

**Just in Time Quick Check**  
**Standard of Learning A.ST.1**  
**Strand: Statistics**

**Standard of Learning A.ST.1**

**The student will apply the data cycle (formulate questions; collect or acquire data; organize and represent data; and analyze data and communicate results) with a focus on representing bivariate data in scatterplots and determining the curve of best fit using linear and quadratic functions.**

*Students will demonstrate the following Knowledge and Skills:*

- a) Formulate investigative questions that require the collection or acquisition of bivariate data.
- b) Determine what variables could be used to explain a given contextual problem or situation or answer investigative questions.
- c) Determine an appropriate method to collect a representative sample, which could include a simple random sample, to answer an investigative question.
- d) Given a table of ordered pairs or a scatterplot representing no more than 30 data points, use available technology to determine whether a linear or quadratic function would represent the relationship, and if so, determine the equation of the curve of best fit.
- e) Use linear and quadratic regression methods available through technology to write a linear or quadratic function that represents the data where appropriate and describe the strengths and weaknesses of the model.
- f) Use a linear model to predict outcomes and evaluate the strength and validity of these predictions, including through the use of technology.
- g) Investigate and explain the meaning of the rate of change (slope) and  $y$ -intercept (constant term) of a linear model in context.
- h) Analyze relationships between two quantitative variables revealed in a scatterplot.
- i) Make conclusions based on the analysis of a set of bivariate data and communicate the results.

**Just in Time Quick Check**

**Just in Time Quick Check Teacher Notes**

**Supporting and Prerequisite SOL: 8.PS.3**

### Just in Time Quick Check A.ST.1

1. The ordered pairs below represent the horizontal distance,  $y$  (in feet), a baseball travels when hit at different angles,  $x$ . In each ordered pair  $(x, y)$ ,  $x$  represents the angle in degrees and  $y$  is the distance in feet.

Use the ordered pairs to find the equation of the best-fit curve, rounding the answer to the nearest hundredth.

$(10, 95)$ ,  $(20, 160)$ ,  $(25, 180)$ ,  $(30, 200)$ ,  $(40, 230)$ ,  $(45, 235)$ ,  $(50, 225)$ ,  $(60, 190)$

2. A diver jumps off a high dive into the water. The table shows the time elapsed (in seconds, from the moment the diver's feet leave the platform until she lands in the water) and her height (in feet) at various points during the dive. In each ordered pair  $(t, h)$ ,  $t$  represents time, and  $h$  represents height in feet.

Time (seconds) $t$	Height (feet) $h$
0	6
0.3	6.4
0.5	6.7
0.92	6.5
1.01	6.3
1.4	5.6
1.7	4.8
2	4.1

Use the equation of the quadratic curve of best fit to find the approximate height of the diver at 2.1 seconds. Round the answer to the nearest tenth.

3.

Cord Cutting and Cable TV Households (in Millions)

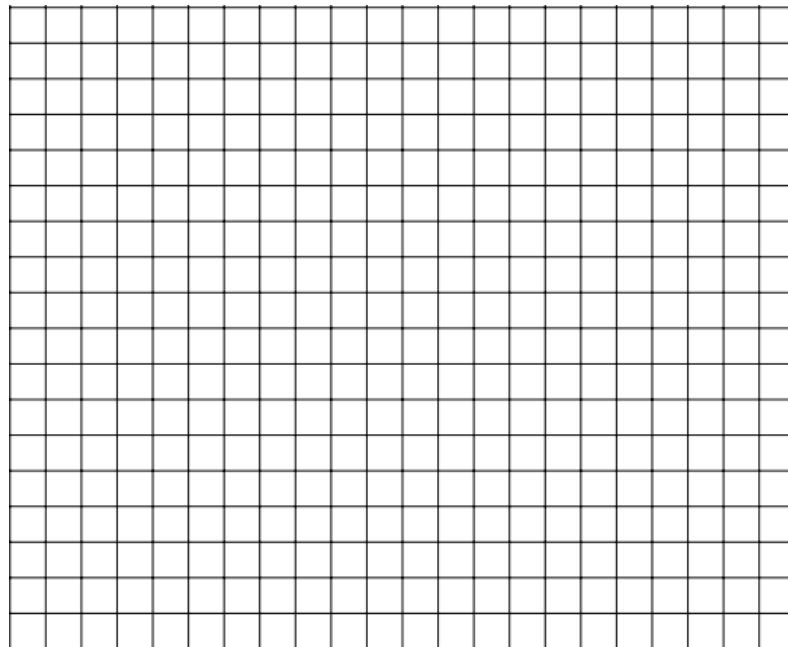
Year	2018	2019	2020	2021	2022	2023	2024	2025
Cord Cutting Households (in millions)	37.3	44.6	50.9	58.3	64.3	68.9	73.2	77.2
Cable TV Households (in millions)	90.3	84.8	79.1	73.9	69.5	72.1	70.2	69.0

Note: Data compiled from Cable Compare.

Graph the number of households (in millions) that have cut the cord (i.e., use streaming services instead of traditional cable) versus those still using cable TV from 2018 to 2025 on the same coordinate plane.

Plot the years on the x-axis and the number of households on the y-axis. Be sure to clearly label both axes and include a legend or key to differentiate Cord-Cutting households (streaming) and cable TV households.

- a) Describe the overall trend for both cord-cutting and cable TV households from 2018 to 2025.
- b) Create a line of best fit for each set of data. Are these services gaining or losing subscribers over time? How does the steepness of each line help you understand the rate of change?
- c) Based on the trends, make a prediction about the number of households that will use streaming services versus cable TV in 2030. Justify your reasoning.
- d) What other questions can you ask about the data set?



4. How would you collect a representative sample if you wanted to know what percentage of teachers at your school preferred streaming TV services over cable TV?
  - a) Who are you gathering data from?
  - b) What method will you use to select a representative sample?
  - c) Why does the method you chose in b) work?
  - d) How many teachers should be included in your sample to make it representative of all teachers at your school?
  - e) How will you ensure every teacher has an equal chance of being selected?
  - f) How will you collect your responses and analyze your data?
  
5. You want to know what percentage of teachers at your school prefer streaming TV or cable TV. Which of the following is the best way to select a representative sample of teachers?
  - a) Ask the first 10 teachers you see in the hallway.
  - b) Send a survey link to all teachers and use only the responses you receive.
  - c) Randomly select teachers from your favorite department.
  - d) Randomly select teachers from a complete list of all teachers at your school.
  
6. Why is it important to use a random sampling method when collecting data from teachers?
  - a) It reduces bias by ensuring every teacher has an equal chance of being selected.
  - b) It allows you to choose only teachers you think will give interesting answers.
  - c) It guarantees that the sample will be exactly half of the teachers like streaming and exactly half of the teachers like cable TV.
  - d) It makes data collection faster because you only ask your teachers.

7. Complete the chart below using data from any major city of your choosing located in the state of Virginia.

Year	Population (Thousands)
2000	
2005	
2010	
2015	
2020	

- a) Write an equation to model the data represented in the table.  
 b) Use the equation in part a) to predict the current population of the city you selected.  
 c) Use the equation in part a) to predict the population of the city you selected in 2035.  
 d) What does the rate of change, and the constant represent in part a)? Explain your thinking.
8. For each example below determine whether the model is linear or quadratic, write the equation that represents each model, then predict the value of  $y$  when  $x = 11$ .

- a)  $\{(1, 2), (2, 5), (3, 8), (4, 9), (5, 13), (6, 14), (7, 11)\}$

x	y
1	8
2	9
3	7
4	3
5	4
6	0
7	-1

b)

x	y
-2	8
-1	12
0	13
4	15
5	20
7	26
8	28

c)

## A.ST.1 Just in Time Quick Check Teacher Notes

### Common Errors/Misconceptions and their Possible Indications

1. The ordered pairs below represent the horizontal distance,  $y$  (in feet), a baseball travels when hit at different angles,  $x$ . In each ordered pair  $(x, y)$ ,  $x$  represents the angle in degrees and  $y$  is the distance in feet.

Use the ordered pairs to find the equation of the best-fit curve, rounding the answer to the nearest hundredth.

$(10, 95), (20, 160), (25, 180), (30, 200), (40, 230), (45, 235), (50, 225), (60, 190)$

*A common error students make when writing equations of lines given a set of ordered pairs is they may assume the relationship of the ordered pairs is linear, therefore writing an equation of a line that is not the best fit for the given ordered pairs. This error indicates students may need help visualizing and interpreting data that represents a quadratic function. Teachers can help by using multiple representations and context-based examples to strengthen student understanding, asking questions and using interactive tools such as Desmos to help students identify the difference between various types of regression models. When using Desmos, students should practice setting an appropriate window with a graphing calculator so they can fully see how the function behaves.*

2. A diver jumps off a high dive into the water. The table shows the time elapsed (in seconds, from the moment the diver's feet leave the platform until she lands in the water) and her height (in feet) at various points during the dive. In each ordered pair  $(t, h)$ ,  $t$  represents time, and  $h$  represents height in feet.

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2	4.1

Use the equation of the quadratic curve of best fit to find the approximate height of the diver at 2.1 seconds. Round the answer to the nearest tenth.

*A common misconception some students may make is a rounding error during the intermediate step of writing the equation for the curve of best fit. This may indicate they need a review of rounding. One strategy to help students understand the impact of rounding errors may be to demonstrate how rounding differently when writing the equation can affect the final answer. Additionally, using Desmos may help students visualize the height of the diver at 2.1 seconds.*

3. Cord Cutting and Cable TV Households (in Millions)

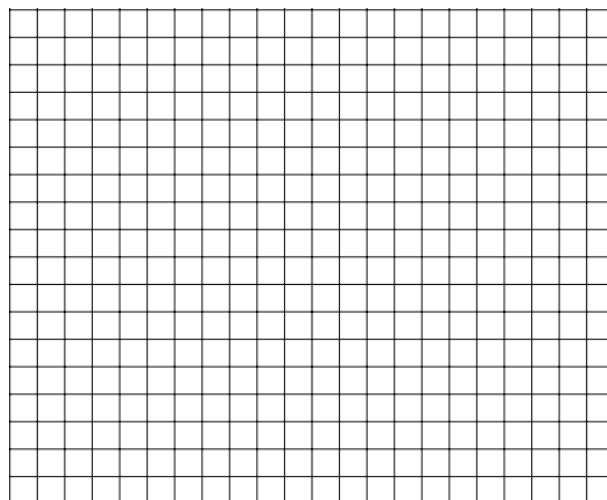
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Graph the number of households (in millions) that have cut the cord (i.e., use streaming services instead of traditional cable) versus those still using cable TV from 2018 to 2025 on the same coordinate plane.

Plot the years on the x-axis and the number of households on the y-axis. Be sure to clearly label both axes and include a legend or key to differentiate Cord-Cutting households (streaming) and cable TV households.

- Describe the overall trend for both cord-cutting and cable TV households from 2018 to 2025.
- Create a line of best fit for each set of data. Are these services gaining or losing subscribers over time? How does the steepness of each line help you understand the rate of change?
- Based on the trends, make a prediction about the number of households that will use streaming services versus cable TV in 2030. Justify your reasoning.
- What other questions can you ask about the data set?



*Students may make errors when graphing the data. For example, they may incorrectly plot the number of households on the x-axis and years on the y-axis, they may omit labels for the axes or exclude the legend that helps distinguish between the two lines, or they may misplace points because of their misunderstanding of the graph's scale. It may be helpful for teachers to reinforce the idea that time generally goes on the x-axis when identifying trends.*

*When answering part a) students may make a general observation about only one set of data without considering the second set of data. In part b) students may not connect the word steepness with the rate of change (a steeper line equates to faster change). In part c) students may predict unrealistic numbers without consideration of population constraints.*

4. How would you collect a representative sample if you wanted to know what percentage of teachers at your school preferred streaming TV services over cable TV?
  - a) Who are you gathering data from?
  - b) What method will you use to select a representative sample?
  - c) Why does the method you chose in b) work?
  - d) How many teachers should be included in your sample to make it representative of all teachers at your school?
  - e) How will you ensure every teacher has an equal chance of being selected?
  - f) How will you collect your responses and analyze your data?

*A common misconception is that students confuse the term population (all teachers) with the term sample (selected teachers), which often leads them to mistakenly state in part a) that they will collect data from all teachers. In part b), students may choose convenience sampling instead of random because they do not fully understand the importance of randomization. Teachers can help by ensuring students have a clear grasp of the definitions of population and sample, using visual organizers to highlight the differences, modeling random sampling techniques, and providing examples that demonstrate both biased and unbiased sampling methods.*

5. You want to know what percentage of teachers at your school prefer streaming TV or cable TV. Which of the following is the best way to select a representative sample of teachers?
  - a) Ask the first 10 teachers you see in the hallway.
  - b) Send a survey link to all teachers and use only the responses you receive.
  - c) Randomly select teachers from your favorite department.
  - d) Randomly select teachers from a complete list of all teachers at your school.

*A common misconception when asked to select a representative sample of teachers is that students may choose convenience samples because they believe that convenience equals representation. Students may also think voluntary responses are representative of all teachers and may think a specific group of teachers represents the entire population.*

6. Why is it important to use a random sampling method when collecting data from teachers?
- It reduces bias by ensuring every teacher has an equal chance of being selected.
  - It allows you to choose only teachers you think will give interesting answers.
  - It guarantees that the sample will be exactly half of the teachers like streaming and exactly half of the teachers like cable TV.
  - It makes data collection faster because you only ask your teachers.

*Common misconceptions students have when using random sampling methods is they think random sampling means choosing people who are convenient to or interesting to them or they may choose people they think will give interesting answers. Students may also have the misconception that random sampling guarantees a perfectly balanced sample that represents their desired subgroup.*

7. Complete the chart below using data from any major city of your choosing located in the state of Virginia.

Year	Population (Thousands)
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2010	
2015	
2020	

- Write an equation to model the data represented in the table.
- Use the equation in part a) to predict the current population of the city you selected.
- Use the equation in part a) to predict the population of the city you selected in 2035.
- What does the rate of change, and the constant represent in part a)? Explain your thinking.

*Common errors students make when collecting population data over a set range of years include students choosing data from different reports that do not match, mixing up units (like thousands and millions), and forgetting to label the units correctly. Sometimes, students may use old data without knowing it has been updated. Teachers can help by showing students how to find reliable sources, check and match units, ensure the data align with the desired place, and ensure that students understand why using outdated data is not accurate or reliable.*

8. For each example below determine whether the model is linear or quadratic, write the equation that represents each model, then predict the value of  $y$  when  $x = 11$ .

a)  $\{(1, 2), (2, 5), (3, 8), (4, 9), (5, 13), (6, 14), (7, 11)\}$

x	y
1	8
2	9
3	7
4	3
5	4
6	0
7	-1

b)

x	y
-2	8
-1	12
0	13
4	15
5	20
7	26
8	28

c)

*Common errors students may make when writing equations from a given data set is that students assume the relationship is linear without checking for patterns, they may incorrectly select the wrong regression model, misinterpret the output the technology displayed, or make rounding errors early in the process that result in less accurate equations. Teachers can help by showing students how to visually and numerically assess patterns within data sets and how to identify constant rate of change in a linear function and the behavior of quadratic functions. Teachers should also model how to use regression tools in graphing technology and how to interpret data and write equations.*