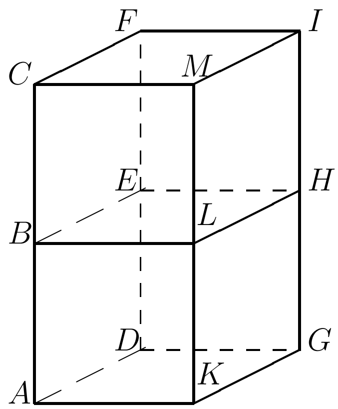
Much of our upcoming work with axiomatic geometry will involve careful, deductive reasoning based on geometric diagrams and notation. We reviewed basic definitions and notation through the earlier Summary in our manual, but some subtle implications of those definitions are easily overlooked when specific diagrams are present. Below are some additional issues to be aware of throughout the rest of the course. Refer to the diagram below of two square blocks stacked atop each other.



- **MOST IMPORTANT: We are NOT operating at merely van Hiele level 0 in this course, so just because an object isn't literally <u>shown</u> in a diagram doesn't mean the object doesn't <u>exist</u>!** For instance, although my diagram is drawn showing only line segments, it determines all sorts of other or extended objects as well; here are a few:
  1. $\overline{KH}$ exists even though it's not drawn initially.
  2. $\overleftrightarrow{AB}$ exists and is not the same as $\overline{AB}$: line $\overleftrightarrow{AB}$ extends infinitely in both directions; segment $\overline{AB}$ definitely has two endpoints cutting it off.
  3. $\angle ACM$'s sides are NOT merely the segments shown, but rather the unending rays $\overrightarrow{CA}$ and $\overrightarrow{CM}$ because that's how the terms "'angle" and 'side" are defined. The definition of a term <u>always</u> takes precedence of the limitations of a picture.
  4. $\angle FEK$ exists (and is made of two unending rays, of course), even though it would be very difficult to typeset or even hand-draw that angle.

  You always can <u>and should</u> visualize (or literally draw in!) any necessary auxiliary lines, rays, etc. in diagrams in this course.

- The perspective issue in 2-dimensional drawings of 3-dimensional objects can be misleading. If necessary, reconsider or revisualize 3-D objects like this one in terms of floor, ceiling, and walls of square or rectangular rooms. That enables you to make better sense of claims such as "$\overleftrightarrow{AD}$ is perpendicular to $\overleftrightarrow{AK}$," which is true even though in the 2-D flat diagram, a child might try to argue that the angle formed between those two lines at point A doesn't "look like" a right angle.

- Traditionally, notational names for lines in geometry use the points that are shown farthest apart on it, writing those two letters in alphabetical order. So for instance, $\overleftrightarrow{AB}$, $\overleftrightarrow{AC}$, $\overleftrightarrow{BA}$, and $\overleftrightarrow{CB}$, and $\overleftrightarrow{CA}$ are all correct names for the same line determined by our diagram, but traditionally, the name $\overleftrightarrow{AC}$ would be preferred. We'll use this same practice, as it makes it easier to communicate with each other.

- Notational names for rays always require that the endpoint letter be used, but it is traditional that the other letter used be the point that is shown farthest along the ray from the endpoint. So for instance, while $\overrightarrow{AB}$ and $\overrightarrow{AC}$ are both correct names for the same ray determined by our diagram (remember: a ray doesn't "stop" at the second point), traditionally, the name $\overrightarrow{AC}$ would be chosen. Alphabetical lettering is NOT always correct for rays, for the endpoint letter must always be written under the endpoint symbol in the notation, as we discussed in class. Thus, the name $\overrightarrow{CA}$ refers to a different ray from $\overrightarrow{AC}$, pointing in a different direction, and so $\overrightarrow{CA}$ would not be correct as an alternative to $\overrightarrow{AC}$.

- Straight lines and straight angles look identical in diagrams, but they are named using different notation. For instance, the names $\overleftrightarrow{AC}$ and $\angle ABC$ both refer to the line extending along (and beyond) the front left edge of our stack, but the name $\angle ABC$ forces us specifically to think of that line as being created by two rays "stuck together" at point B but extending in opposite directions away from each other (think of clock hands where B is the center of the clock). That means the straight angle can have sides and a vertex, whereas the line cannot.

- A plane is traditionally named using three noncollinear points that it contains (see the text), but in figures such as this, it is sometimes more meaningful to use four letters. So while CFM would be one traditional name for the plane extending infinitely across the top surface of our stack of blocks, we can refer to that same plane as $CFIM$. Notice that planes can exist even when they aren't drawn originally (as we discussed earlier in this list), so something like plane $ACIG$ is a perfectly good plane to consider for our diagram.

  As a minor comment, points encountered as you travel around a plane (or plane figure later in the course) are traditionally listed in clockwise order. That's why I wrote the name as $ACIG$ (clockwise order in the picture) instead of as $ACGI$ (alphabetical order) even though both would be considered correct.