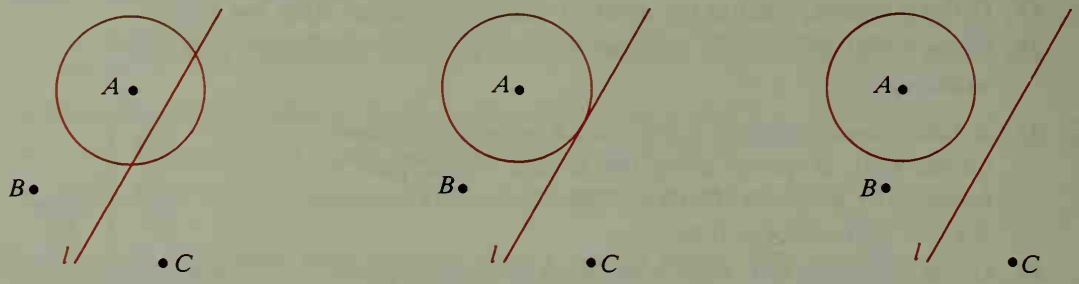
The locus of points satisfying *both* conditions given on the previous page must lie on both circle A and line l. There are three possibilities, depending on the positions of A, B, and C, as shown below.



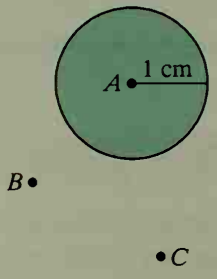
All three can be described in one sentence:

> The locus is two points, one point, or no points, depending on the intersection of the circle with center A and radius 1 cm and the line that is the perpendicular bisector of $\overline{BC}$.

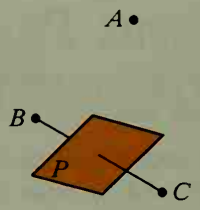
The example that follows deals with the corresponding problem in three dimensions.

Example Given three noncollinear points A, B, and C, what is the locus of points 1 cm from A and equidistant from B and C?

Solution



The first locus is sphere A with radius 1 cm.



The second locus is plane P, the perpendicular bisector of $\overline{BC}$.

Possibilities:

The plane might cut the sphere in a circle.
The plane might be tangent to the sphere.
The plane might not have any points in common with the sphere.

Thus, the locus is a circle, one point, or no points, depending on the intersection of the sphere with center A and radius 1 cm and the plane which is the perpendicular bisector of $\overline{BC}$.