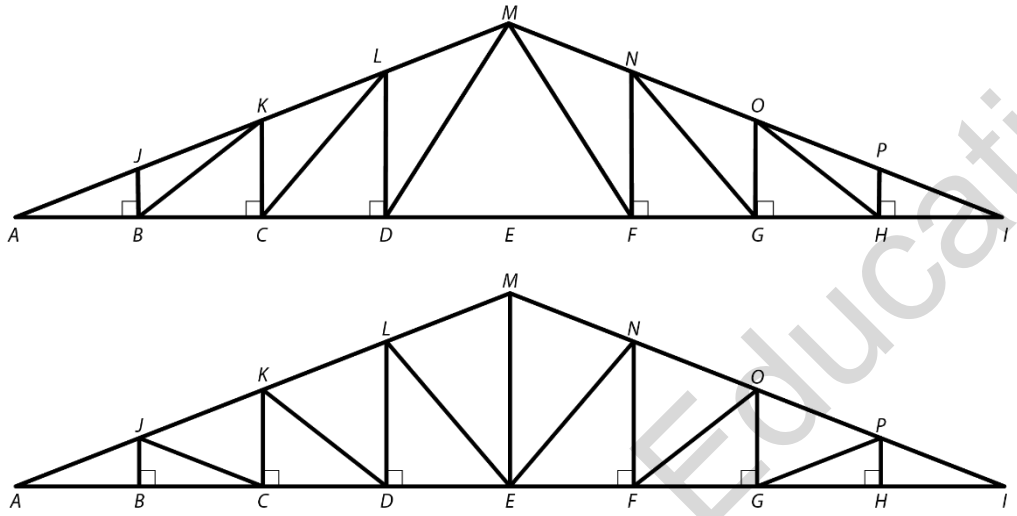
The Truss Bus

Think Like a Programmer



Busses get you places faster. So do spreadsheets and computer programs but without the loud noise and carbon emissions. The diagram shows two different roof trusses that can be fabricated from wood or steel. If you knew the overall width and height of the trusses, you could—because of your geometry superpowers—calculate the lengths of all the pieces required as well as the angles at which to assemble them. If you fabricated a different building and needed a truss with different overall dimensions, you could make those calculations all over again. As you have probably figured out, there's a better way that will save you time and money: solve the problem once.

Your challenge is to create a spreadsheet or write a program that will use the overall height and width of a truss to calculate the lengths of the pieces and the internal angles of all the triangles. Engineers use programs like this that not only calculate the dimensions but that also calculate the tension or compression on each member of the structure.

Here are the guidelines:

1. You and your partner can divide the labor and each tackle one of the trusses.
2. The only inputs to the spreadsheet or program are the overall width and height of the truss in feet.
3. The eight segments along the bottom of the truss are congruent.
4. $\overline{AM}$, $\overline{MI}$, and $\overline{AI}$ are three longer pieces of wood or steel, so you don't have to calculate the lengths of the smaller segments along any of them.

