In [1]:
```
%matplotlib inline
```

1. start ANSYS APDL session from python

In [2]:
```
from ansys.mapdl.core import launch_mapdl
import os
from os import path
import platform
import numpy as np
curdir = os.getcwd()

# license = "ansys" # Ansys Mechanical Enterprise
license = "mech_2" # Ansys Mechanical Premium
if 'Windows' in platform.system():
    execfile = "C:\\Program Files\\ANSYS Inc\\v212\\ansys\\bin\\winx64\\ANSYS212.ex
else:
    execfile = ""

mapdl = launch_mapdl(exec_file=execfile, run_location=curdir, license_type=license,

print(mapdl)
```

```
Product:             Ansys Mechanical Premium
MAPDL Version:       21.2
ansys.mapdl Version: 0.63.3
```

1. Run the APDL input file and save the .db

In [3]:
```
mapdl.input("0_main.inp")
```

Out[3]:
```
'\n /INPUT FILE= C:\\Users\\Jesus Almenara\\0_main.inp  LINE=       0\n\n CLEAR AN
SYS DATABASE AND RESTART\n\n Ansys Mechanical Premium                          \n
\n PARAMETER JOBNAME = MAPDL_shell_forces_postprocess  \n\n CURRENT JOBNAME REDEFI
NED AS MAPDL_shell_forces_postprocess\n     Opening new LOG, ERROR, LOCK and PAGE
FILES\n\n ALL CURRENT ANSYS DATA WRITTEN TO FILE NAME= MAPDL_shell_forces_postproc
ess.db\n  FOR POSSIBLE RESUME FROM THIS POINT\n\n PARAMETER LX =     2.000000000
\n\n PARAMETER LY =    0.5000000000    \n\n PARAMETER THICKNESS =    0.5000000000E
-02\n\n *** ANSYS - ENGINEERING ANALYSIS SYSTEM  RELEASE 2021 R2          21.2
***\n Ansys Mechanical Premium                          \n 00000000  VERSION=WINDO
WS x64   13:24:14  DEC 02, 2022 CP=      0.484\n\n
\n\n\n\n          ***** ANSYS ANALYSIS DEFINITION (PREP7) *****\n\n KEYPOINT
0                  X,Y,Z=   0.00000      0.250000       0.00000      IN CSYS=
0\n\n     KEYPOINT NUMBER =         1\n\n KEYPOINT        0                  X,Y,Z
=   2.00000      0.250000       0.00000      IN CSYS=        0\n\n     KEYPOINT NU
MBER =         2\n\n KEYPOINT        0                  X,Y,Z=   2.00000     -0.25
0000       0.00000      IN CSYS=        0\n\n     KEYPOINT NUMBER =         3\n\n
KEYPOINT        0                  X,Y,Z=   0.00000     -0.250000       0.00000
IN CSYS=        0\n\n     KEYPOINT NUMBER =         4\n\n DEFINE AREA BY LIST OF K
EYPOINTS\n   KEYPOINT LIST =      1     2     3     4\n\n     AREA NUMBER =      1
\n\n ELEMENT TYPE          1 IS SHELL181     4-NODE SHELL                \n  KEYOP
T( 1- 6)=        0      0      0        0      0      0\n  KEYOPT( 7-12)=        0
0      0        0      0      0\n  KEYOPT(13-18)=        0      0      0        0
0      0\n\n CURRENT NODAL DOF SET IS  UX    UY    UZ    ROTX  ROTY  ROTZ\n  THREE
-DIMENSIONAL MODEL\n\n MATERIAL          1     EX   =  0.2000000E+10  \n\n MATERIA
L          1     DENS =   7800.000      \n                                     \n
INPUT SECTION ID NUMBER             1\n   INPUT SECTION TYPE                SHELL
\n   INPUT SHELL SECTION NAME                    \n\n\n Shell Section ID=      1 Nu
mber of layers=    1  Total Thickness=     0.005000\n\n PARAMETER FREEEDGENDIVS =
5.000000000    \n\n SET DIVISIONS ON LINE     2 (IF SELECTED)\n      TO  NDIV =
5,  SPACING RATIO =   1.000\n\n SET DIVISIONS ON LINE     4 (IF SELECTED)\n      T
O  NDIV =    5,  SPACING RATIO =   1.000\n\n SET DIVISIONS ON LINE     1 (IF SELEC
TED)\n      TO  NDIV =   20,  SPACING RATIO =   1.000\n\n SET DIVISIONS ON LINE
3 (IF SELECTED)\n      TO  NDIV =   20,  SPACING RATIO =   1.000\n\n ELEMENT TYPE
SET TO         1\n\n MATERIAL NUMBER SET TO         1\n\n SECTION ID NUMBER=
1\n PRODUCE ALL QUADRILATERAL ELEMENTS IN 2D.\n\n GENERATE NODES AND ELEMENTS\n
IN AREAS         1  TO      1  IN STEPS OF      1\n    ** AREA     1 MESHED WITH
100 QUADRILATERALS,        0 TRIANGLES **\n\n NUMBER OF AREAS MESHED     =
1\n MAXIMUM NODE NUMBER        =        126\n MAXIMUM ELEMENT NUMBER     =
100\n\n PARAMETER TARGETSTRESS =     100.0000000    \n\n PARAMETER FT =     25000
0.0000    \n\n SELECT       FOR ITEM=LOC  COMPONENT=X     BETWEEN  0.0000     AND
0.0000    \n   KABS=  0.  TOLERANCE= 0.100000E-05\n\n          6  NODES (OF
126  DEFINED) SELECTED BY  NSEL  COMMAND.\n\n SPECIFIED CONSTRAINT UX   FOR SELECT
ED NODES           1 TO         126 BY           1\n REAL=  0.00000000       IMAG
=  0.00000000    \n ADDITIONAL DOFS=  UY    UZ    ROTX  ROTY  ROTZ\n\n SELECT
FOR ITEM=LOC  COMPONENT=X     BETWEEN  2.0000     AND   2.0000    \n   KABS=  0.
TOLERANCE= 0.100000E-01\n\n          6  NODES (OF        126  DEFINED) SELECTED BY
NSEL  COMMAND.\n\n *GET  NUMNODES  FROM  NODE  ITEM=COUN       VALUE=  6.00000000
\n\n SPECIFIED NODAL LOAD FX   FOR SELECTED NODES         1 TO      126 BY
1\n  REAL=  41666.6667       IMAG=  0.00000000    \n\n ALL CURRENT ANSYS DATA WRIT
TEN TO FILE NAME= MAPDL_shell_forces_postprocess.db\n  FOR POSSIBLE RESUME FROM TH
IS POINT\n\n\n ***** ROUTINE COMPLETED *****  CP =         0.484\n\n\n\n *****  AN
SYS SOLUTION ROUTINE  *****\n\n\n PERFORM A STATIC ANALYSIS\n  THIS WILL BE A NEW
ANALYSIS\n\n *****  ANSYS SOLVE    COMMAND  *****\n\n *** NOTE ***
CP =       0.484   TIME= 13:24:14\n There is no title defined for this analysis.
\n\n *** SELECTION OF ELEMENT TECHNOLOGIES FOR APPLICABLE ELEMENTS ***\n
---GIVE SUGGESTIONS ONLY---\n\n ELEMENT TYPE         1 IS SHELL181. IT IS ASSOCIAT
ED WITH ELASTOPLASTIC \n MATERIALS ONLY. KEYOPT(8)=2 IS SUGGESTED AND KEYOPT(3)=2
IS SUGGESTED FOR\n HIGHER ACCURACY OF MEMBRANE STRESSES; OTHERWISE, KEYOPT(3)=0 IS
SUGGESTED.\n\n\n\n *** ANSYS - ENGINEERING ANALYSIS SYSTEM  RELEASE 2021 R2
21.2     ***\n Ansys Mechanical Premium                          \n 00000000  VERS
ION=WINDOWS x64   13:24:14  DEC 02, 2022 CP=      0.484\n\n
\n\n\n\n                       S O L U T I O N   O P T I O N S\n\n   PROBLEM DIMEN
SIONALITY. . . . . . . . . . . . . .3-D                \n   DEGREES OF FREEDOM. .
. . . . UX   UY   UZ   ROTX ROTY ROTZ\n   ANALYSIS TYPE . . . . . . . . . . . . .
```

```
. . . .STATIC (STEADY-STATE)\n   GLOBALLY ASSEMBLED MATRIX . . . . . .SY
MMETRIC  \n\n *** WARNING ***                         CP =       0.484   TIME= 13:
24:14\n Node 1 on element 1 is unselected.                                  \n
\n *** WARNING ***                         CP =       0.484   TIME= 13:24:14\n Nod
e 3 on element 1 is unselected.                                    \n\n *** WARN
ING ***                         CP =       0.484   TIME= 13:24:14\n Node 51 on ele
ment 1 is unselected.                                    \n\n *** WARNING ***
CP =       0.484   TIME= 13:24:14\n Node 50 on element 1 is unselected.
\n\n *** WARNING ***                         CP =       0.484   TIME= 13:24:14\n N
ode 3 on element 2 is unselected.                                    \n\n *** WA
RNING ***                         CP =       0.484   TIME= 13:24:14\n Node 4 on el
ement 2 is unselected.                                    \n\n *** WARNING ***
CP =       0.484   TIME= 13:24:14\n Node 55 on element 2 is unselected.
\n\n *** WARNING ***                         CP =       0.484   TIME= 13:24:14\n N
ode 51 on element 2 is unselected.                                    \n\n *** WA
RNING ***                         CP =       0.484   TIME= 13:24:14\n Node 4 on el
ement 3 is unselected.                                    \n\n *** WARNING ***
CP =       0.484   TIME= 13:24:14\n Node 5 on element 3 is unselected.
\n\n *** WARNING ***                         CP =       0.484   TIME= 13:24:14\n N
ode 59 on element 3 is unselected.                                    \n\n *** WA
RNING ***                         CP =       0.484   TIME= 13:24:14\n Node 55 on e
lement 3 is unselected.                                    \n\n *** WARNING ***
CP =       0.484   TIME= 13:24:14\n Node 5 on element 4 is unselected.
\n\n *** WARNING ***                         CP =       0.484   TIME= 13:24:14\n N
ode 6 on element 4 is unselected.                                    \n\n *** WA
RNING ***                         CP =       0.484   TIME= 13:24:14\n Node 63 on e
lement 4 is unselected.                                    \n\n *** WARNING ***
CP =       0.484   TIME= 13:24:14\n Node 59 on element 4 is unselected.
\n\n *** WARNING ***                         CP =       0.484   TIME= 13:24:14\n N
ode 6 on element 5 is unselected.                                    \n\n *** WA
RNING ***                         CP =       0.484   TIME= 13:24:14\n Node 7 on el
ement 5 is unselected.                                    \n\n *** WARNING ***
CP =       0.484   TIME= 13:24:14\n Node 67 on element 5 is unselected.
\n\n *** WARNING ***                         CP =       0.484   TIME= 13:24:14\n N
ode 63 on element 5 is unselected.                                    \n\n ******
************************************************************\n The number of
ERROR and WARNING messages exceeds 20.                    \n Additional messages s
uppressed.  See ( C:\\Users\\Jesus                    \n Almenara\\MAPDL_shell_forc
es_postprocess.err ) for suppressed messages.  \n ******************************
**************************************\n\n *** NOTE ***
CP =       0.500   TIME= 13:24:14\n Present time 0 is less than or equal to the pr
evious time.  Time will   \n default to 1.
\n\n *** NOTE ***                         CP =       0.500   TIME= 13:24:14\n T
he step data was checked and warning messages were found.              \n  Please
review output or errors file ( C:\\Users\\Jesus                    \n Almenara\\MAP
DL_shell_forces_postprocess.err ) for these warning         \n messages.
\n\n *** NOTE ***                         CP =       0.500   TIME= 13:24:14\n T
he conditions for direct assembly have been met.  No .emat or .erot    \n files wi
ll be produced.                                                \n\n
L O A D   S T E P   O P T I O N S\n\n   LOAD STEP NUMBER. . . . . . . . . . . .
. . .     1\n   TIME AT END OF THE LOAD STEP. . . . . . . . .  1.0000    \n   NU
MBER OF SUBSTEPS. . . . . . . . . . . . . . .     1\n   STEP CHANGE BOUNDARY CONDI
TIONS . . . . . .    NO\n   PRINT OUTPUT CONTROLS . . . . . . . . . . . . .NO
PRINTOUT\n   DATABASE OUTPUT CONTROLS. . . . . . . . . . . .ALL DATA WRITTEN\n
FOR THE LAST SUBSTEP\n\n\n SOLUTION MONITORING INFO IS WRITTEN TO FILE= MAPDL_shel
l_forces_postprocess.mntr
\n\n *** NOTE ***                         CP =       0.500   TIME= 13:24:14\n P
redictor is ON by default for structural elements with rotational      \n degrees
of freedom.  Use the PRED,OFF command to turn the predictor     \n OFF if it adver
sely affects the convergence.                          \n\n\n\n
***********  PRECISE MASS SUMMARY  ***********\n\n   TOTAL RIGID BODY MASS MATRIX
ABOUT ORIGIN\n               Translational mass                |   Coupled translat
ional/rotational mass\n         39.000      -0.95526E-31    0.0000     |     0.000
0        0.0000       0.16653E-15\n       -0.95526E-31    39.000        0.0000
```

```
|     0.0000        0.0000        39.000    \n         0.0000        0.0000
39.000     |   -0.13878E-16   -39.000        0.0000    \n     ------------------
---------------------- | ----------------------------------------\n
|         Rotational mass (inertia)\n
|    0.81258        0.0000        0.0000    \n
|   -0.83267E-16    52.000        0.0000    \n
|     0.0000        0.0000        52.748    \n\n   TOTAL MASS =  39.000    \n
The mass principal axes coincide with the global Cartesian axes\n\n   CENTER OF MA
SS (X,Y,Z)=    1.0000      -0.42701E-17    0.0000    \n\n   TOTAL INERTIA ABOUT CE
NTER OF MASS\n        0.81258      -0.13878E-16    0.0000    \n       -0.13878E-16
13.000        0.0000    \n         0.0000        0.0000        13.748    \n     Th
e inertia principal axes coincide with the global Cartesian axes\n\n\n  *** MASS S
UMMARY BY ELEMENT TYPE ***\n\n  TYPE      MASS\n     1   39.0000    \n\n Range of
element maximum matrix coefficients in global coordinates\n Maximum = 3742094.83 a
t element 97.                                    \n Minimum = 3742094.83 at eleme
nt 50.                                    \n\n   *** ELEMENT MATRIX FORMULATION T
IMES\n     TYPE    NUMBER   ENAME      TOTAL CP  AVE CP\n\n        1       100  SH
ELL181      0.062   0.000625\n Time at end of element matrix formulation CP = 0.53
125.                \n\n SPARSE MATRIX DIRECT SOLVER.\n  Number of equations =
720,    Maximum wavefront =     36\n  Memory allocated for solver              =
1.071 MB\n  Memory required for in-core solution     =     1.036 MB\n  Memory requ
ired for out-of-core solution =     0.712 MB\n\n *** NOTE ***
CP =       0.531   TIME= 13:24:14\n The Sparse Matrix Solver is currently running
in the in-core memory     \n mode.  This memory mode uses the most amount of memor
y in order to      \n avoid using the hard drive as much as possible, which most o
ften        \n results in the fastest solution time.  This mode is recommended if
\n enough physical memory is present to accommodate all of the solver      \n dat
a.                                                                \n Sparse sol
ver maximum pivot= 14968379.3 at node 117 UY.                \n Sparse solver min
imum pivot= 11.5547118 at node 13 ROTY.               \n Sparse solver minimum pi
vot in absolute value= 11.5547118 at node 13    \n ROTY.
\n\n   *** ELEMENT RESULT CALCULATION TIMES\n     TYPE    NUMBER   ENAME      TOTA
L CP  AVE CP\n\n        1       100  SHELL181      0.000   0.000000\n\n   *** NODA
L LOAD CALCULATION TIMES\n     TYPE    NUMBER   ENAME      TOTAL CP  AVE CP\n\n
1       100  SHELL181      0.000   0.000000\n *** LOAD STEP     1   SUBSTEP     1
COMPLETED.    CUM ITER =      1\n *** TIME =   1.00000         TIME INC =   1.0000
0      NEW TRIANG MATRIX\n\n\n *** ANSYS BINARY FILE STATISTICS\n  BUFFER SIZE USE
D= 16384\n        0.125 MB WRITTEN ON ASSEMBLED MATRIX FILE: MAPDL_shell_forces_po
stprocess.full\n        0.438 MB WRITTEN ON RESULTS FILE: MAPDL_shell_forces_postp
rocess.rst\n\n FINISH SOLUTION PROCESSING\n\n\n ***** ROUTINE COMPLETED *****  CP
=         0.641\n\n\n\n ALL CURRENT ANSYS DATA WRITTEN TO FILE NAME= MAPDL_shell_f
orces_postprocess.db\n  FOR POSSIBLE RESUME FROM THIS POINT\n'
```

In [4]:
```python
mapdl.prep7()
mapdl.allsel()

# mapdl.nplot(plot_bc=True)
#mapdl.show('png')
mapdl.nplot(vtk=False)
#mapdl.show('close')
```

In [5]:
```python
mapdl.post1()

mapdl.plesol(item='F',comp='X',vtk=False, savefig='plesol.png')
```

In [6]:
```python
mapdl.exit()
```