Lesson 5-1A Stairs and Slopes

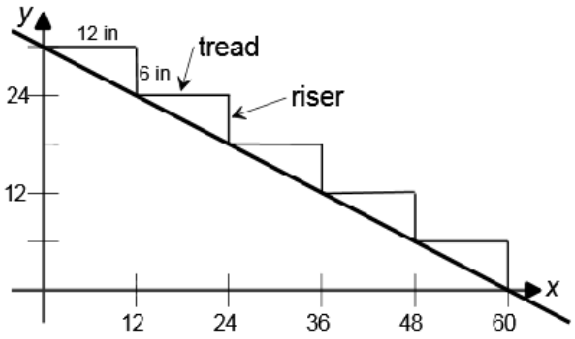
Have you ever been to Washington, D.C.? The city has many buildings of great historical significance, such as the Washington Monument, the Capitol building, and the Lincoln Memorial. These buildings also have *stairs*! Everywhere you go in Washington D.C., you have to climb flights of stairs, or at least it seems that way. Some of the stairs have steps that are short and far apart making them less steep, others have steps that are tall and close together, making them much steeper.

The mathematical term that describes the steepness of stairs, hillsides, roads, snow board runs, etc., is called **slope**. *Slope* is a number that compares the amount of vertical change to the amount of horizontal change:

$$\textbf{slope} = \frac{\text{amount of vertical change}}{\text{amount of horizontal change}}$$

Slope is defined this way so that a larger slope describes a steeper set of stairs (or hill, street, mountain, etc.), because there is more vertical change compared to horizontal change. A smaller slope means less vertical change compared to horizontal change, or a flatter set of stairs.

1. The diagram to the right shows a set of five stairs. The vertical part of the stairs are called the *risers*. The horizontal part of the stairs are called the *treads*. Each riser is 6 inches tall. Each tread is 12 inches long.



   a. Calculate the slope of one stair as follows:

$$\text{slope of one stair} = \frac{\text{amount of vertical change in one stair}}{\text{amount of horizontal change in one stair}} = \frac{\text{down 6 in}}{\text{right 12 in}} = \frac{-6}{+12} = \text{\_\_\_}$$

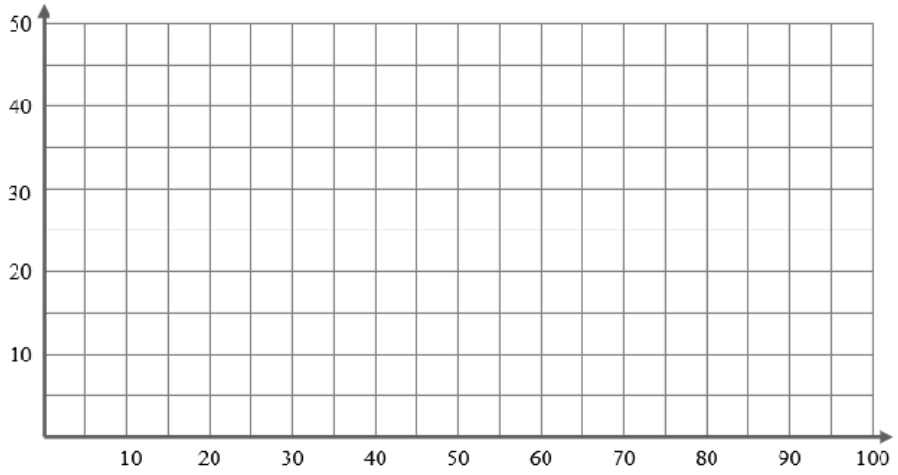
   b. What is the total amount of vertical change for the entire set of stairs? (Remember to use + for up, and - for down.)

   c. What is the total amount of horizontal change for the entire set of stairs? (Remember to use + for right, and - for left.)

   d. Now calculate the slope for the entire set of stairs as follows:

$$\text{slope of whole set of stairs} = \frac{\text{total amount of vertical change}}{\text{total amount of horizontal change}} = \ ?$$

2. Now draw a set of 8 stairs that start 10 inches above the ground and go up from there. (As you move to the right on the graph.) Let each riser be 5 inches tall, and each tread be 10 inches long.



a. What is the slope of one stair?

b. What is the total vertical change for the entire set of stairs?

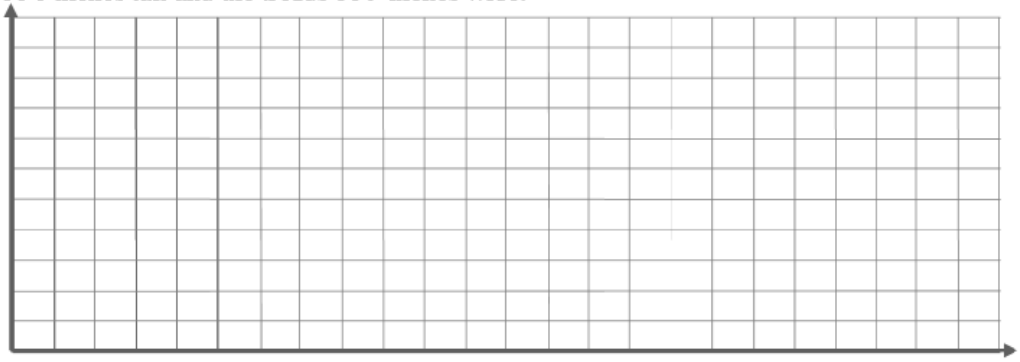
c. What is the total horizontal change for the entire set of stairs?

d. What is the slope of the entire set of stairs?

e. How does the slope of one stair compare with the slope of the entire set of stairs?

More Lesson 5-1A More Stairs and Slopes

Draw a set of five stairs that start 3 inches above the ground, and go ***up*** from there. Let the risers be 6 inches tall and the treads be 9 inches wide.



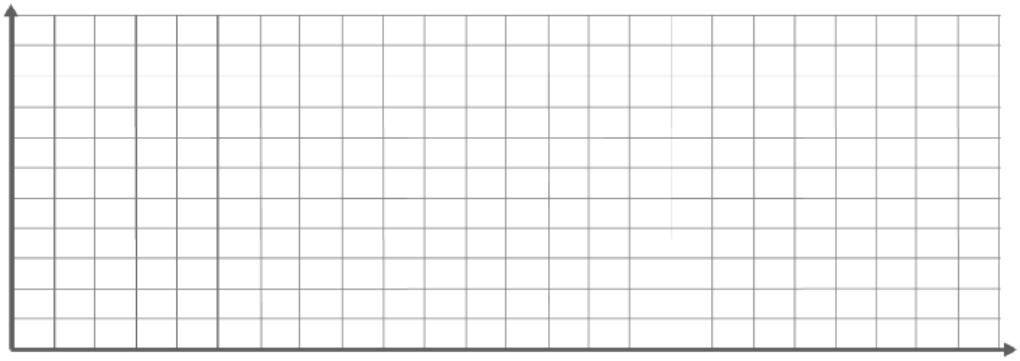
1. What is the slope of one stair?

2. What is the slope of the entire set of stairs?

3. How does the slope of one stair compare to the slope of the entire set of stairs?

4. On your graph above, draw the line that starts 3 inches above the ground and has the same slope as the stairs.

5. What is the slope of the line?



6. Draw a set of 6 stairs that start 9 feet above the ground and go <u>down</u> from there with 1.5-foot risers and 2-foot treads.

7. What is the slope of one stair?

8. What is the slope of the entire set of stairs?

9. How does the slope of one stair compare with the slope of the entire set of stairs?

10. Draw the line that starts where the stairs start, and has the same slope.

11. On the grid provided, draw and label each of the following lines.

Line A: starting point (vertical or y intercept) of 1, and slope $\frac{2}{5}$

Line B: starting point (vertical or y intercept) of 6, and slope $\frac{-1}{4}$

Line C: starting point (vertical or y intercept) of -1, and slope $\frac{2}{3}$

Line D: starting point (vertical or y intercept) of 8, and slope of $\frac{-4}{3}$

12. Which two lines have positive slopes?

13. Which of these positive slopes is the steepest?

14 How can you tell which one is steepest?

15. Which two lines have negative slopes?

16. Which of these negative slopes is the flattest?

17. How can you tell which one is flattest?

18. Of all the lines, which is the flattest?

19. Explain how you can tell which is steepest or flattest when comparing positive slopes and negative slopes