 Interpolating and extrapolating

Student activity

Least squares regression line of best fit and interpolating and extrapolating

Activity 1

Random data sets

Part 1

For this activity, you will need the following files:

* data-file-1.xlsx
* how-to-guide-Desmos-lines-of-best-fit-by-eye.docx

Steps:

For data sets 1 to 9, construct a scatterplot, fit a line of best fit by eye and find its equation.

Note: Students may have already developed scatterplots and equations in fitting-a-line-of-best-fit-by-eye-activity.DOCX

| Data set | Equation of the line of best fit |
| --- | --- |
| 1 |  |
| 2 |  |
| 3 |  |
| 4 |  |
| 5 |  |
| 6 |  |
| 7 |  |
| 8 |  |
| 9 |  |

Part 2 – interpolating and extrapolating

Using the line of best fit by eye

Estimate the missing values in the table below by interpolating or extrapolating using the line of best fit. State if this is an example of interpolating or extrapolating.

| Data set | Variable 1 | Variable 2 | Interpolating or extrapolating? |
| --- | --- | --- | --- |
| 1 | 25 |       |       |
| 1 | 42 |       |       |
| 1 |       | 30 |       |
| 2 | 45 |       |       |
| 2 |       | 22 |       |
| 3 | 27 |       |       |
| 3 |       | 65 |       |
| 4 |       | 40 |       |
| 4 | 60 |       |       |
| 5 | 25 |       |       |
| 5 |       | 27 |       |
| 6 |       | 35 |       |
| 6 | 22 |       |       |
| 7 | 95 |       |       |
| 7 |       | 23 |       |
| 8 | 2 |       |       |
| 8 |       | 23 |       |
| 9 | 30 |       |       |
| 9 |       | 30 |       |

Using the equation of the line of best fit by eye

Recalculate the missing values by substituting the known value into the equation of the line of best fit. Show your working out.

| Data set | Variable 1 | Variable 2 |
| --- | --- | --- |
| 1 | 25 |       |
| 1 | 42 |       |
| 1 |       | 30 |
| 2 | 45 |       |
| 2 |       | 22 |
| 3 | 27 |       |
| 3 |       | 65 |
| 4 |       | 40 |
| 4 | 60 |       |
| 5 | 25 |       |
| 5 |       | 27 |
| 6 |       | 35 |
| 6 | 22 |       |
| 7 | 95 |       |
| 7 |       | 23 |
| 8 | 2 |       |
| 8 |       | 23 |
| 9 | 30 |       |
| 9 |       | 30 |

Activity 2

Practical questions

Construct a scatterplot, fit a line of best fit by eye and find its equation.

You will need the following file open:

* Data-file-2.xls

Data Set 1 Engine Size and Fuel Use:

| Question | **Graphical method** | **Algebraic method** |
| --- | --- | --- |
| Equation of the line of best fit |  |  |
| Estimate the fuel use of a car with an engine size of 4L |  |  |
| Estimate the engine size of a car with an average fuel use of 8km/L |  |  |

Data Set 2 Goods Manufactured and Energy Costs:

| Question | **Graphical method** | **Algebraic method** |
| --- | --- | --- |
| Equation of the line of best fit |  |  |
| Estimate the monthly energy costs if 550 goods are manufactured |  |  |
| Estimate the number of goods manufactured if the monthly energy cost is $2000 |  |  |

Data Set 3 Height and Arm Span:

| Question | **Graphical method** | **Algebraic method** |
| --- | --- | --- |
| Equation of the line of best fit |  |  |
| Estimate the height of a person with an arm span of 160cm |  |  |
| Estimate the arm span of a person with a height of 180cm |  |  |

Data Set 4 GDP and CO2 Emissions:

| Question | **Graphical method** | **Algebraic method** |
| --- | --- | --- |
| Equation of the line of best fit |  |  |
| Estimate the tonnes per capita of CO2 emissions if a country has a GDP of $30,000 |  |  |
| Estimate the GDP of a country with CO2 emissions of 25 tonners per capita |  |  |

Activity 3

You will need the Desmos files saved during Part 2 of fitting-a-line-of-best-fit-by-eye-activity.docx

1. Record the equations of the lines of best fit fitted by eye.
2. Use the equation or scatterplot to answer each questions.

Data Set 1 Engine Size and Fuel Use:

| Question | **Graphical method** | **Algebraic method** |
| --- | --- | --- |
| Equation of the line of best fit (by eye) |  |  |
| Estimate the fuel use of a car with an engine size of 4L |  |  |
| Estimate the engine size of a car with an average fuel use of 8km/L |  |  |

Data Set 2 Goods Manufactured and Energy Costs:

| Question | **Graphical method** | **Algebraic method** |
| --- | --- | --- |
| Equation of the line of best fit (by eye) |  |  |
| Estimate the monthly energy costs if 550 goods are manufactured |  |  |
| Estimate the number of goods manufactured if the monthly energy cost is $2000 |  |  |

Data Set 3 Height and Arm Span:

| Question | **Graphical method** | **Algebraic method** |
| --- | --- | --- |
| Equation of the line of best fit (by eye) |  |  |
| Estimate the height of a person with an arm span of 160cm |  |  |
| Estimate the arm span of a person with a height of 180cm |  |  |

Data Set 4 GDP and CO2 Emissions:

| Question | Graphical method | **Algebraic method** |
| --- | --- | --- |
| Equation of the line of best fit (by eye) |  |  |
| Estimate the tonnes per capita of CO2 emissions if a country has a GDP of $30,000 |  |  |
| Estimate the GDP of a country with CO2 emissions of 25 tonners per capita |  |  |

Activity 6

1. Compare the estimate obtained between the graphical and algebraic methods. (Part 4 and Part 5)
* Are there any discrepancies?
* Why might there be discrepancies?
* Which predictions are more accurate? Why.
* What are the benefits of each method?