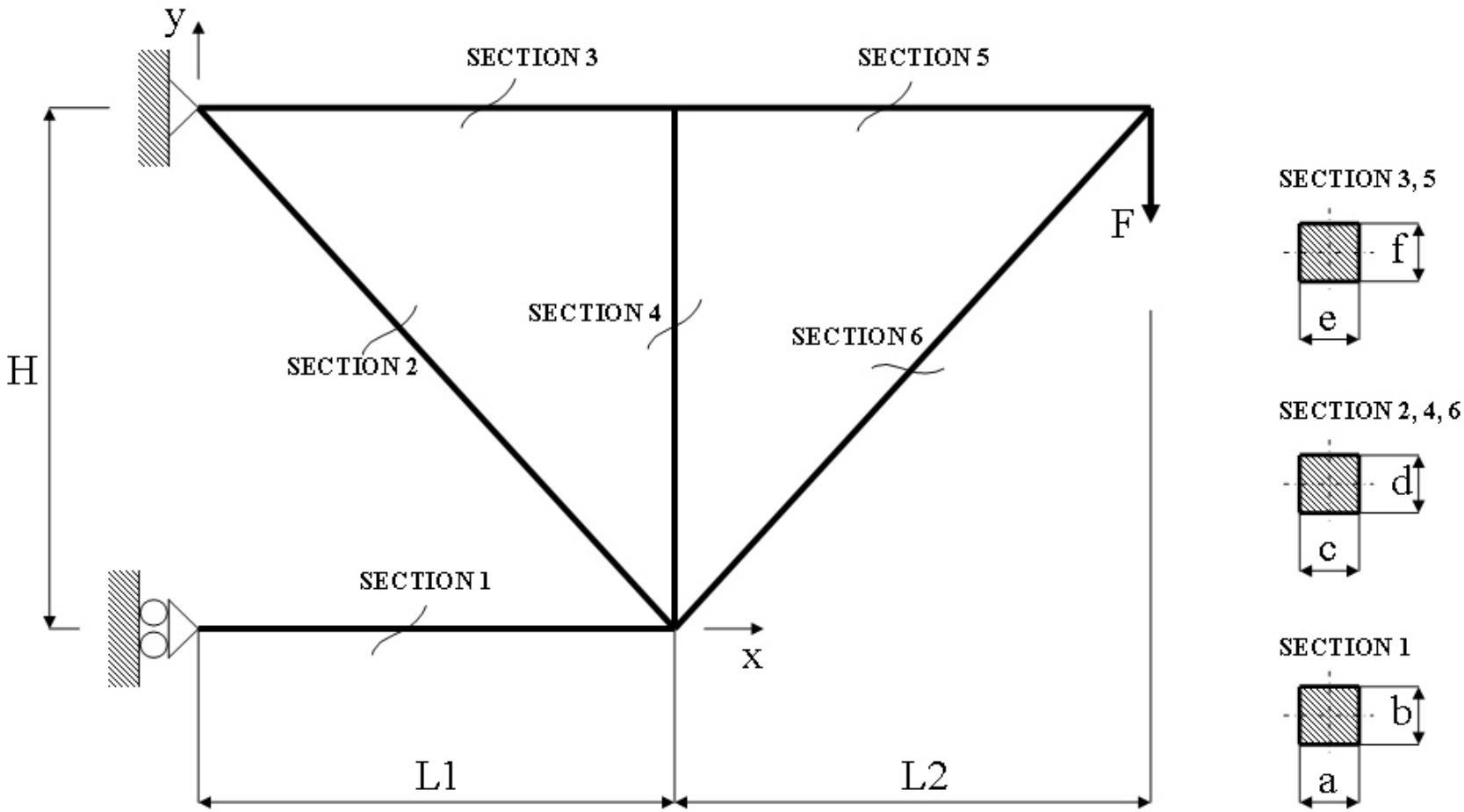
Course in ANSYS

Example0151

Example – Truss 2D



Example – Truss 2D

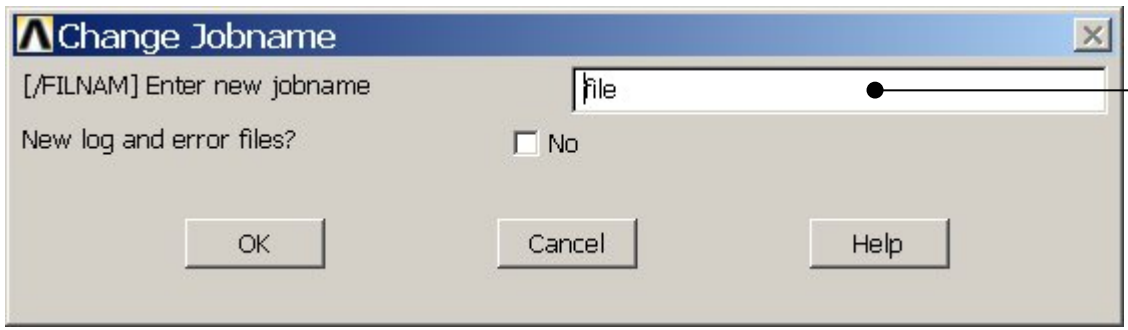
Objective:
Compute the maximum deflection
Tasks:
Display the deflection figure?
Topics:
Topics: Start of analysis, Element type, Real constants, Material, modeling, element size for beam models, saving/restoring

$E = 210000 N/mm^2$
$\nu = 0.3$
$L = 100mm$
$H = 120mm$
$a = b = 20mm$
$c = d = 10mm$
$e = f = 5mm$
$F = 1000N$

Example - title

Utility Menu > File > Change Jobname — GUI

/jobname, Example0151 — Command line entry

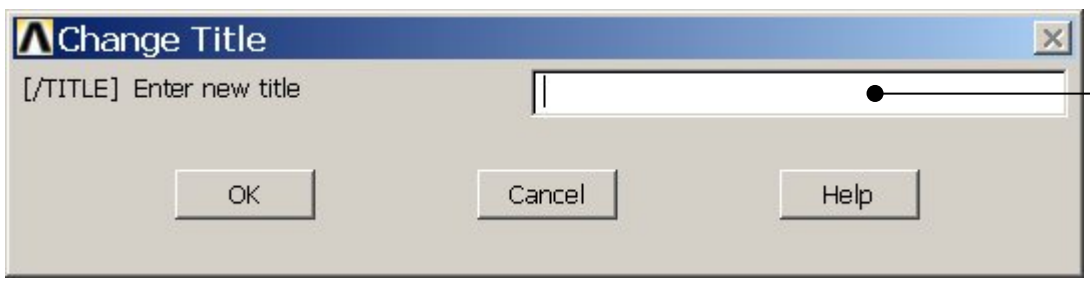


Enter: Example0151

Utility Menu > File > Change Title

/title, Truss 2D

Enter: Truss 2D



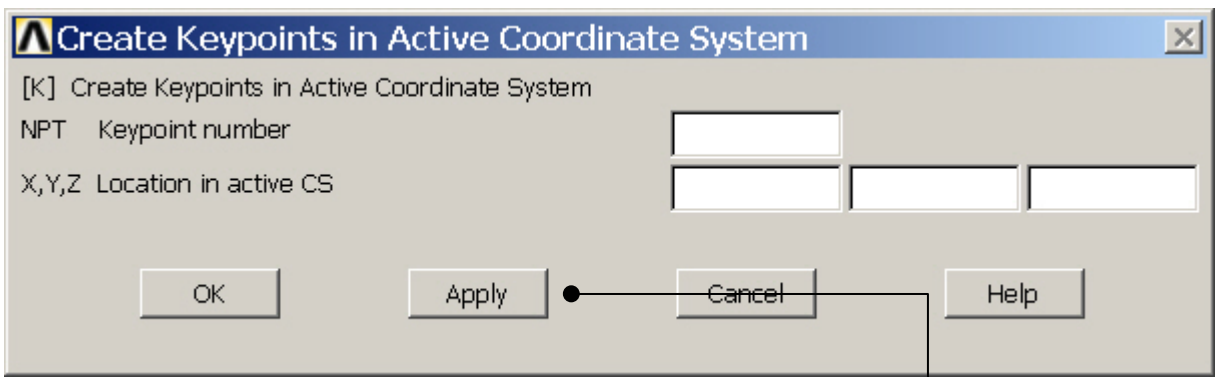
Example - Keypoints

Preprocessor > Modeling > Create > Keypoints > In Active CS

Enter five points with coordinates
0,0,0
0,120,0
100,0,0
100,120,0
200,120,0

General format:
K,#,X,Y,Z

Note: An empty # result in automatic numbering.

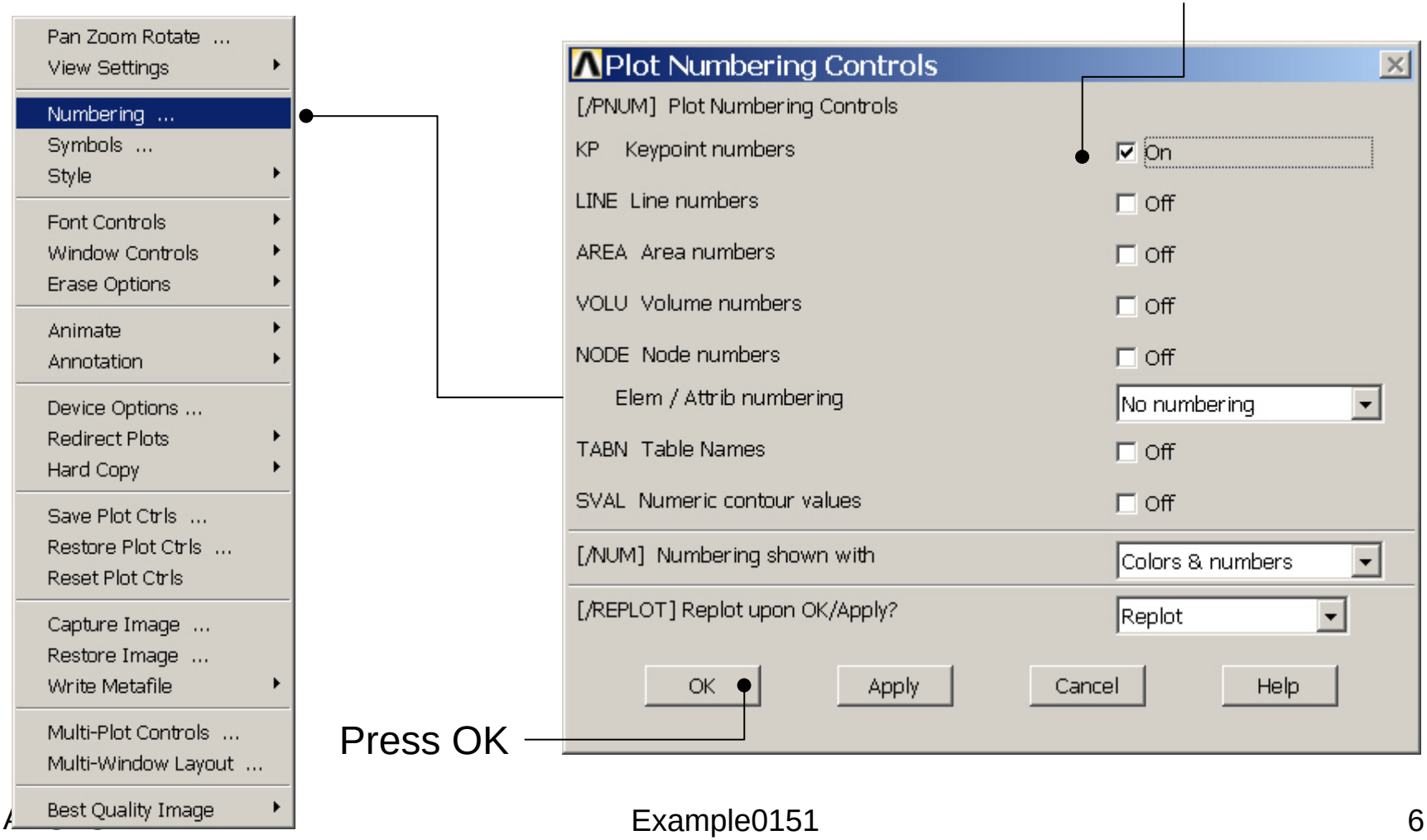


Enter 0,0,0
Press **Apply** for KP1
Enter 0,120,0
Press **Apply** for KP2
Enter 100,0,0
Press **Apply** for KP3
Enter 100,120,0
Press **Apply** for KP4
Enter 200,120,0
Press **Apply** for KP5

Example - Numbering

Utility Menu > PlotCtrls > Numbering

Switch on Keypoint numbers



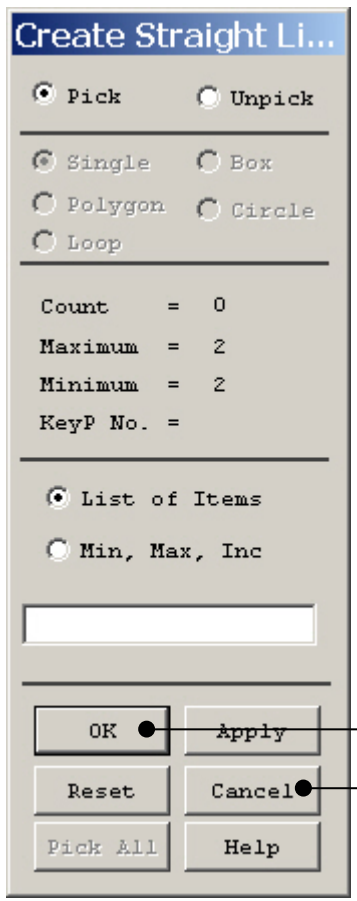
Press OK

Example - Lines

Preprocessor > Modeling > Create > Lines > Lines > Straight Line

Create a line between Keypoint 1 and Keypoint 2 and so on

L,1,3
L,2,3
L,2,4
L,3,4
L,4,5
L,3,5



HINT: By clicking with the right-hand mouse button you shift between the Pick/Unpick function. This is indicated by the direction of the cursor arrow:

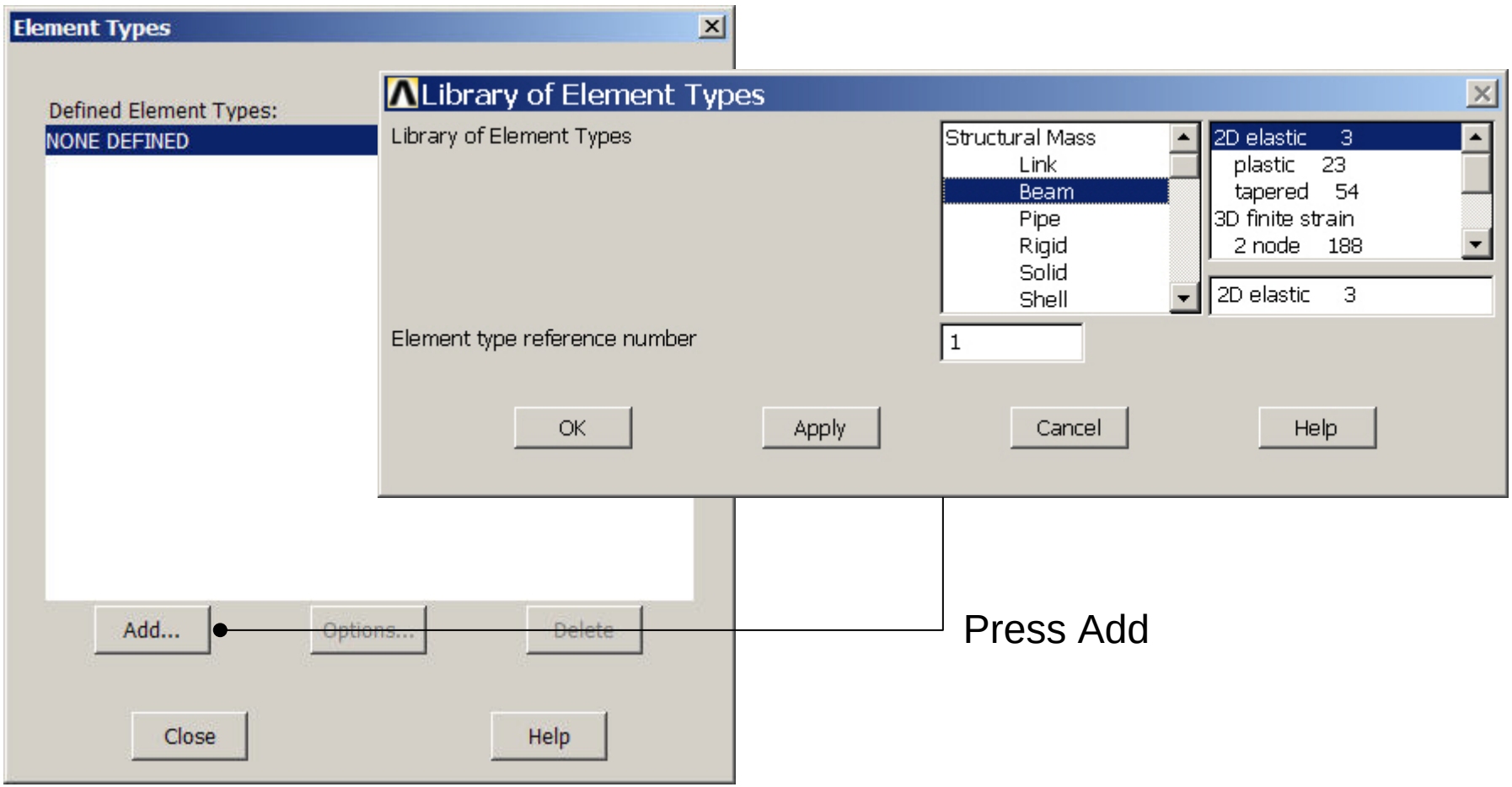
Pick: upward arrow

Unpick: downward arrow

Press OK or Cancel to finish selection

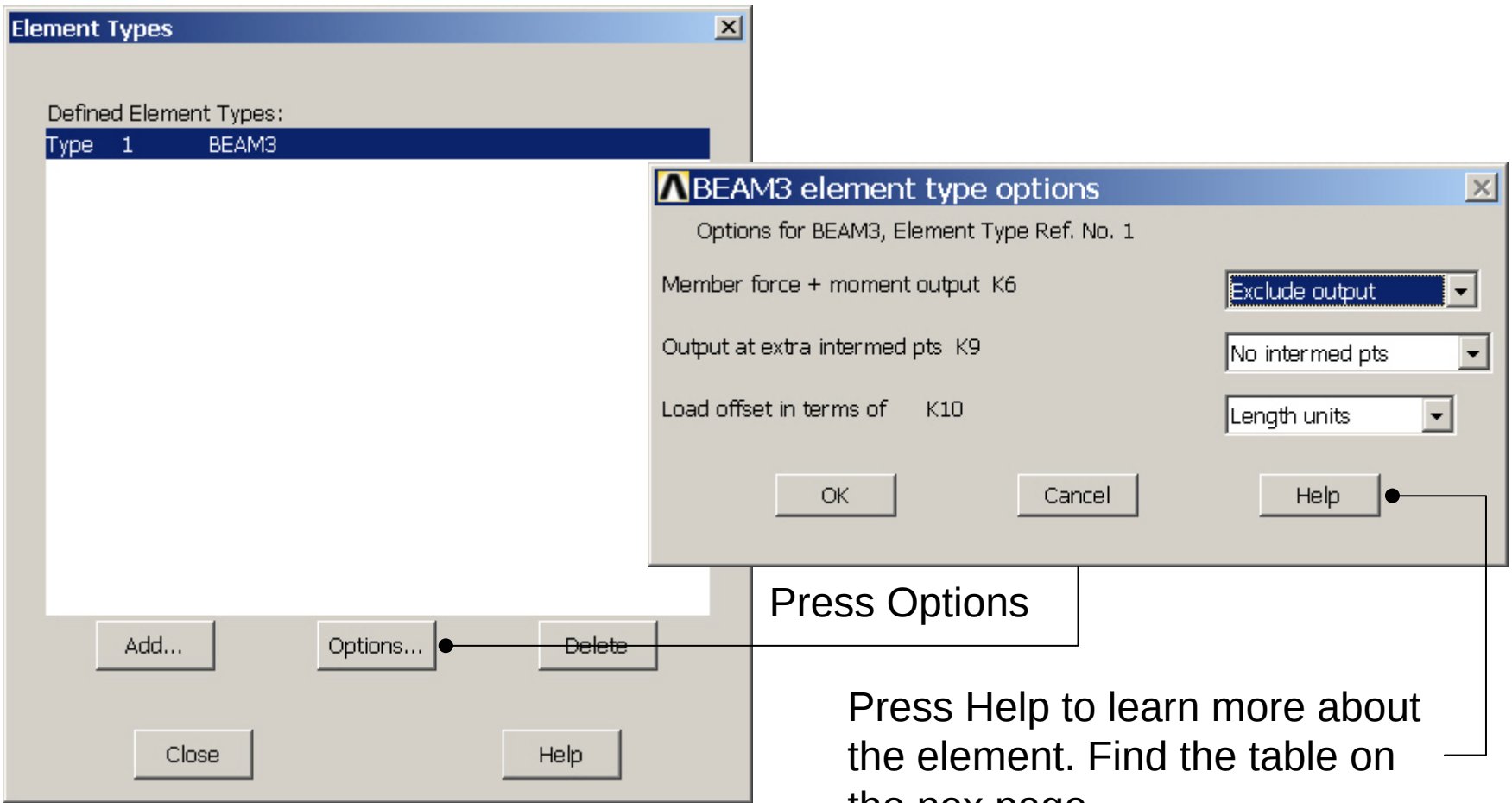
Example – Element Type

Preprocessor > Element Type > Add/Edit/Delete



Example - Element Type

Preprocessor > Element Type > Add/Edit/Delete



Press Options

Press Help to learn more about the element. Find the table on the nex page

Example – Element Table

Find the following table for the element. Identify how to plot member forces in longitudinal direction of the beam element - MFORX

Name	Definition	O	R
EL	Element Number	Y	Y
NODES	Element nodes - I, J	Y	Y
MAT	Element material number	Y	Y
VOLU:	Element volume	N	Y
XC, YC	Location where results are reported	Y	3
TEMP	Temperatures T1, T2, T3, T4	Y	Y
PRES	Pressure P1 at nodes I,J; OFFST1 at I,J; P2 at I,J; OFFST2 at I, J; P3 at I; P4 at J	Y	Y
SDIR	Axial direct stress	1	1
SBYT	Bending stress on the element +Y side of the beam	1	1
SBYB	Bending stress on the element -Y side of the beam	1	1
SMAX	Maximum stress (direct stress + bending stress)	1	1
SMIN	Minimum stress (direct stress - bending stress)	1	1
EPELDIR	Axial elastic strain at the end	1	1
EPELBYT	Bending elastic strain on the element +Y side of the beam	1	1
EPELBYB	Bending elastic strain on the element -Y side of the beam	1	1
EPTHDIR	Axial thermal strain at the end	1	1
EPTHBYT	Bending thermal strain on the element +Y side of the beam	1	1
EPTHBYB	Bending thermal strain on the element -Y side of the beam	1	1
EPINAXL	Initial axial strain in the element	1	1
MFOR(X, Y)	Member forces in the element coordinate system X and Y direction	2	Y
MMOMZ	Member moment in the element coordinate system Z direction	2	Y

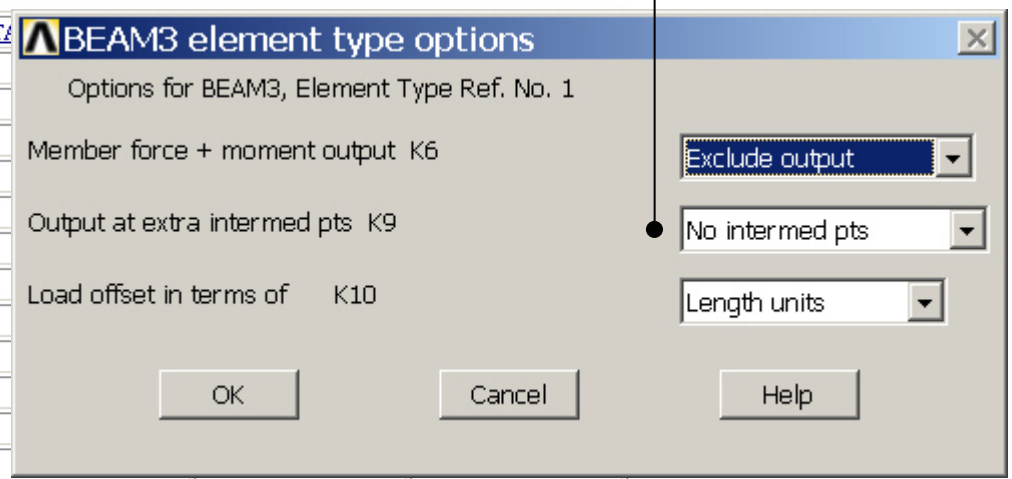
Example – Element Table

Find also the following table in the Help function

Table 3.2. BEAM3 Item and Sequence Numbers (KEYOPT(9) = 0)

Output Quantity Name	Item	ETA		
SDIR	LS			
SBYT	LS			
SBYB	LS			
EPELDIR	LEPEL			
EPELBYT	LEPEL			
EPELBYB	LEPEL			
EPTHDIR	LEPTH			
EPTHBYT	LEPTH			
EPTHBYB	LEPTH			
EPINAXL	LEPTH			
SMAX	NMISC			
SMIN	NMISC	-	2	4
MFORX	SMISC	-	1	7
MFORY	SMISC	-	2	8
MMOMZ	SMISC	-	6	12
P1	SMISC	-	13	14
OFFST1	SMISC	-		
P2	SMISC	-		
OFFST2	SMISC	-	19	20
P3	SMISC	-	21	-
P4	SMISC	-	-	22

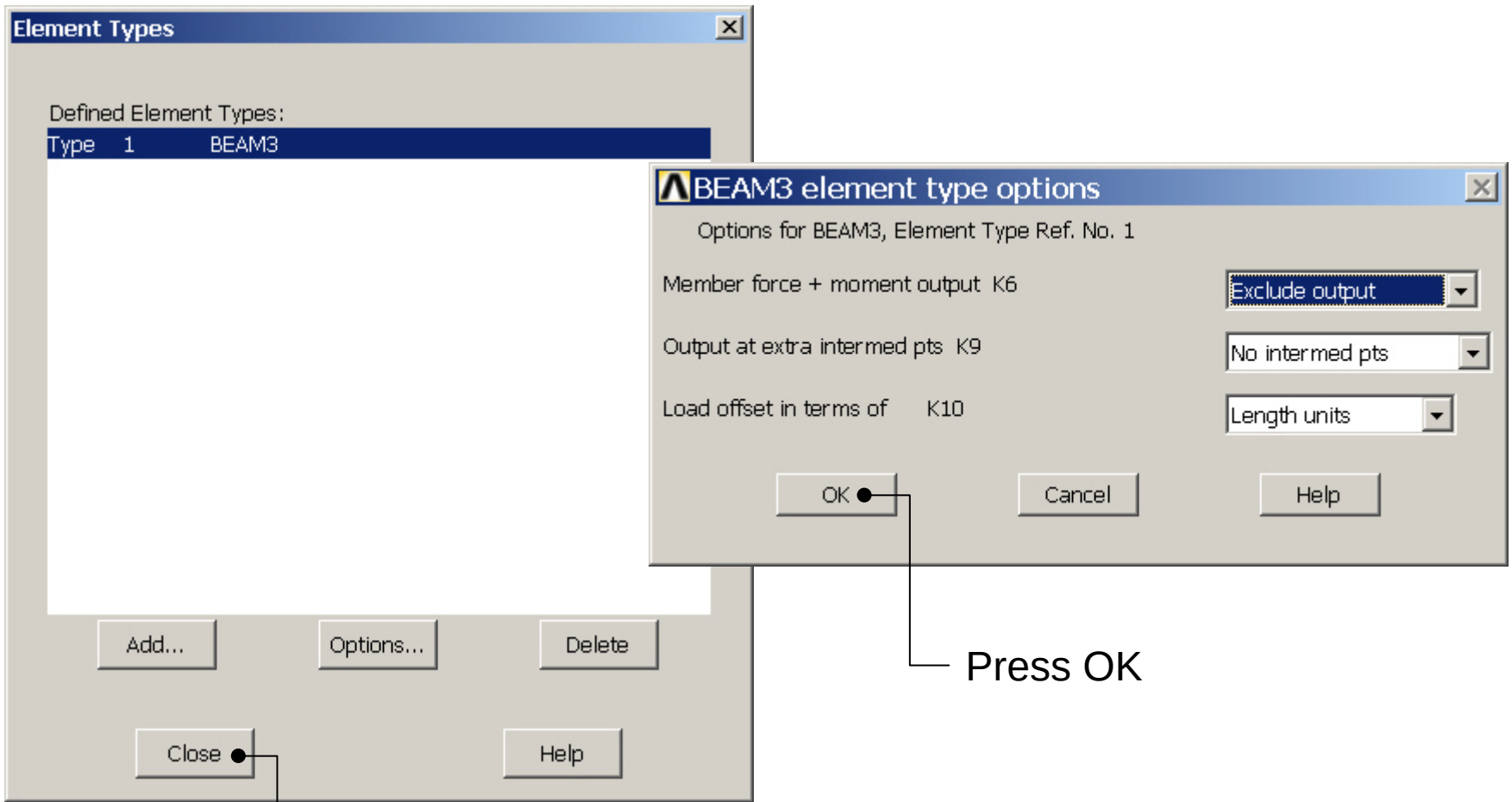
		Pseudo Node			
		1	2	3	4
TEMP	LBFE	1	2	3	4



Remember MFORX, SMISC,1,7

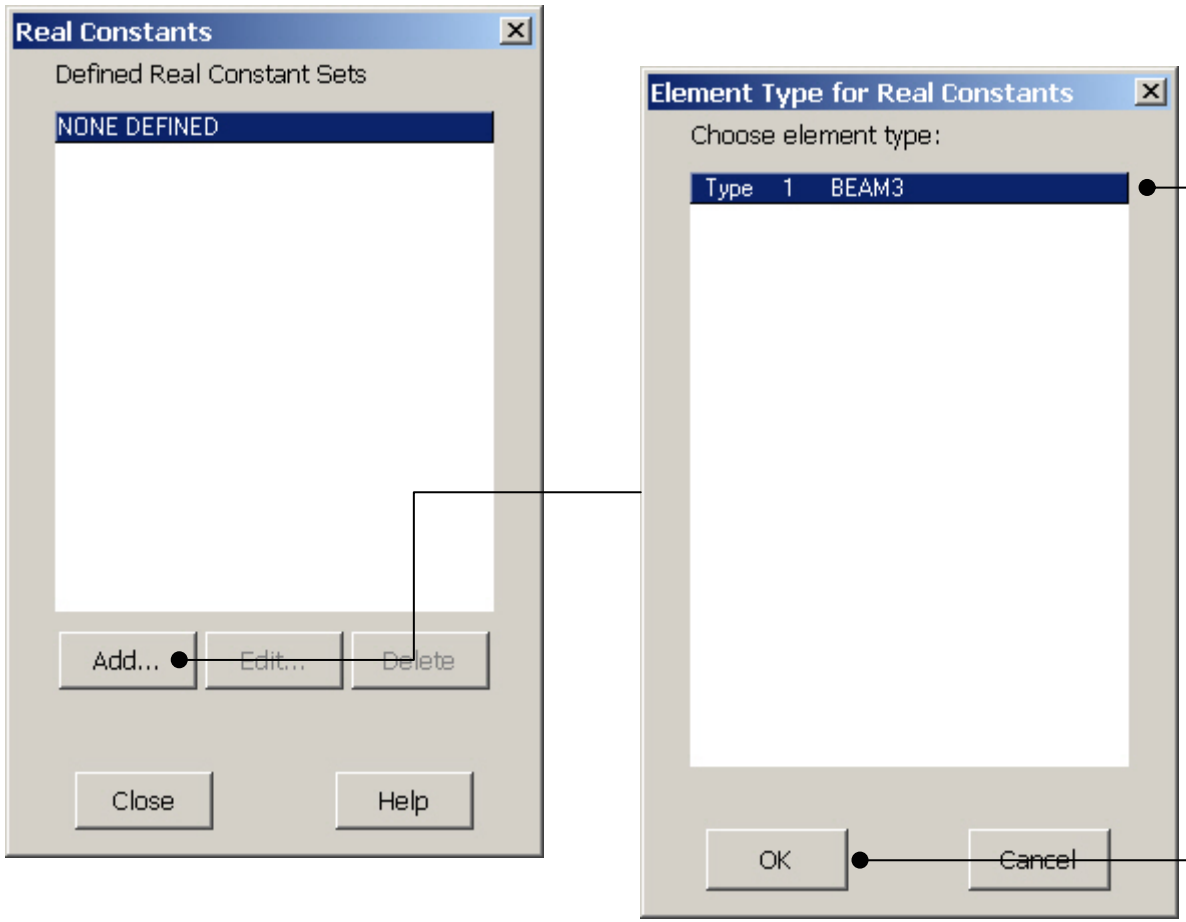
Example - Element Type

Preprocessor > Element Type > Add/Edit/Delete



Example – Real Constants

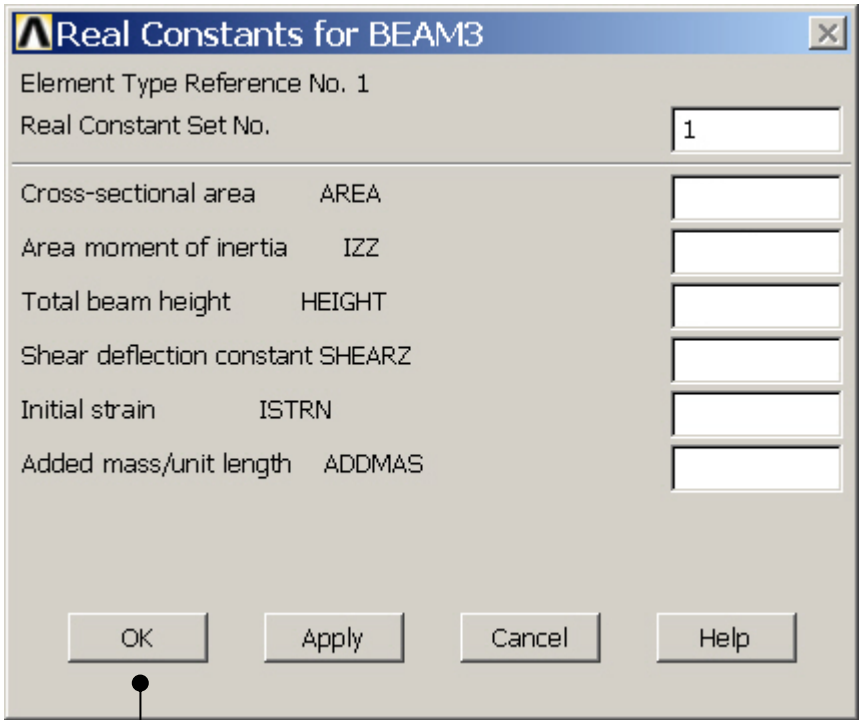
Preprocessor > Real Constants > Add



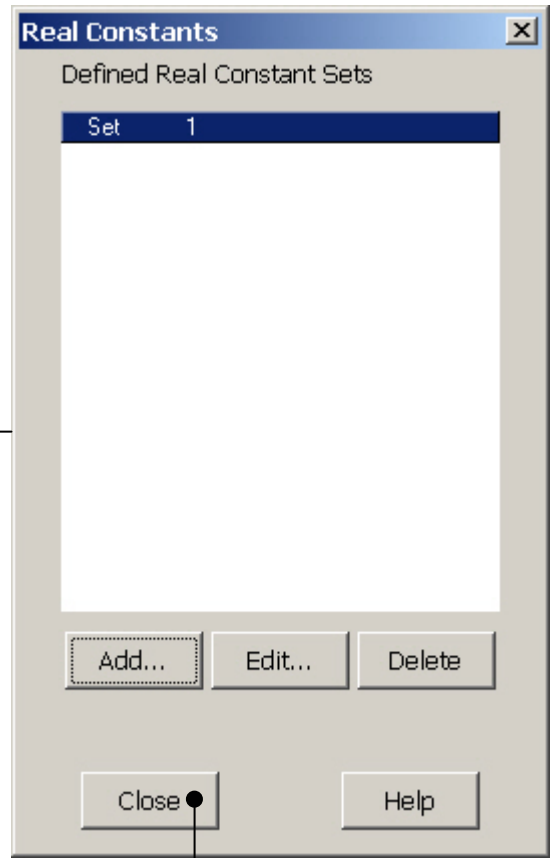
Place the cursor on the relevant element and press OK

Example - Real Constants

Preprocessor > Real Constants > Add



Enter cross-sectional data for section 1

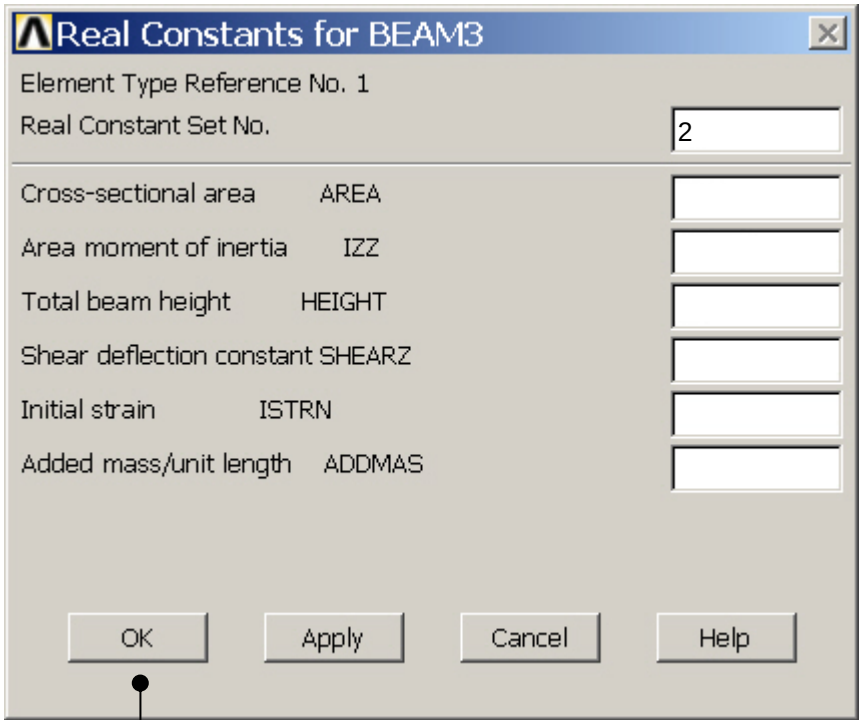


Press OK

Press Close to finish

Example - Real Constants

Preprocessor > Real Constants > Add

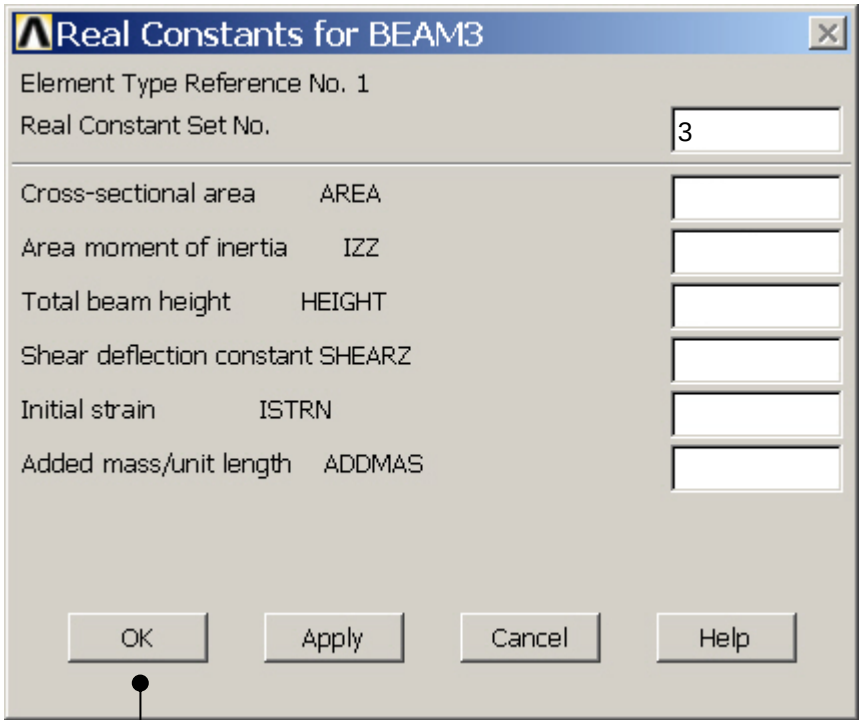


Enter cross-sectional data for section 2, 4, 6

Press OK

Example - Real Constants

Preprocessor > Real Constants > Add

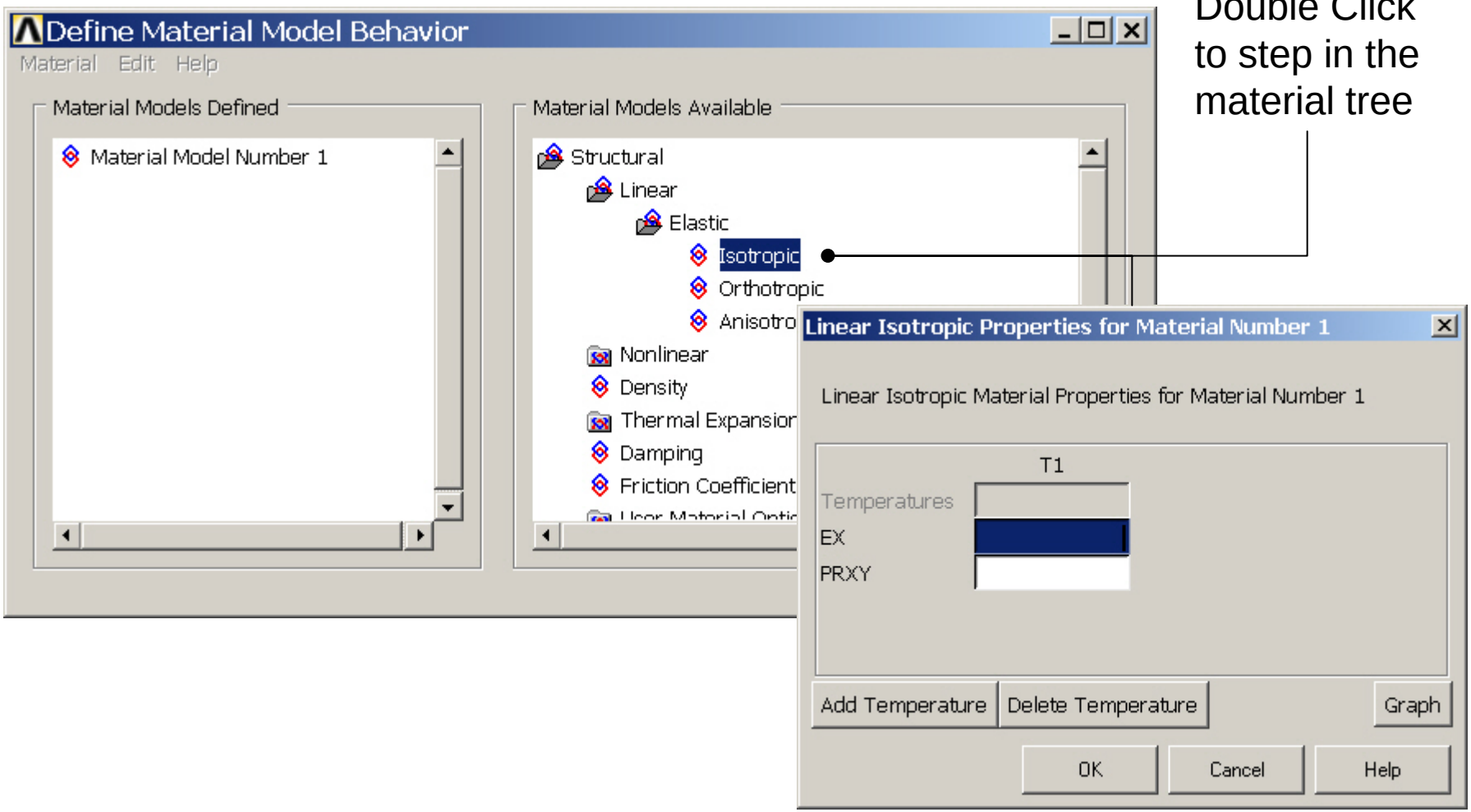


Enter cross-sectional data for section 3, 5

Press OK

Example - Material Properties

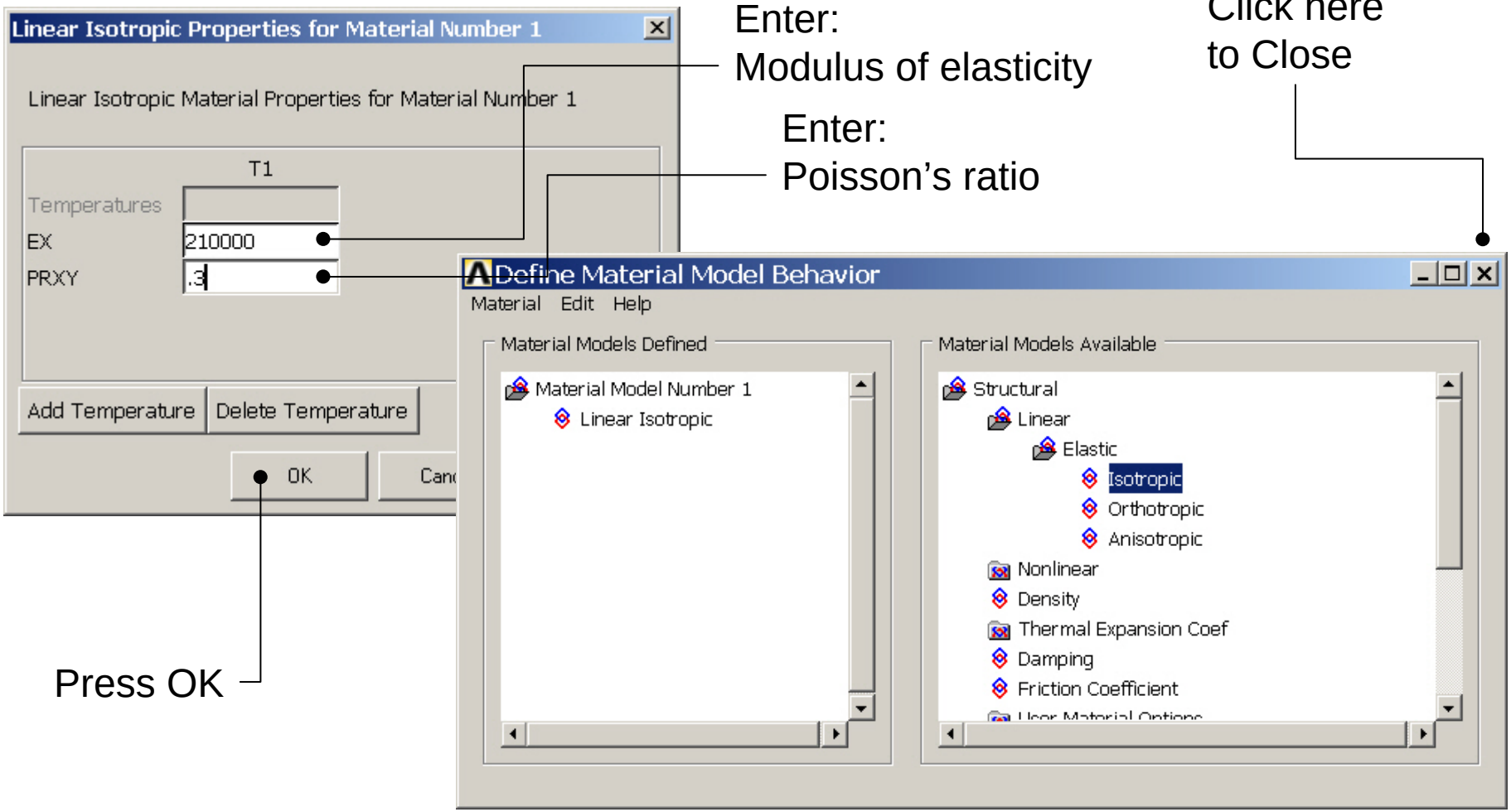
Preprocessor > Material Props > Material Models



Double Click to step in the material tree

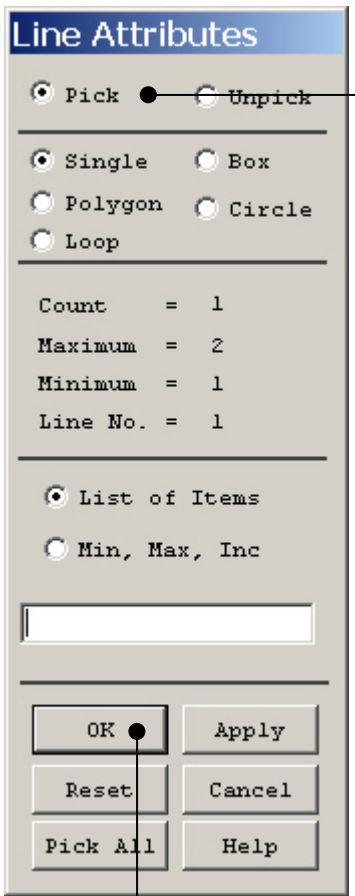
Example - Material Properties

Preprocessor > Material Props > Material Models

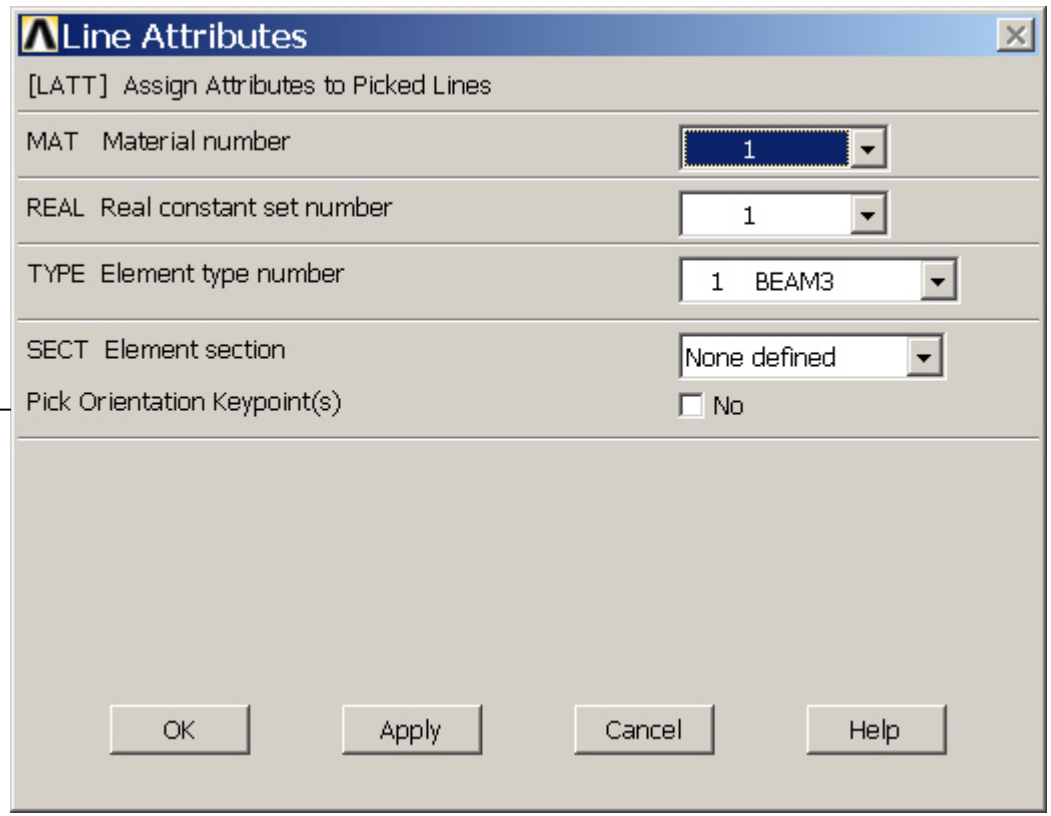


Example – Mesh Attributes

Preprocessor > Meshing > Mesh Attributes > Line Attributes > Picked Lines



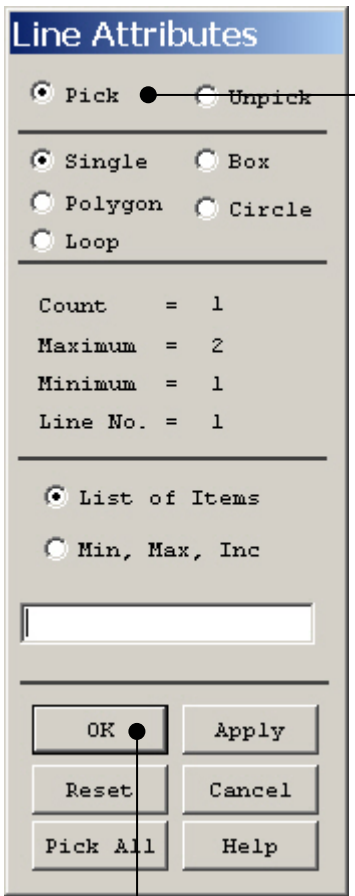
Select Line 1



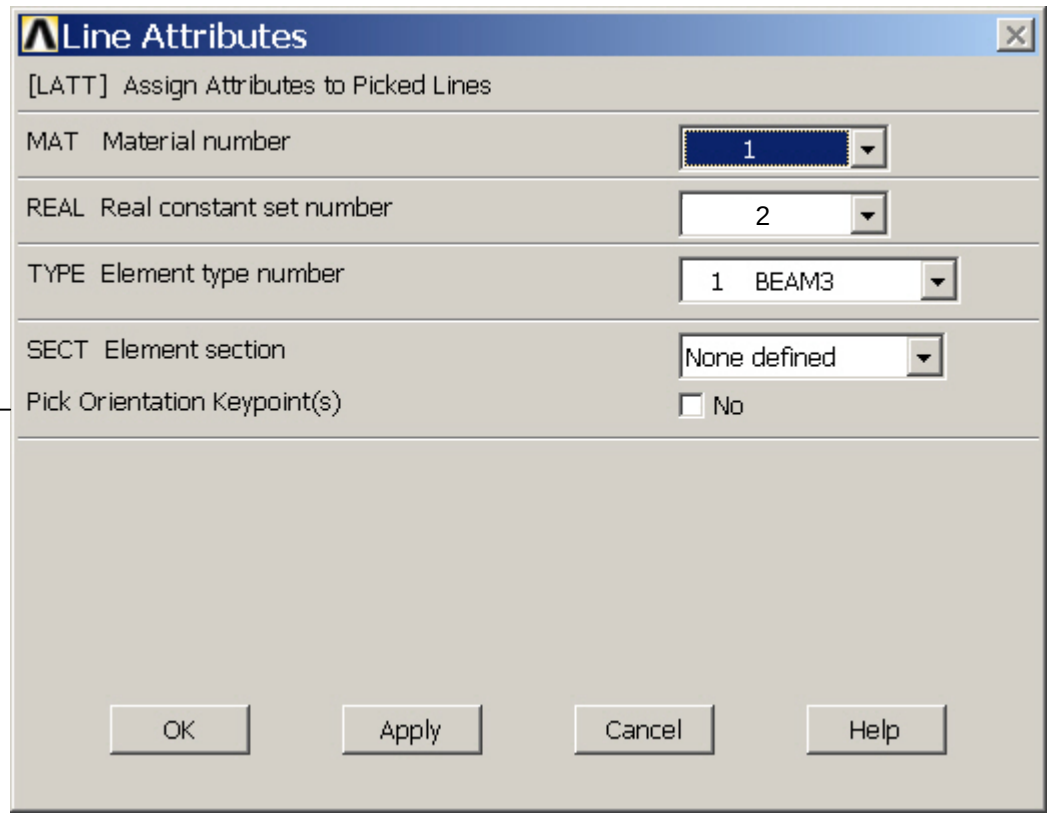
Press OK

Example – Mesh Attributes

Preprocessor > Meshing > Mesh Attributes > Line Attributes > Picked Lines



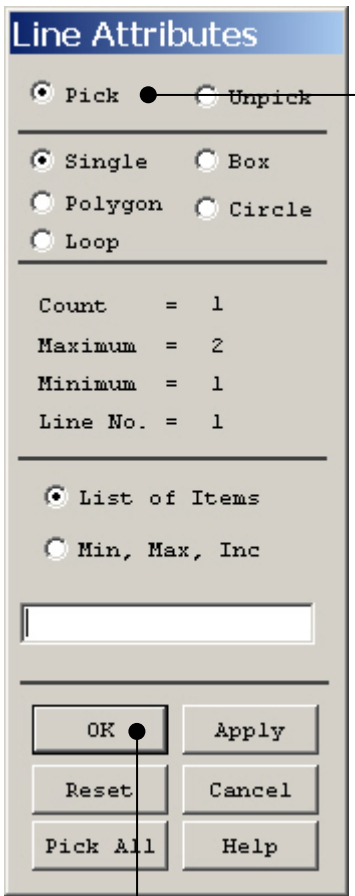
Select Line 2, 4, 6



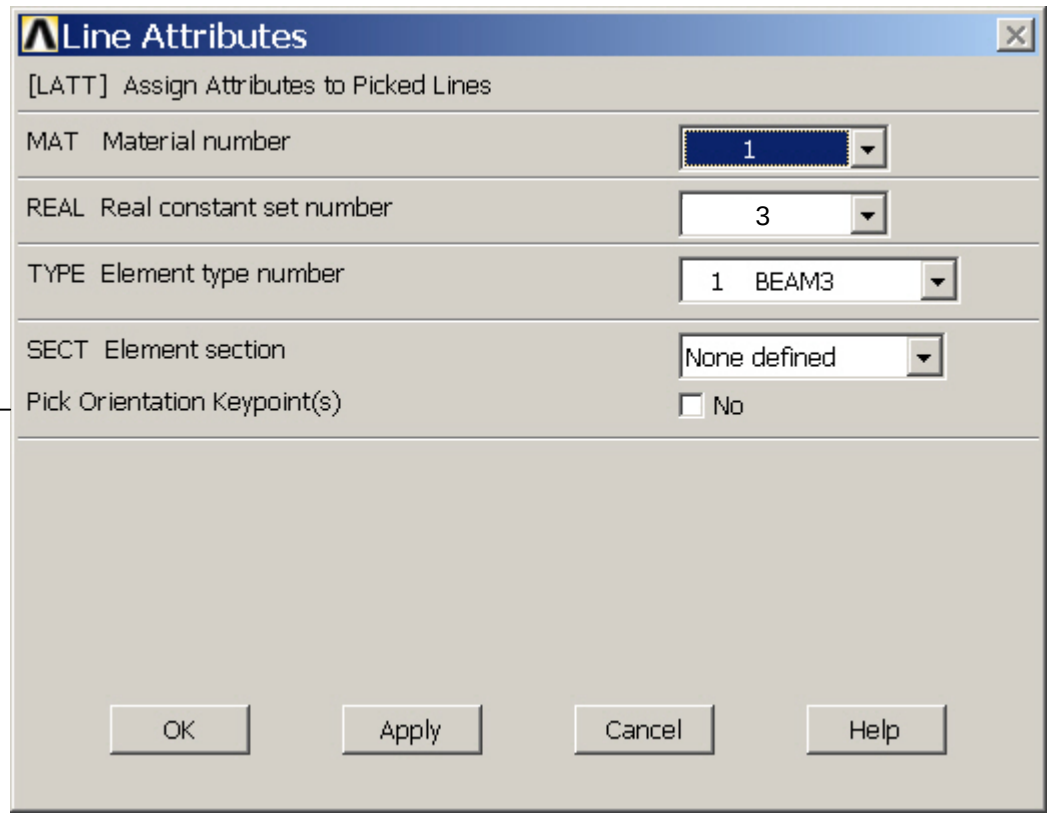
Press OK

Example – Mesh Attributes

Preprocessor > Meshing > Mesh Attributes > Line Attributes > Picked Lines



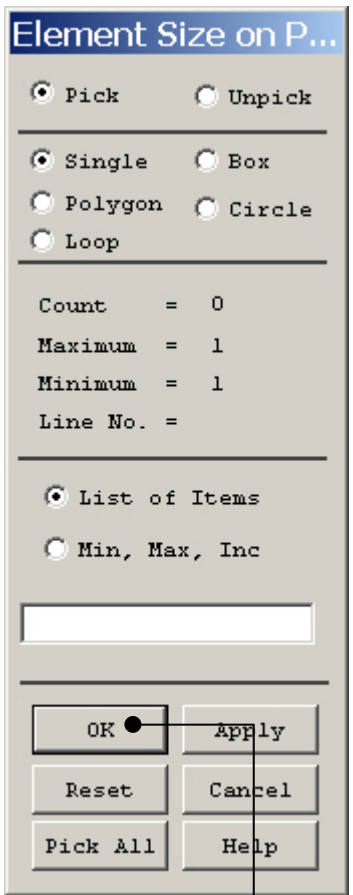
Select Line 3, 5



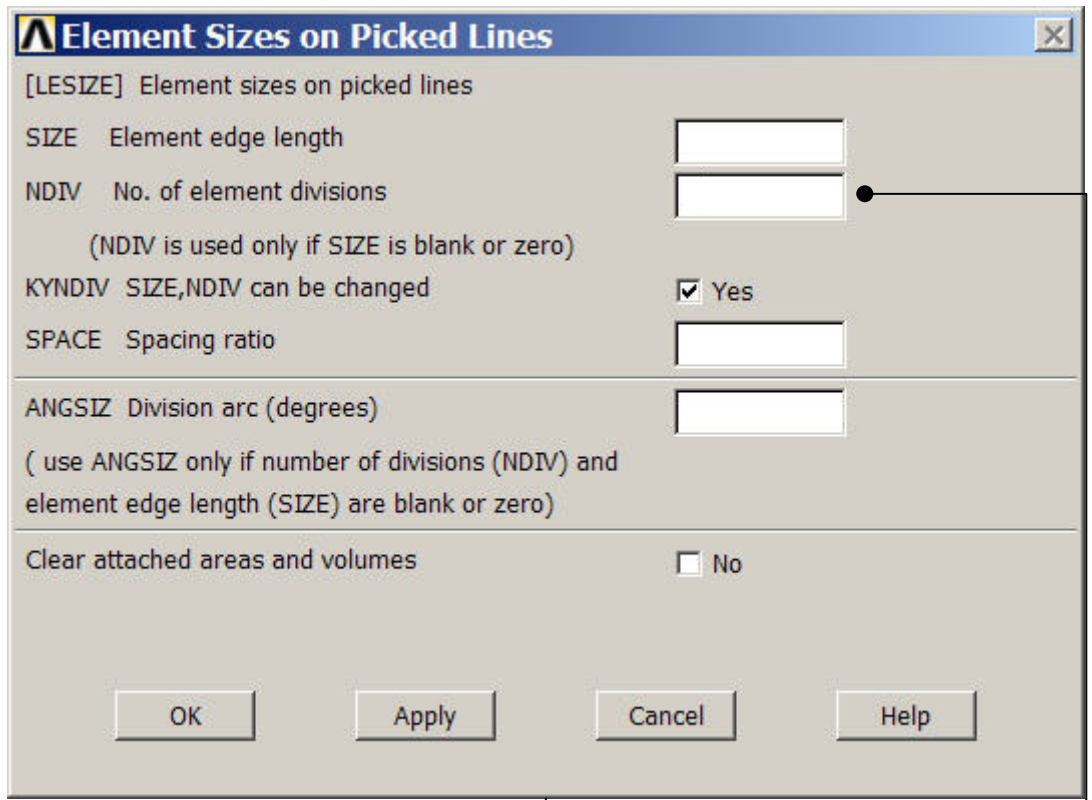
Press OK

Example - Meshing

Preprocessor > Meshing > Size Cntrls > ManualSize > Lines > Picked Lines



Select/Pick All lines to specify mesh size for

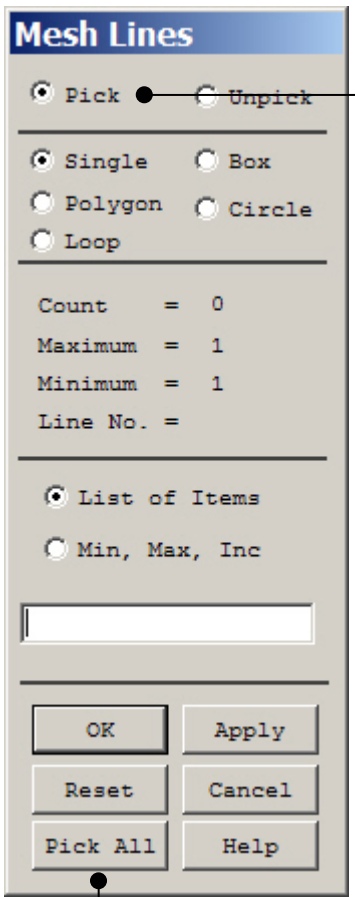


Press OK when finish with selection

Enter 1

Example - Meshing

Preprocessor > Meshing > Mesh > Lines

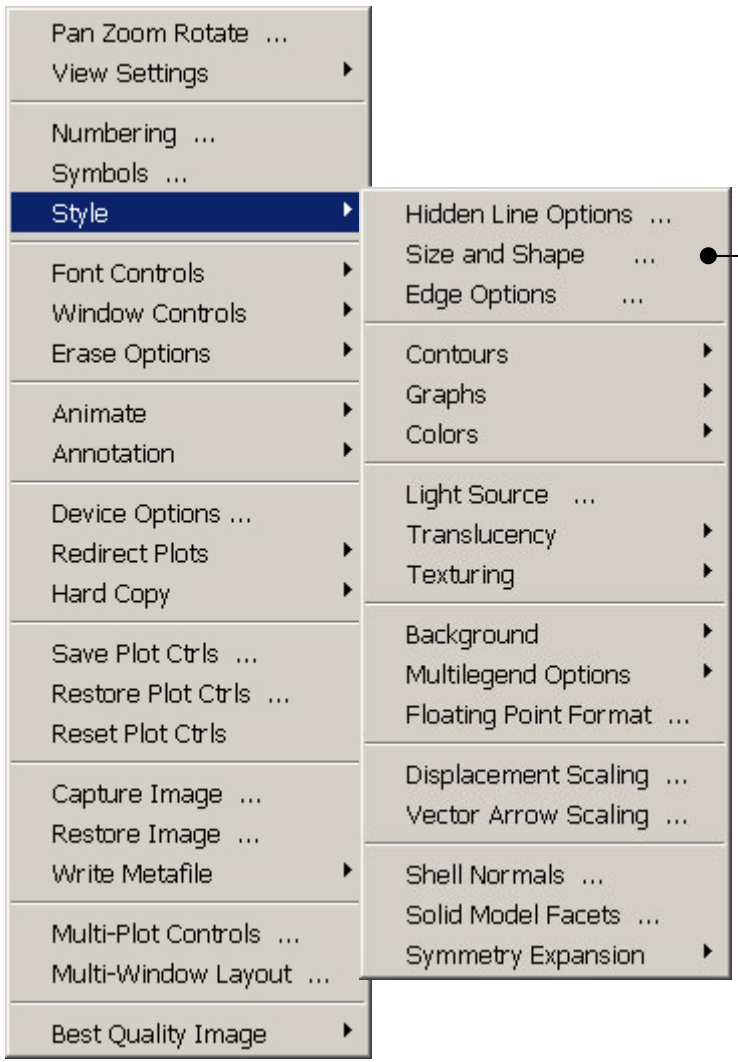


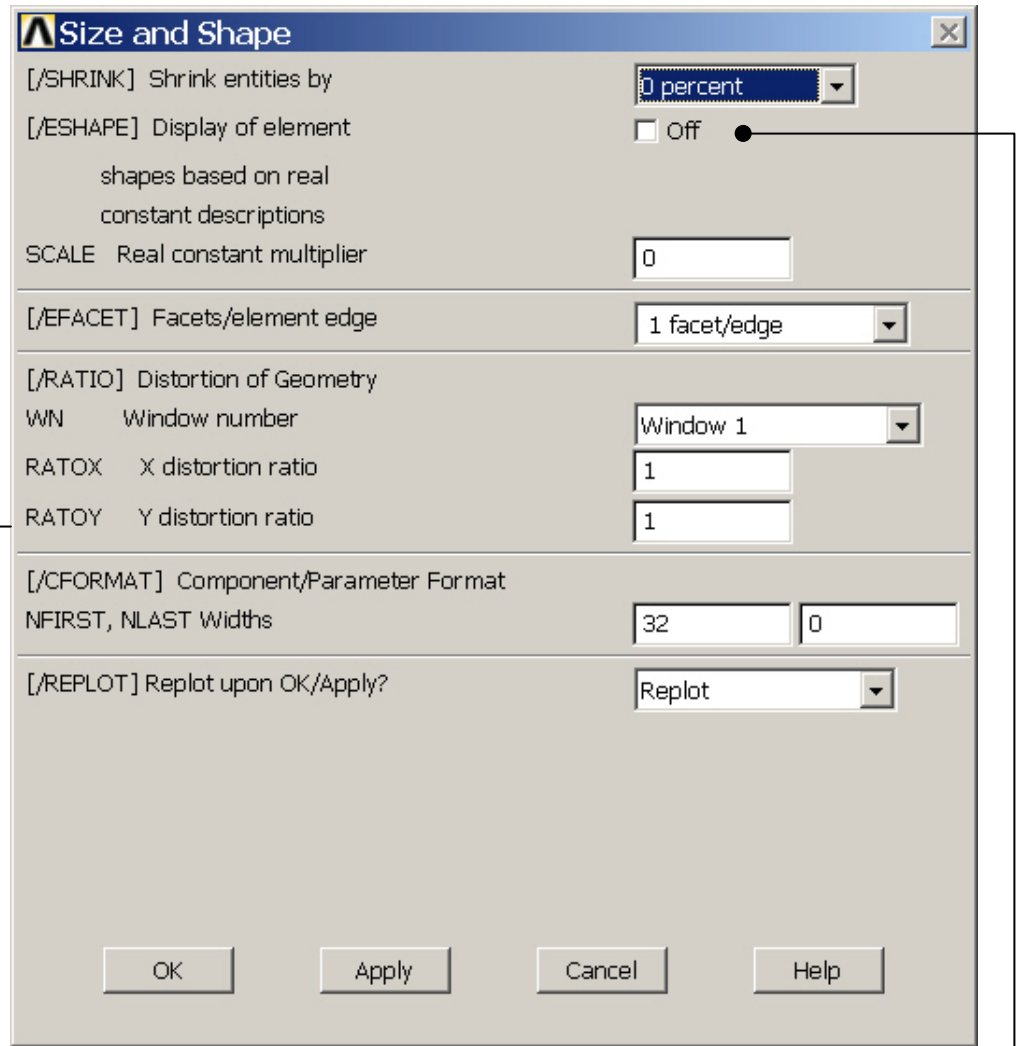
Select individual lines to be meshed by Picking

NB: It is often necessary to “Clear” the model for example if Element Type is to be changed

Select all lines defined to be meshed

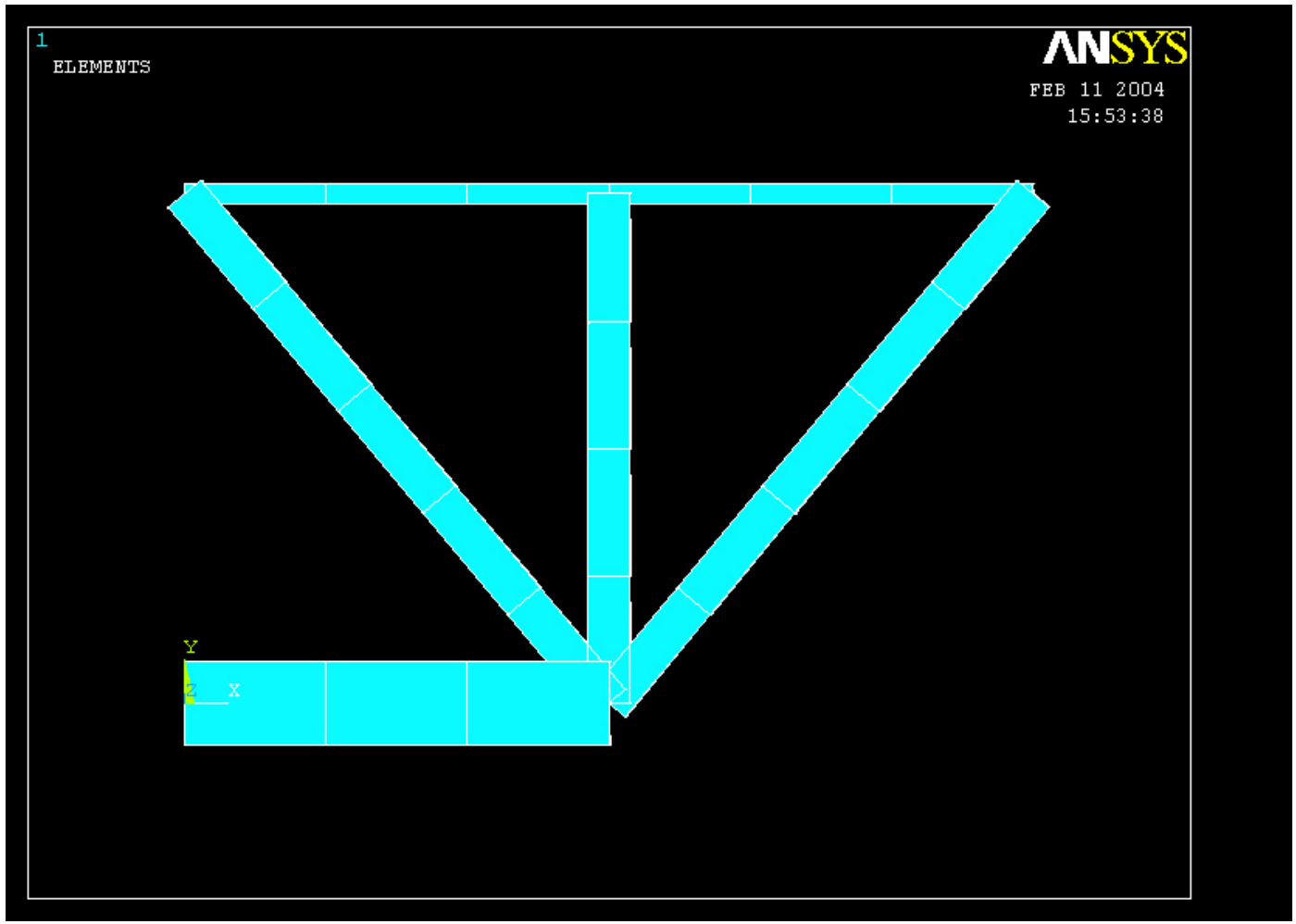
Example - PlotCtrls Menu





Change to On

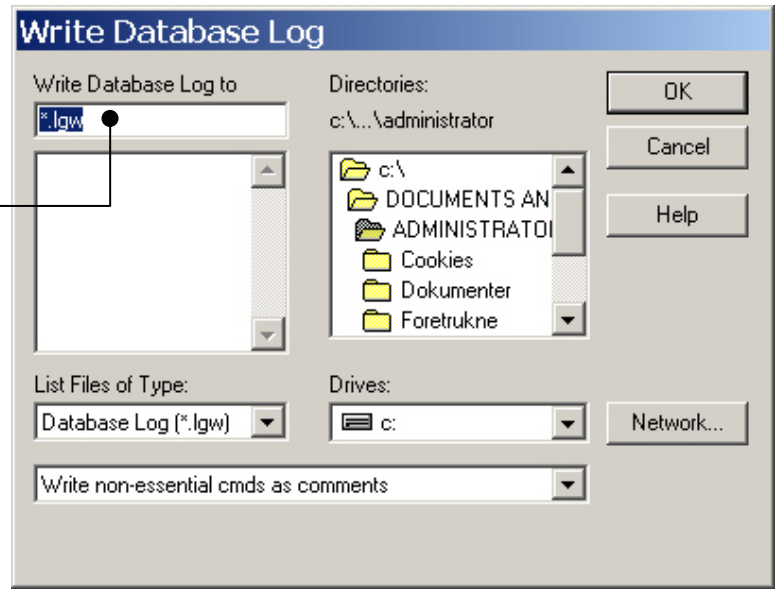
Example – Display of element



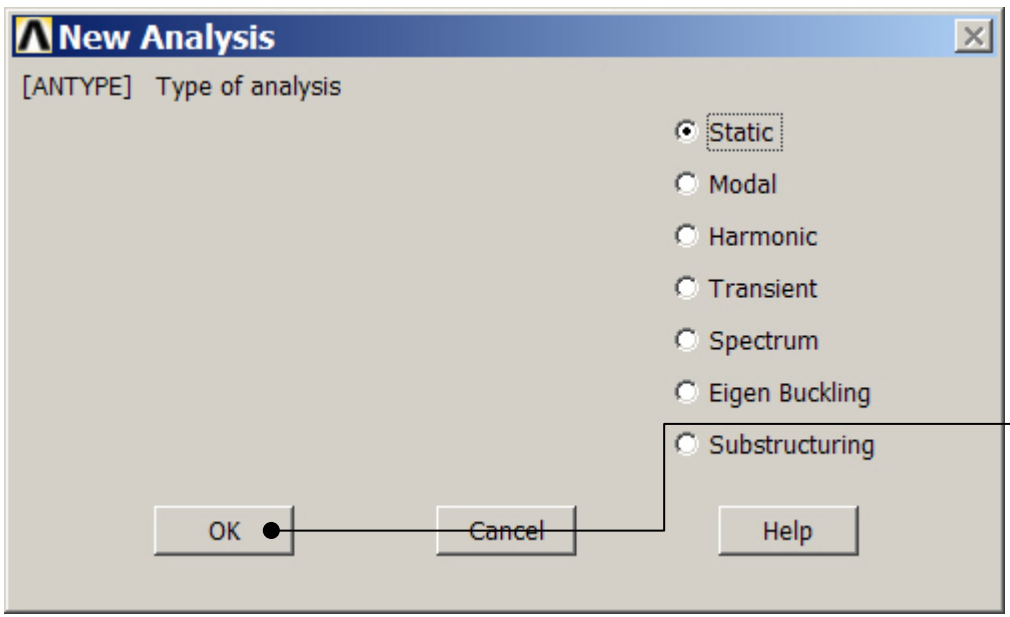
Example – Analysis Type

File > Write DB log file

Enter “example0151.lgw”



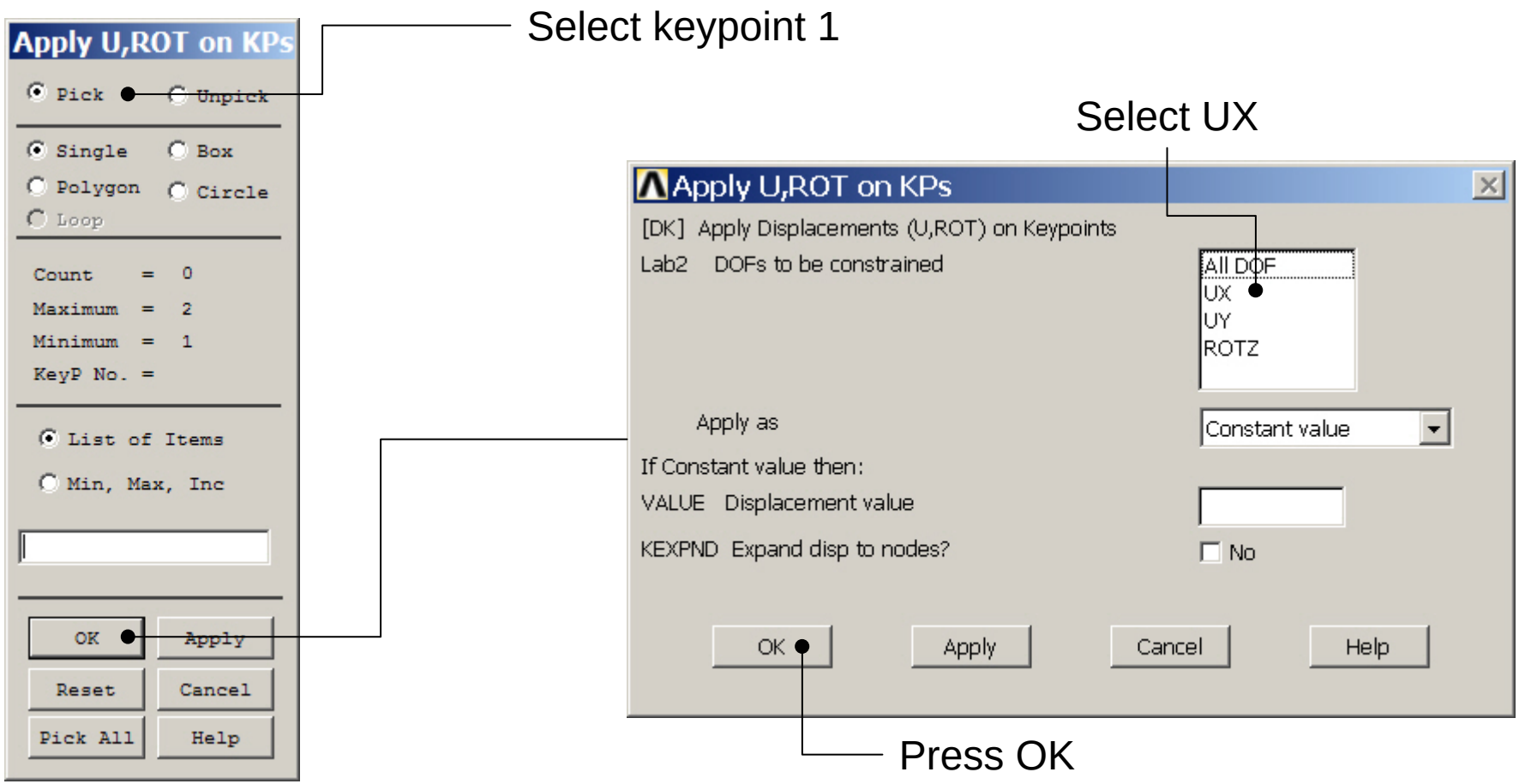
Solution > Analysis Type > New Analysis



Press OK

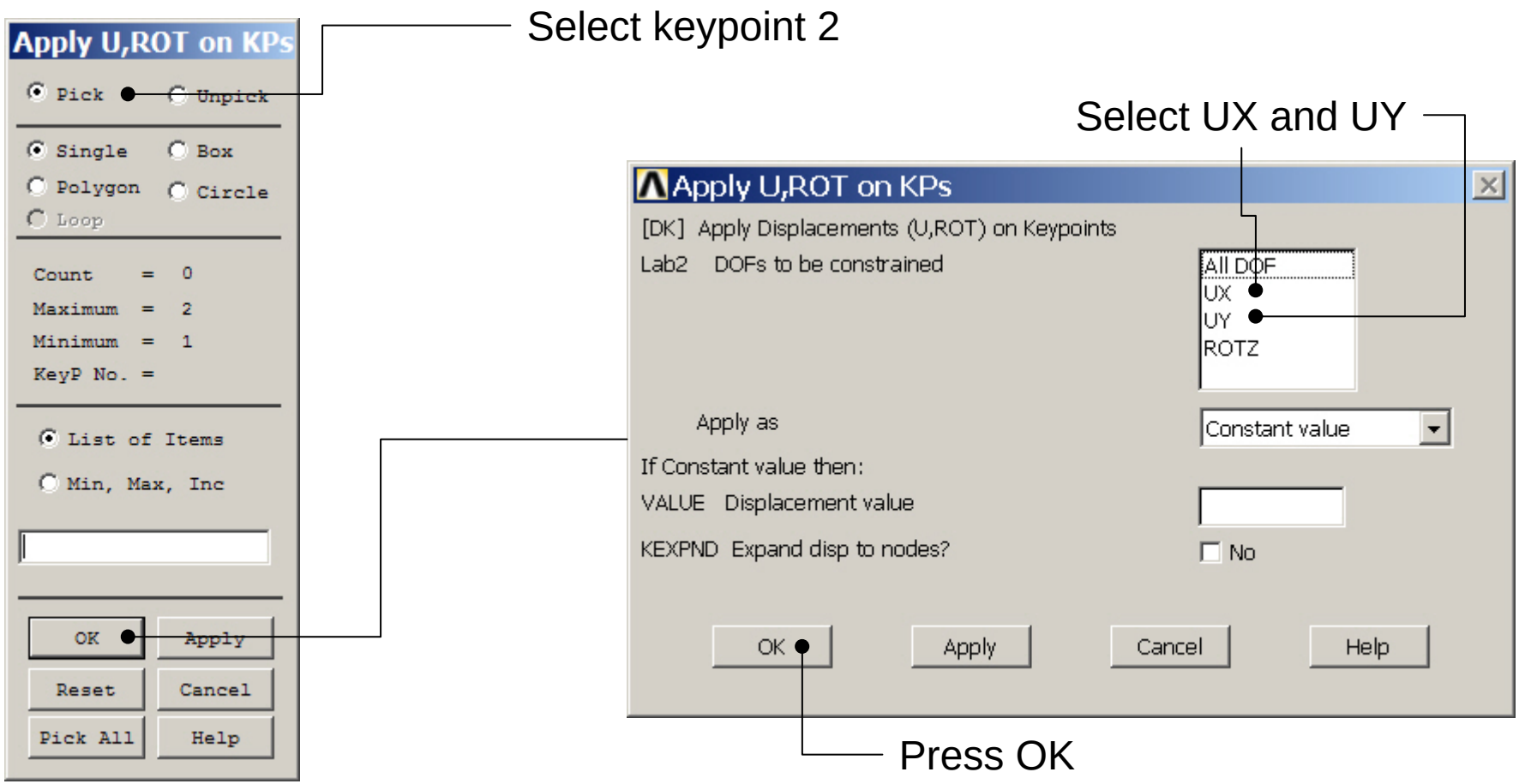
Example – Define Loads

Solution > Define Loads > Apply > Structural > Displacement > On Keypoints



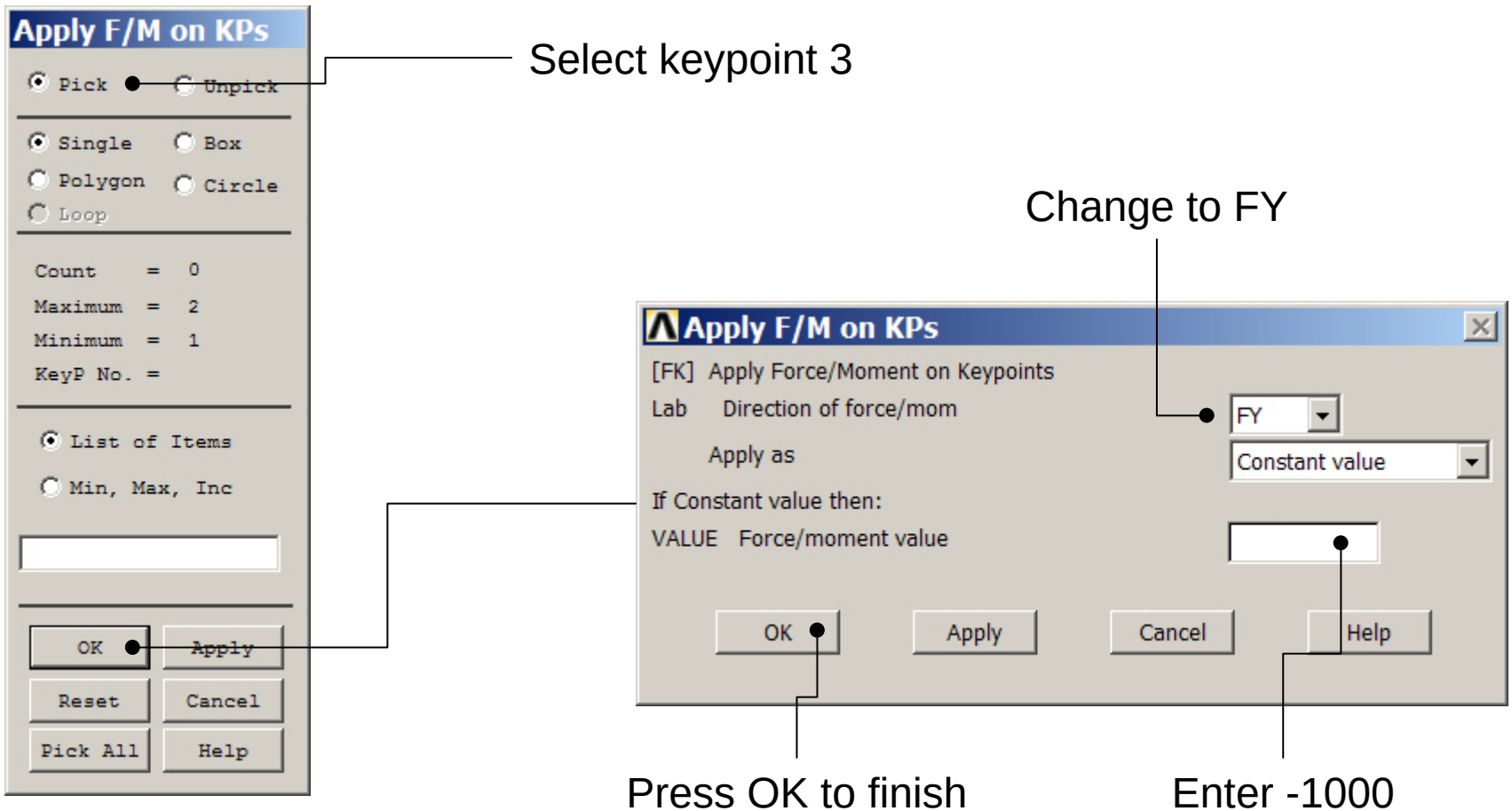
Example – Define Loads

Solution > Define Loads > Apply > Structural > Displacement > On Keypoints



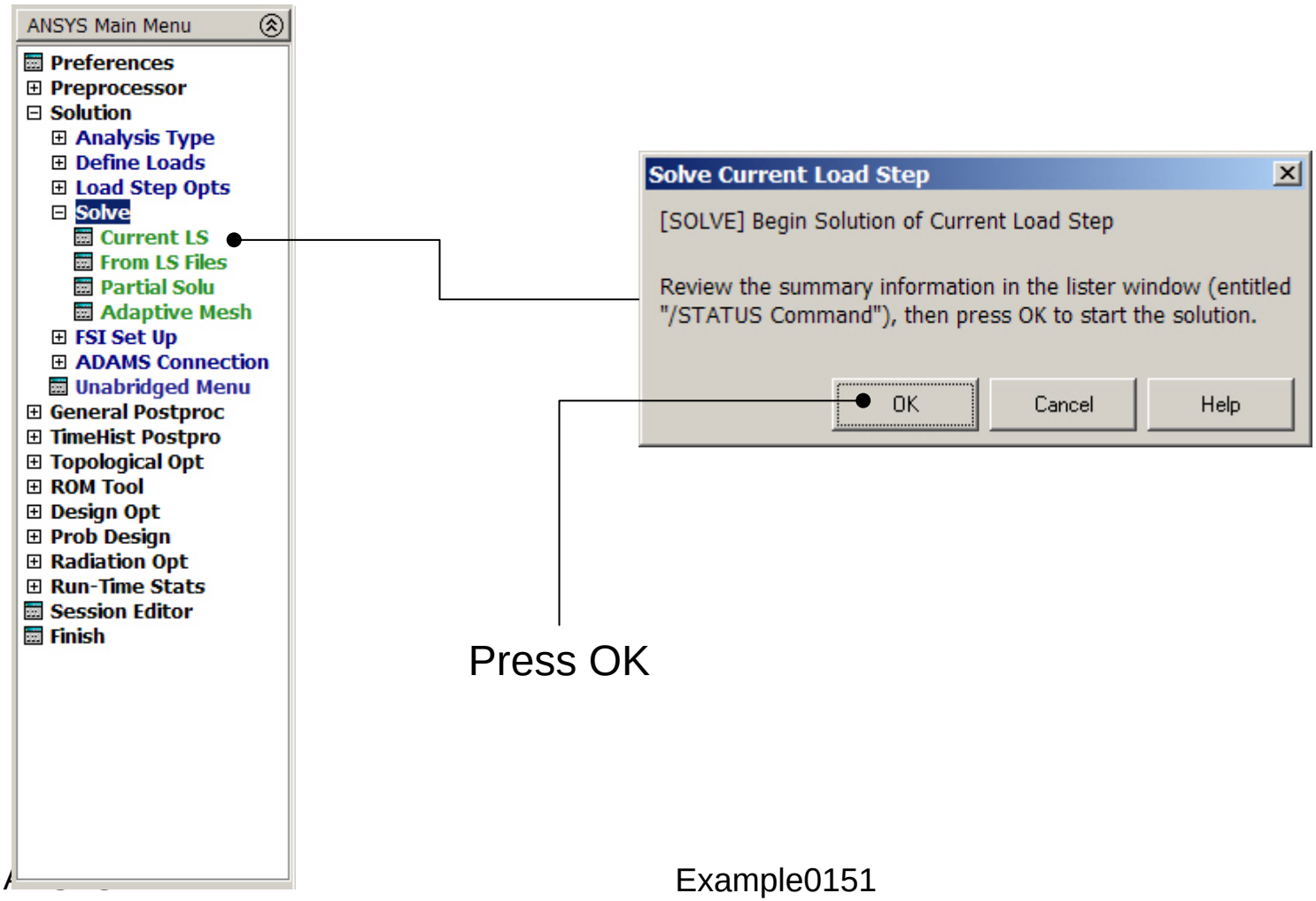
Example – Define Loads

Solution > Define Loads > Apply > Structural > Force/Moment > On Keypoints



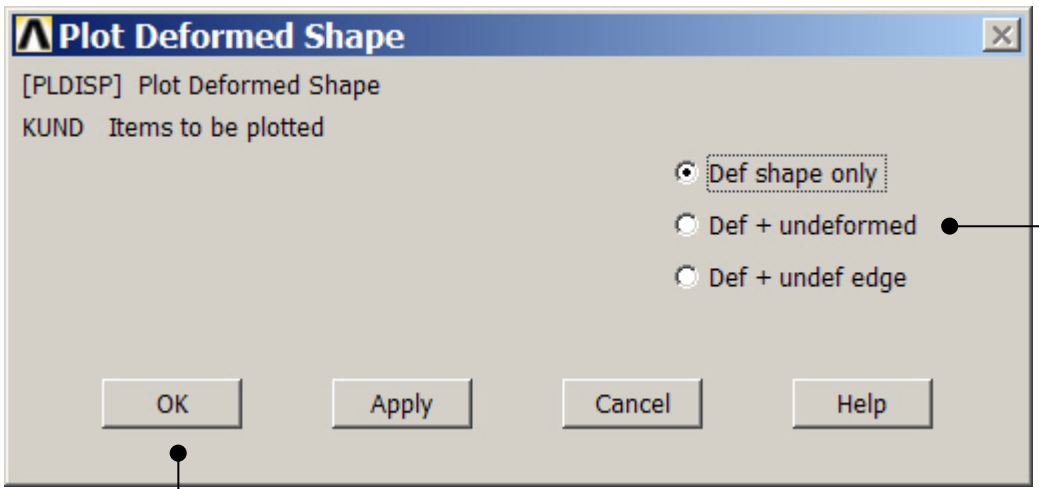
Example - Solve

Solution > Solve > Current LS



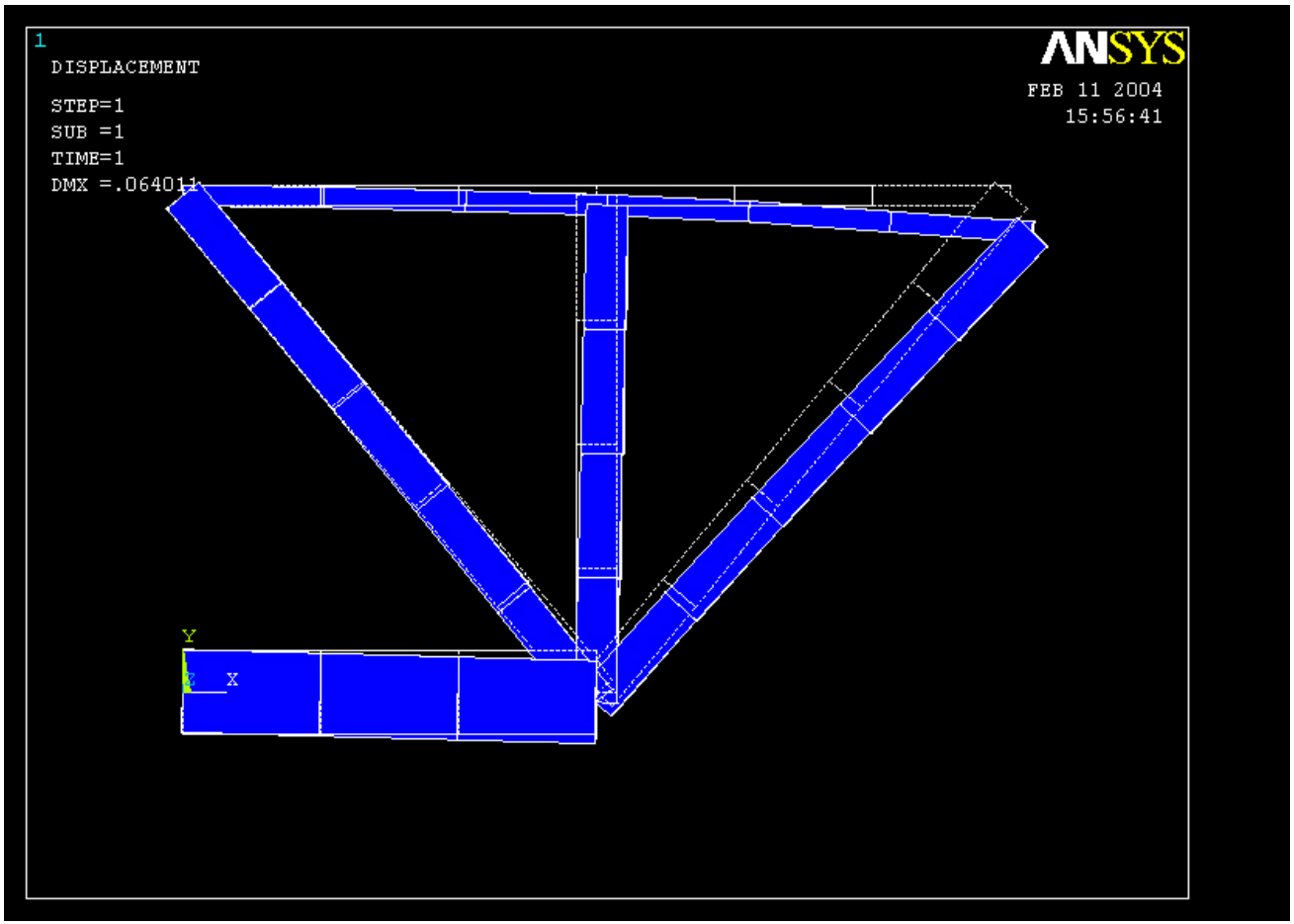
Example - PostProcessing

General Postproc > Plot Results > Deformed Shape



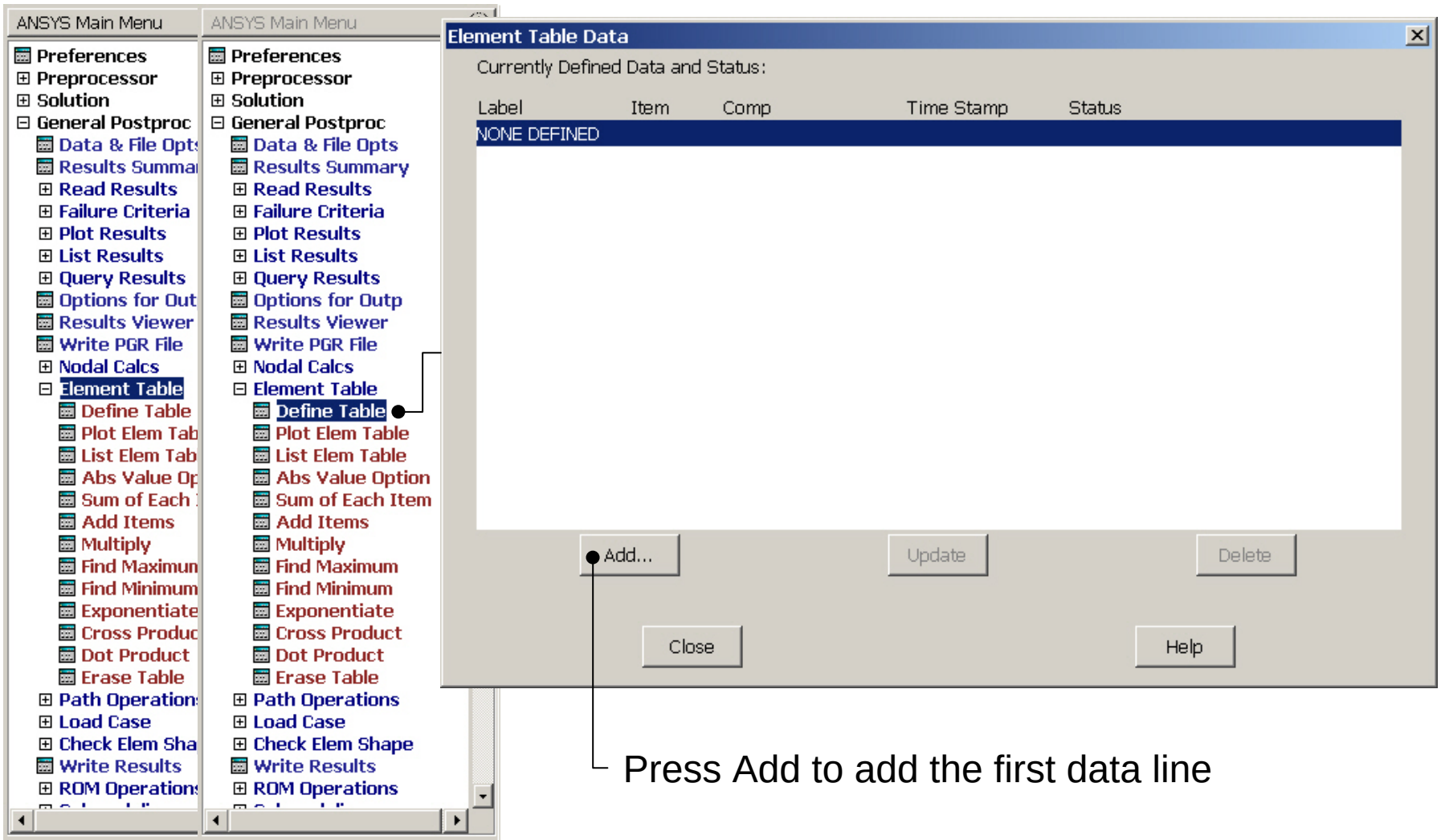
Select “Def+undeformed” and Press OK

Example - PostProcessing



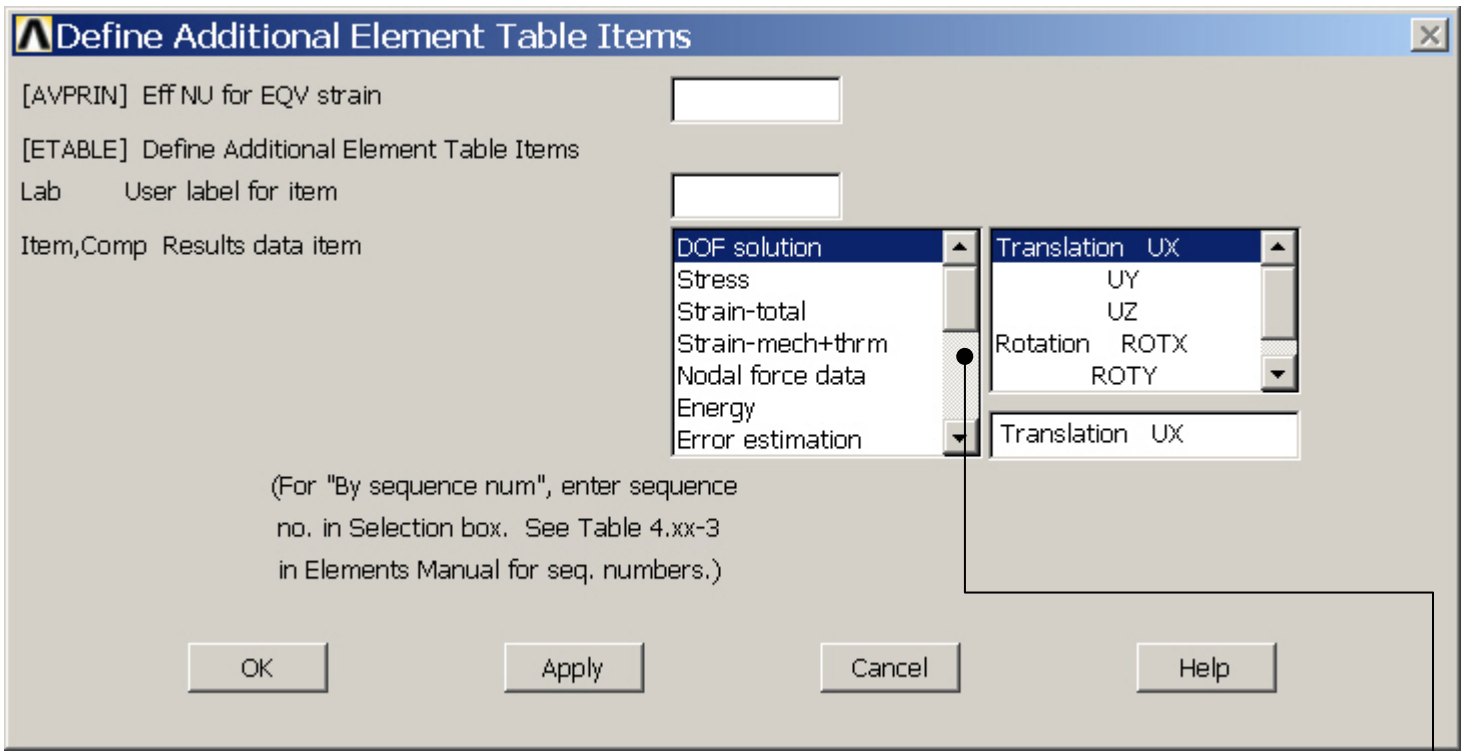
Read Maximum displacement: DMX

Example – Element Table



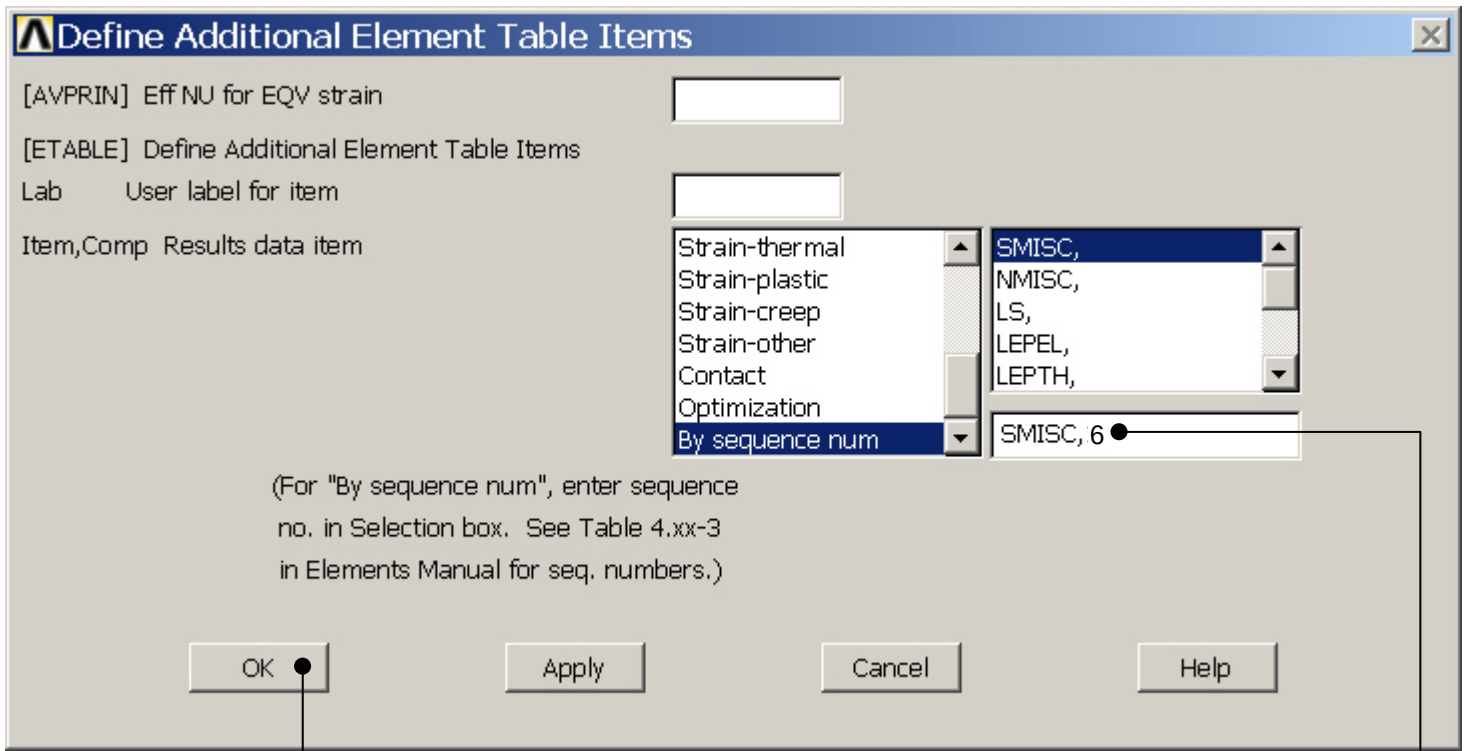
Press Add to add the first data line

Example – Element Table



Scroll down in this menu to find the line “By sequence number”

Example – Element Table

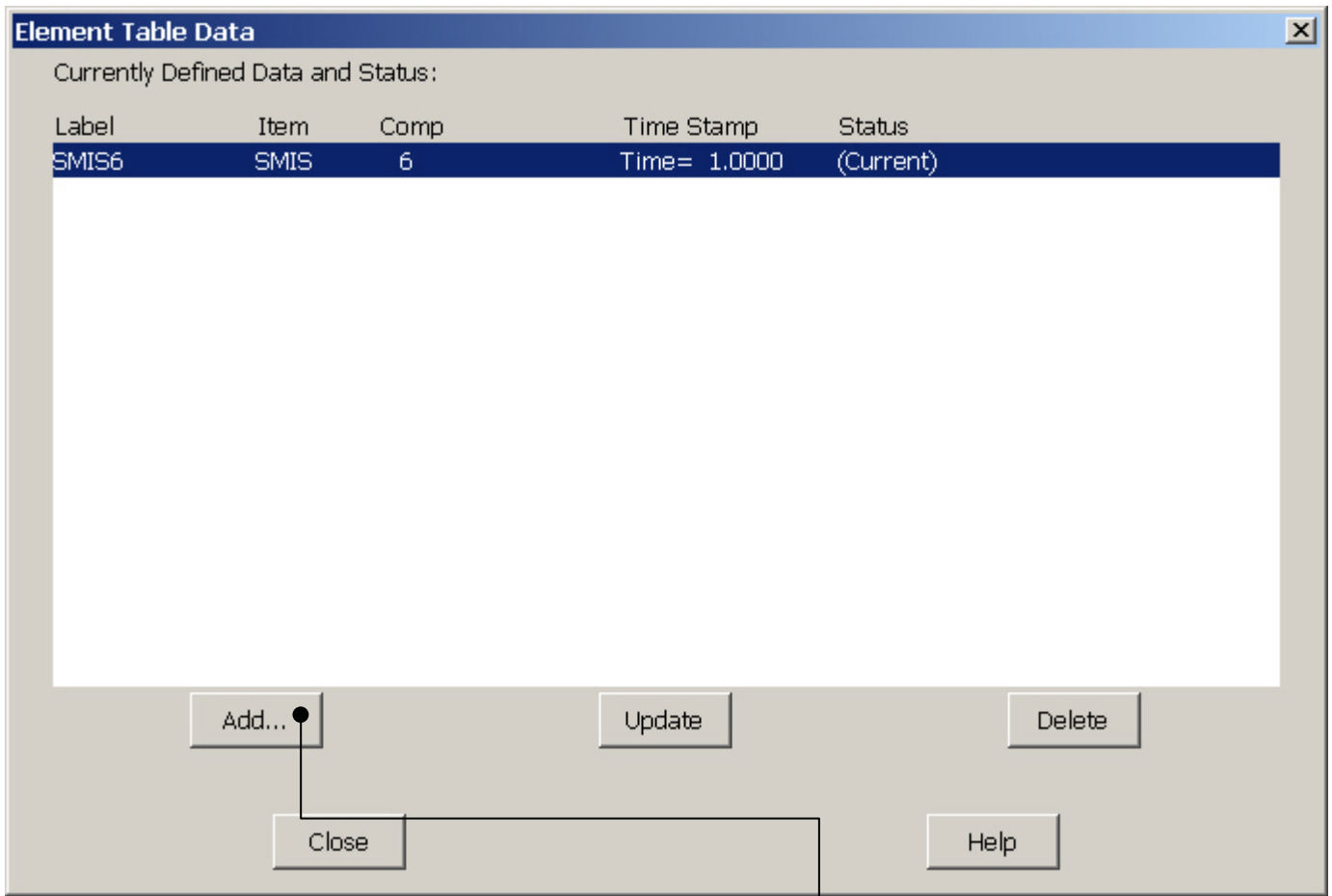


Press OK

Enter 6 as found in table 3.2

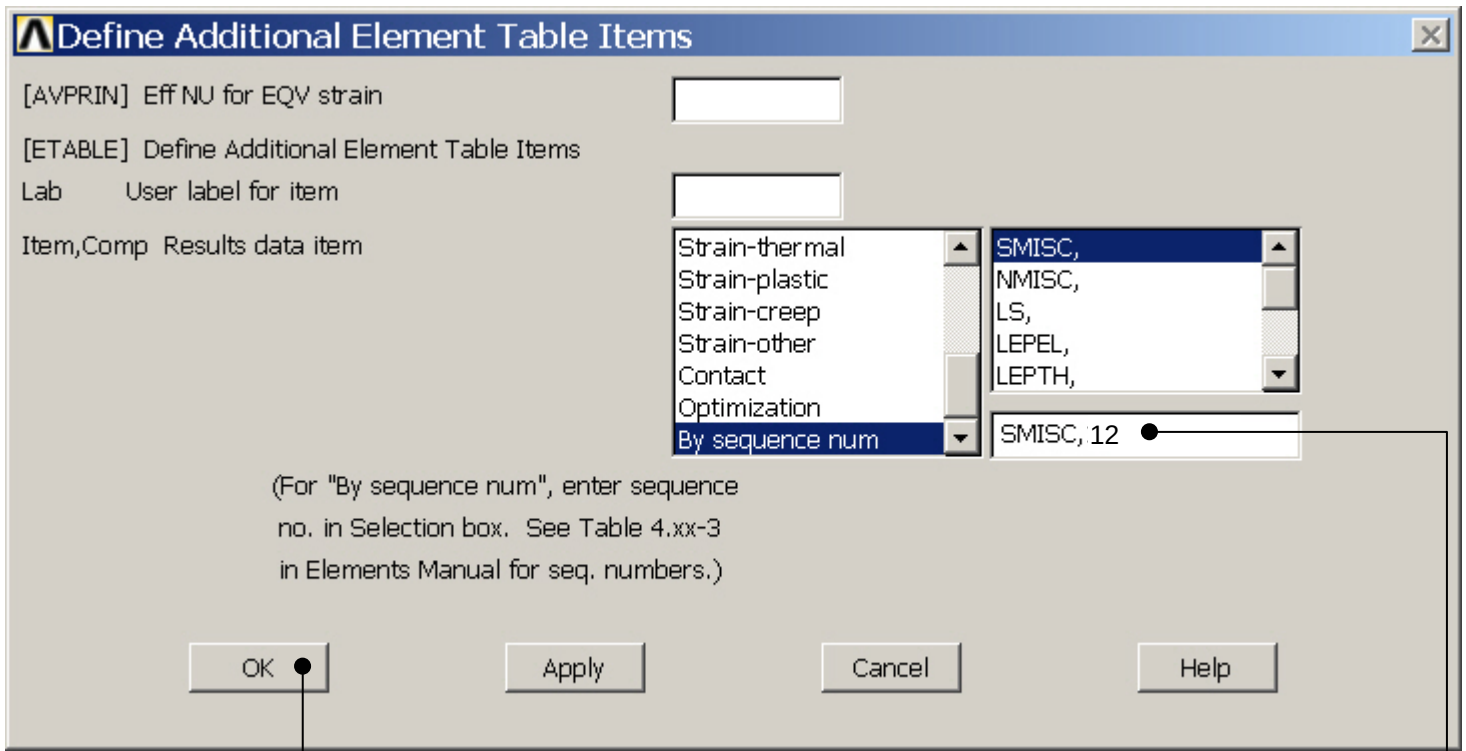
From table 3.2 MFORX, SMISC,6,12

Example – Element Table



Press Add to add the second data line

Example – Element Table

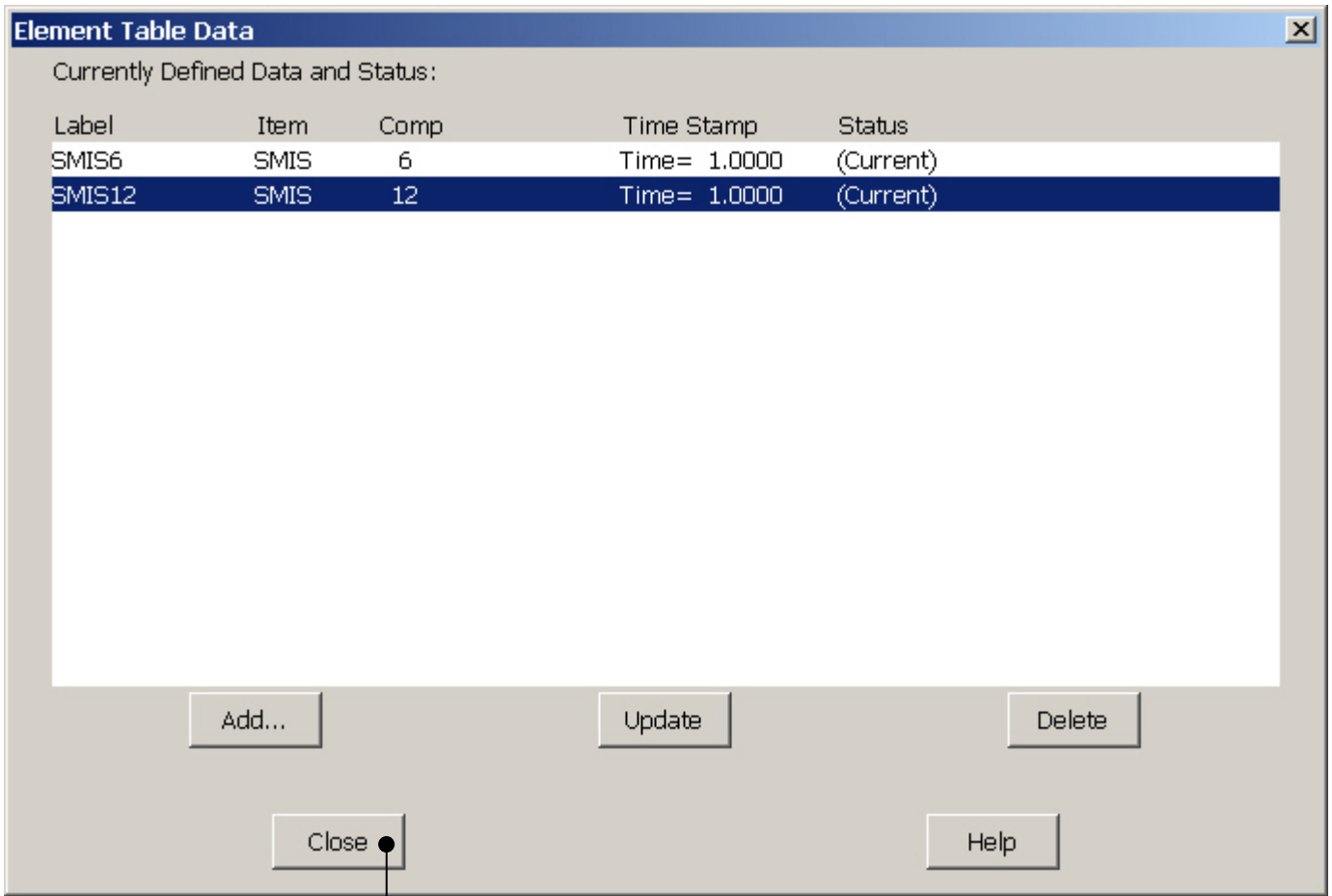


Press OK

Enter 12 as found in table 3.2

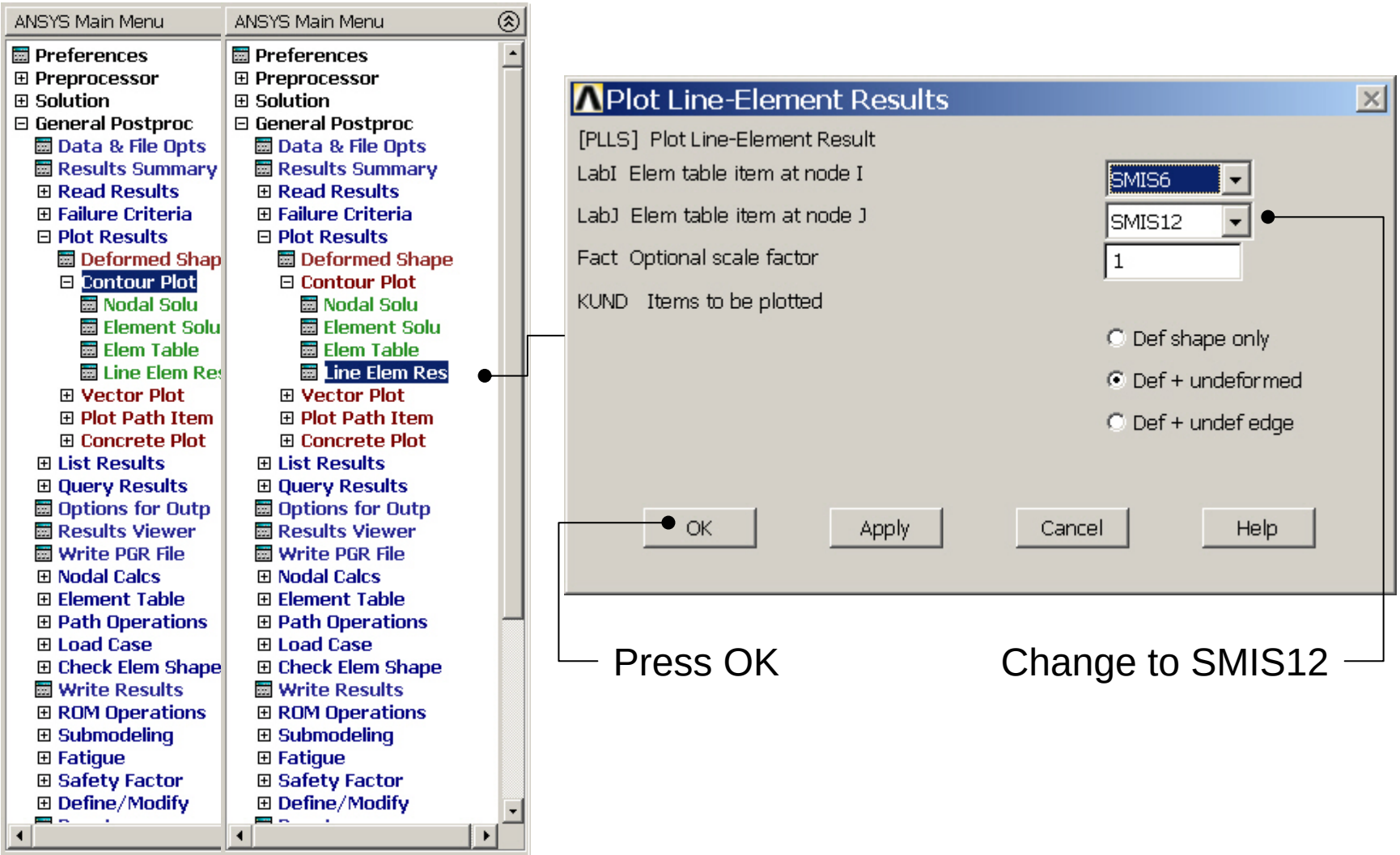
From table 3.2 MFORX, SMISC,6,12

Example – Element Table



Press Close

Example – Plot Line-Element



Example – Plot Line-Element