

Blackline Masters Table of Contents

Lesson 1	Food Deserts Statistics handout	2
	Shape and Direction card sort	3
Lesson 2	Scatter Plot Fit card sort	4
Lesson 5 & 6	Station E: Are You Ready For More?	5
Lesson 7	Best Residuals card sort	9
Lesson 8	Find Your Cause card sort	11
Lessons 9 & 10	Modeling Rubric	12
	Modeling Prompt #3	14
	Modeling Prompt #4	16
Lesson 11	End-of-Unit 4 Student Survey	18

CMS HS Math Curriculum - Math 1 © 2021 by Charlotte Mecklenburg Schools and its partners is licensed under a Creative Commons Attribution-Noncommercial 4.0 International License. To view a copy of this license, visit <https://creativecommons.org/licenses/by-nc/4.0/>. Our digital acknowledgement page can be viewed at <http://bit.ly/CMSHSMath1Acknowledgements>.

Under this license, you may share (copy and redistribute the materials in any medium or format) or adapt (remix, transform, and build upon the materials for any purpose) the materials, however you may not use the materials for commercial purposes and you must provide proper attribution by giving appropriate credit, providing a link to the license, and indicating if changes were made. (E.g. Adapted from the Charlotte Mecklenburg Schools Math 1 Curriculum, which is licensed under a Creative Commons Attribution 4.0 International License. To view a copy of this license, visit <http://creativecommons.org/licenses/by/4.0/>.)



A PROJECT OF THE SOUTHERN POVERTY LAW CENTER
WWW.TOLERANCE.ORG

MIDDLE & UPPER GRADES ACTIVITY

K 1 2 3 4 5 6 7 8 9 10 11 12

Food Desert Statistics

Obesity is a big problem in the United States. Studies show that certain racial groups are more affected by obesity than others. These problems may be worse in certain communities because access to affordable and nutritious food is difficult. This is especially true for those living in low-income communities of color and rural areas with limited access to grocery stores. These areas are often called “food deserts.”

Residents of food deserts may rely more on convenience stores and fast food restaurants since access to grocery stores is limited. These convenience stores and fast food restaurants don’t typically sell the variety of foods needed for a healthy diet such as fresh fruits and vegetables, whole grains, fresh dairy and lean meat products. If they do sell them, they often cost more than they cost at grocery stores. This puts those who live in food deserts at a financial and nutritional disadvantage.

Studies show that:

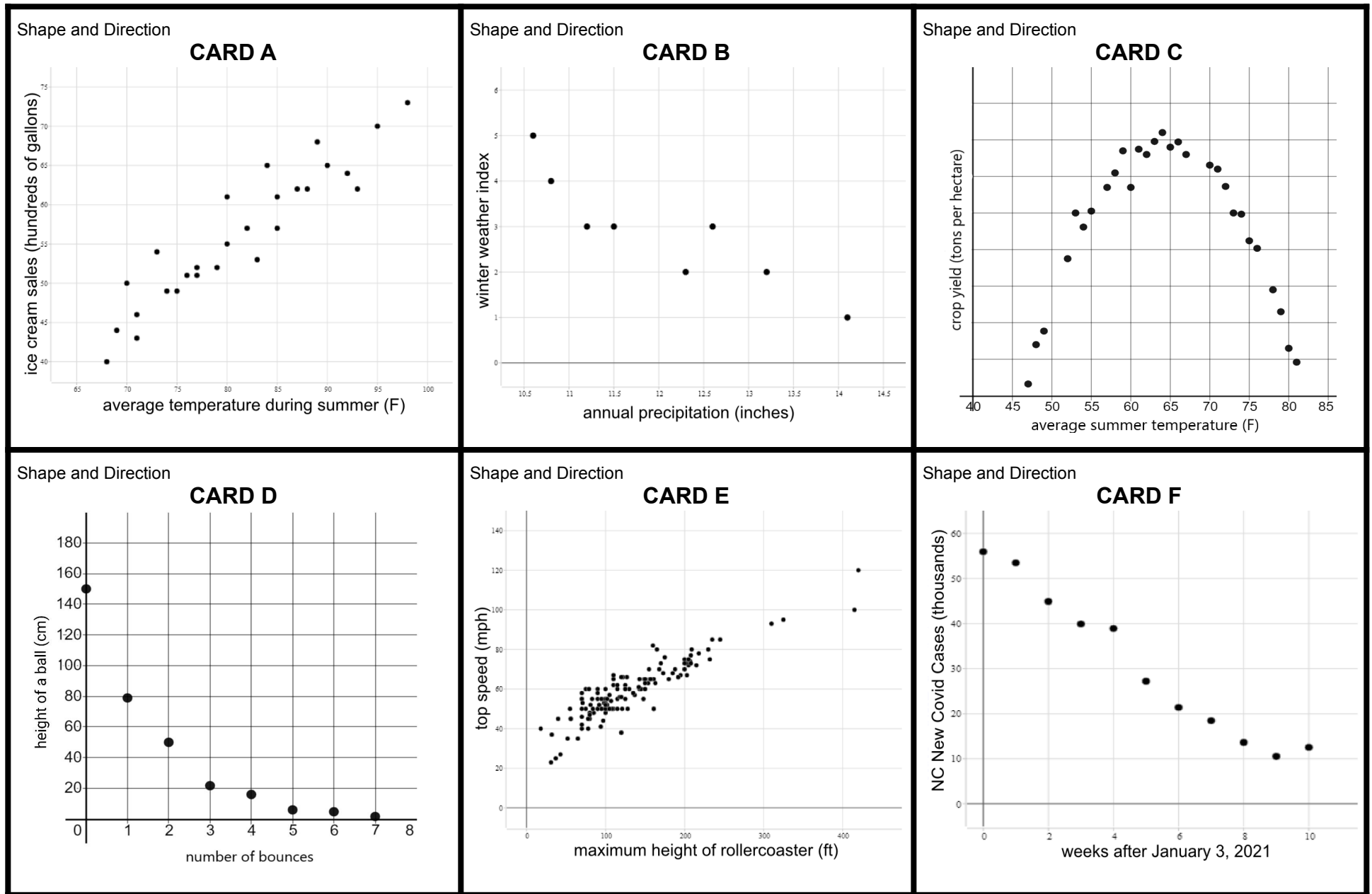
- Of all U.S. households, 2.3 million (2.2 percent) live more than a mile from a supermarket and do not have access to a vehicle. An additional 3.2 percent live between a half-mile to a mile from a supermarket with no vehicle access.
- 23.5 million people live in low-income areas more than one mile from a supermarket.
- Low-income census tracts have half as many supermarkets as wealthy tracts.
- 8 percent of African Americans live in a census tract with a supermarket, compared to 31 percent of whites.
- Low-income zip codes have 30 percent more convenience stores, which tend to lack healthy items, than middle-income zip codes.
- Residents in 20 percent of rural counties live more than 10 miles from a supermarket.
- For every additional supermarket in a census tract, produce consumption increases for 32 percent of African Americans and 11 percent of whites.

Sources:

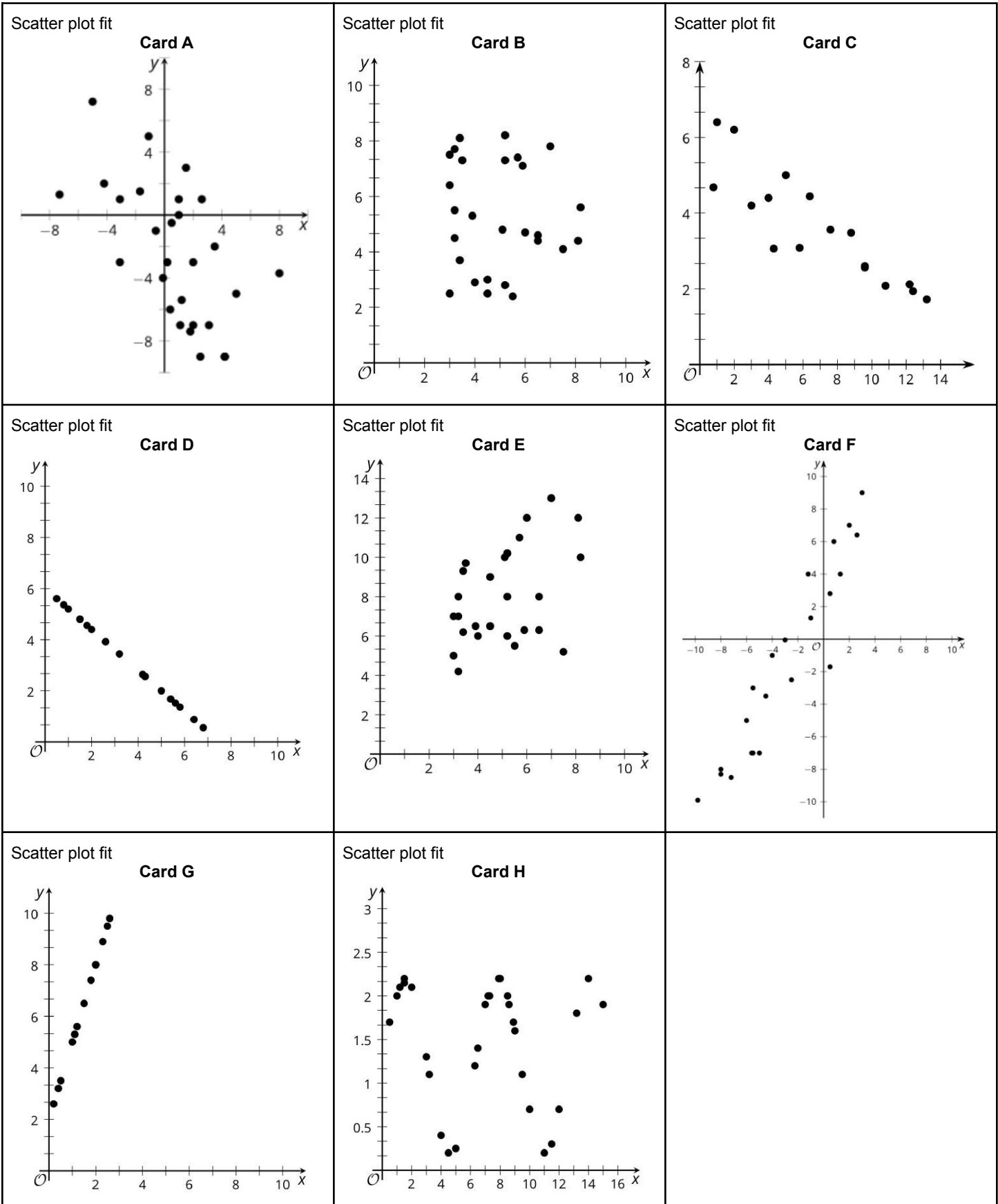
“Access to Affordable and Nutritious Food: Measuring and Understanding Food Deserts and their Consequences.” Report (2009) to Congress from the United States Department of Agriculture.

“The Grocery Gap: Who Has Access to Healthy Food and Why It Matters.” Report from Policy Link and the Food Trust.

M1.U4.L1 Activity 2: Shape and Direction card sort



M1.U4.L2 Scatter Plot Fit card sort



Name:

Period:

Date:

Station E: Are You Ready For More?

1. Students in Charlotte, NC were interested to examine the access in their city. They collected the following data. In this case, they also collected the population within the neighborhood (defined by zip code).

Population	Median household income (2019)	Organic produce available
71048	65963	27
59664	93942	40
49635	59438	43
9280	136333	44
53629	51676	44
37286	91494	44
37309	45808	46
11315	88039	47

Population	Median household income (2019)	Organic produce available
11195	92786	55
43931	52766	55
42263	71914	55
19283	93938	56
28523	90057	57
20317	76022	58
47208	49465	59

- a. Create a scatter plot for the (*median household income, organic produce available*) and describe any relationship between the two variables.
- b. Compare this relationship to the one you found for San Antonio. What do you think are the reasons for any similarities or differences?

Population	Median household income (2019)	Organic produce available
71048	65963	27
59664	93942	40
49635	59438	43
9280	136333	44
53629	51676	44
37286	91494	44
37309	45808	46
11315	88039	47

Population	Median household income (2019)	Organic produce available
11195	92786	55
43931	52766	55
42263	71914	55
19283	93938	56
28523	90057	57
20317	76022	58
47208	49465	59

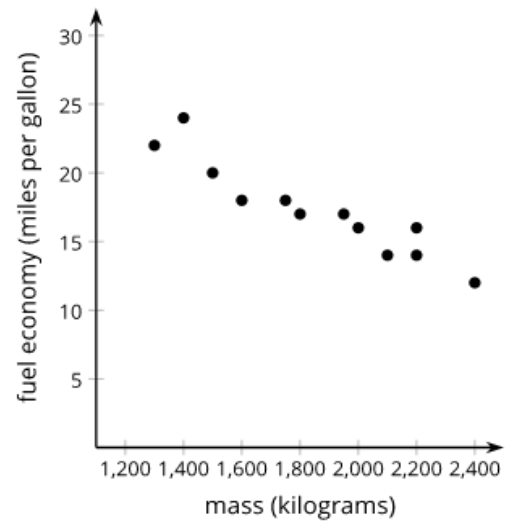
c. Create a scatter plot for the (*population, organic produce available*) and describe any relationship between the two variables.

d. One of the points appears to be an outlier. How does your answer to question 3 change if the outlier is removed?

2. Clare, Diego, and Elena collect data on the mass and fuel economy of cars at different dealerships. Clare finds the line of best fit for data she collected for 12 used cars at a used car dealership. The line of best fit is $y = \frac{-9}{1000}x + 34.3$, where x is the car's mass, in kilograms, and y is the fuel economy, in miles per gallon.

Diego made a scatter plot for the data he collected for 10 new cars at a different dealership.

Elena made a table for data she collected on 11 hybrid cars at another dealership.



- a. Interpret the slope and y -intercept of Clare's line of best fit in this situation.

- b. Diego looks at the data for new cars and used cars. He claims that the fuel economy of new cars decreases as the mass increases. He also claims that the fuel economy of used cars increases as the mass increases. Do you agree with Diego's claims? Explain your reasoning.

Mass (kilograms)	Fuel economy (miles per gallon)
1,100	38
1,200	39
1,250	35
1,300	36
1,400	31
1,600	27
1,650	28
1,700	26
1,800	28
2,000	24
2,050	22

- c. Elena looks at the data for hybrid cars and correctly claims that the fuel economy decreases as the mass increases. How could Elena compare this decrease for hybrid cars to the decrease for new cars? Explain your reasoning.

3. (*Technology required.*) Priya uses several different ride services to get around her city. The table shows the distance, in miles, she traveled during her last 10 trips and the price of each trip, in dollars.

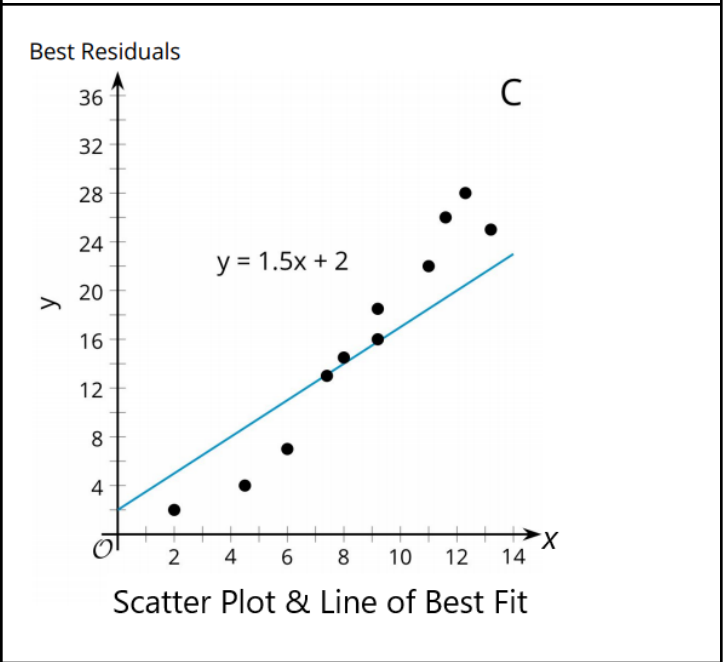
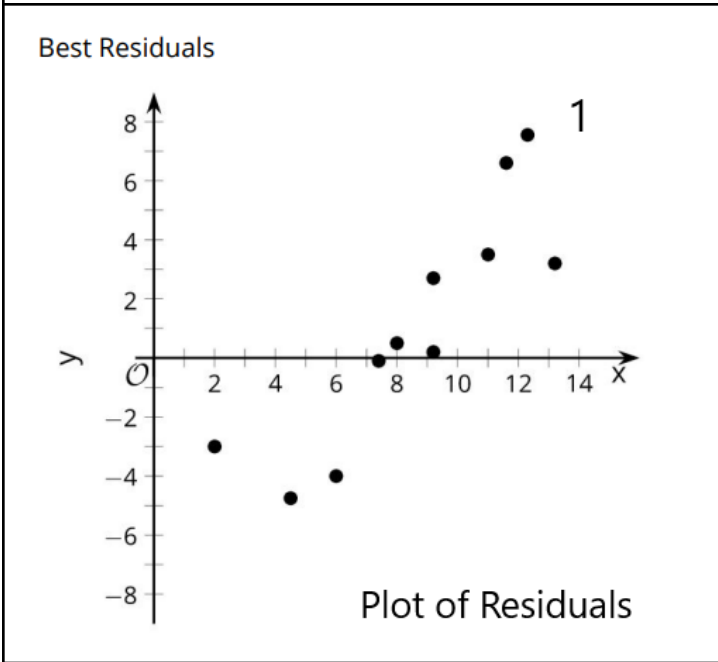
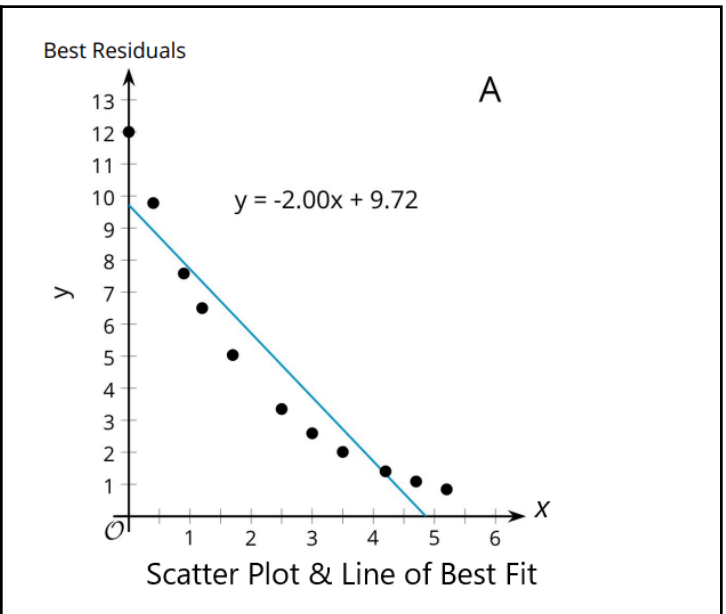
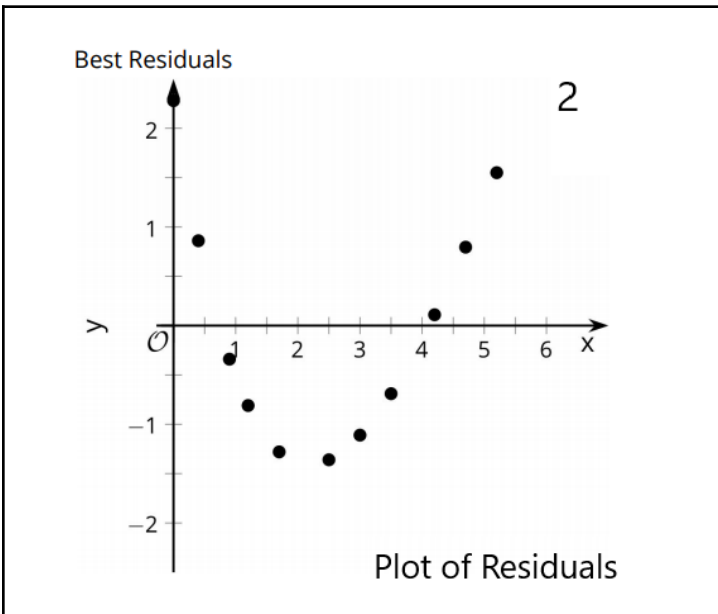
Distance (miles)	Price (dollars)
3.1	12.5
4.2	14.75
5	16
3.5	13.25
2.5	12
1	9
0.8	8.75
1.6	9.75
4.3	12
3.3	14

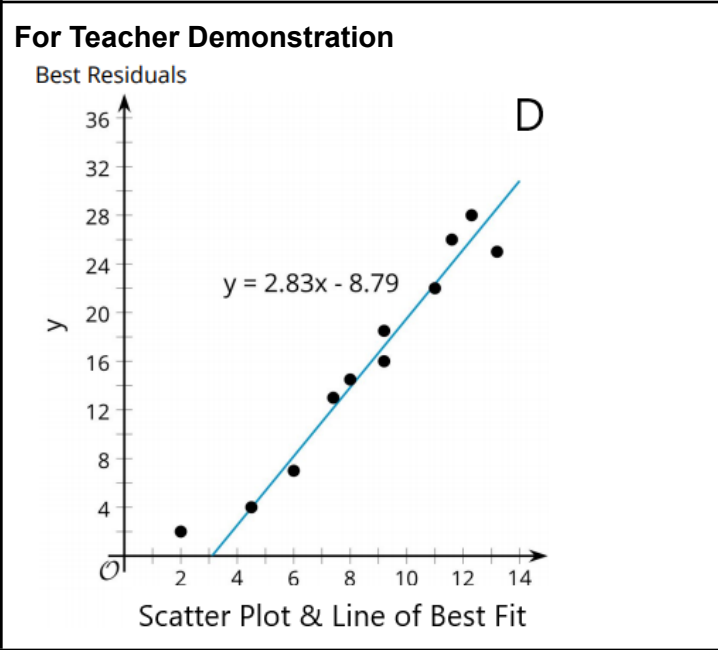
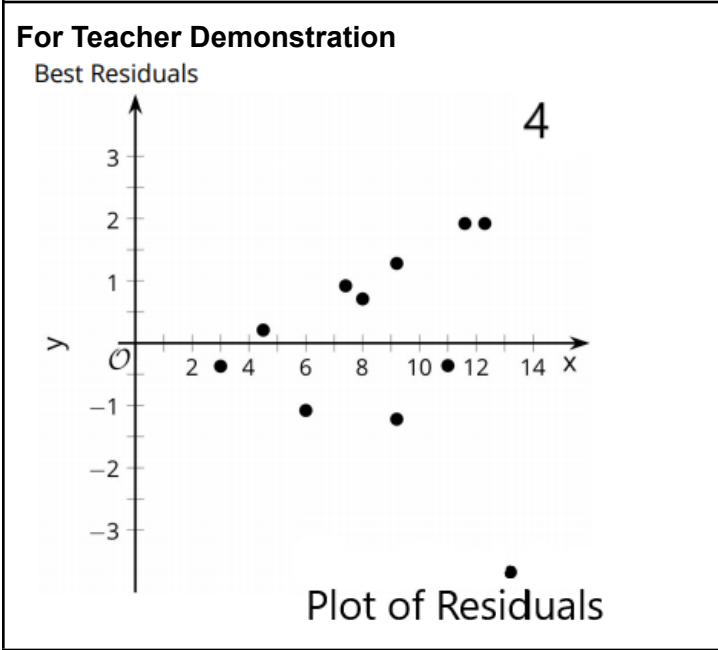
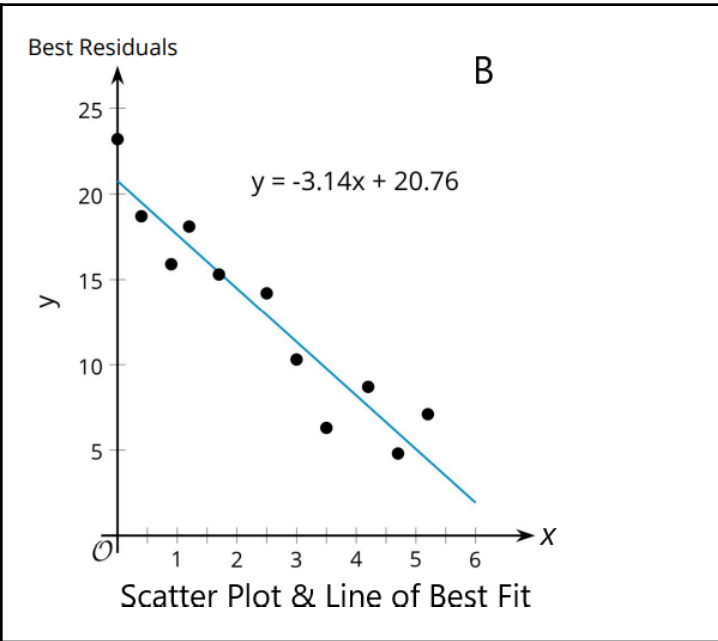
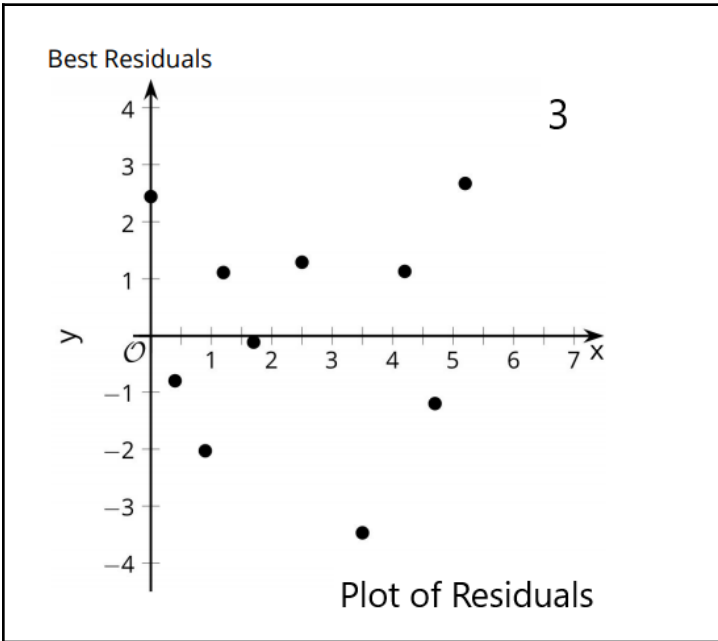
- a. Priya creates a scatter plot of the data using the distance, x , and the price, y . She determines that a linear model is appropriate to use with the data. Use technology to find the regression equation.
- b. Interpret the slope and the y -intercept of the line of best fit in this situation.
- c. Use the line of best fit to estimate the cost of a 3.6-mile trip. Will this estimate be close to the actual value? Explain your reasoning.

d. On her next trip, Priya tries a new ride service and travels 3.6 miles, but she pays only \$4.00 because she receives a discount. Include this trip in the table and calculate the regression equation for the 11 trips. Did the slope of the line of best fit increase, decrease, or stay the same? Why? Explain your reasoning.

e. Priya uses the new ride service for her 12th trip. She travels 4.1 miles and is charged \$24.75. How do you think the slope of the regression equation will change when this 12th trip is added to the table?

M1.U4.L7 Best Residuals card sort





<p>a. The number of ice cream cones sold rises as the temperature outside rises.</p>	<p>d. As the number of people in a family increases, the number of cars the family owns increases.</p>
<p>b. The average speed of travel from Mooresville to Carowinds on the interstate increases as the average amount of time it takes decreases.</p>	<p>e. The number of pirates has increased as the global average temperature has increased.¹</p>
<p>c. The per capita cheese consumption has increased as the number of people who died by getting tangled in their bedsheets has increased.²</p>	<p>f. As the divorce rate in Maine increases, so does the per capita consumption of margarine in pounds.³</p>

¹ From <http://goopennc.oercommons.org/courses/correlation-and-causation-practice-worksheet/view>

² From <http://tylervigen.com/spurious-correlations>

³ From <http://goopennc.oercommons.org/courses/association-and-causation/view>

Modeling Rubric¹

Skill	Score			Notes or Comments
	Proficient	Developing	Needs Revisiting	
1. Decide What to Model	<ul style="list-style-type: none"> Assumptions made are clearly identified and justified. Resulting limitations are stated when appropriate. Variables of interest are clearly identified and chosen wisely, and appropriate units of measure are used. 	<ul style="list-style-type: none"> Assumptions are noted but lacking in justification or difficult to find. Variables of interest are noted, but may lack justification, be difficult to find, or not be measured with appropriate units. 	<ul style="list-style-type: none"> No assumptions are stated. No variables are defined. 	
	<p>To improve at this skill, you could:</p> <ul style="list-style-type: none"> Ask questions about the situation to understand it better Check the assumptions you're making to see if they're reasonable (Try asking a friend, or imagining that you're a person involved in the scenario. Would those assumptions make sense to you?) Double-check the variables you've identified: Are there other quantities in the situation that could vary? Is there something you've identified as a variable that is actually fixed or determined? (Remember that more abstract things like time and speed are also quantities.) 			
2. Formulate a Mathematical Model	<ul style="list-style-type: none"> An appropriate model is chosen and represented clearly. Diagrams, graphs, etc. are clear and appropriately labeled. 	Parts of the model are unclear, incomplete, or contain mistakes.	No model is presented, or the presentation contains significant errors.	
	<p>To improve at this skill, you could:</p> <ul style="list-style-type: none"> Check your model more carefully to make sure it really fits well Consider a wider variety of possible models, to find one that fits the situation better Think about the situation more deeply before trying to find a model Convince a skeptic: Pretend that you think your model is inadequate, or ask a friend to pretend to be skeptical of it. What would a skeptic find wrong with your model? Try to fix those things, or explain why they're not actually problems. 			

¹ Adapted from IM 9-12 Math Algebra 1 Modeling Prompts <https://curriculum.illustrativemathematics.org/HS/teachers/index.html>, copyright 2019 by Illustrative Mathematics. Licensed under the Creative Commons Attribution 4.0 license <https://creativecommons.org/licenses/by/4.0/>.

Skill	Score			Notes or Comments
	Proficient	Developing	Needs Revisiting	
3. Use Your Model to Reach a Conclusion	<ul style="list-style-type: none"> • Solution is relevant to the original problem. • Reader can easily understand the reasoning leading to the solution. • Relevant details are included like units of measure. 	Solution is not well-aligned to the original problem, or aspects of the solution are difficult to understand or incomplete.	No solution is provided.	
	<p>To improve at this skill, you could:</p> <ul style="list-style-type: none"> • Double-check your calculations: Show them to someone else to see if they agree, or take a break and look at your calculations again later • Make sure your calculations are justified by your model: Ask yourself how you decided what to calculate, and see if your reasoning matches up with your model • Think more deeply about what your conclusions mean in the original scenario: Imagine you're a person involved in the scenario, or explain your conclusions to someone else and see if they have questions 			
4. Refine and Share Your Model	<ul style="list-style-type: none"> • The model's implications are clearly stated. • The limitations of the model and solution are addressed. 	The limitations of the model and solution are addressed but lacking in depth or ignoring key components.	No interpretation of model and solution is provided.	
	<p>To improve at this skill, you could:</p> <ul style="list-style-type: none"> • Think more creatively about what your conclusions mean: Ask yourself "If I was involved in this situation, what would I understand better because of these conclusions? What would I want to do next?" • Be skeptical of your model: What don't you like about it, and what can you do to fix those things? • Explain your model to someone else: Tell them how it works and why it's good. If you're not sure how it works or why it's good, you might need to change it. 			

Modeling Prompt 3A

A homeowner wants to replace their old heating system. Energy is measured in kilowatt-hours (kWh). It takes about 11,700 kWh of energy to heat the house for the winter. The current heating system uses natural gas and is 60% efficient, which means that for every 100 kWh of natural gas it uses, it produces 60 kWh of heat. With the homeowner's current system, it costs \$975 to heat the house.

Research at least two other options available in your area that this homeowner could replace their heating system with. Assume that natural gas costs \$0.05/kWh and electricity costs \$0.21/kWh. The house is 2,500 square feet.

The homeowner also has an air conditioner that uses 2,500 kWh of electricity per year and produces 290 kWh of cooling for every 100 kWh it uses. They also have a water heater that uses 4,300 kWh of electricity per year and produces 90 kWh of heat for every 100 kWh it uses. These systems could also be replaced if there is a cheaper option, but it isn't necessary.

1. Which system would you recommend? Make a graph to convince the homeowner to switch to this system.
2. If the homeowner switches to the system you recommend, how long will it take them to save as much money as the new system cost?

Modeling Prompt 3B

A homeowner wants to replace their old heating system. Energy is measured in kilowatt-hours (kWh). It takes about 11,700 kWh of energy to heat the house for the winter. The current heating system uses natural gas and is 60% efficient, which means that for every 100 kWh of natural gas it uses, it produces 60 kWh of heat. With the homeowner's current system, it costs \$975 to heat the house. Assume that natural gas costs \$0.05/kWh and electricity costs \$0.21/kWh.

The homeowner also has an air conditioner that uses 2,500 kWh of electricity per year and produces 290 kWh of cooling for every 100 kWh it uses. They also have a water heater that uses 4,300 kWh of electricity per year and produces 90 kWh of heat for every 100 kWh it uses. These systems could also be replaced if there is a cheaper option, but it isn't necessary.

Here are three other types of heating systems the homeowner could replace their current system with:

- **A new furnace which also runs on natural gas and is more efficient.** For every 100 kWh of natural gas it uses, it produces 95 kWh of heat. This system costs \$5,000 to install.
 - **A geothermal heat pump.** This system uses electricity instead of natural gas, but it produces 4 kWh of heat for every 1 kWh of electricity it uses. It costs \$14,000, but it's very low-maintenance and it also replaces the air conditioner and water heater.
 - **A grid-tied solar array.** This system is connected to the electrical grid so that when it generates more energy than the house needs, the extra electricity can be sold back to the grid. Over the whole year, the house will use as much electricity as is sold back, which means the homeowner would basically be heating and cooling the house for free. It costs \$16,000 to install.
1. Which system would you recommend? Make a graph to convince the homeowner to switch to this system.
 2. How long will it take to save as much money as the new system cost?

Modeling Prompt 4A

1. Below are the characteristics of colleges that we have data about. Choose two that might be related. What do you predict the relationship between them is?
 - college ownership: public, private non-profit, or private for-profit
 - average SAT score of admitted students
 - acceptance rate
 - number of enrolled students
 - average cost of attendance per year
 - median earnings 10 years after graduation
 - highest degree awarded
 - completion rate
 - percent of students who self-identify as white
 - median ACT score of admitted students
2. Take a look at the data in the spreadsheet. Before calculating, do some estimation based on the data. Can you tell if your hypothesis seems reasonable?
3. Use an appropriate display to summarize the data.
4. Analyze your graph or table and do any other calculations needed. Do your results confirm your prediction? If not, what do you think explains the results?
5. Here are some headlines. What analysis do you think the article describes? Give some examples of evidence that would support the headline or contradict it.
 - “Students from Selective Colleges Tend to Succeed”
 - “Isolation at Larger Colleges Leads to Higher Dropout Rates”
 - “High Cost of Private Colleges Not Outweighed by Lifetime Earnings”

Modeling Prompt 4B

1. Below are the characteristics of colleges that we have data about. Choose two that might be related. What do you predict the relationship between them is?
 - college ownership: public, private non-profit, or private for-profit
 - average SAT score of admitted students
 - acceptance rate
 - number of enrolled students
 - average cost of attendance per year
 - median earnings 10 years after graduation
2. Take a look at the data in the spreadsheet. Before calculating, do some estimation based on the data. Can you tell if your hypothesis seems reasonable?
3. Use an appropriate display to summarize the data.
4. Analyze your graph or table and do any other calculations needed. Do your results confirm your prediction? If not, what do you think explains the results?
5. Here are some headlines. What analysis do you think the article describes? Give some examples of evidence that would support the headline or contradict it.
 - “Students from Selective Colleges Tend to Succeed”
 - “Isolation at Larger Colleges Leads to Higher Dropout Rates”
 - “High Cost of Private Colleges Not Outweighed by Lifetime Earnings”

Name: _____

Period: _____

Date: _____

End-of-Unit 4 Student Survey

1. Ending this unit I feel ... (this question could be answered with pictures, words, etc.)

2. How much did you know about the content of this unit before starting?

a. A great deal

b. A little

c. Not much

Feel free to share more:

3. After finishing the unit did your knowledge in the content:

a. Increase greatly

b. Increase a little

c. Stay the Same

Feel free to share more:

4. What was most frustrating for you while learning during this unit?

a. Materials Used

b. Teacher strategies

c. Technology

d. Other: _____

Feel free to share more:

5. What boosted your confidence in math during this unit?

a. Materials Used

b. Teacher strategies

c. Technology

d. Other: _____

Feel free to share more:

