Lesson 1.4	SAT Math Content: Slope-Intercept Form, Part 1
Learning Goal	a. I will be able to plot and identify coordinates. b. I will be able to identify slope and intercepts given a graph, table of values, pair of points, and/or equation.
Materials Needed	● Answer Key for this lesson ● Student Handout for this lesson (copies for each student and for teacher(s)) ● Electronic device for each student that supports desmos.com graphing calculator ● Physical graphing calculators: students should bring an [approved calculator](#)—ideally a graphing calculator—with them to each SAT Math class ● Student Notebooks - 1 per student
Key Takeaways	● The slope of a linear relationship is the rate of change of y with respect to x. The y-intercept of a linear relationship is its starting value: that is, the y-intercept is the value of y when $x = 0$. ● If we know a line's slope and at least one point on the line, we can find the y-intercept by substituting the slope and known point into $y = mx + b$ (see Example #2 for instance). Similarly, we can find the slope if we know the y-intercept and at least one point.
Additional Resources for Students	● [Khan Academy Algebra I: unit on slope](#) ● [Khan Academy Digital SAT Math: relevant lessons and practice sets include "Solving linear equations and inequalities," and "Graphs of linear equations and functions" (Foundations)](#) ● [Khan Academy Digital SAT Math: relevant lessons and practice sets include "Solving linear equations and inequalities, and "Graphs of linear equations and functions" (Advanced)](#)

BESPOKE EDUCATION

Do Now & Review (11 min)	**Do Now (5 min):** ● Give students 5 minutes to complete the Do Now. ● Monitor for mastery and identify key questions that need review in Do Now Review. **Tell the Story (2 min):** ● *Welcome to Lesson 1.4 of SAT Math Prep! In our last lesson, we focused on ratios and rates. Today, we are going to focus on the rate of change in a linear relationship, also known as slope! More specifically, we're going to practice slope-intercept form questions. This is one of the most common question types in the Algebra domain, and remember that over a third of SAT Math questions are in the Algebra domain—so this is important! So important that we're actually going to be focusing on slope-intercept form today and in the next two lessons.* ● *Before we get started, let's take a few minutes to review the Do Now.* **Do Now Review (4 min):** ● Share answers for all Do Now questions. ● Review the questions that the most students got incorrect.
Introduction to Lesson (1 min)	● *Today's main learning goal is to be able to identify slope and intercepts when given a graph, table of values, pair of points, and/or equation.*
Class Notes, Examples, & Independent Practice (26 min)	**Class Notes (8 min):** ● Direct students to take the notes in their SAT notebooks. Use your own notebook or the attached page of ruled paper as you model taking the notes below: Teacher explains: ● *A relationship between x and y is linear if, for a given change in x, the change in y is constant. The graph of a linear relationship is a (straight) line.* ● *Slope-intercept form is a convenient way to represent linear relationships, because it allows us to see right away what the slope and y-intercept are.* ● *Let's remember and make a note of some of the key ideas when it comes to slope-intercept form.*

- Note #1: Make sure students know that Δ means "change in."
- Note #2: You may want to clarify that $\frac{\Delta y}{\Delta x}$ and $\frac{y_2 - y_1}{x_2 - x_1}$ are equivalent, where (x_1, y_1) and (x_2, y_2) are points on the line. (Students may be more familiar with the $\frac{y_2 - y_1}{x_2 - x_1}$ notation.) Emphasize that "it doesn't matter which point you start with," i.e. $\frac{y_2 - y_1}{x_2 - x_1} = \frac{y_1 - y_2}{x_1 - x_2}$.

Students write:

Slope-intercept form

- Slope-intercept form is one way to represent a linear relationship: $y = mx + b$, where m is the slope and b is the y-coordinate of y-intercept
- Slope $= \frac{\Delta y}{\Delta x}$ "rise over run"
  - Rate of change
  - Steepness of graph
- y-intercept = y-value when $x = 0$
  - Starting value
  - Where graph crosses y-axis

Examples (group practice) (8 min):
- Example #1:
  - *Let's consider Example #1. We're going to review how a linear relationship can be shown with a table, a graph, an equation, or in words.*
  - Graph: On the graph, show how for every increase of 1 in x, there is an increase of 4 in y. That means a slope of 4/1 or 4. Also show that the line crosses the y-axis at 5, so the y-intercept is $(0, 5)$.
  - Equation: Therefore, the equation of this relationship in slope-intercept form is $y = 4x + 5$.
  - Table: We can simply write points from the graph here in table form: $(0, 5)$; $(1, 9)$; $(2, 13)$; $(3, 17)$.
  - In words [line in quotation marks]: "The starting value is 5. The rate of change (change in y with respect to x) is 4."
  - Note: Please direct students who are struggling with slope to the Khan Academy unit on slope listed above, in Additional Resources for Students.

	- Example #2 - Guide students through this example as needed. They can start by using the graph to find the slope, which is -4. This means that the slope-intercept form equation for the graph is $y = -4x + b$. Students can find b by substituting the x and y values of a point on the line. For example, we can see that $(4, 6)$ is on the line $\rightarrow 6 = -4(4) + b \rightarrow b = 22$. - Example #3: - In part c, students can again find the y-intercept by substituting a known (x, y) ordered pair, this time from the table instead of from a graph. For example: $m = \frac{2}{5} \rightarrow$ $y = \frac{2}{5}x + b \rightarrow 12 = \frac{2}{5}(5) + b \rightarrow b = 10$. **Independent Practice ("You Do") (10 min):** - Read directions aloud. - Have students complete the practice through #6. However, if they finish early and/or need more of a challenge, have them work on #7–9. - Monitor for mastery using the Answer Key.
Review the Practice (4 min)	Based on what you observed while monitoring students during their practice, review the answers. Important points to emphasize when you review: - Relevant to #1 and 5 in particular: The slope of a linear relationship is the rate of change of y with respect to x. The y-intercept of a linear relationship is its starting value: that is, the y-intercept is the value of y when $x = 0$. - Relevant to #2, 4, and 9: If we know a line's slope and at least one point on the line, we can find the y-intercept by substituting the slope and known point into $y = mx + b$.

Recap the Lesson (3 min)	Have students turn and talk with a partner for 30 seconds, summarizing what they think the one or two big takeaways of the lesson are. If there are Key Takeaways (as listed on the first page of this Lesson Plan) that students don't mention, state them.
Exit Ticket (5 min)	Have students silently and independently complete the Exit Ticket on the last page of their packet. Remind them to write their name at the top. After five minutes, have students tear off the Exit Ticket page and turn it in to you.