# Algebra 1

## ELG HS.S.3: Interpret linear models

## Vertical Progression:

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| **7th Grade** | **Draw informal comparative inferences about two populations.**<br>○ **7.SP.4** Use measures of center and measures of variability for numerical data from random samples to draw informal comparative inferences about two populations. For example, decide whether the words in a chapter of a seventh-grade science book are generally longer than the words in a chapter of a fourth-grade science book. |
| **8th Grade** | **Investigate patterns of association in bivariate data.**<br>○ **8.SP.1** Construct and interpret scatter plots for bivariate measurement data to investigate patterns of association between two quantities. Describe patterns such as clustering, outliers, positive or negative association, linear association, and nonlinear association.<br>○ **8.SP.2** Know that straight lines are widely used to model relationships between two quantitative variables. For scatter plots that suggest a linear association, informally fit a straight line, and informally assess the model fit by judging the closeness of the data points to the line.<br>○ **8.SP.3** Use the equation of a linear model to solve problems in the context of bivariate measurement data, interpreting the slope and intercept. |
| **Algebra 1** | **ELG.MA.HS.S.3 Interpret linear models**<br>○ **S-ID.7** Interpret the slope (rate of change) and the intercept (constant term) of a linear model in the context of the data.<br>○ **S-ID.8** Compute (using technology) and interpret the correlation coefficient of a linear fit.<br>○ **S-ID.9** Distinguish between correlation and causation. |
| **Algebra 2** | **ELG.MA.HS.S.2 Summarize, represent, and interpret data on two categorical and quantitative variables**<br>○ **S-ID.6** Represent data on two quantitative variables on a scatter plot, and describe how the variables are related.<br>○ **S-ID.6a** Fit a function to the data; use functions fitted to data to solve problems in the context of the data. *Use given functions or choose a function suggested by the context. Emphasize linear, quadratic, and exponential models.* |

## Students will demonstrate command of the ELG by:

- Computing slope.
- Explaining specific data points (*x, y*) of the graph in context of the data.
- Interpreting the starting point/initial value (y-intercept).
- Making predictions based on current data and inferences made from slope
- Computing the correlation coefficient using technology.
- Interpreting the correlation coefficient in the given context.
- Differentiating between correlated events and causation.

## Vocabulary:

- causation
- correlation
- correlation coefficient
- data point (ordered pair)
- dependent variable
- event
- extrapolate
- independent variable
- initial value
- intercepts
- interpolate
- line of fit (regression model)
- linear data
- linear models
- negative correlation
- no correlation
- outcome
- point-slope form
- positive correlation
- scatter plot slope (rate of change)
- slope-intercept form
- standard form

## Sample Instructional/Assessment Tasks:

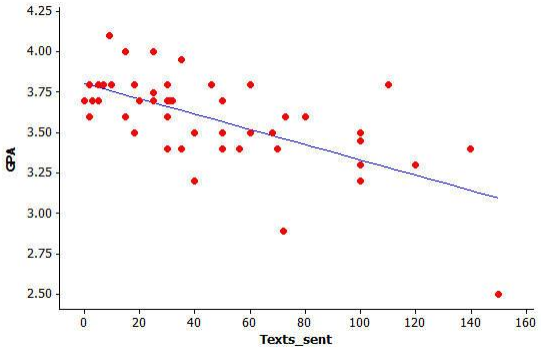
1) **Standard(s):** ELG.MA.HS.S.3 (S-ID.7)

**Texting and Grades**

**Source:** Illustrative Mathematics
https://www.illustrativemathematics.org/content-standards/HSS/ID/C/7/tasks/1028

**Item Prompt:**

Medhavi suspects that there is a relationship between the number of text messages high school students send and their academic achievement. To explore this, she asks a random sample of 52 students at her school how many text messages they sent yesterday and what their grade point average (GPA) was during the most recent marking period. Her data are summarized in the scatter plot below. The line of best fit is also shown.




The equation of the line of best fit is $\widehat{GPA}$ =3.8 − 0.005(Texts sent). Interpret the quantities −0.005 and 3.8 in the context of these data.

**Correct Answer:**

Interpretation of the slope: For students at this school, the predicted GPA decreases by 0.005 for each additional text message sent OR GPA decreases by 0.005, on average, for each additional text message sent.

Interpretation of intercept: The model predicts that students at this school who send no text messages have, on average, a GPA of 3.8.

2) **Standard(s):** ELG.MA.HS.S.3 (S-ID.9)

**TV and Blood Pressure**

**Source: Illustrative Mathematics**
https://www.illustrativemathematics.org/content-standards/HSS/ID/C/9/tasks/1100)

**Item Prompt:**

In a study of college freshmen, researchers found that students who watched TV for an hour or more on weeknights were significantly more likely to have high blood pressure, compared to those students who watched less than an hour of TV on weeknights. Does this mean that watching more TV raises one's blood pressure? Explain your reasoning.

**Correct Answer:**

This does not mean that watching more TV raises blood pressure. Whether or not we can conclude that "watching more TV raises one's blood pressure" depends on the design of the study. If the researchers had conducted a randomized experiment where some of the participants were randomly assigned to watch less than an hour of TV and others were assigned to watch more than hour of TV, and if we found a statistically significant difference in the average blood pressure of the two groups, we could conclude causation. If the study is simply an observational study (which is the case here), we can only conclude that there is an association between time spent watching TV and blood pressure.