

Horizontal and Vertical Lines

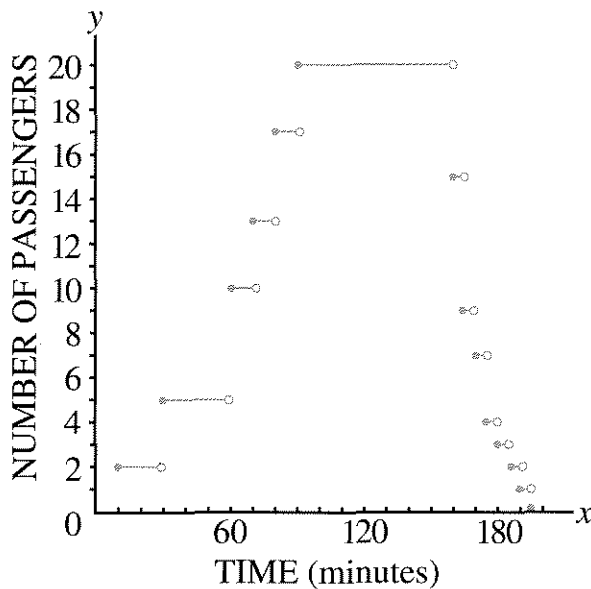
You will need:

graph paper



STEP FUNCTIONS

1. This graph shows how the number of passengers in the Alaberg Airport Express van changes over time. The graph shows a trip between the city and the airport.
 - a. Write a description of what is shown by this graph.
 - b. Why is there a long horizontal line on the graph?



Definitions: This graph is an example of a *step function*. Note that the endpoints of the steps are either filled-in (this is called a *closed circle*), or hollow (this is called an *open circle*).

For a given value of x , the value of y can be found by looking for the corresponding point on the graph. Only points on the steps and closed circles are considered to be on the graph. The open circles are there to show where the step ends, but that point is not considered to be on the graph. This way a given x -value has only one corresponding y -value.

2. After 60 minutes, how many people were in the van?

HORIZONTAL AND VERTICAL LINES

3.
 - a. Graph the vertical line through the point $(1, -2)$.
 - b. Label four more points on this line.
 - c. Which coordinate is the same for all the points on the line, the x -coordinate or the y -coordinate?
4.
 - a. Graph the horizontal line through the point $(1, -2)$.
 - b. Label four more points on this line.
 - c. Which coordinate is the same for all the points on the line, the x -coordinate or the y -coordinate?
5.
 - a. The equation of a line is $y = -3$. There is no x in the equation because the value of y does not depend on the value of x . Graph this equation.
 - b. Did you graph a horizontal or a vertical line?

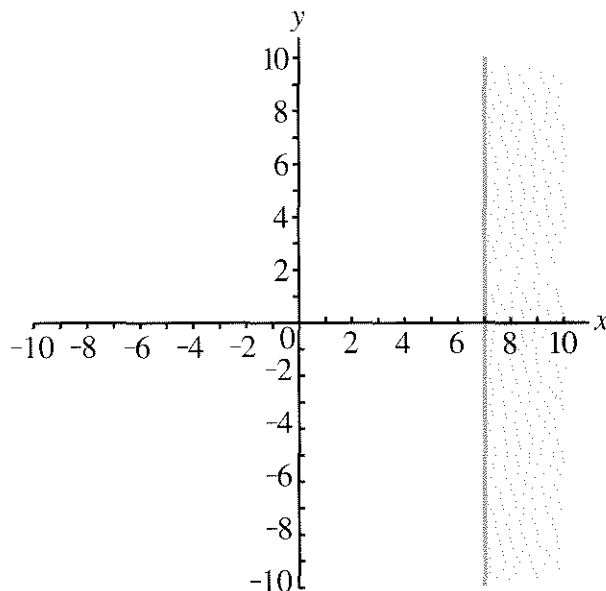
6. a. The equation of a line is $x = 6$. There is no y in the equation because the value of x does not depend on the value of y . Graph this equation.
- b. Did you graph a horizontal or a vertical line?
7. a. Graph the vertical line through $(2, -5)$. Write its equation.
- b. Find the coordinates of any point on the line.
- c. Find the coordinates of any point to the right of the line.
- d. Find the coordinates of any point to the left of the line.
- e. For each part (b), (c), and (d), answer this question: What do you think all the points chosen by students in your class have in common?
8. The equation of a line is $y = 5$. If possible, answer these questions without graphing the line.
- a. Is the line vertical or horizontal?
- b. Where does the point $(4, -2)$ lie in relation to the line? Explain.
- c. Write the coordinates of one point on the line and one point not on the line.
- d. What can you say about the y -coordinate of any point that lies on the line? Below the line? Above the line?

INEQUALITIES

The x -coordinate of any point that lies to the left of the vertical line $x = 6$ must be a number less than 6. For example $(2, 7)$ is such a point, since $2 < 6$. The expressions $2 < 6$ and $x < 4$ are examples of *inequalities*.

9. The mathematical shorthand for *less than* is $<$. What are the mathematical symbols for *greater than*, *less than or equal to*, and *greater than or equal to*?

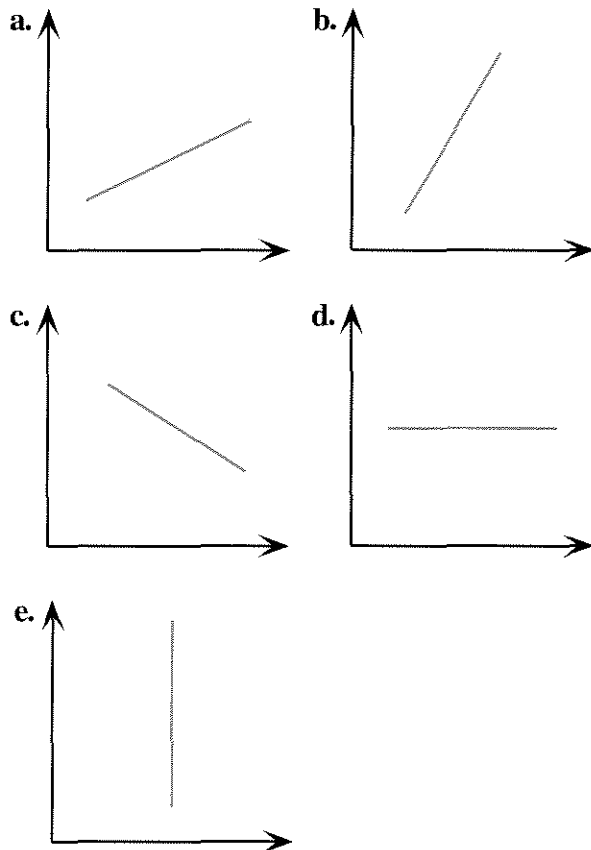
Inequalities can be used to describe sets of points on a graph. For example, all the points that lie on or to the right of the line $x = 7$ can be described by the inequality $x \geq 7$.



10. Graph each set of points given. Use one or more inequalities to describe it.
- a. All points that lie on or below the line $y = -1$
- b. All points that lie on or above the x -axis
- c. All points that lie on or between the vertical lines $x = 3$ and $x = 6$
11. **Report** Write an illustrated report on horizontal lines, vertical lines, and inequalities.

DISTANCE VS. TIME, AGAIN

These graphs represent the motion of Paul's car. The vertical axis shows distance from his house, and the horizontal axis shows time.



12. Describe the trips shown in each graph. Are all of them possible?

COST OF MAILING A LETTER

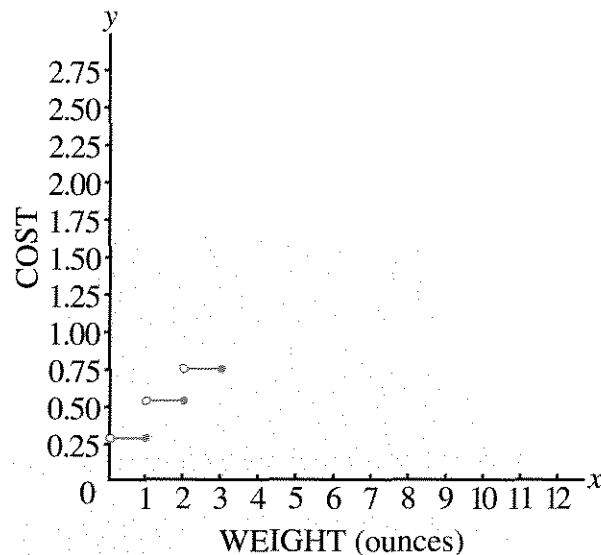
In January of 1991 the United States Postal Service raised its rates for first-class mail. It printed the following table in a flyer for postal customers.

13. Answer questions (a-c) using the information in the following table.

Single-Piece Letter Rates:

Pieces not exceeding (oz)	The rate is	Pieces not exceeding (oz)	The rate is
1	\$0.29	7	\$1.67
2	\$0.52	8	\$1.90
3	\$0.75	9	\$2.13
4	\$0.98	10	\$2.36
5	\$1.21	11	\$2.59
6	\$1.44		

- a. How much does it cost to mail a letter weighing 7 and 1/2 ounces?
 - b. How much does it cost to mail a letter weighing exactly 3 ounces?
 - c. Would it be possible for a letter to cost 45 cents to mail? If so, how much would it weigh? If not, explain why not.
14. Use the data in the table to graph the relationship of cost to weight. It is a step function. Copy and complete this graph.



15. Study the table. What is the rule being used to determine these rates?