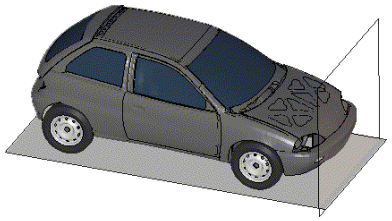
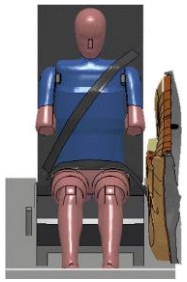
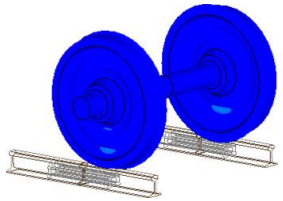
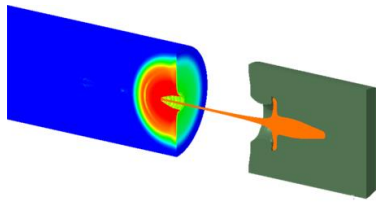
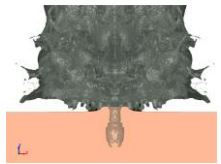
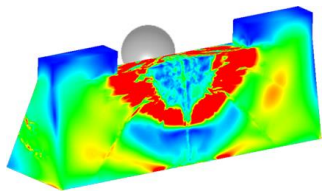












اللهم عجل لوليك الفرج

Online Course

Simulation and Numerical Modeling of Engineering Problems using

LS-DYNA

Course instructor

Ahmad Rahmati-Alaei

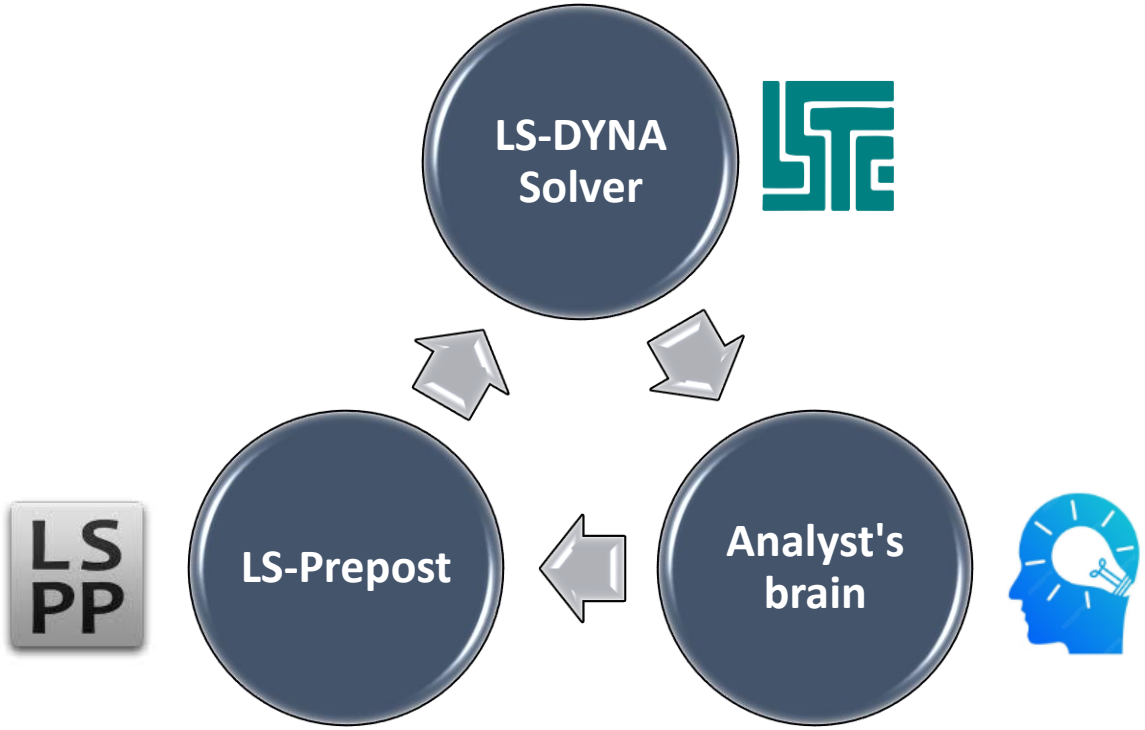
Assistant Professor, Department of Mechanical Engineering
National University of Skills (NUS), Tehran, Iran

Part 2

1. *LS-DYNA & LS-PrePost (versions and download)?*
2. *Simulation Process by LS-DYNA?*
3. *Basic Sample for Starting (Familiarity with GUI of LS-PrePost)*

LS-DYNA & LS-PrePost (download & versions)?

All we need for simulation are:



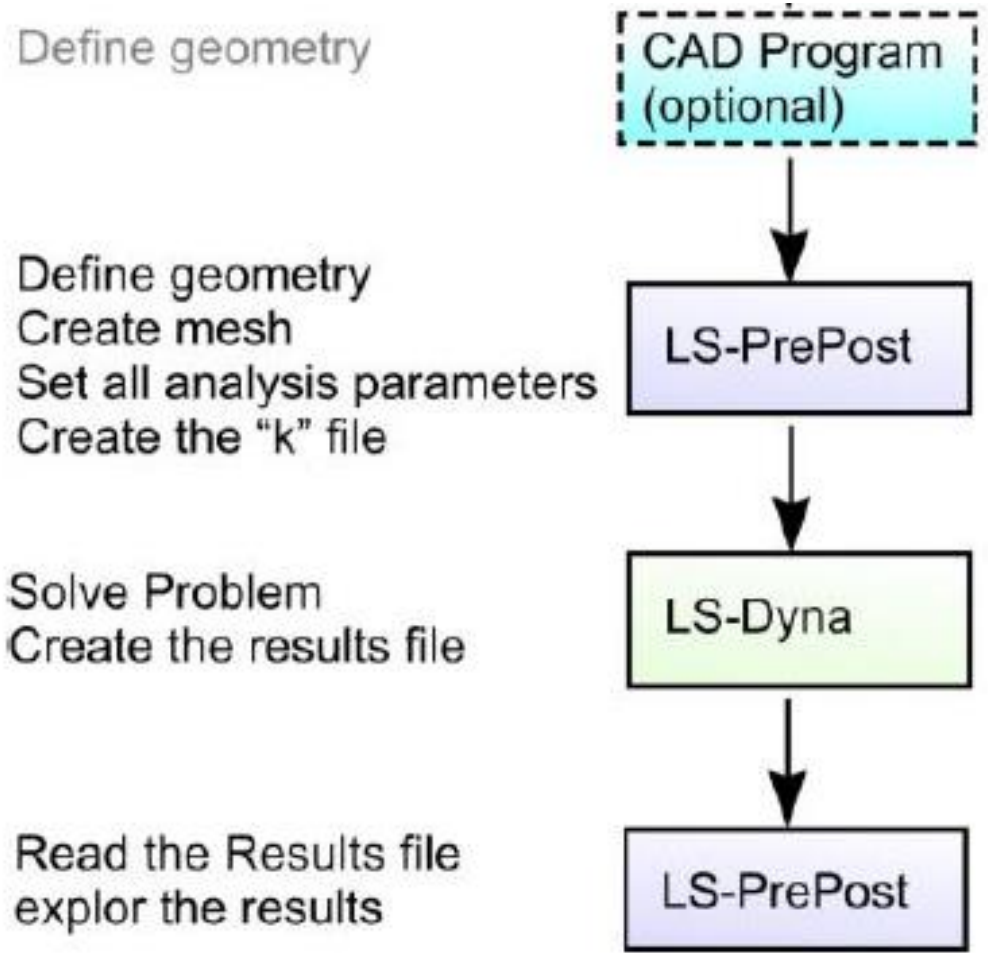
LS-Prepost is a pre and post-processing program for LS-DYNA. LSTC always distributes the latest LS-PrePost version free of charge and it is an essential program to use LS-DYNA, so download the latest version and use it:

http://ftp.lstc.com/anonymous/outgoing/lsprepost/

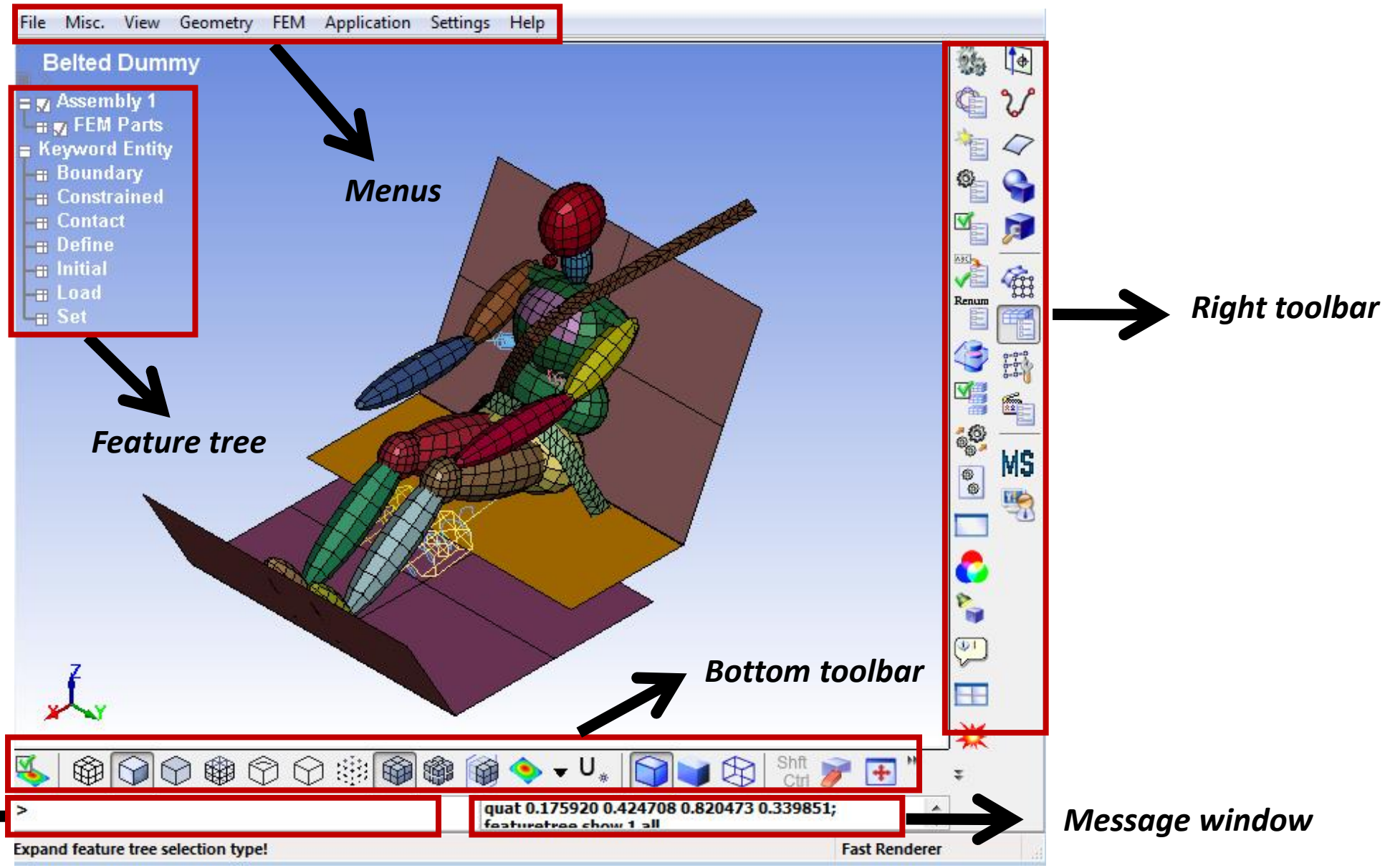
LS-DYNA & LS-PrePost (download & versions)?

- LS-DYNA software is continuously being developed and updated by the developers at Livermore Software Technology Corporation (LSTC).
- New versions of the software are released periodically with added features, enhancements, bug fixes, and improved capabilities.
- The LS-DYNA versions are denoted by a combination of numbers such as R11.1, R11.2, R11.3, etc.
- The "R" stands for release, and the subsequent numbers represent the major version, minor version, and maintenance version of the software.

Simulation Process?

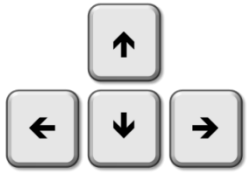


Basic Sample for Starting (Familiarity with GUI of LS-PrePost)

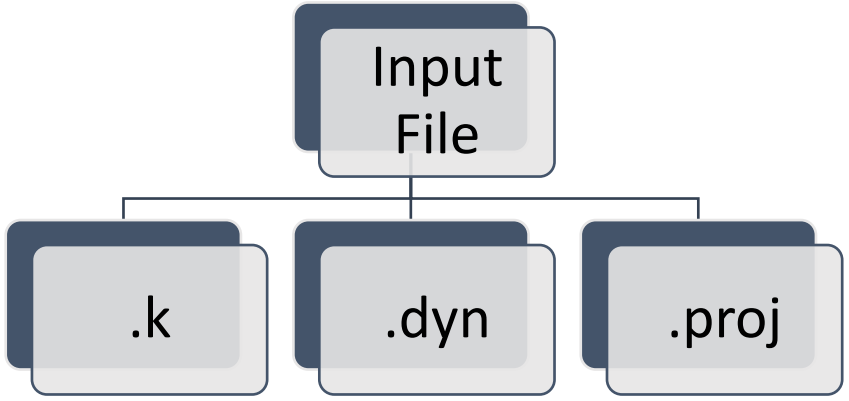


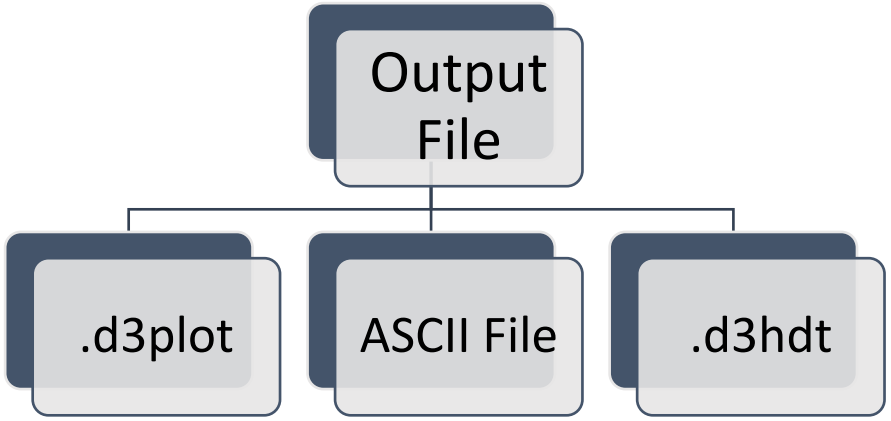
Basic Sample for Starting (Familiarity with GUI of LS-PrePost)

Model manipulation

- Shift +  → Rotate
- Shift +  (or scroll wheel) → Zoom
-  → Translate

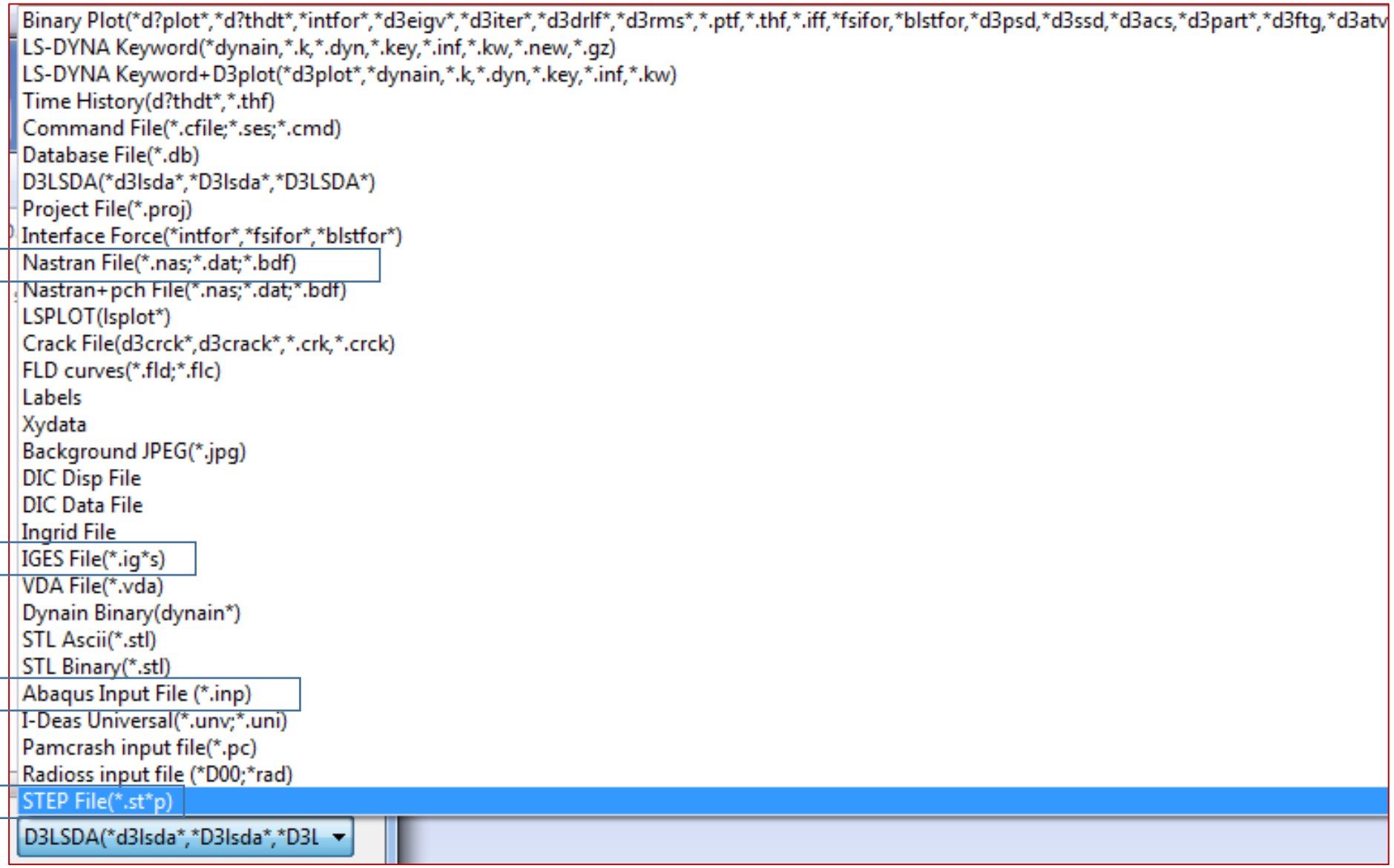
LS-DYNA Main File Format



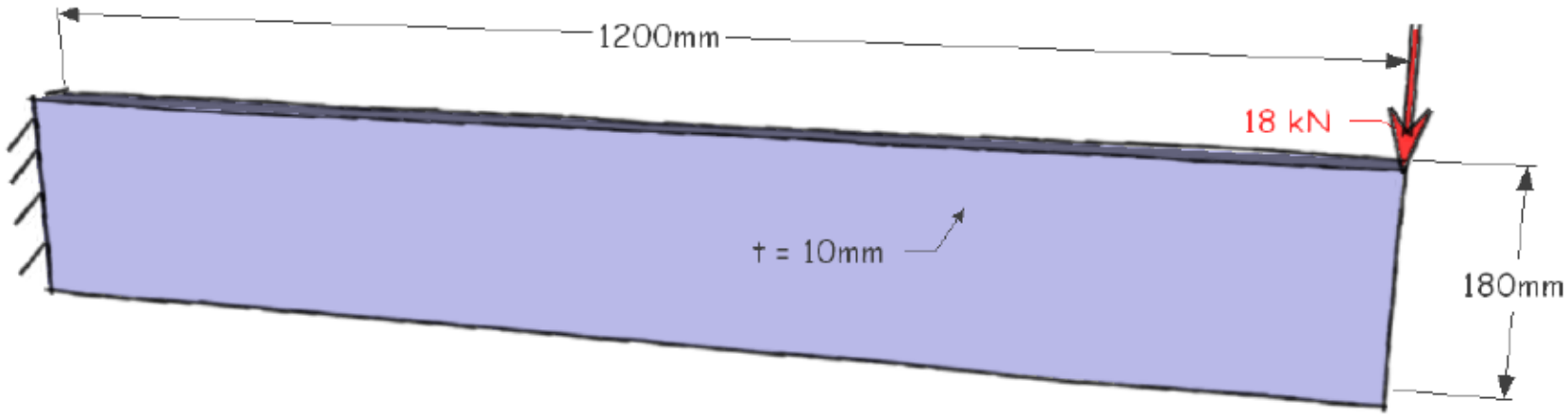


Basic Sample for Starting (Familiarity with GUI of LS-PrePost)

All LS-DYNA File Format



In this first example we will model a simple steel cantilever, to see how the simple structure responds to load. The problem is sketched below.



The problem description is as follows:

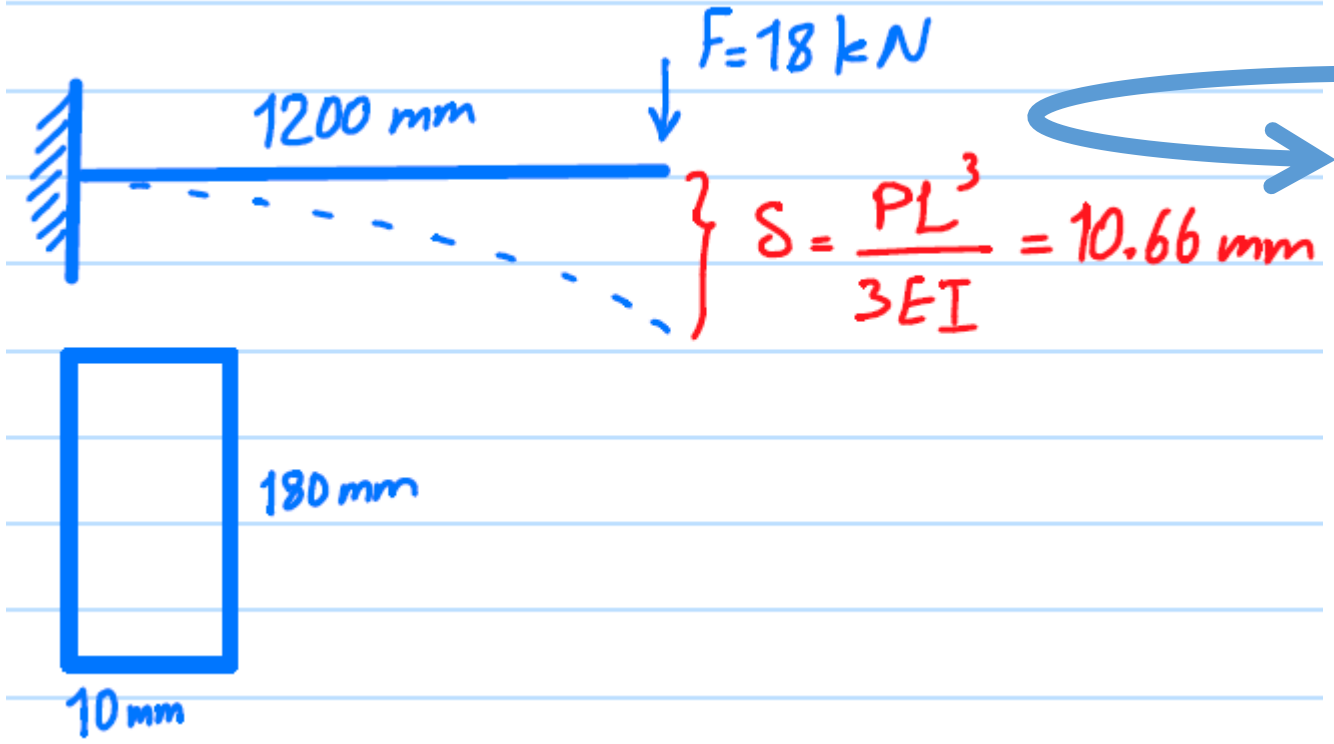
Geometry:	1.200 x .180 x .010 m
Load:	18000 N applied at the end of the cantilever in the string direction
Supports:	the base is fixed in all degrees of freedom, all other boundaries are free.
Material:	Steel, with E = 200e9 Pa (2e11 N/m2), σy = 3e8 Pa, Et= 1e9 Pa

Consistent Unit Table

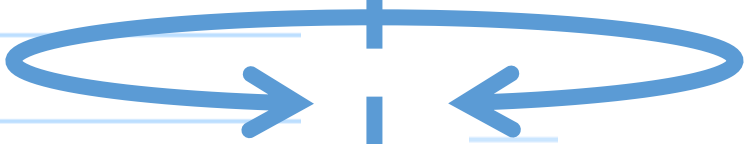
Sample for Steel

MASS	LENGTH	TIME	FORCE	STRESS	ENERGY	DENSITY	YOUNG's Modulus	GRAVITY
kg	m	s	N	Pa	J	7.83e+03	2.07e+11	9.806
kg	cm	s	1.0e-02 N			7.83e-03	2.07e+09	9.806e+02
kg	cm	ms	1.0e+04 N			7.83e-03	2.07e+03	9.806e-04
kg	cm	us	1.0e+10 N			7.83e-03	2.07e-03	9.806e-10
kg	mm	ms	kN	GPa	kN-mm	7.83e-06	2.07e+02	9.806e-03
g	cm	s	dyne	dyne/cm²	erg	7.83e+00	2.07e+12	9.806e+02
g	cm	us	1.0e+07 N	Mbar	1.0e+07 Ncm	7.83e+00	2.07e+00	9.806e-10
g	mm	s	1.0e-06 N	Pa		7.83e-03	2.07e+11	9.806e+03
g	mm	ms	N	MPa	N-mm	7.83e-03	2.07e+05	9.806e-03
ton	mm	s	N	MPa	N-mm	7.83e-09	2.07e+05	9.806e+03
g	cm	ms	1.0e+1 N	1.0e+05 Pa		7.83e+00	2.07e+06	9.806e-04
kg	mm	s	mN	1.0e+03 Pa		7.83e-06	2.07e+08	9.806e+03
lbf-s²/in	in	s	lbf	psi	lbf-in	7.33e-04	3.00e+07	386
slug	ft	s	lbf	psf	lbf-ft	1.52e+01	4.32e+09	32.17
kgf-s²/mm	mm	s	kgf	kgf/mm²	kgf-mm	7.98e-10	2.11e+04	9.806e+03

Analytical Solution



LS-DYNA Simulation Solution



$\delta =$ *10.8 mm* — *Beam Element*

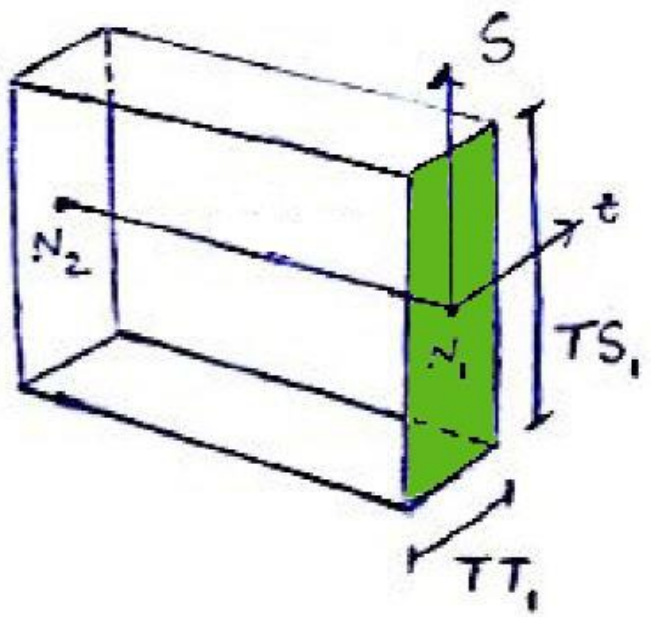
$\delta =$ *11.2 mm* — *Shell Element*

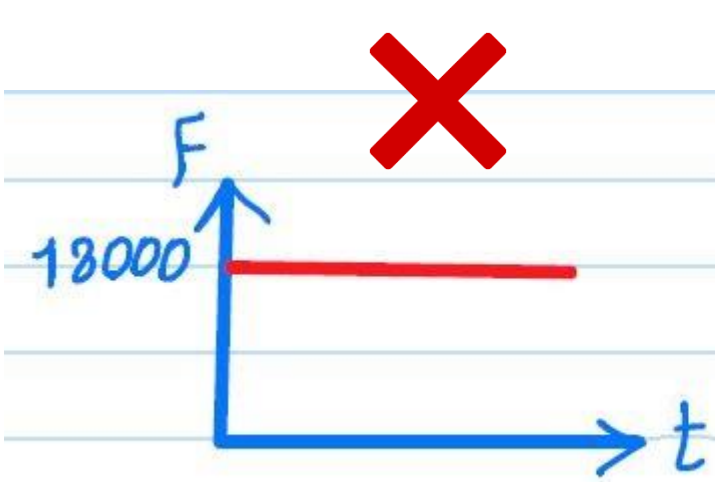
It is likely that the LSDYNA results will be close to this result

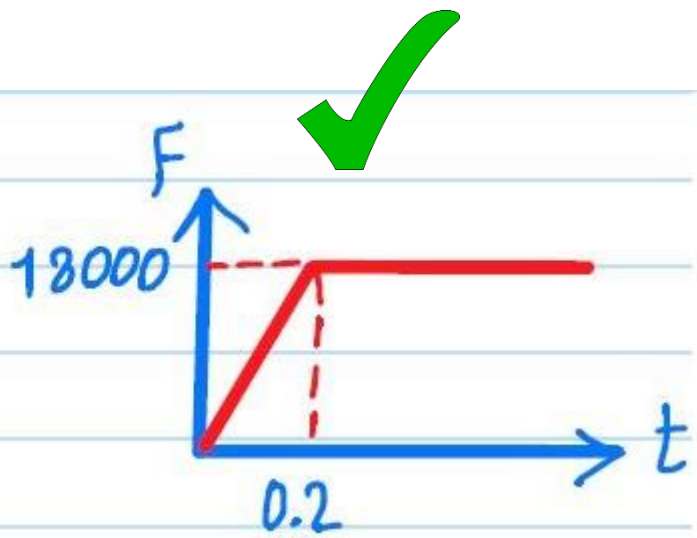
General process of simulation and modeling with LS-DYNA

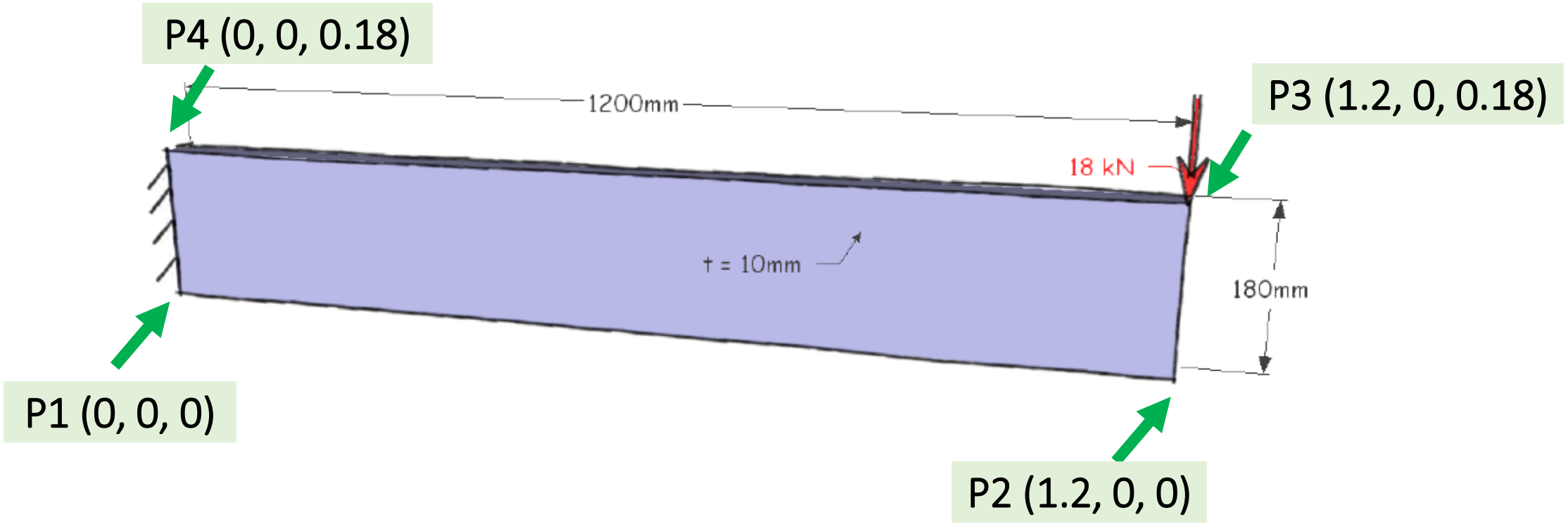
Geometry	• *Create geometry according to the dimensions of the problem*
Mesh	• Meshing of the model using appropriate elements and acceptable element quality
Boundary Condition	• Creating appropriate boundary conditions according to the degrees of freedom of the problem
Material	• Creating a suitable behavioral material model for the problem
Section	• Creating the cross section of the element and defining the appropriate formulation for the element
Load	• Creating point, distributed and body forces for the model
Termination	• Definition of the end time of the numerical solution of the problem
Time Step	• Defining the time step of writing the output data of the problem

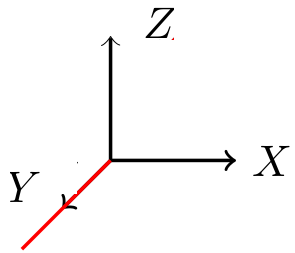
Beam Element Cross Section











Distance	# Element
1.2	50
0.18	? → ~=8

Course instructor

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