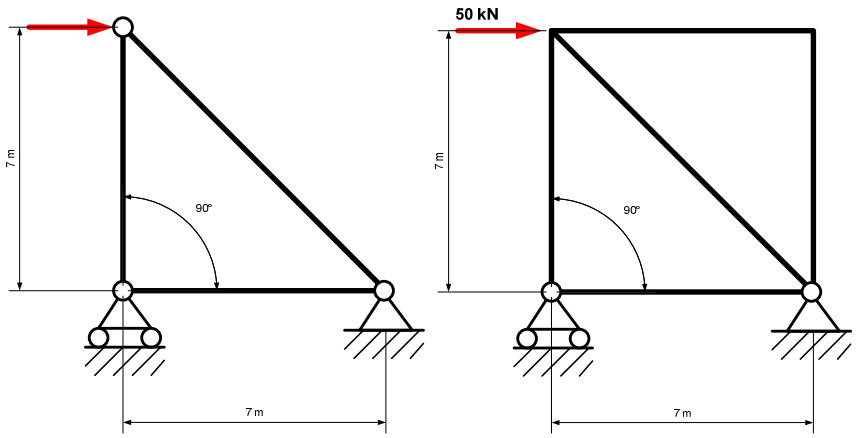
Problem 1

a) Draw a load path diagram for each of the structures shown below.
b) Draw a free-body diagram for every member of the structures and calculate the base reactions of both structures.
c) Sketch the deflected shape for each of the structures. Use Dr.Frame to compute the deflected shape.
d) Which structure is a stiffer structure? Explain why?
e) Compute the member forces, stresses, and deflections of all members in the first structure.
f) All members are W150×30 (A=3,790 mm^2, E=200,000 MPa), base is 7 m and vertical is 7 m long.

(Note all connections with a small circle are "pin" connections. This leads to no bending in first structure.)



Problem 2

Sketch a concept design for an open air elevated walkway which is to span between two buildings spaced 30 m apart, using steel or timber. Estimate the expected depths of your proposed structural systems.

Problem 3

A new type of composite column is being tested. The following table shows the compressive strength of the columns as tested as well as the loads survey in the planned applications. Please note this is an exercise. In the real case many more samples would be needed.

Find the

a) 5th percentile of the column resistance and 95th percentile of the loads.
b) Global safety factor of the column when used in the planned application.
c) Safety index of the column when used in the planned application.
d) Comment on if the column is safe to use in a typical building structure.

column compressive strength samples (kN)	load samples (kN)
50	30
60	35
65	22
55	50
20	37
30	44
50	54
49	37
65	33
66	44
	42
	34

Problem 4

A truck with 8 m wheelbase and of 5 ton weight drives over a 400 m three span bridge. The wheel loads are equal, as are the bridge spans.

a) Sketch by hand the shear and moment envelopes by hand, identifying approximate location and value of maxima and minima. Use Dr.Beam for your analysis.
b) Identify the location of maximum deflection.
c) Where would you place a joint in the bridge deck, if one would be required?

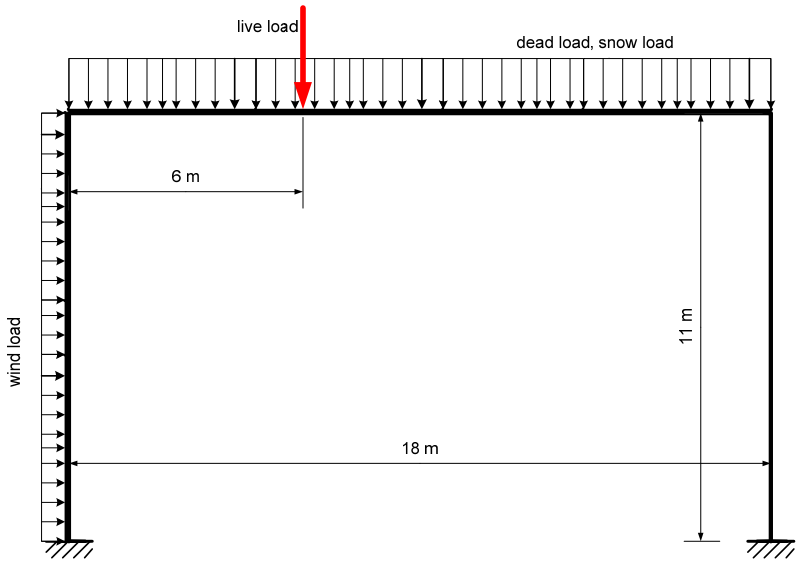
Problem 5

A structure of high importance experiences the following notional loads (= value without importance factors):

type	dead	live	wind	snow
total load in kN	**25**	**30**	**15**	**10**

a) Find all load combinations for the ultimate limit state.

b) What load case gives the maximum deflection for the roof beam, assuming columns and beam have the same cross section and material?



Problem 6

Limit states that are concerned with safety are called:

ultimate limit states [_]
serviceability limit states [_]
endurance limit states [_]
allowable limit states [_]

Who publishes the American standards equivalent to the CAN/CSA standards for steel qualities:

Canadian Standards Association (CSA) [_]
American Standards Association (ASA) [_]
American Society for Testing and Materials (ASTM) [_]

The member forces must be computed considering:

all load cases [_]
only the load cases with highest values when added [_]
without stress factors [_]
the 5^{th} and 95^{th} percentile [_]

Dead loads are computed from the:

mass of the material [_]
volume and yield strength of the members [_]
total mass of individual members [_]
total volume of individual members [_]

A live load must always be a:

moving load [_]
moving of fixed load [_]
load that change in magnitude [_]
vibrating load [_]