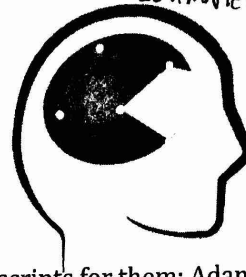


ESTIMATED TIME: 20 minutes total



Your IQ is ... ?

## Can You Guess My IQ?

As part of a new transcript at our school, the counselors have decided to include an IQ score in addition to GPA.

Five students requested that the counselors update their transcripts for them: Adam, Bernard, Christie, Deja, and Eldin.

Their IQ scores are 110, 85, 120, 95, 105 but they have been all mixed up and the counselors don't know which IQ score goes with which student. The guidance counselors are forced to predict the IQ for each student.

Each counselor takes a different approach

### Counselor #1: The New Guy

The New Guy is so nervous about being wrong, so he wants to play it safe with his predictions and minimize his error. He decides to find the average IQ and use it as his prediction for all five of the students:

Student	Adam	Bernard	Christie	Deja	Eldin
Predicted IQ	103	103	103	103	103

No GPA data

### Counselor #2: The Veteran

The Veteran noticed an equation written on the board in the AP Statistics room:  $IQ = 16 \cdot GPA + 57.3$ . She realized that GPA can help her to make better predictions. She looks up the GPA of each student:

Adam	GPA = 1.8
Bernard	GPA = 2.4
Christie	GPA = 2.9
Deja	GPA = 3.4
Eldin	GPA = 3.8

How does adding another variable (GPA) improve our predictions?

Then she used the line of best fit to make her predictions.  $IQ = 16 \cdot GPA + 57.3$

Student	Adam	Bernard	Christie	Deja	Eldin
GPA	1.8	2.4	2.9	3.4	3.8
Predicted IQ	86.1	95.7	103.7	111.7	118.1

### Counselor #3: The Truth Seeker

Guidance counselor #3 pulled the five students out of class and found the truth.

Student	Adam	Bernard	Christie	Deja	Eldin
GPA	1.8	2.4	2.9	3.4	3.8
Actual IQ	85	95	110	105	120

## Who made the better predictions?

Now let's see which counselor made better predictions:

### Counselor #1: The New Guy (used the mean IQ for every prediction)

Student	Adam	Bernard	Christie	Deja	Eldin
Actual IQ	85	95	110	105	120
Predicted IQ	103	103	103	103	103
Error (Actual - Predicted)	-18	-8	7	2	17
Squared error	324	64	49	4	289

Sum of the squared errors:

730

### Counselor #2: The Veteran (used the line of best fit for every prediction)

Student	Adam	Bernard	Christie	Deja	Eldin
GPA	1.8	2.4	2.9	3.4	3.8
Actual IQ	85	95	110	105	120
Predicted IQ	86.1	95.7	103.7	111.7	118.1
Error (Actual - Predicted)	-1.1	-0.7	6.3	-6.7	1.9
Squared error	1.21	0.49	39.69	44.89	3.61

Sum of the squared errors:

89.89

Who did better? Why?

The Veteran. Her sum of squared errors (89.89) was less than the sum of squared errors for the New Guy (730)

Counselor #1 sum of squared errors: 730    Counselor #2 sum of squared errors: 89.89

Calculate the percentage improvement of the sum of squared errors from Guidance Counselor #1 to Guidance Counselor #2.

$$\frac{730 - 89.89}{730} = \frac{640.11}{730} = 0.8769 \quad \text{SAME!}$$

Find the correlation (r) and the coefficient of determination (r<sup>2</sup>) for the data using the calculator.

GPA	1.8	2.4	2.9	3.4	3.8
Actual IQ	85	95	110	105	120

$$r = 0.936 \quad r^2 = 0.8769$$

Interpretation for r<sup>2</sup>:

87.69% of the variation in IQ can be accounted for (explained by) the line of best fit.