Finding Lines and Planes

LINES: To find the equation of line, you need

1. ANY POINT ON THE LINE

2. ANY DIRECTION VECTOR PARALLEL TO THE LINE

3. Then one parameterization of the line is: $\mathbf{r} = \mathbf{r_0} + t\mathbf{v}$.

PLANES: To find the equation of a plane, you need

1. ANY POINT ON THE LINE

2. ANY NORMAL VECTOR TO THE PLANE

3. Then any vector on the plane must be orthogonal to $\mathbf{n}$ so we get the equation: $\mathbf{n} \cdot (\mathbf{r} - \mathbf{r_0}) = 0$.

GIVEN A PROBLEM:
- [I] IDENTIFY WHAT YOU NEED.
- [II] CAREFULLY READ AND SUMMARIZE WHAT YOU ARE GIVEN.

LINES $\longrightarrow$ GIVEN 2 POINTS A and B $\longrightarrow$
$$\begin{cases} \vec{r_0} = \vec{A} \\ \vec{v} = \vec{AB} = \vec{B} - \vec{A} \end{cases}$$

NOT GIVEN 2 POINTS

↳ IS THE INFORMATION YOU NEED ALREADY GIVEN?

↳ CAN YOU SOLVE FOR TWO POINTS?

PLANES $\rightarrow$ GIVEN 3 POINTS, A, B and C $\rightarrow$
$$\begin{cases} \vec{r_0} = \vec{A} \\ \vec{n} = \vec{AB} \times \vec{AC} \end{cases}$$

NOT GIVEN 3 POINTS

↳ IS THE INFORMATION YOU NEED ALREADY GIVEN?

↳ CAN YOU SOLVE FOR THREE POINTS?