

## Basics of Geometry

A solid definition should use only terms that have been previously defined or are at least well-understood by the reader. So, at some point, there must be terms that are the beginning of our understanding. In Geometry, those terms are “point,” “line,” and “plane.” Even though these terms are not defined, we must understand them and be able to form a mental image of them.

**Point:** In Geometry, a point represents a location in space. We generally represent points as dots in two dimensions and small spheres when we think in three dimensions. These models help our eyes transfer this concept to our brains. In reality, a point has NO thickness at all. If we could measure exactly three feet up from the floor, then seven feet from the wall in front of us, and five feet from the wall on our right, we would be at a point in space. If we could show that point by “pointing” to it with the “point” of a needle, and then move the needle a hundredth of an inch, would we be at the same point? No. What about a millionth of an inch? No. A vigintillionth? The key word is “move.” If we moved at all, we would be in a new location, no matter how small the move. So a point has no thickness. A point model has to have thickness, so we can see it. For this purpose, think of a point as being round and small, like the beads that make up a ceiling fan’s pull-chain.

**Line:** A line is an infinite number of points in a straight path, extending forever in both directions. Again, think of our point as being the small bead. Then a line would be the whole pull-chain, but having no end. If it had a beginning and end, it would represent a segment. If it had a beginning but no end, it would be a ray.

**Plane:** Imagine a shoe box lid. Now pour our pull-chain beads into the lid until the bottom is covered exactly one bead deep. Now imagine the shoe-box lid has expanded to the size of a room, but still has the floor completely covered, one bead deep. Do you see that if you looked at the floor from one angle, the bead patterns would form lines? If you moved to a different location, they would still form lines, but in a different direction, sort of like the headstones in a military cemetery. Now imagine an infinitely large floor...

So points are the building material of lines and planes. And each line lies completely within a plane. If we could freeze our beads in place and clone that plane, then turn it at an angle so it intersects our original plane, the place where the planes cross would be a row of our beads, thus forming a line. When two lines cross, there would be one bead (point) that is on both lines. So the intersection of two lines is a point, and the intersection of two planes is a line. Unless, of course, the two planes are parallel or the two lines are parallel or skew.

Most folks have a good idea of the concept of “parallel,” but many are unsure of “skew.” Picture this: Take a pull-chain and stretch it straight on a table-top, running north-south. Now take a second pull-chain. Hold it **above** the table-top, and stretch it straight in any direction **except** north-south. The lines represented will get close to each other, but will not touch. They are skew.