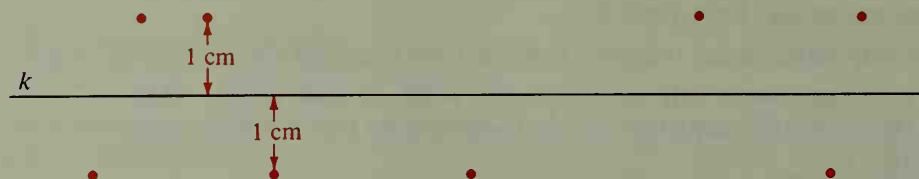
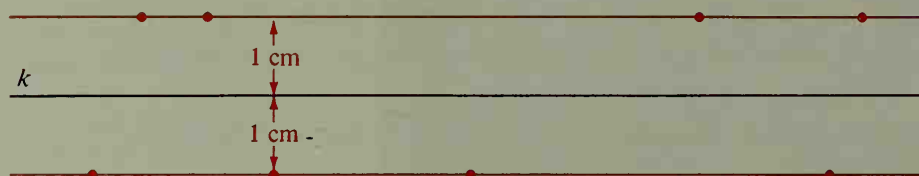


Suppose we have a line  $k$  in a plane and wish to picture the locus of points in the plane that are 1 cm from  $k$ . Several points are shown in the first diagram below.



All the points satisfying the given conditions are indicated in the next diagram. You see that the required locus is a pair of lines parallel to, and 1 cm from,  $k$ .



Suppose we wish to picture the locus of points 1 cm from  $k$  without requiring the points to be *in a plane*. The problem changes. Now you need to consider all the points in space that are 1 cm from line  $k$ . The required locus is a cylindrical surface with axis  $k$  and a 1 cm radius, as shown below. Of course, the surface will extend in both directions without end, just as line  $k$  does.



When you are solving a locus problem, always think in terms of three dimensions unless the statement of the problem restricts the locus to a plane.

## Classroom Exercises

1. Draw a point  $A$  on the chalkboard.
  - a. Draw several points on the chalkboard that are 20 cm from  $A$ .
  - b. Draw all the points on the chalkboard that are 20 cm from  $A$ .
  - c. Complete: The locus of all points on the chalkboard that are 20 cm from point  $A$  is     ?.
  - d. Remove the restriction that the points must lie in the plane of the chalkboard. Now describe the locus.