTUAL VALUE
PREDICTED VALUE
$residual = y_i - \hat{y}$
GPA
STUDY TIME (IN HOURS)
0
1
2
3
4
5
0
2
4
6
8
10
12

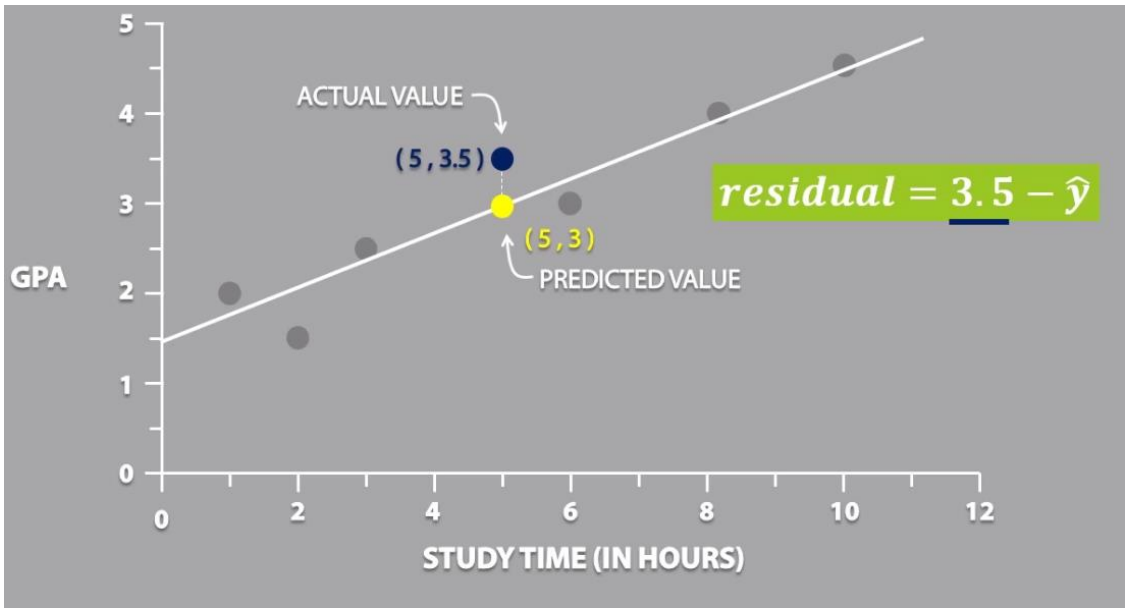

ACTUAL VALUE
(x,y)
(x,y)
PREDICTED VALUE
$residual = y_i - \hat{y}$
GPA
STUDY TIME (IN HOURS)
0
1
2
3
4
5
0
2
4
6
8
10
12

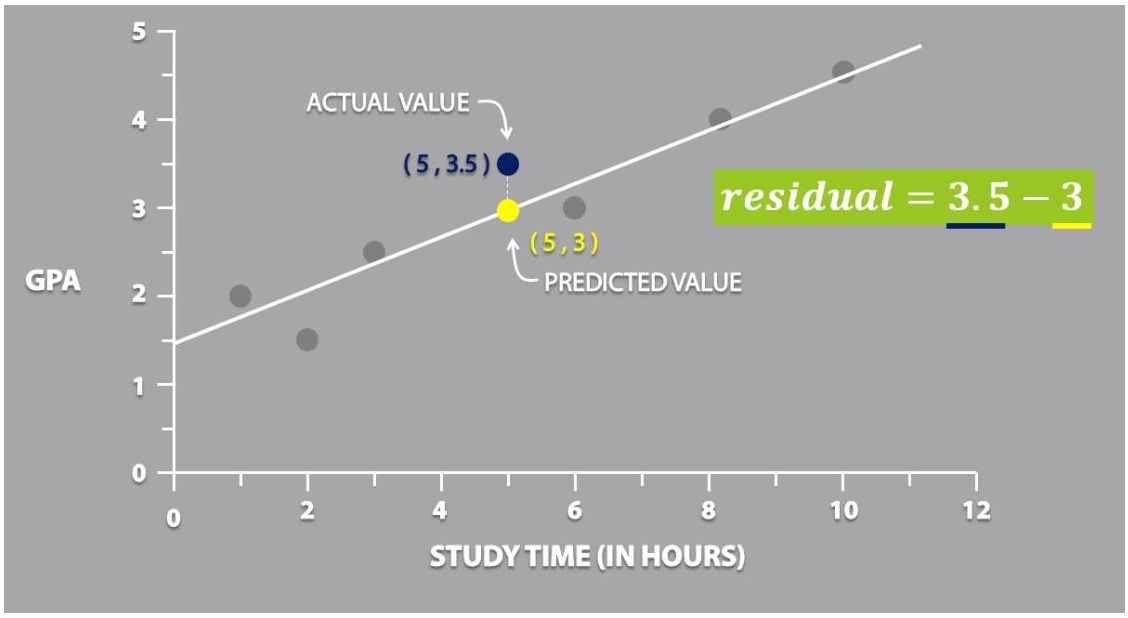

ACTUAL VALUE
3.5
(x,y)
(x,y)
PREDICTED VALUE
$residual = y_i - \hat{y}$
GPA
STUDY TIME (IN HOURS)
0
1
2
3
4
5
0
2
4
5
6
8
10
12

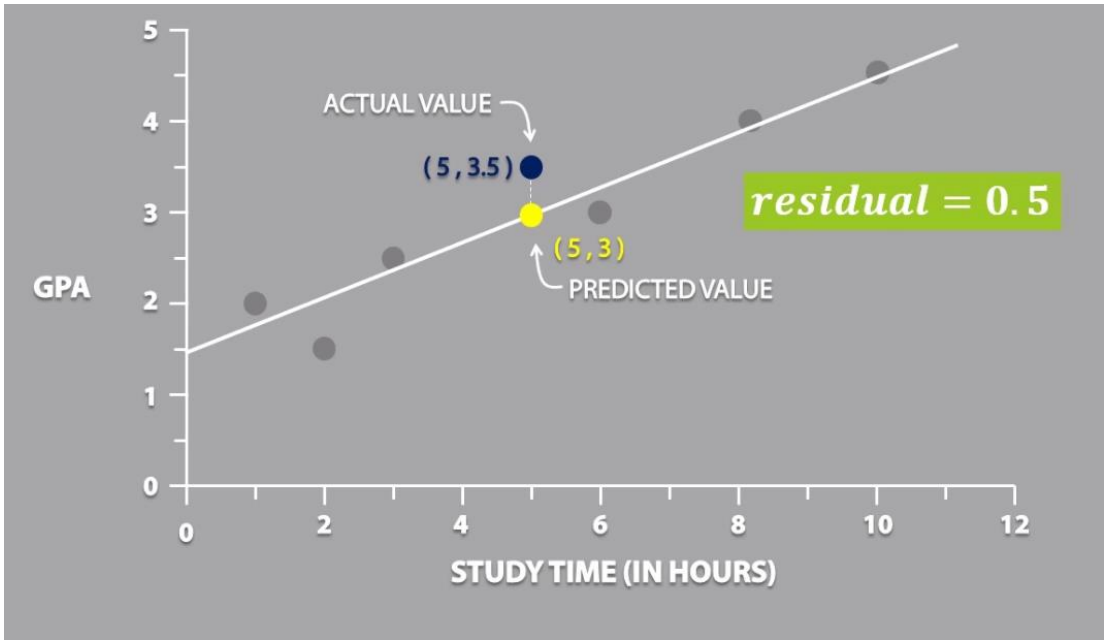

ACTUAL VALUE
(5, 3.5)
(x, y)
PREDICTED VALUE
$residual = y_i - \hat{y}$
GPA
STUDY TIME (IN HOURS)
0
1
2
3
4
5
0
2
4
6
8
10
12

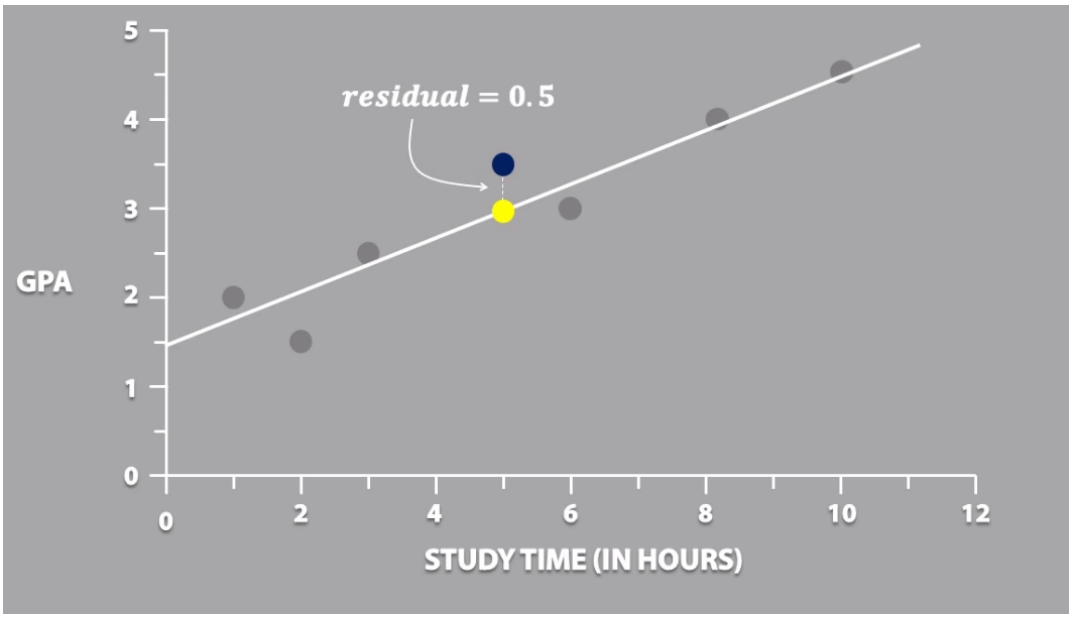

ACTUAL VALUE
(5, 3.5)
(x, y)
PREDICTED VALUE
$residual = y_i - \hat{y}$
GPA
STUDY TIME (IN HOURS)
0
1
2
3
4
5
0
2
4
5
6
8
10
12

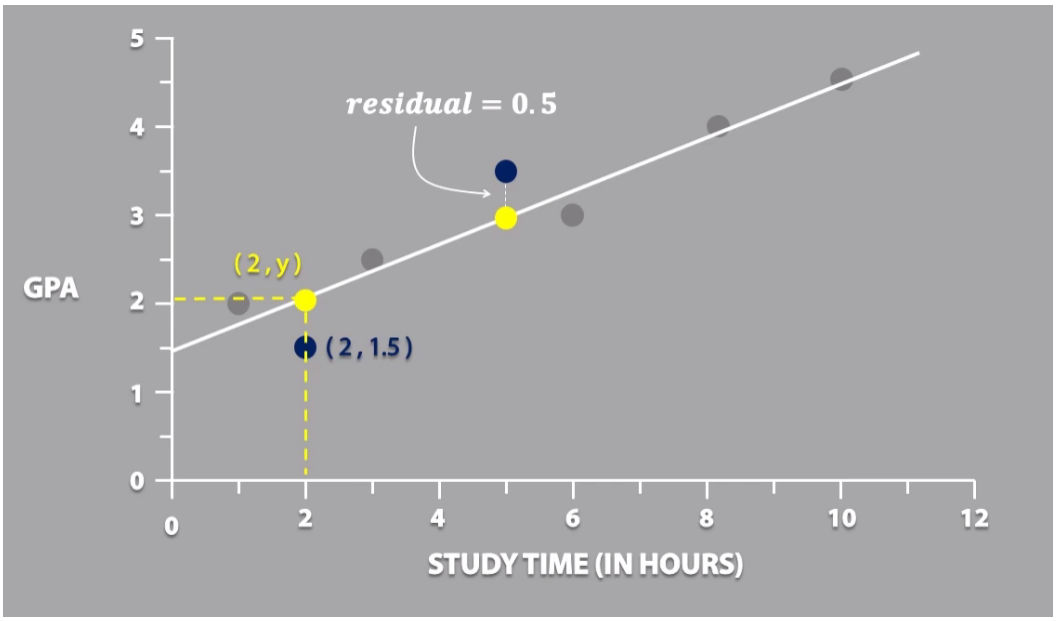

ACTUAL VALUE
(5, 3.5)
(5,3)
PREDICTED VALUE
$residual = y_i - \hat{y}$
GPA
STUDY TIME (IN HOURS)
0
1
2
3
4
5
0
2
4
6
8
10
12

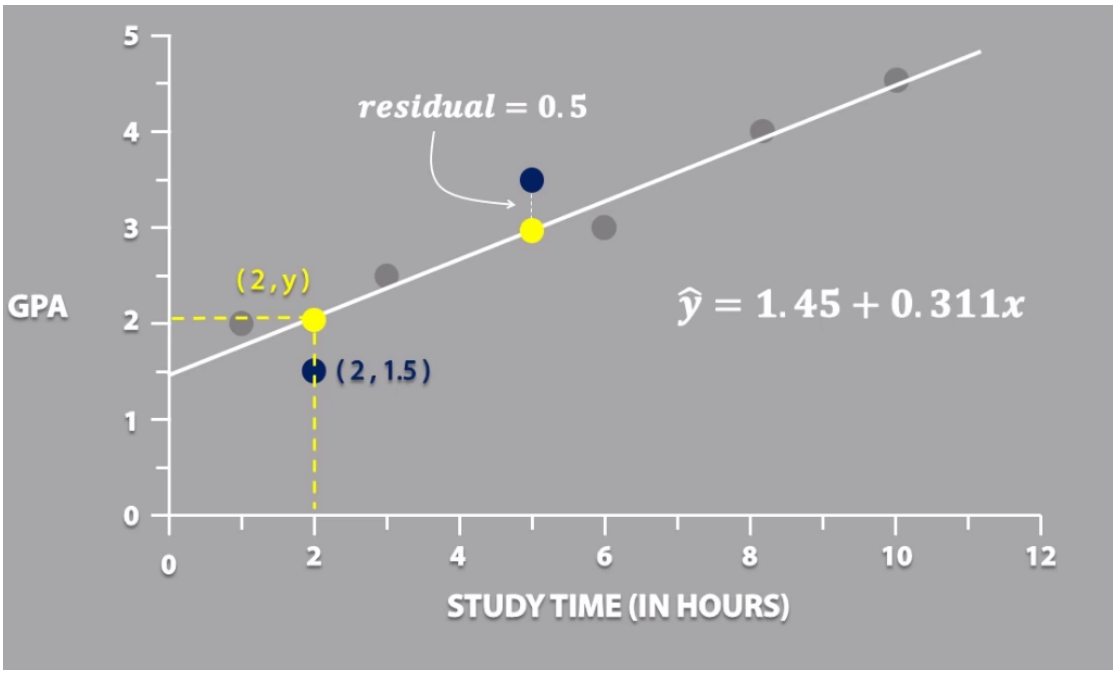

ACTUAL VALUE
(5, 3.5)
(5,3)
PREDICTED VALUE
$residual = 3.5 - \hat{y}$
GPA
STUDY TIME (IN HOURS)
0
1
2
3
4
5
0
2
4
6
8
10
12

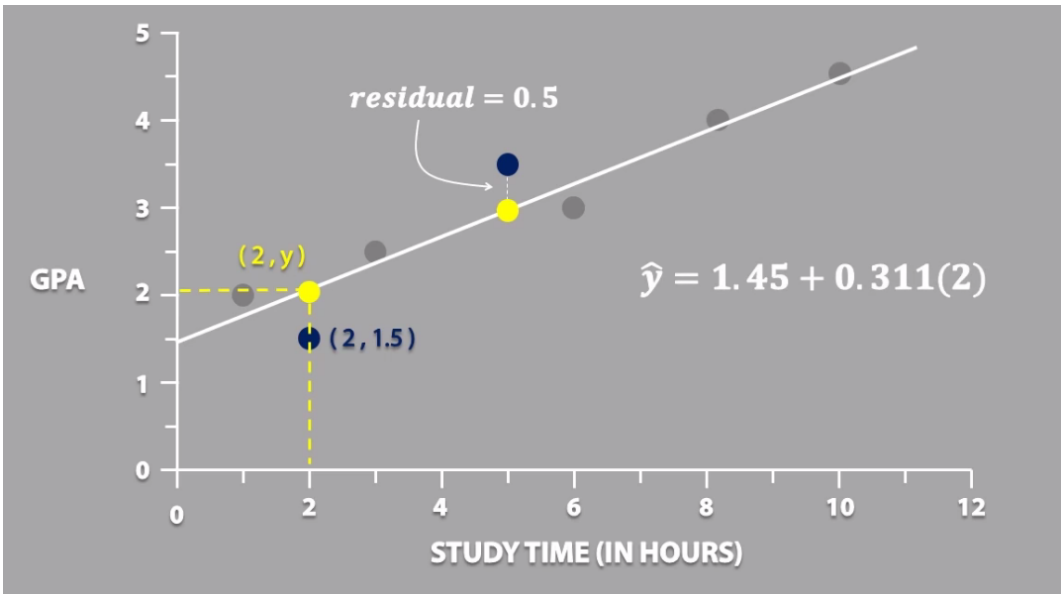

ACTUAL VALUE
(5, 3.5)
(5, 3)
PREDICTED VALUE
residual = 3.5 − 3
GPA
STUDY TIME (IN HOURS)
0
1
2
3
4
5
0
2
4
6
8
10
12

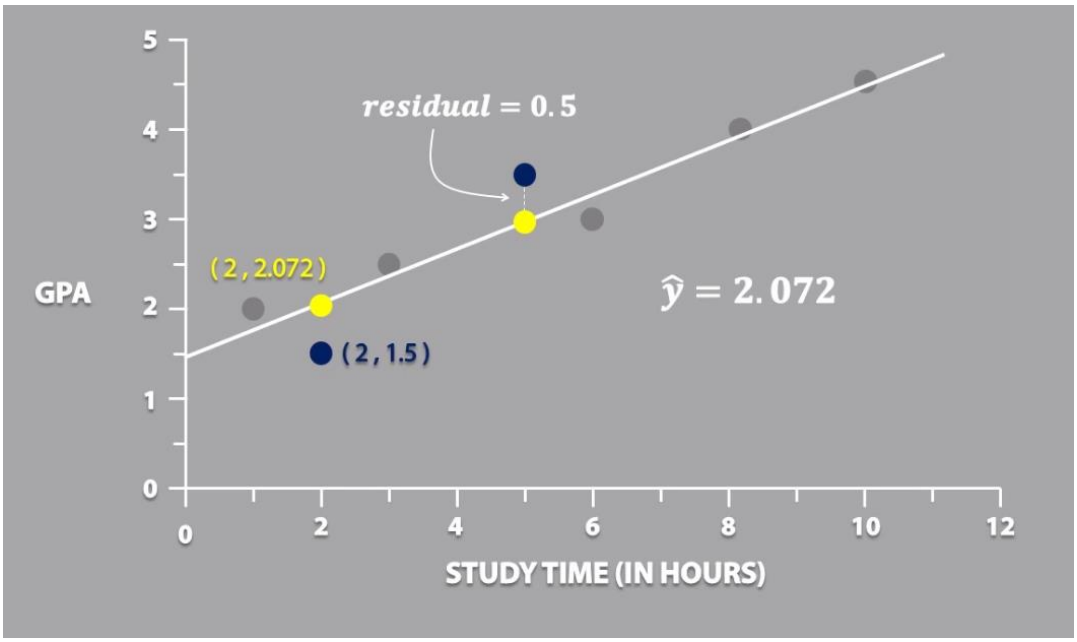

ACTUAL VALUE
(5, 3.5)
(5, 3)
PREDICTED VALUE
residual = 0.5
GPA
STUDY TIME (IN HOURS)
0
1
2
3
4
5
0
2
4
6
8
10
12

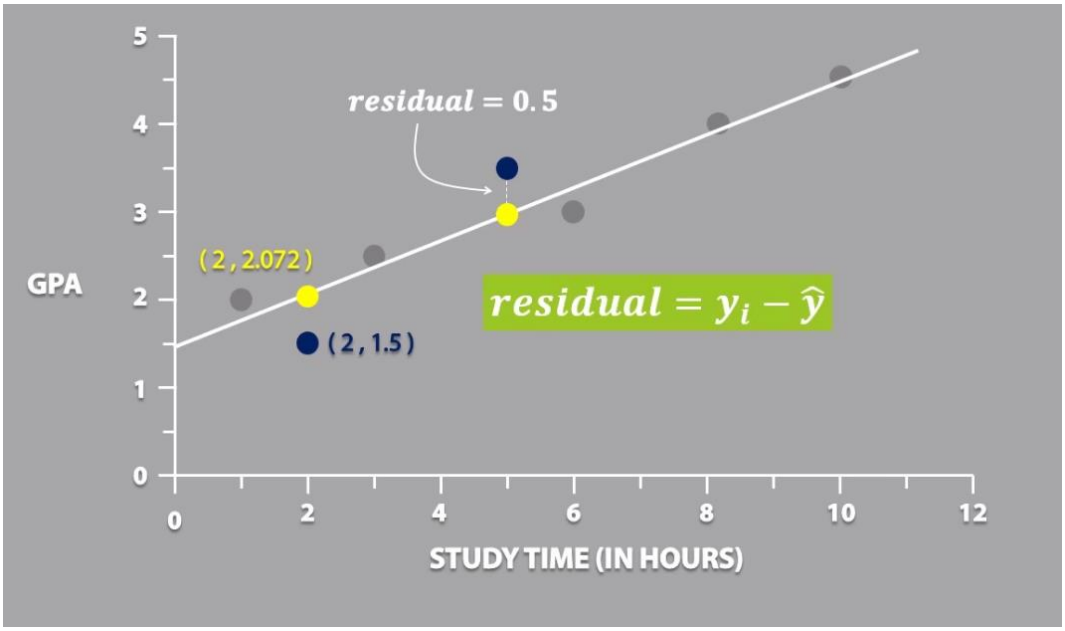

residual = 0.5
GPA
STUDY TIME (IN HOURS)
0
1
2
3
4
5
0
2
4
6
8
10
12

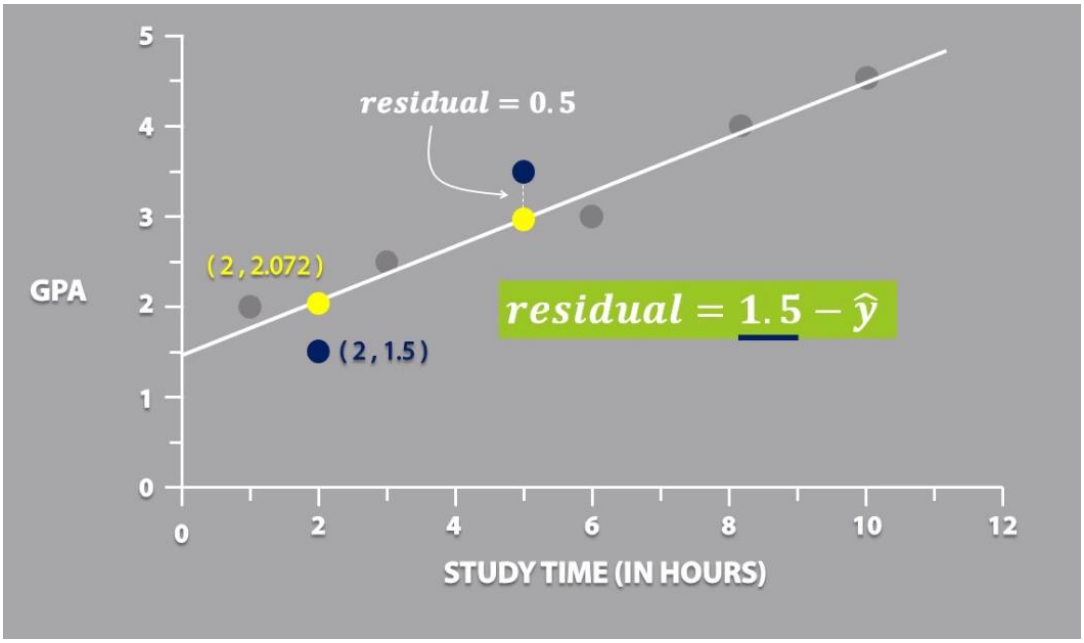

residual = 0.5
(2, y)
(2, 1.5)
GPA
STUDY TIME (IN HOURS)
0
1
2
3
4
5
0
2
4
6
8
10
12

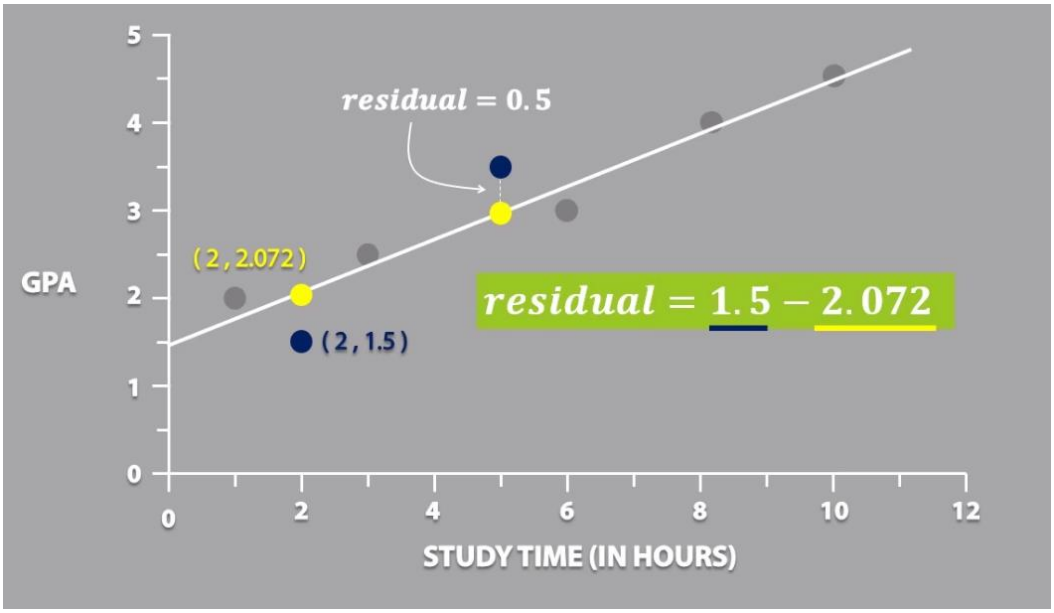

residual = 0.5
(2, y)
(2, 1.5)
GPA
$\hat{y} = 1.45 + 0.311x$
STUDY TIME (IN HOURS)
0
1
2
3
4
5
0
2
4
6
8
10
12

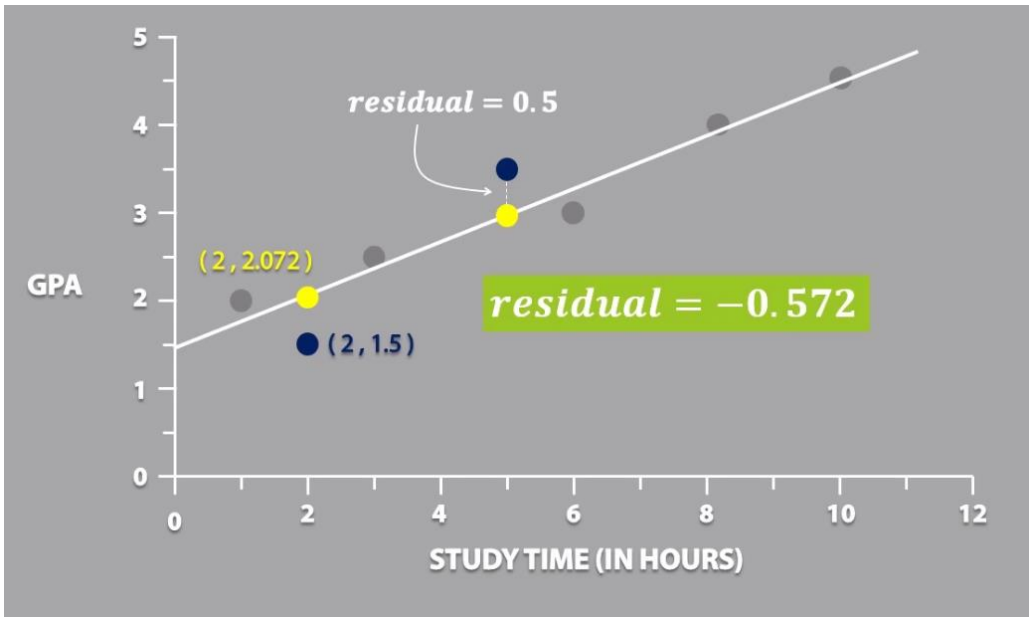

residual = 0.5
(2, y)
(2, 1.5)
GPA
$\hat{y} = 1.45 + 0.311(2)$
STUDY TIME (IN HOURS)
0
1
2
3
4
5
0
2
4
6
8
10
12

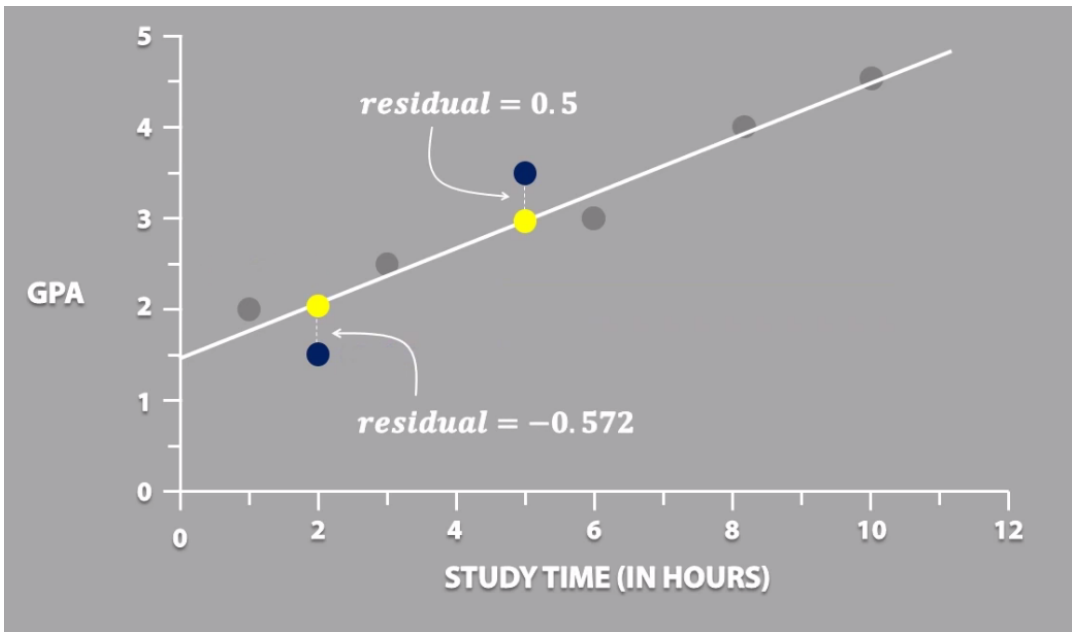

residual = 0.5
(2, 2.072)
(2, 1.5)
ŷ = 2.072
GPA
STUDY TIME (IN HOURS)
0
1
2
3
4
5
0
2
4
6
8
10
12

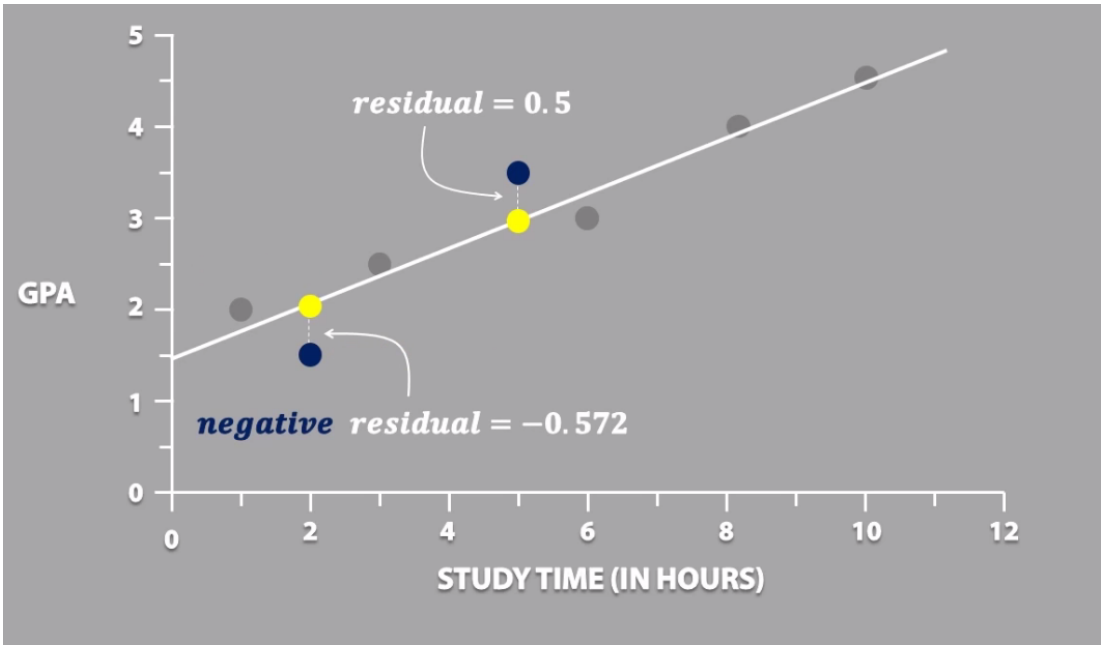
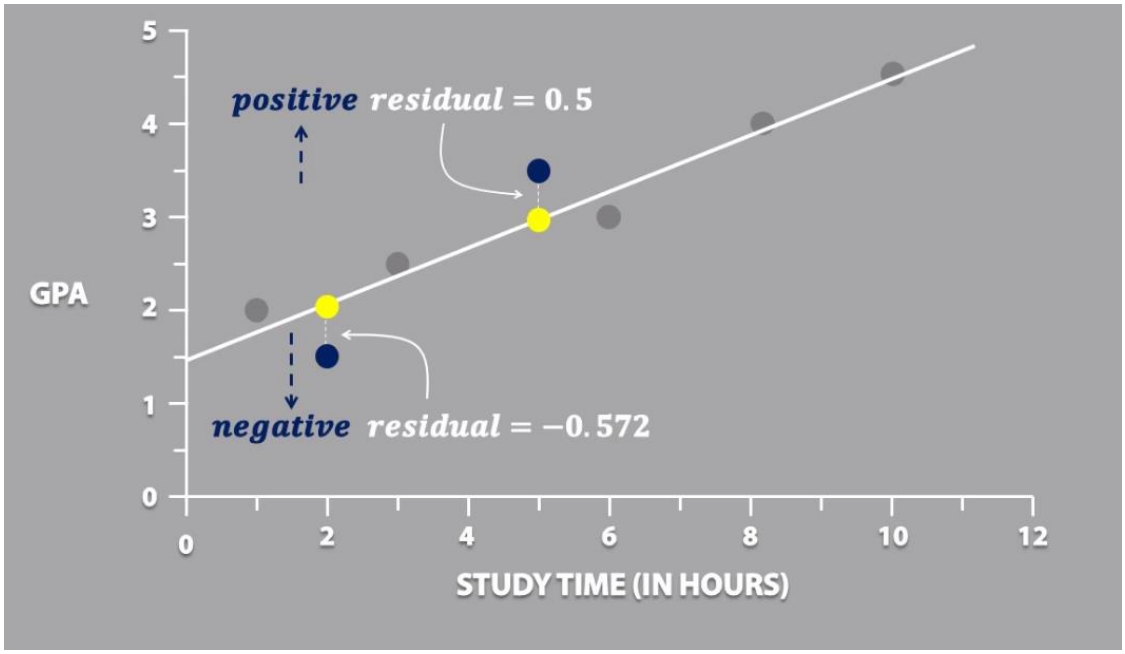

residual = 0.5
(2, 2.072)
(2, 1.5)
residual = $y_i - \hat{y}$
GPA
STUDY TIME (IN HOURS)
0
1
2
3
4
5
0
2
4
6
8
10
12


residual = 0.5
(2, 2.072)
(2, 1.5)
residual = 1.5 − ŷ
GPA
STUDY TIME (IN HOURS)
0
1
2
3
4
5
0
2
4
6
8
10
12


residual = 0.5
(2, 2.072)
(2, 1.5)
residual = 1.5 − 2.072
GPA
STUDY TIME (IN HOURS)
0
1
2
3
4
5
0
2
4
6
8
10
12


residual = 0.5
(2, 2.072)
(2, 1.5)
residual = −0.572
GPA
STUDY TIME (IN HOURS)
0
1
2
3
4
5
0
2
4
6
8
10
12


residual = 0.5
residual = −0.572
GPA
STUDY TIME (IN HOURS)
0
1
2
3
4
5
0
2
4
6
8
10
12


residual = 0.5
negative residual = −0.572
GPA
STUDY TIME (IN HOURS)
0
1
2
3
4
5
0
2
4
6
8
10
12

- ✓ A negative residual value means, it falls the below the regression line
- ✓ A positive residual value means, the actual value located into above regression line