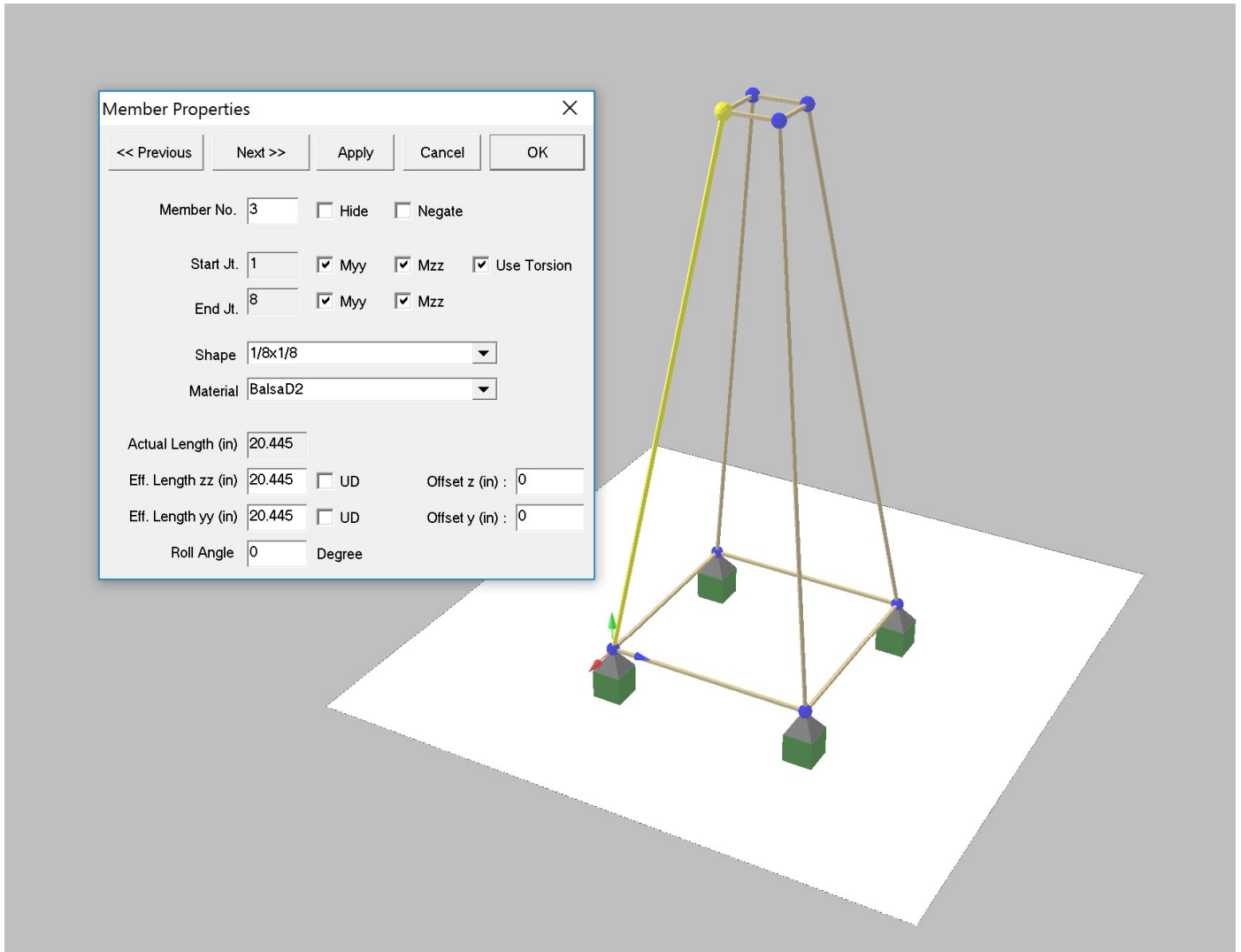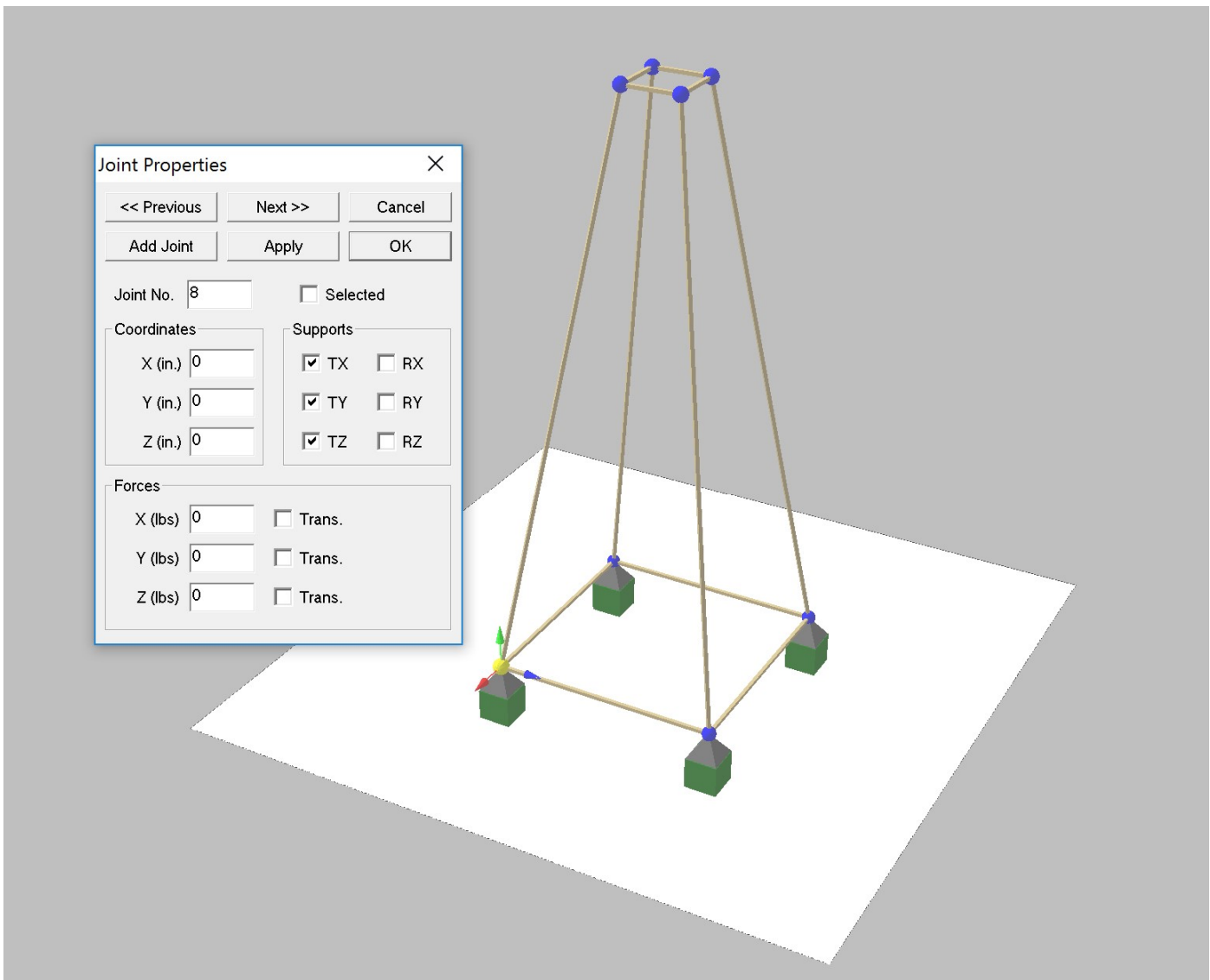# Model Geometry

Using a Unit Vector to find

Coordinates Along a Skewed Column

This example uses a unit vector to locate a node 4" from the base of the column measured along the column.

The unit vector for the column is: **c** = .14674**i** +.97823**j** -.14674**k**

(The unit vector was calculated in the previous example, "Calculating Angles Associated with Skewed Columns ".)

Once you have the unit vector this is a simple problem.

We need to convert the unit vector (**c**) to a vector with a magnitude of 4" directed along the column, C_4.

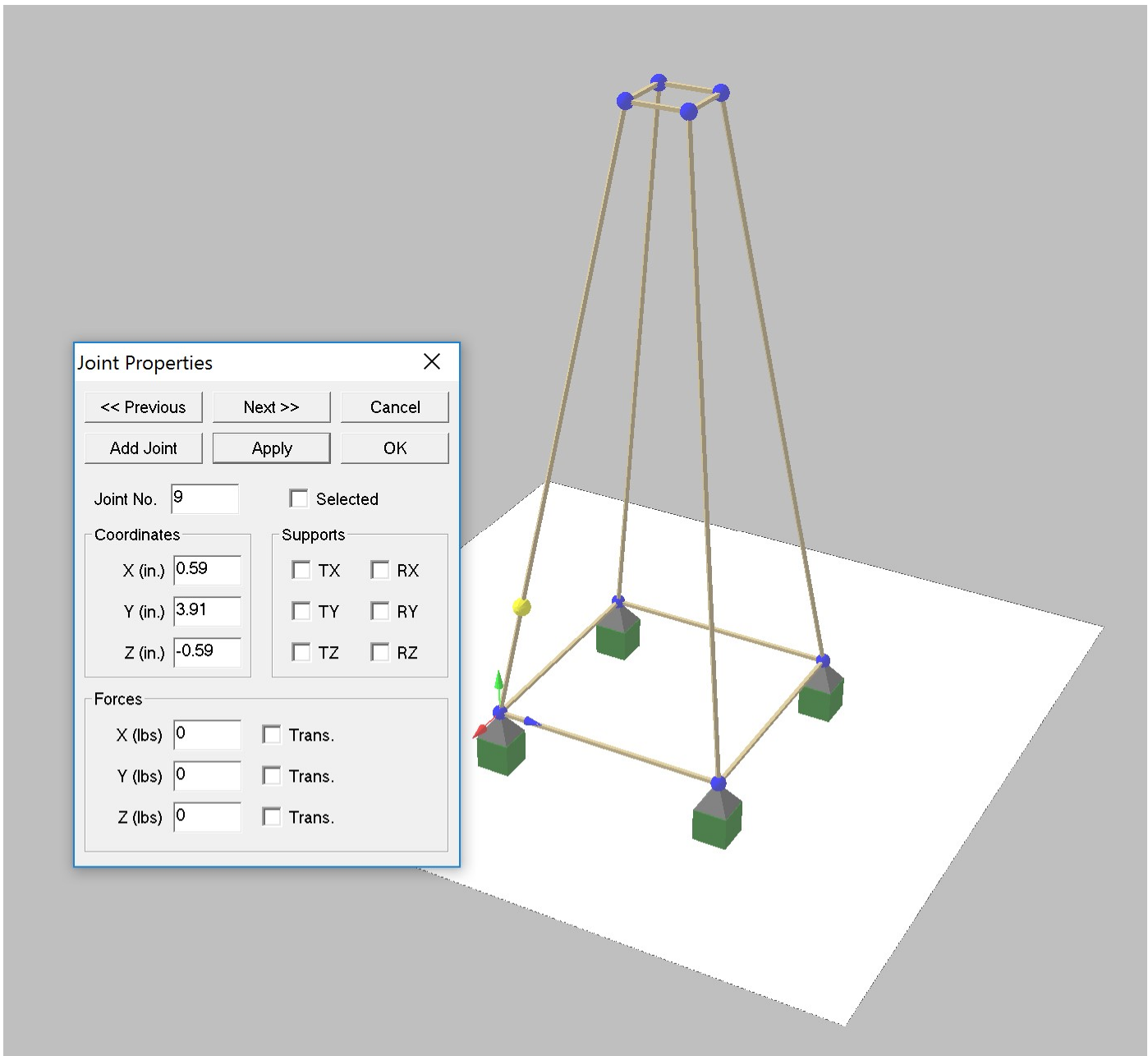The unit vector (**c**) is directed along the column but has a length of 1" not 4"

Let's multiply the unit vector times 4.:

$C_4 = 4c = 4(.14674i + .97823j - .14674k) = .59i + 3.91j - .59k$

Since I moved the origin to the base of the column, the coordinates of the new joint are:

C_4:(.59,3.91,-.59) or X=.59, Y=3.91, Z=-.59

Joint Properties ✕

[<< Previous] [Next >>] [Cancel]

[Add Joint] [Apply] [OK]

Joint No. 9   ☐ Selected

Coordinates   **Supports**

X (in.) 0.59   ☐ TX   ☐ RX

Y (in.) 3.91   ☐ TY   ☐ RY

Z (in.) -0.59   ☐ TZ   ☐ RZ

Forces

X (lbs) 0   ☐ Trans.

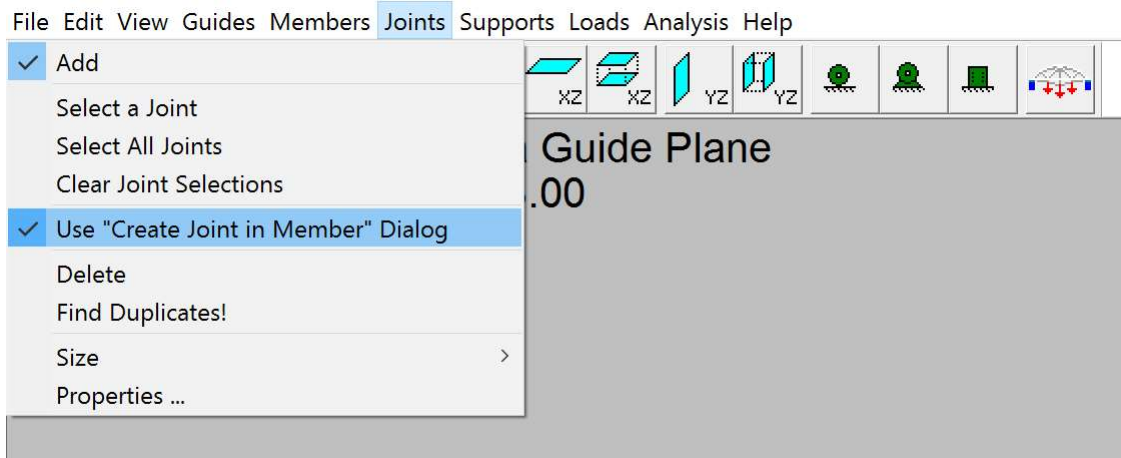Y (lbs) 0   ☐ Trans.

Z (lbs) 0   ☐ Trans.

Select "Properties" from the Joints menu. Click the "Add Joint" button and change the coordinates of the new joint to .59, 3.91, -.59 then click "Apply". Mathmagic!
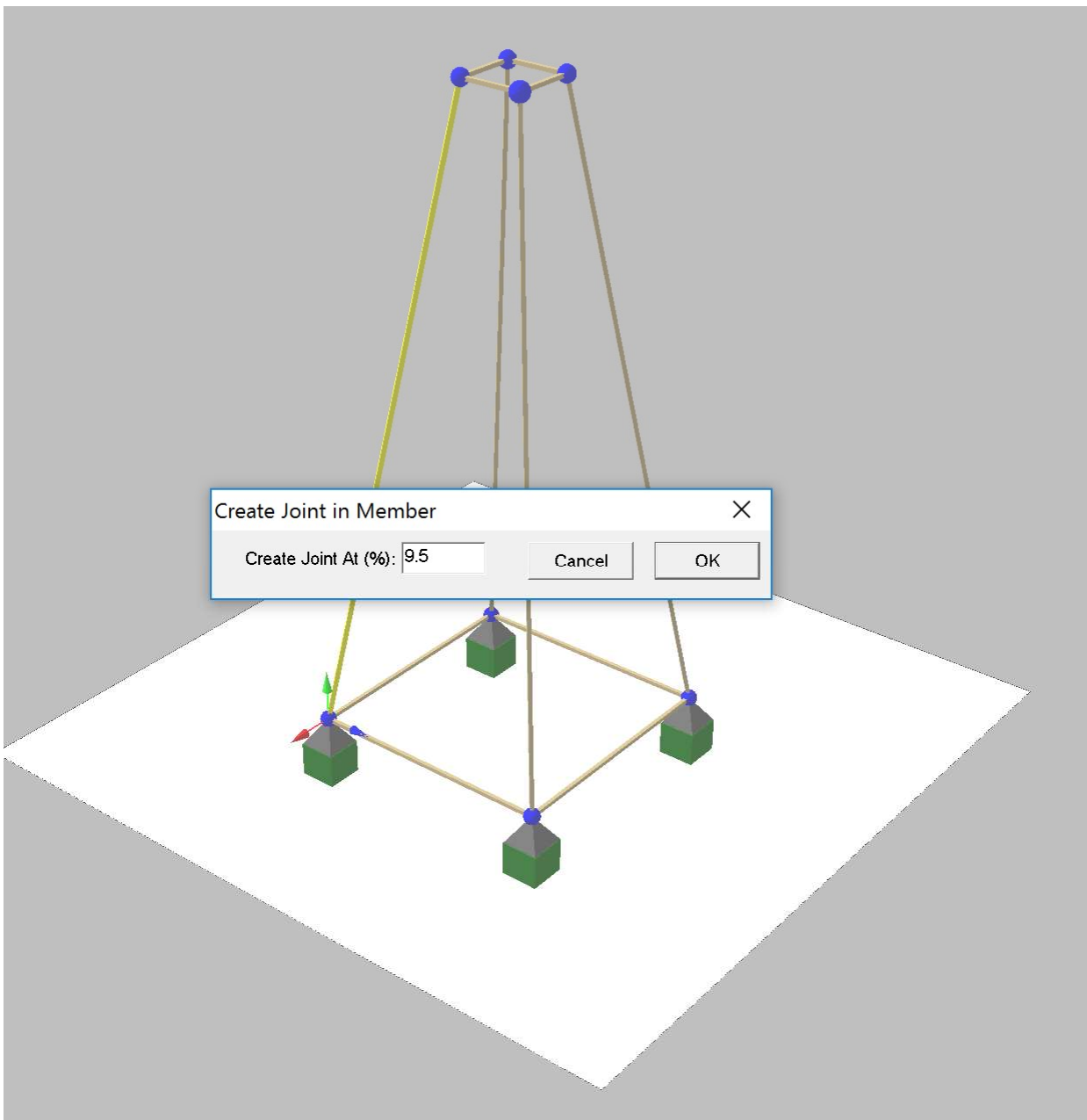
An aside:

To let ModelSmart3D know that this new joint is actually in this member you should erase the original column and put two members back in its place. Members must be drawn from joint to joint. Create all your new joints first then delete and reconnect the new member segments.

There is a menu option in ModelSmart3D that can do everything for you using a single percentage calculation.

Select the "Use Create Joint in Member Dialog" and "Add" menu options in the "Joints" menu

Click the column near the end where you want to add a joint.

I clicked 9.5% from the base (measured along the column).

If we want a joint at 4" from the base along the column:

Percent Distance =100[4/20.445] = 19.56%   Enter 19.56% and click "OK".

ModelSmart3D will create a joint in the column 4" from the base measured along the column.