**Name\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_**

2nd 6 Weeks Benchmark

In the box to the left of the standard, rate our understanding of it on a scale from 1-5. (1= I do not know what this means;3 = I remember the concept but need to revisit; 5= I do not have to learn about this again because I know it so well.)

Math I

|  |  |  |  |
| --- | --- | --- | --- |
| Score | Rating | Standard |  |
|  |  | A.REI.6 | Solve systems of linear equations exactly and approximately (e.g., with graphs), focusing on pairs of linear equations in two variables of two functions each represented in a different way  (algebraically, graphically, numerically in tables, or by verbal descriptions)  ***Solve systems of equations exactly by using the substitution method and solve systems of equations by using the elimination method (sometimes called linear combinations). Solve systems of equations approximately by using graphs. Graph the system of linear functions on the same coordinate plane and find the point of intersection. This point is the solution to the system because it is the one point that makes all equations in the system true. Equations may be in standard or slope-intercept form.***Ex. Solve the system by elimination, checking your solution by graphing using technology.3x + 2y = 6x - 4y = 2Ex. Solve the system by substitution, checking your solution by graphing using technology. -3x + 5y = 6 2x + y = 6 Ex. The equations y = 18 + .4m and y = 11.2 + .54m give the lengths of two different springs in centimeters, as mass is added in grams, m, to each separately. 1. Graph each equation on the same set of axes.
2. What mass makes the springs the same length?
3. What is the length at that mass?
4. Write a sentence comparing the two springs.
 |
|  |  | A.REI.11 | Explain why the x‐coordinates of the points where the graphs of the equations y=f(x) and y=g(x) intersect are the solutions of the equation f(x)=g(x); find the  solutions approximately e.g.,  **using technology to graph the  functions,  make  tables of values, or find  successive  approximations.**  Include cases where f(x) and/or g(x) are linear, and exponential  functions  \* ***Understand that solving a one-variable equation of the form f(x) = g(x) is the same as solving the two-variable system y = f(x) and y = g(x). When solving by graphing, the x-value(s) of the intersection point(s) of y = f(x) and y = g(x) is the solution of f(x) = g(x) for any combination of linear and exponential functions. Use technology, entering f(x) in y1 and g(x) in y2, graphing the equations to find their point of equality. At this level, focus on linear and exponential functions.*** Ex. How do you find the solution to an equation graphically? ***\*\*Solve graphically, finding approximate solutions using technology. At this level, focus on linear and exponential functions.*** Ex. Solve the following equations by graphing. Give your answer to the nearest tenth.$$3\left(2^{x}\right)=6x-7$$10x +5 = -x +8 \*\*\****Solve by making tables for each side of the equation. Use the results from substituting previous values of x to decide whether to try a larger or smaller value of x to find where the two sides are equal. The x-value that makes the two sides equal is the solution to the equation. At this level, focus on linear and exponential functions.***Ex. Solve the following equations by using a table. Give your answer to the nearest tenth.$$3\left(x+2\right)- 8x=4x+1$$$$ 3.5^{x}=22$$  |
|  |  | A.REI.12 | Graph the solutions to a linear inequality in two variables as a half‐ plane (excluding the boundary in the case of a strict inequality), and graph the solution set to a **system of linear inequalities  in two variables as the intersection of two corresponding  half‐ planes*****Graph the solutions to a linear inequality in two variables as a half-plane, excluding the boundary for non-inclusive inequalities.***Ex. Graph the following inequalities:$$3x-4y\leq 7$$$$y>-2x+6$$$$-9x+4y\geq 1$$ ***Understand that the solutions to a system of inequalities in two-variables are the points that lie in the intersection of the corresponding half-planes.***Ex. Compare the solution to a system of equations to the solution of a system of inequalities**.** *Ex. Describe the solution set of a system of inequalities* ***Graph the solution set to a system of linear inequalities in two variables as the intersection of their corresponding half-planes.***Ex. Graph the solution set for the following system of inequalities:$$3x+5y\leq 10$$$$y>-4$$ |
|  |  | G.GPE.5 | Prove the slope criteria for parallel and perpendicular lines and use them to solve geometric  problems  (e.g., find the equation  of a line parallel or perpendicular  to a given line that passes through a given point) ***Use the formula for the slope of a line to determine whether two lines are parallel or perpinducular. Two lines are parallel if they have the same slope and two lines are perpendicular if their slopes are opposite reciprocals of each other. In other words the product of the slopes of lines that are perpendicular is (-1). Find the equations of lines that are parallel or perpendicular given certain criteria***.Ex. Suppose a line k in a coordinate plane has slope .1. What is the slope of a line parallel to k? Why must this be the case?
2. What is the slope of a line perpendicular to k? Why does this seem reasonable?

Ex. Two points A(0, -4) , B(2, -1) determines a line, AB. 1. What is the equation of the line AB?
2. What is the equation of the line perpendicular to AB passing through the point (2,-1)?

Ex. There is a situation in which two lines are perpendicular but the product of their slopes is not (-1). Explain the situation in which this happens. |
|  |  | S.ID.1 | Represent data with plots on the real number line (dot plots, histograms, and box plots ***\*Here they choose a summary statistic appropriate to the characteristics of the data distribution, such as the shape (skewed vs. normal) or the presence of outliers. Construct appropriate graphical displays (dot plots, histogram, and box plot) to describe sets of data values.***Ex. Make a dot plot of the number of siblings that members of your class have.Ex. Create a frequency distribution table and histogram for the following set of data:

|  |
| --- |
| **Age (in months) of First Steps** |
| **13** | 9 | 12 | 11 |
| **10** | 8.5 | 14 | 9 |
| **12.5** | 10 | 13.5 | 9.5 |
| **6** | 7.5 | 15 | 9 |
| **8** | 11.5 | 10 | 12 |
| **10.5** | 11 | 13 | 12.5 |

Ex. Construct a box plot of the number of buttons each of your classmates has on their clothing today. |
|  |  | S.ID.2 | Use statistics appropriate to the shape of the data distribution to compare center (median,mean) and spread (interquartile range, standard deviation) of two or More different data sets. ***Understand which measure of center and which measure of spread is most appropriate to describe a given data set. The mean and standard deviation are most commonly used to describe sets of data. However, if the distribution is extremely skewed and/or has outliers, it is best to use the median and the interquartile range to describe the distribution since these measures are not sensitive to outliers.***Ex. You are planning to take on a part time job as a waiter at a local restaurant. During your interview, the boss told you that their best waitress, Jenni, made an average of $70 a night in tips last week. However, when you asked Jenni about this, she said that she made an average of only $50 per night last week. She provides you with a copy of her nightly tip amounts from last week (see below). Calculate the mean and the median tip amount. 1. Which value is Jenni’s boss using to describe the average tip? Why do you think he chose this value?
2. Which value is Jenni using? Why do you think she chose this value?
3. Which value best describes the typical amount of tips per night? Explain why.

|  |  |
| --- | --- |
| **Day** | **Tip Amount** |
| Sunday | $50 |
| Monday | $45 |
| Wednesday | $48 |
| Friday | $125 |
| Saturday | $85 |

 ***Select the appropriate measures to describe and compare the center and spread of two or more data sets in context.***Ex. Delia wanted to find the best type of fertilizer for her tomato plants. She purchased three types of fertilizer and used each on a set of seedlings. After 10 days, she measured the heights (in cm) of each set of seedlings. The data she collected is shown below. Construct box plots to analyze the data. Write a brief description comparing the three types of fertilizer. Which fertilizer do you recommend that Delia use?

|  |
| --- |
| Fertilizer A |
| 7.1 | 6.3 | 1.0 |
| 5.0 | 4.5 | 5.2 |
| 3.2 | 4.6 | 2.4 |
| 5.5 | 3.8 | 1.5 |
| 6.2 | 6.9 | 2.6 |
| Fertilizer B |
| 11.0 | 9.2 | 5.6 |
| 8.4 | 7.2 | 12.1 |
| 10.5 | 14.0 | 15.3 |
| 6.3 | 8.7 | 11.3 |
| 17.0 | 13.5 | 14.2 |

|  |
| --- |
| Fertilizer C |
| 10.5 | 11.8 | 15.5 |
| 14.7 | 11.0 | 10.8 |
| 13.9 | 12.7 | 9.9 |
| 10.3 | 10.1 | 15.8 |
| 9.5 | 13.2 | 9.7 |

 |
|  |  | 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. ***Determine which type of function best models a set of data. Fit this type of function to the data and interpret constants and coefficients in the context of the data (e.g. slope and y-intercept of linear models, base/growth or decay rate and y-intercept of exponential models). Use the fitted function to make predictions and solve problems in the context of the data.***Ex. What type of function models the data found in the scatterplot above? Find the function that best describes the data. What is the meaning of the slope and y-intercept in the context of the problem? Use the model to predict Connie’s earnings for selling 100 services. ***Create a scatter plot from two quantitative variables.***Ex. Connie works for a telephone company. She calls existing customers to sell them additional services for their account. The table below shows how much Connie earns for selling selected numbers of additional services. Create a scatter plot of the number of services sold and the daily pay she received.

|  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- |
| # of services sold | 10 | 20 | 30 | 40 | 50 |
| Daily Pay in dollars | 60 | 80 | 100 | 120 | 140 |

 ***Describe the form, strength, and direction of the relationship between the two variables in context.***Ex. Describe, in context, the form, strength, and direction of the scatterplot from the problem above. |
|  |  | N-Q.1 | Use units as a way to understand problems and to guide the solution of multi-step problems; choose and interpret units consistently in formulas; choose and interpret the scale and the origin in graphs and data displays. \****Use units as a tool to help solve multi-step problems. For example, students should use the units assigned to quantities in a problem to help identify which variable they correspond to in a formula. Students should also analyze units to determine which operations to use when solving a problem. Given the speed in mph and time traveled in hours, what is the distance traveled? From looking at the units, we can determine that we must multiply mph times hours to get an answer expressed in miles:*** $\left(\frac{mi}{hr}\right)\left(hr\right)=mi$ **\*\*** ***Based on the type of quantities represented by variables in a formula, choose the appropriate units to express the variables and interpret the meaning of the units in the context of the relationships that the formula describes.***Ex. When finding the area of a circle using the formula $A=πr^{2}$, which unit of measure would be appropriate for the radius?1. square feet
2. inches
3. cubic yards
4. pounds

Ex. Based on your answer to the previous question, what units would the area be measured in? \*\*\* ***When given a graph or data display, read and interpret the scale and origin. When creating a graph or data display, choose a scale that is appropriate for viewing the features of a graph or data display. Understand that using larger values for the tick marks on the scale effectively “zooms out” from the graph and choosing smaller values “zooms in.” Understand that the viewing window does not necessarily show the x- or y-axis, but the apparent axes are parallel to the x- and y-axes. Hence, the intersection of the apparent axes in the viewing window may not be the origin. Also be aware that apparent intercepts may not correspond to the actual x- or y-intercepts of the graph of a function.***Ex. What scale would be appropriate for making a histogram of the following data that describes the level of lead in the blood of children (in micrograms per deciliter) who were exposed to lead from their parents’ workplace?10, 13, 14, 15, 16, 17, 18, 20, 21, 22, 23, 23, 24, 25, 27, 31, 34, 34, 35, 35, 36, 37, 38, 39, 39, 41, 43, 44, 45, 48, 49, 62, 73 |
|  |  | N-Q.2 | Define appropriate quantities for the purpose of descriptive modeling. ***Define the appropriate quantities to describe the characteristics of interest for a population. For example, if you want to describe how dangerous the roads are, you may choose to report the number of accidents per year on a particular stretch of interstate.*** Ex. What quantities could you use to describe the best city in North Carolina?Ex. What quantities could you use to describe how good a basketball player is? |
|  |  | N-Q.3 | Choose a level of accuracy appropriate to limitations on measurement when reporting quantities.***Understand that the tool used determines the level of accuracy that can be reported for a measurement. For example, when using a ruler, you can only legitimately report accuracy to the nearest division. If I use a ruler that has centimeter divisions to measure the length of my pencil, I can only report its length to the nearest centimeter.***Ex. What is the accuracy of a ruler with 16 divisions per inch? |
|  |  | A-CED.1 | Benchmark document #1 |
|  |  | A-CED.3 | Represent constraints by equations or inequalities, and by systems of equation, and by systems of equations and /or inequalities, and interpret solutions as viable or non-viable options in a modeling context.Use constraints which are situations that are restricted to develop equations and inequalities and systems of equations or inequalities. Describe the solutions in context and explain why any particular one would be the optimal solution. Ex. The Elite Dance Studio budgets a maximum of $100 per month for newspaper and yellow pages advertising. The news paper charges $50 per ad and requires at least four ads per month. The phone company charges $100 dollars for half a page and requires a minimum of two advertisements per month. It is estimated that each newspaper ad reaches 8000 people and that each half page of yellow page advertisement reaches 15,000 people. What combination of newspaper and yellow page advertising should the Elite Dance Studio use in order to reach the maximum number of people? What assumptions did you make in solving this problem? How realistic do you think they are?<http://ccssmath.org/?s=A-CED.3> |
|  |  | A-REI.5 | Prove that, given a system of two equations in two variables, replacing one equation by the sum of that equation and a multiple of the other produces a system with the same solutions.<http://ccssmath.org/?page_id=2137> |
|  |  | S-ID.3 |  Interpret differences in shape, center, and spread in the context of the data sets, accounting for possible effects of extreme data points (outliers). \****Understand and be able to use the context of the data to explain why its distribution takes on a particular shape (e.g. are there real-life limits to the values of the data that force skewness? are there outliers?)***Ex. Why does the shape of the distribution of incomes for professional athletes tend to be skewed to the right? Ex. Why does the shape of the distribution of test scores on a really easy test tend to be skewed to the left?Ex. Why does the shape of the distribution of heights of the students at your school tend to be symmetrical? \*\****Understand that the higher the value of a measure of variability, the more spread out the data set is.***Ex. On last week’s math test, Mrs. Smith’s class had an average of 83 points with a standard deviation of 8 points. Mr. Tucker’s class had an average of 78 points with a standard deviation of 4 points. Which class was more consistent with their test scores? How do you know? \*\*\****Explain the effect of any outliers on the shape, center, and spread of the data sets.***Ex. Explain the relationship between the mean and the median for a data set that has a few high outliers. What would most likely be the shape of its distribution?Ex. The heights of Washington High School’s basketball players are: 5 ft 9in, 5 ft 4in, 5 ft 7 in, 5ft 6 in, 5 ft 5 in, 5 ft 3 in, and 5 ft 7 in. A student transfers to Washington High and joins the basketball team. Her height is 6 ft 10in. a. What is the mean height of the team before the new player transfers in? What is the median height?b. What is the mean height after the new player transfers? What is the median height?c. What affect does her height have on the team’s height distribution and stats (center and spread)? d. How many players are taller than the new mean team height?e. Which measure of center most accurately describes the team’s average height? Explain. |
|  |  | S-ID.5 |  Summarize categorical data for two categories in two-way frequency tables. Interpret relative frequencies in the context of the data (including joint, marginal, and conditional relative frequencies). Recognize possible associations and trends in the data.***\*Create a two-way frequency table from a set of data on two categorical variables.*** Ex. Make a two-way frequency table for the following set of data. Use the following age groups: 3-5, 6-8, 9-11, 12-14, 15-17.Youth Soccer League

|  |  |  |  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- | --- | --- | --- |
| Gender | Age | Gender | Age | Gender | Age | Gender | Age | Gender | Age |
| M | 4 | F | 7 | M | 17 | M | 5 | F | 10 |
| M | 7 | M | 7 | M | 16 | M | 9 | M | 6 |
| F | 8 | F | 15 | F | 14 | F | 13 | F | 4 |
| F | 6 | M | 13 | M | 14 | M | 15 | M | 5 |
| M | 4 | M | 12 | F | 12 | M | 17 | M | 9 |
| F | 10 | M | 15 | F | 8 | M | 12 | M | 10 |
| F | 11 | F | 16 | M | 13 | F | 13 | F | 15 |

 \*\****Calculate joint, marginal, and conditional relative frequencies and interpret in context. Joint relative frequencies are compound probabilities of using AND to combine one possible outcome of each categorical variable (P(A and B)). Marginal relative frequencies are the probabilities for the outcomes of one of the two categorical variables in a two-way table, without considering the other variable. Conditional relative frequencies are the probabilities of one particular outcome of a categorical variable occurring, given that one particular outcome of the other categorical variable has already occurred.***Ex. Use the frequency table to answer the following questions. Youth Soccer League

|  |  |
| --- | --- |
|  | **Age Group** |
| **Gender** | **3-5****years old** | **6-8****years old** | **9-11****years old** | **12-14****years old** | **15-17****years old** | **Total** |
| **Male** | 4 | 3 | 3 | 5 | 5 | **20** |
| **Female** | 1 | 4 | 3 | 4 | 3 | **15** |
| Total | 5 | 7 | 6 | 9 | 8 | 35 |

1. What is the relative frequency of players who are male and 9-11 years old? (joint relative frequency)
2. What is percentage of female players that are 15-17 years old? (conditional relative frequency)
3. What percentage of league members are male? (marginal relative frequency)

***\*\* Recognize associations and trends in data from a two-way table.***Ex. Given the segmented bar graph below, describe any trends in the context of the data. |
|  |  | S-ID.6b | . Informally assess the fit of a function by plotting and analyzing residuals.Represent data on two quantitative variables on a scatter plot, and describe how the variables are related. \****Calculate the residuals for the data points fitted to a function. A residual is the difference between the actual y-value and the predicted y-value (***$y-\hat{y}$***), which is a measure of the error in prediction. (Note:*** $\hat{y}$ ***is the symbol for the predicted y-value for a given x-value.) A residual is represented on the graph of the data by the vertical distance between a data point and the graph of the function.***Ex. Calculate the residuals from the plot above. What do they represent? Are the points with negative residuals located above or below the regression line?  \*\****Create and analyze a residual plot. A residual plot is a graph of the x-values vs. their corresponding residuals. (Note that some computer software programs plot*** $\hat{y}$ ***vs. residual instead of x vs. residual. However, the interpretation of the residual plot remains the same.) If the residual plot shows a balance between positive and negative residuals and a lack of a pattern, this indicates that the model is a good fit. For more accurate predictions, the size of the residuals should be small relative to the data. At this level, for part b, focus on linear models.***Ex. What is the sum of the squared residuals of the linear model that represents the situation described above? Can you find a different line that gives a smaller sum? Explain.  |
|  |  | S-ID.6c | . Fit a linear function for a scatter plot that suggests a linear association. \****For data sets that appear to be linear, use algebraic methods and technology to fit a linear function to the data. To develop the concept of LSRL, begin by finding the centroid (***$\overbar{x}, \overbar{y})$ ***and selecting another point to fit a line through the center of the data. Find the sum of the squared errors of this line and compare to lines fitted to the same set of data (but a different second point) by others. The Least Squares Regression Line is a line that goes through the centroid and minimizes the sum of these squared errors.***Ex. Below is the data for the 1919 season and World Series batting averages for nine White Sox players.

|  |  |  |  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- | --- | --- | --- |
| Season Batting Average | .319 | .279 | .275 | .290 | .351 | 302 | 256 | 282 | 296 |
| World Series Batting Average | .226 | .250 | .192 | .233 | .375 | .056 | .080 | .304 | .324 |

1. Create a scatter plot for the data provided. Is there a linear association? Explain.
2. What is the Least Squares Regression Line that models this data?

How do you know this equation is the line of best fit to model the data? |
|  |  | S-ID.8 | Compute (using technology) and interpret the correlation coefficient of a linear fit. \*\****Understand that the correlation coefficient, r, is a measure of the strength and direction of a linear relationship between two quantities in a set of data. The magnitude (absolute value) of r indicates how closely the data points fit a linear pattern. If r = 1, the points all fall on a line. The closer*** $\left|r\right|$ ***is to 1, the stronger the correlation. The closer*** $\left|r\right|$ ***is to zero, the weaker the correlation. The sign of r indicates the direction of the relationship – positive or negative.*** Ex. A couple of friends decided to measure their compatibility by ranking their favorite activities.

|  |  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- | --- |
| Mary | 4 | 5 | 2 | 7 | 6 | 1 | 3 |
| Maria | 7 | 2 | 4 | 3 | 5 | 6 | 1 |
|  | Watching TV | Listening to Music | Reading | Talking on the phone | Hanging out with friends | Shopping | Exercise |

 1. Using technology, make a scatterplot for the two rankings.
2. Predict what the rs value is. Use the scatterplot to help explain your answer.
3. Find the Least Squares Regression Line that models this set of data.
4. Using technology identify what the correlation coefficient is and interpret what it means in the context of the data.
 |
|  |  | S-ID.9 | Distinguish between correlation and causation. \****Understand that because two quantities have a strong correlation, we cannot assume that the explanatory (independent) variable causes a change in the response (dependent) variable. The best method for establishing causation is to conduct an experiment that carefully controls for the effects of lurking variables. If this is not feasible or ethical, causation can be established by a body of evidence collected over time (e.g. smoking causes cancer).***Ex. When you have an association between two variables, how can you determine if the association is a result of a cause-and-effect relationship? |