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**Algebra 1**

# Teacher Guide Sample

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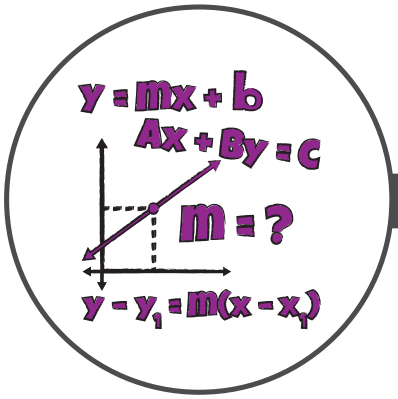


# Slope and Rate of Change

## Scope Introduction

### Scope Summary

*In this scope, students are given the opportunity to identify the slope from the various forms of an equation, as well as from a table of values, a graph, and from two points on a line. Students should also be able to calculate the rate of change of a linear function from a table, from a graph, or algebraically from mathematical and real-world problems.*

**Student Expectations**

**A.3.A**

- Determine the slope of a line given a table of values, a graph, two points on the line, and an equation written in various forms, including y = mx + b, Ax + By = C, and y – y1 = m(x – x1).

**A.3.B**

- Calculate the rate of change of a linear function represented tabularly, graphically, or algebraically in context of mathematical and real-world problems.

### Vertical Alignment

**Background Knowledge**

In previous grades, students interpret unit rate as slope and determine rate of change or slope from a table or graph. Students also calculate the slope of a line comparing the change in y values to the change in x values using the formula m = (y2 - y1)/(x2 - x1) using two points found on a line.

**Future Expectations**

Students continue to build on their basic knowledge of rate of change when graphing quadratic and exponential functions later in Algebra I. In Algebra II, students calculate the average rate of change of nonlinear functions.

### Engage Activities

**Accessing Prior Knowledge**

In this activity, students critically analyze tables to identify which option among a set does not belong. Each handout features tables with four options, prompting students to discern inconsistencies and determine the outlier. This exercise is designed to evaluate and correct student misconceptions about slopes and their calculations, fostering a deeper understanding of mathematical relationships. Through group discussions and individual assessments, students articulate their reasoning and clarify their understanding of mathematical concepts before advancing to new material.

*If your students are struggling with previously taught concepts, use the Foundation Builder activity in this scope to reinforce ideas presented in the APK.*

**Hook**

In this activity, students explore the relationship between slopes of lines and real-world applications by making predictions about which line might represent the path of a laser beam aiming at a satellite. They are introduced to a scenario involving a military ship and a satellite, encouraging them to think about the mathematical concepts of slope and rate of change in a practical context. Students analyze graphs, discuss the efficiency of graphing for solving real-world problems, and apply their knowledge to determine if a particular line could hit the target. This lesson emphasizes critical thinking and application of mathematical concepts to understand and solve complex problems.

Home

## Explore Activities

Explore 1

### Slope and Rate of Change Given a Graph

In this activity, students work in groups to analyze the slope and rate of change of a line from various graphs depicting hiking trails. They determine the steepness of each segment by calculating the slope and relate these calculations to practical hiking scenarios, like planning a route. This exercise enhances their understanding of how slope indicates the rate and direction of change, teaching them to apply mathematical concepts to real-world contexts such as navigation and planning. Through guided questions and Math Chats, students discuss their findings and consolidate their learning about slopes of horizontal and vertical lines.

Explore 2

### Slope and Rate of Change Given Two Points or a Table

In this activity, students work in groups to determine the most affordable vacation options for a family by analyzing the rate of change from data presented in tables and pairs of points. They evaluate costs associated with different lengths of stay and group sizes, calculating the slope to find the most economical choices. Through this process, students apply their understanding of linear relationships and slopes to practical, real-life scenarios, enhancing their problem-solving and analytical skills.

Explore 3

### Slope and Rate of Change Given an Equation

In this activity, students identify the slope or rate of change from equations in various forms. They utilize graphing calculators and collaborate in groups to interpret and calculate slopes directly from given equations. This exercise helps them connect algebraic expressions to practical scenarios, like managing production at a candy factory. Students learn to find and apply the slope to understand production rates, enhancing their ability to use mathematical tools and techniques effectively in both academic and real-world settings.

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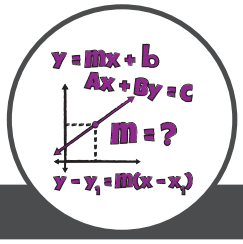


# Slope and Rate of Change

## Accessing Prior Knowledge

## Activity Preparation

Students examine a series of tables based on the prior standard and determine which option does not belong with the group. This element is designed to uncover student misconceptions; it should not be taken for a grade.

### Materials

**Printed**

- 1 Does Not Belong (per student or per group)

### Preparation

- Print one copy of Does Not Belong for each student or group.
- You may place students in groups of two or three.

## Procedure and Facilitation

**FACILITATION TIP**

*If students have difficulty getting started, model the first slide using a "think aloud strategy."*

1. Pass out Does Not Belong to each student or group.
2. Explain that each table on the handout contains four options. Three of the options go together, while one does not belong.
3. Instruct students to determine which letter does not belong in each group, and to explain their thinking.
    a. First slide: Answer choice D does not belong. Answers A, B, and C all simplify to a slope of 3/5, and D simplifies to a slope of 1/3.
    b. Second slide: Answer choice A does not belong. Answers B, C, and D all simplify to a slope of – 4/3, and A represents a slope that is undefined.
    c. Third slide: Answer choice B does not belong. Answers A, C, and D all represent a slope of 2/3, and B represents a slope of 1/3.
4. If students are struggling to complete this task, do the Foundation Builder to fill the gap in prior knowledge before moving on to other parts of the scope.

### Identifying Misconceptions

- Students may struggle to understand that to accurately compare slopes, they should be in the simplest form.
- Students may also forget that to calculate slope, you must use the ratio of the change in *y* over the change in *x*.

Notes

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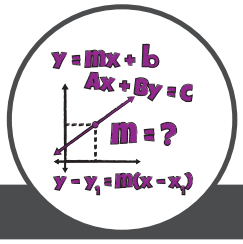


# Slope and Rate of Change

## Hook

## Activity Preparation

Students will make predictions based on slopes of lines.

### Materials

#### Printed

- 1 Slope and Rate of Change (per class)

#### Reusable

- 1 Phenomena (per class)

### Preparation

- Plan to show the video.
- Prepare to project Slope and Rate of Change for the whole class to view.
- Prepare to introduce the scenario and to encourage students to think about how to solve it. Be prepared to move to the Explore activities, returning students to the Hook activity with newly gained knowledge after the Explores have been completed.

## Procedure and Facilitation

#### Part I: Pre-Explore

1. Introduce this activity toward the beginning of the scope. The class will revisit the activity and solve the original problem after students have completed the corresponding Explore activities.
2. Show the Phenomena. Ask students the following questions: *What do you notice? Where can you see math in this situation?* Allow students to share all ideas.
3. Explain the scenario to the class: *A military ship is trying to hit an enemy satellite with a laser beam.*
4. Allow the students to ask questions and clarify the context as needed. Encourage them to share their thoughts and experiences with the class using the following questions:
    a. What are satellites used for? What experience do you have with them?
    b. What is a laser beam?
5. Project Slope and Rate of Change.
6. Discuss the following questions with the class:
    **a.** **DOK-1** How could this graph and question connect to the satellite and laser situation? Answers will vary. The lines could show different trajectories of the laser beam, and the point (510, 341) is the location of the satellite.
    **b.** **DOK-1** What information would you need to answer the question? Answers will vary. We could use the slopes, *y*-intercepts, and equations of each line to help us answer the question.
    **c.** **DOK-2** Why is graphing an inefficient method for answering this question? We would have to extend each of the graphs very far to verify which line passes through (510, 341).
7. Move on to complete the Explore activities.

#### FACILITATION TIP

*Consider setting up a "human size" coordinate grid to review the process for plotting points. Have students take steps along the x-and y-axes and stand at the location of various points.*

## Part II: Post-Explore

1. After students have completed the Explore activities for this topic, show the Phenomena again and repeat the scenario.
2. Refer to the Slope and Rate of Change slide, and discuss the following questions with the class:
   a. **DOK-1** How could this graph and question connect to the satellite and laser situation? The lines show different trajectories of the laser beam, and the point (510, 341) is the location of the satellite and therefore the point the laser beam must pass through in order to hit it.
   b. **DOK-1** What information would you need to answer the question? We need to know the slope of each line, and knowing their y-intercepts would be helpful.
   c. **DOK-2** Why is graphing an inefficient method for answering this question? We would have to extend each of the graphs very far to verify which line passes through (510, 341), which may not be practical.
3. Refer to Slope and Rate of Change, and discuss the following questions with the class:
   a. **DOK-1** What skills can you use to answer this question? I could find the slope of each line using two points and then see if the slope between the point (510, 341) and one of the points on each line is the same.
   b. **DOK-1** Which line passes through (510, 341)? The blue line
   c. **DOK-1** What is the slope of the blue line? Show you are correct in two ways. 3 – 1/3 – 0 = 2/3 and 341 – 1/510 – 0 = 2/3
4. As time allows, challenge students to determine a reasonable domain and range for the laser beam based on the scenario. Encourage students to use appropriate formats for writing the domain and range. Have students discuss whether the satellite and laser beam would be a discrete or continuous situation.

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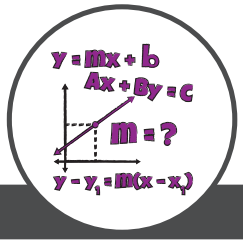


# Slope and Rate of Change

## Explore 1: Slope and Rate of Change Given a Graph

## Activity Preparation

Students identify the slope or rate of change of a line from a graph. They also explore the slopes of vertical and horizontal lines.

### Mathematical Process Standards

- **(A)** Apply mathematics to problems arising in everyday life, society, and the workplace.
- **(C)** Select tools, including real objects, manipulatives, paper and pencil, and technology as appropriate, and techniques, including mental math, estimation, and number sense as appropriate, to solve problems.
- **(D)** Communicate mathematical ideas, reasoning, and their implications using multiple representations, including symbols, diagrams, graphs, and language as appropriate.
- **(E)** Create and use representations to organize, record, and communicate mathematical ideas.
- **(F)** Analyze mathematical relationships to connect and communicate mathematical ideas.

### Materials

#### Printed

- 1 Student Journal (per student)
- 1 Set of GPS Graphs (per group)
- 1 Exit Ticket (per student)

### Preparation

- Plan to have students work in groups of 3 or 4 to complete the activity.
- Print a Student Journal and an Exit Ticket for each student.
- Print a set of GPS Graphs on card stock for durability for each group.

## Procedure and Facilitation

#### Part I

1. Read the following scenario to the class: *Marcus and Tomas went hiking on Saturday. They recorded their ascent using a GPS app on Tomas's phone. Evelyn may want to hike the same trail next weekend with her friends, so Tomas shares the GPS file of the Saturday hike with her as well as GPS files for some other routes he knows. Help Evelyn determine what to expect along different sections of the trails using a graph of the elevation gain data from the GPS file.*
2. Help students access the task by asking the following guiding questions:
    a. What are some situations where you have used a GPS tracker before?
    b. How could a GPS tracker be helpful to a runner? What information would be necessary for it to be effective?
3. Give a Student Journal to each student.
4. Give a set of GPS Graphs to each group.
5. Explain to students that they will work with their groups on problems where they evaluate the slope of a line given a graph. They record their work on their Student Journals.

6. Monitor students, and check for understanding as needed using the following guiding questions:
   a. **DOK-1** How do you calculate the slope of a line? I divide the change in the vertical dimension y by the change in the horizontal dimension x over an interval.
   b. **DOK-2** On the hiking graph, which part looks the steepest? How does the slope of that section compare to the other slopes for the hiking graph? The steepest section is WP3–WP4. When I compare the numerical values for the slopes, the slope for that section has the greatest value.
   c. **DOK-2** How are the slope and steepness of a line related? When the magnitude of the slope increases, the steepness of the line also increases. They are directly related. Similarly, when one decreases, the other decreases.
   d. **DOK-2** What is the slope of a horizontal line? The slope is zero.
   e. **DOK-2** What is the slope of a vertical line? Because the change in the horizontal dimension is zero, dividing by zero is undefined, meaning the slope is undefined.
7. Give students time to complete Part I and answer the questions.
8. After Part I, invite the class to a Math Chat to share their observations and learning.

**FACILITATION TIP**

*If students get stuck, pause to model an example or invite another group that has found success explain their approach with the whole-class.*

### Math Chat

- **DOK-2** What does the value of a line's slope indicate about a line? It indicates the steepness and direction.
- **DOK-2** If a line has a positive slope, does it slant up and to the right or down and to the right? It goes up and to the right.
- **DOK-2** If a line has a negative slope, does it slant up and to the right or down and to the right? It goes down and to the right.
- **Choose a Structured Conversation routine to facilitate the following question: DOK-2** If you determine one line is steeper than another, what does that tell you about the slope? Explain. It has a greater magnitude than the other. A line with a slope of –10 would be steeper than a line with a slope of 2.

**FACILITATION TIP**

*Have students "sky write" to model the direction of positive and negative slopes. Kinesthetic learning assists with conceptual understanding and knowledge retention.*

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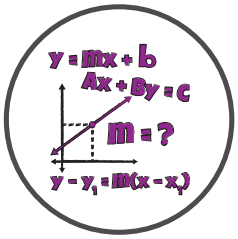



# Slope and Rate of Change

## Explore 1: Slope and Rate of Change Given a Graph

### FACILITATION TIP

*Pause to discuss this concept with the whole-class and record an example on the board. Students may need to review key terms (right triangle and similar triangles).*

### FACILITATION TIP

*Challenge students to draw examples on whiteboards to justify their thinking.*

### Part II

1. Read the following scenario to the class: *In addition to researching trails, Evelyn and her group are carefully planning what they will need to take with them. To have a safe hike, they will need water, food, appropriate clothing, and first-aid supplies. Review the recommendations for two of the most essential items: water and food (calories).*
2. Explain to students that they will work with their groups to analyze the food and water graphs and help Evelyn understand the slope of a line given a graph. They record their work on their Student Journals.
3. Monitor students, and check for understanding as needed using the following guiding questions:
   a. **DOK-2** In question 1, what sign do you expect the slopes to have given that the lines are heading down and to the right? I expect them to all be negative.
   b. **DOK-1** How can a right triangle be used to determine the slope of a line? A right triangle can be constructed with a horizontal side, a vertical side, and a long side on the line. The ratio of the vertical side to the horizontal side will give the slope of the line.
   c. **DOK-1** What does it mean when two triangles are similar? They have congruent and corresponding angles, and the ratio of corresponding sides is the same.
4. Give students time to complete Part II and answer the reflection questions.
5. Ask students to share their strategies, and encourage them to ask each other questions and make connections.
6. After the Explore, invite the class to a Math Chat to share their observations and learning.

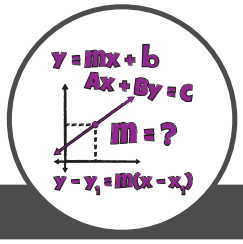
### Math Chat

- **DOK-2** What does the slope of a line tell you about the relationship among the variables being plotted? The slope gives the rate of change of the dependent variable (plotted on the vertical axis) with respect to the independent variable (plotted on the horizontal axis).
- **Choose a Structured Conversation routine to facilitate the following question: DOK-2** When calculating the slope of a line, will the ratio of the change in *y* to the change in *x* always, sometimes, or never be the same? Explain. It will always be the same ratio. To find the slope, we can use right triangles with a horizontal side, a vertical side, and a long side along the same line; all the right triangles on this line will be similar. In similar triangles, corresponding sides are proportional, so the ratio of the vertical to the horizontal (ratio of y to x) will be the same for both triangles.

## Post-Explore

1. Have students complete the Exit Ticket to formatively assess their understanding of the concept.
2. Complete the Anchor Chart as a class.
3. Have each student complete their Interactive Notebook.

Notes




# Slope and Rate of Change

## Explore 2: Slope and Rate of Change Given Two Points or a Table

## Activity Preparation

Students identify the slope or rate of change of a line from two points on the line or a table.

### Mathematical Process Standards

- **(A)** Apply mathematics to problems arising in everyday life, society, and the workplace.
- **(D)** Communicate mathematical ideas, reasoning, and their implications using multiple representations, including symbols, diagrams, graphs, and language as appropriate.
- **(E)** Create and use representations to organize, record, and communicate mathematical ideas.
- **(F)** Analyze mathematical relationships to connect and communicate mathematical ideas.

### Materials

**Printed**

- 1 Student Journal (per student)
- 1 Exit Ticket (per 2 students)

### Preparation

- Plan to have students work in groups of 3 or 4 to complete this activity.
- Print a Student Journal for each student.
- Print an Exit Ticket for every 2 students. Cut apart the half-page Exit Tickets so each student has one.

## Procedure and Facilitation

**FACILITATION TIP**

*Find a picture of the island of Kauai and/or a property beach rental to project for the class. Setting the mood can help make it relatable to the students and can increase their engagement.*

**Part I**

1. Read the following scenario to the class: *The Johnsons are planning a vacation to Hawaii with their extended family. Before making airline reservations, they need to research the main expenses, accommodations and food. The family wants to stay on the island of Kauai, the "Garden Isle." They have found two different accommodations that look appealing. The first is a hotel, and the second is a condominium rental property. The condo has a fixed cleaning fee in addition to the daily cost of renting, so a shorter rental is more expensive. One benefit of renting the condominium is that it has a full kitchen, so the Johnson family could prepare their own food instead of eating all their meals at restaurants. Also, purchasing food in larger quantities is often more economical. Help them determine the most affordable options.*
2. Help students access the task by asking the following guiding questions:
   a. **DOK-2** What are some considerations you would take into account if you were deciding where to stay for a vacation?
   b. **DOK-2** How could you save money if you were traveling in another city?
3. Give a Student Journal to each student.
4. Explain to students that they will work with their groups on problems where they evaluate the rate of change (slope) given a table. They record their work on their Student Journals.

5. Monitor students, and check for understanding as needed using the following guiding questions:
   - **a.** **DOK-2** What is the independent variable for question 1? The independent variable is the length of stay in days.
   - **b.** **DOK-2** What is the dependent variable? The dependent variable is the cost in dollars.
   - **c.** **DOK-2** How do you calculate the daily rate? It is the rate of change. Divide the change in the dependent variable by the change in the independent variable over some interval.
   - **d.** **DOK-2** If the relationship between the dependent and independent variable is linear, does it matter which set of points you choose to calculate the rate of change? No, it doesn't matter because the rate of change is constant among all points.
   - **e.** **DOK-2** In question 5, what are the independent and dependent variables? The independent variable is the number of family members, and the dependent variable is the daily cost per person.
   - **f.** **DOK-2** If the rate of change is zero, what would a graph of the dependent variable with respect to the independent variable look like? It would be a horizontal line.
   - **g.** **DOK-2** If the rate of change is negative, what would the graph look like? The line would be heading downward.
6. Give students time to complete Part I and answer the questions.
7. After Part I, invite the class to a Math Chat to share their observations and learning.

**FACILITATION TIP**

*Consider facilitating a "fishbowl discussion." Choose a group that has a sold grasp of the content and have the rest of the class gather around to observe them work and discuss their strategies.*

### Math Chat

- **DOK-2** How can you tell whether the relationship between the independent and dependent variables is linear? The rate of change will be constant.
- **DOK- 2** How many pairs of points do you need to calculate the rate of change of any linear relationship? I only need two ordered pairs, and I can choose any two from the same line.

**FACILITATION TIP**

*Challenge students to prove this concept using several different pairs of points for the same line.*

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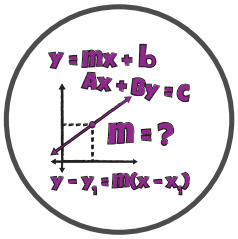


# Slope and Rate of Change

## Explore 2: Slope and Rate of Change Given Two Points or a Table

### FACILITATION TIP

*onsider having students pause partway thought the problem set. Have them leave their work behind and then take a walking tour to view other student's work in progress. Ask students what they noticed and what they wondered and whether or not they may need to revisit an answer for accuracy.*

### FACILITATION TIP

*Challenge students to draw examples of these representations on chart paper and display them in the classroom for future reference.*

### Part II

1. Read the following scenario to the class: *In addition to the basics (a place to sleep and food), the family also wants to research the costs of activities and sightseeing during their stay. Help them determine which activity is the better value.*
2. Explain to students that they will work with their groups on problems where they evaluate the rate of change (slope) given a table or pair of points. They record their work on their Student Journals.
3. Monitor students, and check for understanding as needed using the following guiding questions:
   a. **DOK-2** What are the independent and dependent variables in question 1? The independent variable is the number of people. The dependent variable is the cost per person.
   b. **DOK-2** Why are only two points needed to find the rate of change? The relationship is linear, and the rate of change is constant, so only two points are needed to find the slope of the line, which is the rate of change.
   c. **DOK-2** If the slope is 0, what does it tell you about the relationship between the independent and dependent variables? It tells me that the value of the dependent variable stays the same as the independent variable increases.
4. Give students time to complete Part II and answer the reflection questions.
5. Ask students to share their strategies, and encourage them to ask each other questions and make connections. Encourage them to notice the similarities and differences among the strategies used to find the better value.
6. After the Explore, invite the class to a Math Chat to share their observations and learning.

### Math Chat

- **Choose a Structured Conversation routine to facilitate the following question: DOK-2** Besides tables, what other way can you represent (*x*, *y*) pairs to determine the rate of change? I can make a line plot of *y* as a function of *x* and find the slope of the line, which is the rate of change.
- **DOK-2** If you know the coordinates of two points on a line, how can you tell whether it has a positive or negative slope? I can sketch the points on a graph to see which way it slants. I can find the ratio of the change in *y* to the change in *x*.

## Post-Explore

1. Have students complete the Exit Ticket to formatively assess their understanding of the concept.
2. Complete the Anchor Chart as a class.
3. Have each student complete their Interactive Notebook.

Notes

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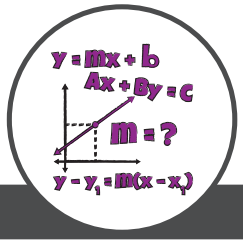



# Slope and Rate of Change

## Explore 3: Slope and Rate of Change Given an Equation

## Activity Preparation

Students identify the slope or rate of change of a line from the various forms of an equation.

### Mathematical Process Standards

- **(A)** Apply mathematics to problems arising in everyday life, society, and the workplace.
- **(C)** Select tools, including real objects, manipulatives, paper and pencil, and technology as appropriate, and techniques, including mental math, estimation, and number sense as appropriate, to solve problems.
- **(D)** Communicate mathematical ideas, reasoning, and their implications using multiple representations, including symbols, diagrams, graphs, and language as appropriate.
- **(E)** Create and use representations to organize, record, and communicate mathematical ideas.
- **(F)** Analyze mathematical relationships to connect and communicate mathematical ideas.

### Materials

#### Printed

- 1 Student Journal (per student)
- 1 Exit Ticket (per 2 students)

#### Reusable

- 1 Graphing calculator (per group)

### Preparation

- Plan to have students work in groups of 3 or 4 to complete this activity.
- Print a Student Journal for each student.
- Print an Exit Ticket for every 2 students. Cut apart the half-page Exit Tickets so each student has one.

## Procedure and Facilitation

**FACILITATION TIP**

*Find a short video clip of a candy factory and the machines used to product the candy to project for the class. Setting the mood can help make it relatable to the students and can increase their engagement.*

#### Part I

1. Read the following scenario to the class: *Jasmine, the assistant supervisor at Sweet Delights Candy Factory, will be in charge while the head supervisor is on vacation. She needs to be familiar with the company's production requirements so production quotas and quality are maintained. She starts with production lines A and B. Production line A carries Sweet Dots candy on a conveyor belt through the chocolate enrober to get coated with chocolate. Production line B carries Astro Bars candy through. Help her review the specifications in the internal company documents.*
2. Help students access the task by asking the following guiding questions:
   a. **DOK-2** What are some considerations you believe the supervisor of a factory should take into account?
   b. **DOK-2** What automated processes in a factory might take longer than others?
3. Give a Student Journal to each student.
4. Give a graphing calculator to each group.
5. Explain to students that they will work with their groups on problems where they evaluate the slope of a line given an equation. They record their work on their Student Journals.

6. Monitor students, and check for understanding as needed using the following guiding questions:
   a. **DOK-2** In the equations given for the first problem, which variable is the independent variable? The independent variable is *t*.
   b. **DOK-2** Which variable is the dependent variable? The dependent variable is *s*.
   c. **DOK-2** How do you calculate the rate of change? I calculate the change in the dependent variable *s* and divide it by the change in the independent variable *t* over some interval.
   d. **DOK-2** How do you choose the points to calculate the rate of change? I can choose any two points because the rate of change is constant.
   e. **DOK-2** In the equations, do you see the same values that you calculated from the tables for the slopes? If so, where? Yes, the value is multiplying the variable *t* in each equation.
   f. **DOK-2** From the direction of the line on the graph in the second problem, do you expect the rate of change (slope) to be positive or negative? I expect it to be negative because it is heading down and to the right.
   g. **DOK-2** In the equation, do you see the same value that you calculated from the graph for the slope? If so, where? Yes, the value is multiplying the variable *t* again in the equation.
7. Give students time to complete Part I and answer the questions.
8. After Part I, invite the class to a Math Chat to share their observations and learning.

### Math Chat

- **Choose a Structured Conversation routine to facilitate the following question: DOK-2** How does slope connect to equations you have seen before? When I graphed linear equations, I could more easily visualize the slope.
- **DOK-1** In the first scenario, the equation was given in slope-intercept form: $y = mx + b$. In the second, the equation was given in a different form. How could you still identify the slope? Because *m* is the slope or rate of change of *y* with respect to *x* when *y* is in slope-intercept form, I can isolate y to determine the slope for any other equation.

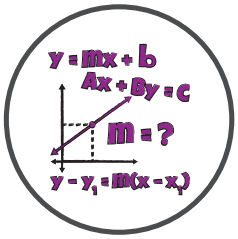
**FACILITATION TIP**

*Students may need to review these terms (A dependent variable is a variable, often y, that relies on the value of the independent variable. An independent variable is a variable, often x, that does not rely on the value of another variable.)*

**FACILITATION TIP**

*Points e and g are key observations. Emphasize these points and relate this to slope intercept form during the math chat.*

Notes




# Slope and Rate of Change

## Explore 3: Slope and Rate of Change Given an Equation

### Part II

1. Read the following scenario to the class: *Jasmine is hoping for a promotion soon, so desired production and shipping rates must be maintained while she is in charge. Demand for different candies changes over time. Based on market research, Sweet Delights Candy Factory has developed sales forecasts for three of its products. Help Jasmine analyze the sales forecasts to improve her chances of a promotion.*
2. Explain to students that they will work with their groups to evaluate the slope of a line given an equation. They record their work on their Student Journals.
3. Monitor students, and check for understanding as needed using the following guiding questions:
   a. **DOK-2** To find the rate of change (slope) from the equations, what term do you look at? I can look at the linear term t. The coefficient multiplying t is the slope.
   b. **DOK-2** What is the value of the slope when the equation doesn't have an independent variable, such as the equation for Astro Bars? What does it tell you about the line? It is a horizontal line with a slope equal to zero.
4. Give students time to complete Part II and answer the reflections questions.
5. Ask students to share their strategies, and encourage them to ask each other questions and make connections. Encourage students to notice the similarities and differences among the strategies used to find the rate of change.
6. After the Explore, invite the class to a Math Chat to share their observations and learning.

### Math Chat

- **DOK-2** For a linear equation, is the rate of change constant? Yes, for a linear equation, the rate of change of *y* with respect to *x* is constant and equal to the slope of the line corresponding to the equation.
- **Choose a Structured Conversation routine to facilitate the following question: DOK-2** How can the slope be identified from an equation in any form? The slope is always the coefficient of the independent variable once *y* is isolated, so we can convert any equation into slope-intercept form.

**FACILITATION TIP**

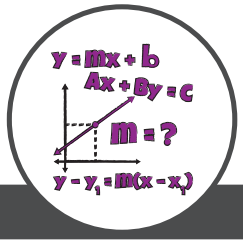
*Challenge students to think of an example that demonstrates this concept.*

## Post-Explore

1. Have students complete the Exit Ticket to formatively assess their understanding of the concept.
2. Complete the Anchor Chart as a class.
3. Have each student complete their Interactive Notebook.
4. Return to the Hook and instruct students to use their newly acquired skills to successfully complete the activity.

Notes

Notes




# Slope and Rate of Change

## Additional Scope Resources

## Explain Elements

ELEMENT USE KEY ● Can be assigned digitally ■ Contains printable handouts ★ Can be done independently

### Picture Vocabulary
A slide presentation of important vocabulary terms along with a picture and definition

● ■ ★

### Anchor Chart
A guide to facilitating the creation of a chart with students for each scope.

● ■

### Interactive Notebook
A cut-and-glue activity to process learning that can be added to a notebook for future reference

■ ★

### Interactive Vocabulary
Students form definitions of mathematical vocabulary words used throughout the scope.

● ■ ★

### Show What You Know, Part 1
**Slope and Rate of Change Given a Graph**
Independent practice assignment that gives students an opportunity to demonstrate their learning

● ■ ★

### Show What You Know, Part 2
**Slope and Rate of Change Given Two Points or a Table**
Independent practice assignment that gives students an opportunity to demonstrate their learning

● ■ ★

### Show What You Know, Part 3
**Slope and Rate of Change Given an Equation**
Independent practice assignment that gives students an opportunity to demonstrate their learning

● ■ ★

### Language Connections
**Language Connections**
An opportunity to use linguistic and cultural background knowledge to support connections to new skills, vocabulary, and concepts at different proficiency levels and linguistic domains.

● ■

Notes

# Elaborate Elements

ELEMENT USE KEY ● Can be assigned digitally ■ Contains printable handouts ★ Can be done independently

## Spiraled Review

Cafeteria Changes

A quick story to engage student interest along with four problems over previously learned skills.

● ■ ★

## Interactive Practice

Dragon Egg Hatchery

A game to practice the skills established by the standards in the scope.

● ★

## Interactive Practice

First Contact

A game to practice the skills established by the standards in the scope.

● ★

## Fluency Builder

Calculate Slope

Independent and partner games and other activities that provide students with an engaging way to practice the new concept

## PhET

Graphing Lines: Linear Equations and Pairs of Equations

Student activities using the PhET Interactive Simulations from the University of Colorado Boulder.

● ★

## PhET

Graphing Slope-Intercept: Exploring Slope

Student activities using the PhET Interactive Simulations from the University of Colorado Boulder.

● ★

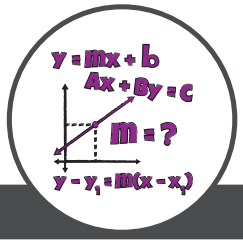
## PhET

Unit Rates: Unit Rate as Slope

Student activities using the PhET Interactive Simulations from the University of Colorado Boulder.

● ★

Notes




# Slope and Rate of Change

## Intervention and Assessment

**Student Intervention**

1 *Use the Skill Review and Practice under the Intervention section to assess student mastery after this scope's content has been taught. Distribute a copy of Quick Check to each student. Each student should complete the Quick Check independently.*

| | How to Use the Review | Students | Notes & Comments |
|---|---|---|---|
| **Students who are still acquiring the concept and need remediation** | ❑ *Distribute a copy of the Review to these students.*<br>❑ *Meet with students individually or in a small group to assist them in working through the Review's concepts.*<br>❑ *Talk individually with each student about their thoughts in order to highlight strengths and roadblocks.*<br>❑ *Look out for possible misconceptions.* | | |
| **Students who are approaching mastery and need review** | ❑ *Distribute a copy of the Review to these students.*<br>❑ *Meet with students in a small-group to answer questions and identify areas where students are struggling.*<br>❑ *Look out for moments of possible reteaching.*<br>❑ *Release students to work independently once you see they're nearing mastery of the concept.* | | |
| **Students who have mastered the concept and need extension** | ❑ *Distribute a copy of the Review to these students.*<br>❑ *Confirm that students are on the right track.*<br>❑ *Direct students to work on materials in the Acceleration section, such as the Choice Board, while you work with the other students.* | | |

2

3 *Distribute a copy of Checkup to each student. Students should complete the Checkup independently. Watch out for students who need additional help.*

## Assessment Planner

*Evaluate Resources*

- ❑ *Standards-Based Assessment*
- ❑ *Skills Quiz*
- ❑ *Mathematical Modeling Task*
- ❑ *Technology-Enhanced Questions*
- ❑ *Heat Map*

*Use this template to decide how to assess your students for concept mastery. Depending on the format of the assessment, you can identify prompts and intended responses that would measure student mastery of the expectation. See the beginning of this scope to identify standards and grade-level expectations.*

| *Fundamental Questions* | *What prompts will be used?* | *What does mastery look like?* |
|---|---|---|
| *I can determine the slope and rate of change given a graph.* | | |
| *I can determine the slope and rate of change given two points or a table.* | | |
| *I can determine the slope and rate of change given an equation.* | | |
| *I can determine the slope and rate of change given a real-world problem.* | | |
| *I can interpret the meaning of the rate of change of linear functions.* | | |

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