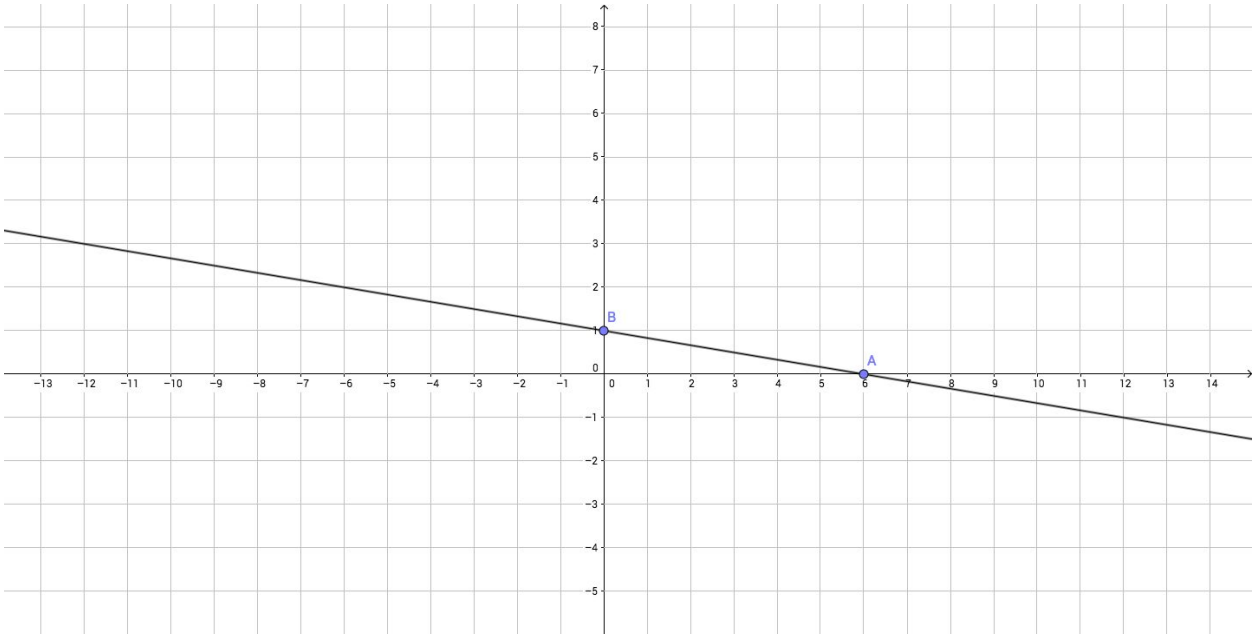
We presents below mathematical problems which are related to **line & line slope** concept. Some online 1 & 2 resources discuss how to prepare SAT toward understanding this concept.

Problem 1.1: Given an equation 2+3y+2x-y+2x+5=4, graph this equation's corresponding shape?

Problem Analysis: This problem comes from normal textbook, its topic is Line Slope, its difficulty level is basic, its word verbalized level can be categorized as a shallow verbalized algebra-and-geometry math problem. It is the student-produced response problem.

Problem Analysis (2): This problem wants students to use their algebra skills to simplify the problem, and then their geometric skills to graph the corresponding line. It is a typical problem you would see in a textbook, and it is a basic level student-produced response problem. The word level of this problem can be categorized as a shallow verbalized algebra-and-geometry math problem.

Problem 1.2: A line is graphed in the xy-plane as shown below. Which of the following equations represent the line?



A. x+6y=1
B. x+6y=6
C. x-6y=1
D. x-6y=-6

Problem Analysis: This problem comes from KahnAcademy, its topic is Line Slope, its difficulty level is basic, its word verbalized level can be categorized as a shallow verbalized algebra-and-geometry math problem. In compared to Problem 1.1, this problem asks students to solve it inversely, from its graphic representation toward the symbolic representation. It is the multiple-choice problem.

Problem Analysis (2): This problem is a common practice problem you would find online at the KahnAcademy. There are many similarities to its partner Problem 1.1, such as the word level (shallow verbalized algebra-and-geometry math problem) and its difficulty level (basic). However the difference with this problem is that it wants students to use their geometry skills to identify the key features of the line, and then use their algebraic skills to further solve the problem. This is a multiple-choice problem.

Problem 2.1: Line B crosses point A(2,3) and B(2,8), what is the slope of line B?
Problem Analysis: This problem comes from normal textbook, its topic is Line Slope, its difficulty level is basic, its word verbalized level can be categorized as a medium verbalized algebra-and-geometry math problem. It is the student-produced response problem.
Problem Analysis (2): This problem is more verbalized then Problems 1.1 and 1.2. It asks for more language to math translation than the first problems did. Therefore, it is categorized as a medium verbalized algebra-and-geometry math problem. It allows students to either use their geometric skills to graph the points and find the equation from there, or use their algebraic skills to solve for the slope of the line using the formula. The difficulty level is basic, and it is a student-produced response problem.

Question: Are both the x coordinates supposed to be 2? Because this would mean that the line is vertical and therefore the slope is undefined. If it is meant to be this way, it's a bit trickier than the basic level

Problem 2.2: A line passes through points (2,3) and (4,y), the slope of this line is 5. What is the value of y?
Problem Analysis: This problem comes from normal textbook, its topic is Line Slope, its difficulty level is hard(?), its word verbalized level can be categorized as a medium verbalized algebra-and-geometry math problem. In compared to Problem2.1, this problem lets students build relation(or a schema) in the forward manner, but solve the problem in the backward manner.It is the student-produced response problem.
Problem Analysis (2):

Problem 3.1 : Bob's Car Rental is offering a special of $45 a day for a convertible as long as you purchase the car damage protection insurance for $30. You will need the car for 5 days. How much of your budget is going to rent the car?
Problem Analysis: This problem comes from online, its topic is Line Slope, its difficulty level is basic, its word verbalized level can be categorized as a deep verbalized algebra-and-geometry math word problem. It is the student-produced response problem.

Problem 3.1.2: A college bookstore charges $60 for a yearly membership. The first book is free with the membership,and any book after that costs $7.60 including tax. How many money, **m**, does a student spend after buying, **b,** books and a yearly membership?

A. m = 7.60b
B. m = 7.60(b-1)
C. m = 7.60b+60
D. m = 7.60(b-1)+60

Problem Analysis: This problem comes from Kahn Academy, its topic is Line Slope, its difficulty level is basic, its word verbalized level can be categorized as a deep word problem. However, in comparison to Problem 3.1, this problems give a hint to translate verbalized natural language toward the math model. It is a multiple-choice problem.

Problem 3.2: Felix is having a birthday party. It costs $50 for 3 games of bowling. He also needs shoes for each of his friends. It costs $4 for each pair of rental shoes. If Felix finally spends $98 in total, how many friends attend his party?

Problem Analysis: This problem comes from online, its topic is Line Slope, its difficulty level is hard(?), its word verbalized level can be categorized as a deep verbalized algebra-and-geometry math word problem. In compared to Problem 3.1, this problem lets students build the math model in a forward manner, and further solve the problem in a backward manner.It is the student-produced response problem.

Problem 4.1 : Write and graph the linear equation described by the following statement: Jenna works at a retail shop. She makes $10 per hour, plus $3 for each item she sells. Within 2 hours, she sold 3 items. How much does she earn in this 2 hours?

Problem Analysis: This problem comes from online, its topic is Line Slope, its difficulty level is basic, its word verbalized level can be categorized as a deep word problem. However, in comparison to Problem 3.1, this problems give a hint to translate verbalized natural language toward the math model. It is the student-produced response problem.

Problem a3: The amount of money that farmers in Massachusetts paid to maintain their between 1991 and 2008 is modeled by the equation P=3.53t+100, where P is the amount of money the farmers paid, in millions of dollars, and t is the year (assuming 1991 is t=0). How much money does farmers get in the year 2001?

Problem a4: A college bookstore charges $60 for a yearly membership. The first book is free with the membership, and any book after that costs $7.60. How many money does a student spend after buying 3 books and a yearly membership?

Problem 4.2: The amount of money that farmers in Massachusetts paid to maintain their crops between 1991 and 2008 is modeled by the equation P=Qt+R, where P is the amount of money the farmers paid, in millions of dollars, Q is the amount of money that

the farmers' pay increased each year, in millions of dollars, R is the amount of money that farmers were paid the 0th year, in millions of dollars, and t is the year(assuming 1991 is t=0). What variable represents the slope?

Problem 4.2: The amount of money that farmers in Massachusetts paid to maintain their crops between 1991 and 2008 is modeled by the equation P=3.53t+100, where P is the amount of money the farmers paid, in millions of dollars, and t is the year(assuming 1991 is t=0). What does the 3.53 mean in the equation?

A.The cost for maintaining crops was $3.53 million in 1991.

B.The cost for maintaining crops was $3.53 million in 2008.

C.The costs for maintaining crops increased a total of $3.53 million between 1991 and 2008.

D.The costs for maintaining crops increased by $3.53 million each year between 1991 and 2008.

Problem Analysis: This problem comes from KahnAcademy, its topic is Line Slope, its difficulty level is basic, its word verbalized level can be categorized as a deep word problem. However, in comparison to Problem 4.1, this problems directly gives the math model in a forward manner, but asks students to explain its variable's meaning in a backward manner. It is a multiple-choice problem.

Problem 5(TODO): understand the connection between linear regression concept and line concept. understanding the table's data and answer the question in the equation. See the below problem.

Geogebra provides a better UI between table and graph.

x	y
1	7.5
2	13.0
3	18.5
4	24.0

Which of the following equations expresses y in terms of x for each of the four pairs of values shown in the table above?

(A) $y = 5x + 7.5$

(B) $y = 5.5x + 2$

(C) $y = 5.5x + 7.5$

(D) $y = 7.5x$

(E) $y = 7.5x + 5.5$

Problem 4.2: The amount of money that farmers in Massachusetts paid to maintain their crops between 1991 and 2008 is modeled by the equation P=Qt+R, where P is the amount of money the farmers paid, in millions of dollars, Q is the amount of money that the farmers' pay increased each year, in millions of dollars, R is the amount of money that farmers were paid the 0th year, in millions of dollars, and t is the year(assuming 1991 is t=0). What variable represents the slope?

A. P.
B. Q.
C. T.
D. R.