LESSON 4.10 Up in the Air

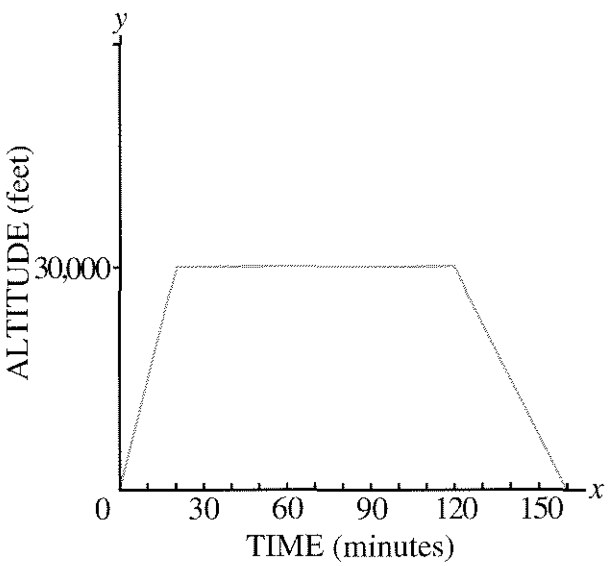
You will need:

graph paper

People rarely travel at constant speeds. Almost all travel involves speeding up and slowing down. However, sometimes to simplify a problem it is useful to use the average speed over a given period of time. In this lesson we will use the average speed.

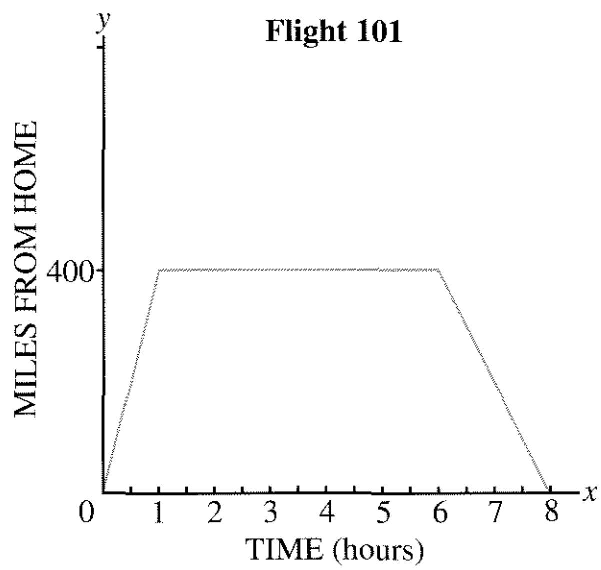
MULTIPLE MEANINGS

The graph below shows the relationship between the altitude of the airplane and the time after take-off.



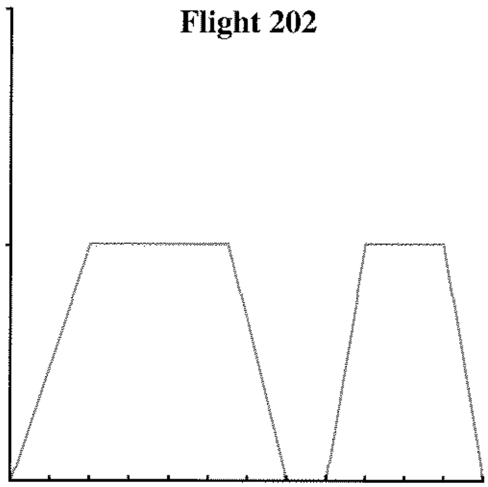
1. How high was the airplane 20 minutes after take-off?
2. How long after take-off did the airplane reach its cruising altitude?
3. How long did the plane cruise at a constant altitude before descending?
4. Can you figure out the speed of the airplane from this graph? Explain.

The graph below shows that Flight 101 left its home airport at 8 A.M. and flew to the town of Alaberg. It stayed in Alaberg for several hours and then returned to its home airport.



5. According to the graph, how far away is Alaberg?
6. How long did it take Flight 101 to get to Alaberg?
7. How long did the plane stay in Alaberg?
8. Can you figure out the speed of the airplane from this graph? Explain.

Someone made this graph about Flight 202, but accidentally left off the labels and the scale for the axes.

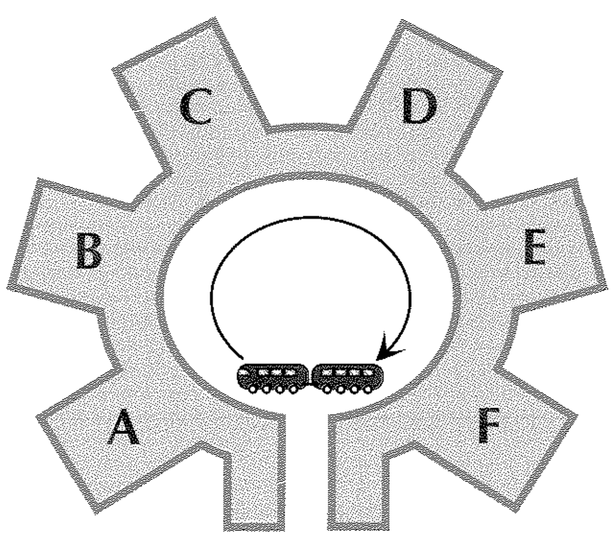


9. Copy the graph and label the axes like those in the figure just before problem 1. Write a description of what the graph conveys.

10. Make another copy of the graph and label the axes like those in the figure preceding problem 5. Write a description of what that graph conveys.

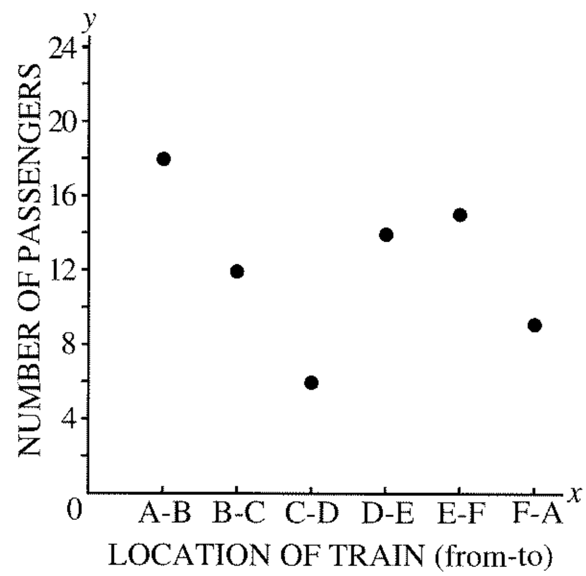
11. What else might the axes and scale be for the graph about Flight 202? Make up another possibility and write a description of what your graph shows.

DISCRETE AND CONTINUOUS GRAPHS



Alaberg has a large airport with several terminals. A small train runs through the airport, carrying passengers between the terminals. Passengers use this train when they have to transfer from one plane to another. The graph shows the relationship between the location of the train between the terminals and the number of passengers in the train.

12. Write a description of what is conveyed by this graph.



13. Can you tell how many passengers got on and off at each terminal? Explain.

14. Can you tell if the train was ever empty?

15. Can you tell from this graph how fast the train was traveling?

The Alaberg Airport Express is a van service that carries passengers between the city and Alaberg Airport. A group of math teachers is holding a convention in Alaberg, and 1024 people have arrived at the airport. They all need to get into the city.

16. If the Alaberg Airport Express van holds 20 people, how many trips will be needed to take all the people into the city?

17. If more vans were available, fewer trips would be needed per van. If 15 vans were available, and the trips were divided as evenly as possible among the vans, what would be the maximum number of trips that any van would need to take?

18. Copy and complete the table to show the relationship between vans available and maximum number of trips per van necessary. (Once again, assume that the trips would be divided as evenly as possible among the vans.)

Number of vans	Max number of trips per van necessary
1 . . . 15	

19. a. Make a graph from your table.

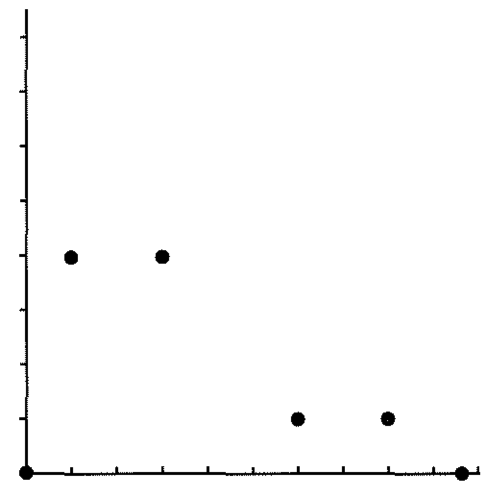
b. What is the rule for finding the maximum number of trips per van necessary, given the number of vans?

20. The graphs you used in problems 12 and 19 involved points instead of lines. Explain why it does not make sense to connect these points.

Definition: If the points are not connected on a graph, it is called *discrete*. If the points are connected, it is called *continuous*.

YOUR OWN GRAPHS

21. The meaning of this graph is still up in the air until you add some things to it. Copy the graph, label the axes, and show the scale. If it makes sense, connect the points. Tell what the graph conveys.



22. Make up a discrete graph. Label the axes and indicate the scale. Write a description of what the graph conveys.

23. Repeat problem 22 for a continuous graph.