Name:

Line Slide

Your Challenge

When a linear equation has the form $y = mx + b$, how does changing m or b affect its graph?

➤ **Use graphing technology to explore the effect of changing the values of *m* and *b* on the graph of a line.***

a. Open the graphing technology program.

b. Type $y = mx + b$ in the field where equations are entered. Then create sliders for m and b.

c. Move each slider bar to see how changing the values for m and b affects the graph of the equation.

d. Investigate how changing m in the equation $y = mx + b$ changes the graph of the equation.

1. What is the overall effect on the graph when the value of m changes?

   Possible answer: Changing *m* changes the slope of the line.

2. How does the graph change when the value of m changes from positive to negative?

   Possible answer: When *m* is positive, the line slants up from left to right. When *m* is negative, the line slants down from left to right.

3. How does the graph of the line change as positive m increases? How does it change as negative m decreases?

   Possible answer: As positive *m* increases or as negative *m* decreases, the line becomes steeper, or closer to vertical. As positive *m* decreases or as negative *m* increases, the line becomes less steep, or closer to horizontal.

*** You may need to adjust the steps depending on which calculator or graphing program you use. If needed, use Help or Support menus or online tutorials.**

Name:

Line Slide

e. Investigate how changing b in the equation $y = mx + b$ changes the graph of the equation.

4 What is the overall effect on the graph when the value of b changes?

Possible answer: Changing the value of b changes the y-intercept of the line, so it moves the graph up or down in the coordinate plane.

5 How does the graph change when the value of b changes from positive to negative?

Possible answer: When b is positive, the line intersects the y-axis above the x-axis. When b is negative, the line intersects the y-axis below the x-axis.

6 What does the graph of the line look like when $b = 0$?

Possible answer: When $b = 0$, the line passes through the origin, (0, 0).

f. Investigate graphing a vertical line.

7 Can you use the sliders to make the graph a vertical line? Why or why not?

No; Possible explanation: The slope of a vertical line is undefined. When the equation has the form $y = mx + b$, m must be defined; it must have a value. I can make the graph look close to being a vertical line by increasing the value of m, but it is never exactly vertical. (NOTE: To graph a vertical line, students must change the input equation to be in the form $x = a$, where a is any number.)

Name:

Deep Equations

Your Challenge

➤ **In 2012, a filmmaker used a special submarine to make the deepest solo ocean dive ever done. He descended 6.8 miles below the ocean's surface to the deepest part of the Mariana Trench, called Challenger Deep. You will simulate this journey by writing and solving one-variable equations. Follow these steps:**

- Gather a paper clip and two number cubes, numbered 1 to 6.
- Choose an equation in the table. Roll the number cubes and write the numbers in the blanks to complete the equation.
- Solve the equation. If there is no solution, score 0.2 point. If there is 1 solution, score 0.5 point. If there are an infinite number of solutions, score 1 point.
- Your points tell you the number of miles to move your paper clip down toward Challenger Deep on the **Recording Sheet**. You goal is to reach Challenger Deep using the least number of equations.

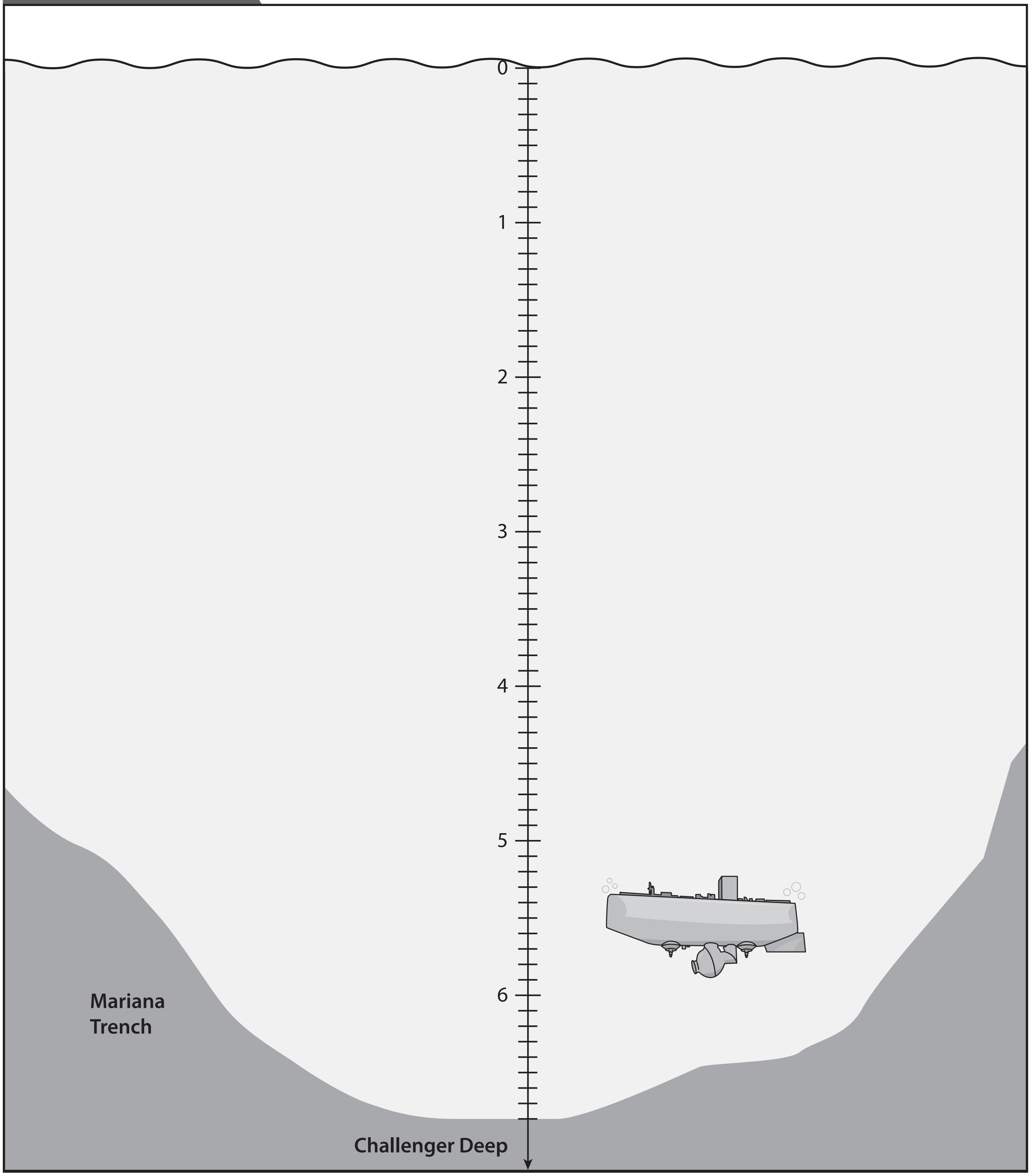
Possible answers shown.

Equation	Number of Solutions	Equation	Number of Solutions
$x - \underline{3} = \underline{2}x + 1$	1	$\underline{2} + \underline{6} = 19$	0
$\underline{4}a + 1 = 4a + \underline{1}$	Infinite	$2p - \_\_\_ = \frac{1}{2}(\_\_\_p - 16)$	
$\frac{1}{2}(2z + \underline{6}) = z + \underline{6}$	0	$4s + \underline{3} = \underline{4}s + 3$	Infinite
$\underline{5}w = 2w + \underline{3}w$	Infinite	$\_\_\_d + 9 = \_\_\_(d - 3)$	
$25\underline{2} = 10\underline{5}$	Infinite	$4n - \_\_\_ = 0.5(8n - \_\_\_)$	
$2p + \_\_\_ = 0.5(\_\_\_p + 10)$		$6c - 5 = \underline{4}c + \underline{5}$	1
$\_\_\_y - 4 = 3(2y - \_\_\_)$		$16u + \underline{3} = \underline{2}(8u + 3)$	0
$\_\_\_t = \_\_\_t + 9$		$\_\_\_(7b - 2) = \frac{1}{2}(14b - \_\_\_)$	
$8m + \underline{4} = \underline{4}(2m + 3)$	0	$9\_\_\_ - r = 8\_\_\_ + r$	
$\underline{4}k + 16 = \underline{4}(k + 4)$	Infinite	$\_\_\_q + \_\_\_ = \frac{1}{3}(18q + 12)$	

Name:

Deep Equations

RECORDING SHEET



Name:

Space Challenge

Your Challenge

➤ **Write equations to determine the path of a spacecraft, making sure it avoids collisions with asteroids.**

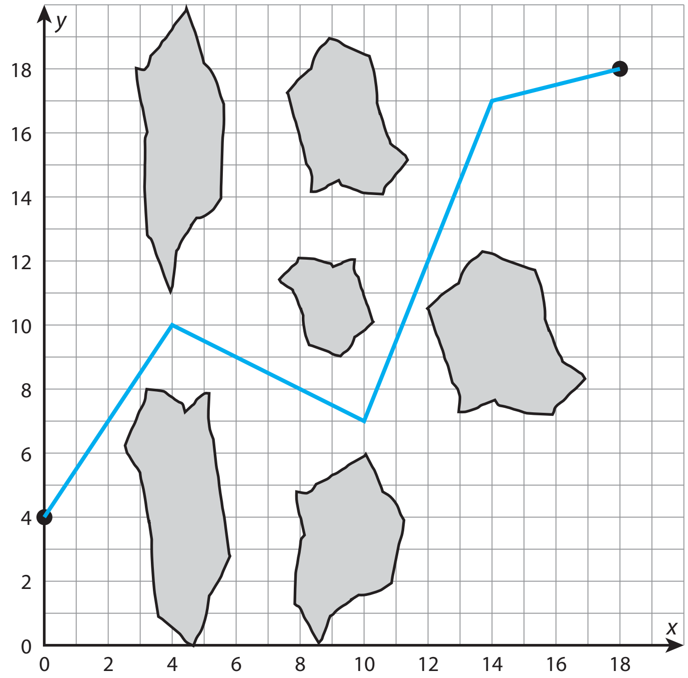
- Write and graph equations to guide your spacecraft through the obstacles shown on the **Recording Sheet** graph.
- Your spacecraft begins on the *y*-axis at the point (0, 4).
- You will need to change direction after passing by each obstacle, so you will write at least three different equations.
- The intersections of your lines determine the points where the spacecraft changes direction. Name the points of intersection of your lines in the form (x, y).
- Your goal is to guide the spacecraft to the point (18, 18) without touching any of the obstacles.
- With each equation, name the *x*-interval that you will use for the equation. For example, if your first equation will be used from $x = 0$ to $x = 2$, write $0 \leq x \leq 2$ next to the equation.

Name:

Space Challenge

RECORDING SHEET

Possible answer:



Possible equations:

$y = \frac{3}{2}x + 4;\ 0 \leq x \leq 4$

$y = -\frac{1}{2}x + 12;\ 4 \leq x \leq 10$

$y = \frac{5}{2}x - 18;\ 10 \leq x \leq 14$

$y = \frac{1}{4}x + \frac{27}{2};\ 14 \leq x \leq 18$

Turning points: (4, 10), (10, 7), and (14, 17).