Converting between Description of Planes

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1 Goals

The goals of this activity are:

1. To give students practice working with planes and their various descriptions.
2. To stress the relationship between the concept of spanning and the various sneaky mathematicians activity.

2 Materials

For this activity you will need:

1. White boards (or alternatively, flip chart paper)
2. Markers

3 Instructions

This activity will take approximately 80 minutes.

1. Form 6 groups of 3 to 4 students, and explain the goals of the activity.
2. Ask students to discuss any observations they have about how the various sneaky mathematicians activity is related to converting between the descriptions of planes they have just been reading about.
3. Explain that the class as a whole will now work on creating a dictionary for converting one description of a plane to another. If possible, use 6 portable whiteboards, and assign each group a whiteboard. Ask the groups to the two sides of the white boards for two different conversion.
4. Emphasize that it is good to think about concrete examples before writing down a general method to perform the conversions.
5. When students are done, organize a gallery walk for students to look at each other's work.
6. Ask each student to identify a conversion they have the least amount of confidence in, and provide the student with an example conversion to perform. Students can use the white boards for help.

4 Tips

1. This activity comes after the various sneaky mathematicians activitiy, and just after students have read about planes.

2. Perhaps you can assign two students to converting between parametric and 3 point, and two students to equation and point-normal. Assign four students to each of the remaining four combinations, since the other combinations are harder.

3. Some examples you could give students are:

   Equation: $2x + 5y - z = 3$
   Point-normal: $(2, 0, 1), (2, 5, -1)$
   Parametric: $(2, 0, 1) + t(1, 0, 2) + t'(0, 1, 5)$
   3 Point: $(1, 2, 9), (0, 2, 7), (2, 0, 1)$

   and

   Equation: $x + 2y + 3z = 5$
   Point-normal: $(2, 0, 1), (1, 2, 3)$
   Parametric: $(2, 0, 1) + t(-2, 1, 0) + t'(-3, 0, 1))$
   3 Point: $(5, 0, 0), (3, 1, 0), (2, 0, 1)$

4. Emphasize that many different answers are possible for each of the descriptions.