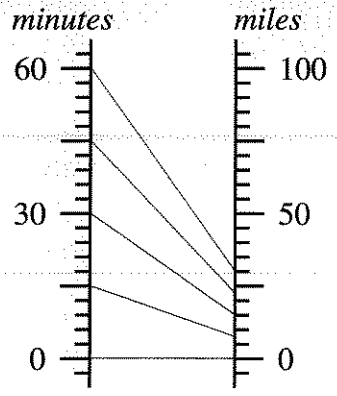
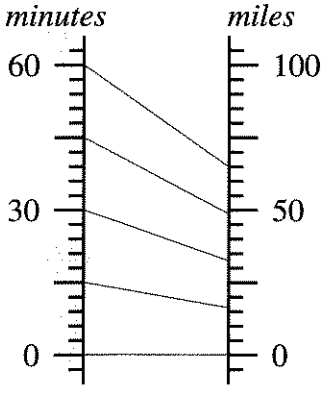
2.8 Time, Distance, Speed

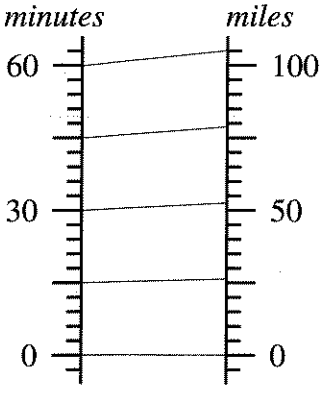
MOTION PICTURES



Roller Skater



Cheetah



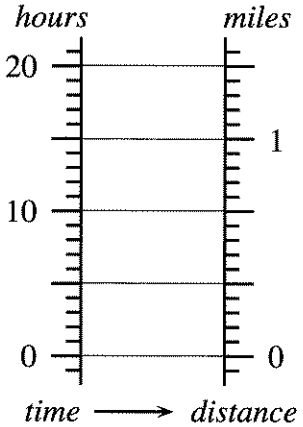
Needletail

The above function diagrams represent the motion of three living creatures: a fast roller skater; a cheetah (one of the world's fastest mammals, it's a large, wild cat that lives in Africa); and a white-throated needletail (one the world's fastest birds, it lives in Australia).

The diagrams assume that the three creatures ran a one-hour race, and were able to maintai their top speed for the full hour. (This is not realistic, but then neither is the idea of a rolle skater racing with a cheetah and a bird.)

Each diagram shows minutes on the x-numbe line, and miles on the y-number line.

1. Use the diagrams to estimate how far eac went in an hour.
2. After thirty minutes, approximately
   a. how far is the needletail ahead of the cheetah?
   b. how far is the cheetah ahead of the skater?
3. Estimate each speed
   a. in miles per hour;
   b. in miles per minute.
4. Explain how time-distance function diagrams allow you to compare speeds. Time is on the x-number line, distance is on the y-number line. Where is speed?



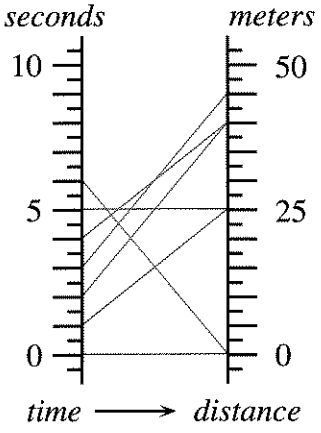
Sloth

5. The preceding diagram shows the hypothetical progress of a sloth. The x-number line represents time in hours, and the y-number line represents distance in miles. Compare the sloth's motion to the motion of the skater, cheetah, and needletail. How fast is it going per hour? Per minute?

6. Explain why someone comparing the sloth's speed to the needletail's might make a mistake and take the diagrams to mean the sloth is almost as fast as the needletail.

THE BALL

In a physics experiment, a ball is launched straight up by some device, and its height above the ground is recorded at one-second intervals. The resulting information is displayed in the function diagram below, where the x-number line represents time in seconds, and the y-number line represents distance from the ground at that time in meters.



Ball

On the function diagram, follow the motion of the ball with your finger on the y-number line, second by second.

7. During which one-second interval(s) did the ball move the fastest? The slowest?

8. At what time did the ball change direction?

9. Make a table like this one, showing the height of the ball at one-second intervals. Extend the table until you have included all the information given on the function diagram.

Time (seconds)	Height (meters)
0	0
1	25
2	...

10. Estimate the times when the ball was at the following heights. (Give two times for each part, one on the way up, and one on the way down.)
    a. 40 m b. 30 m
    c. 20 m d. 10 m