# Project 3: Truss Design

## Contributors:


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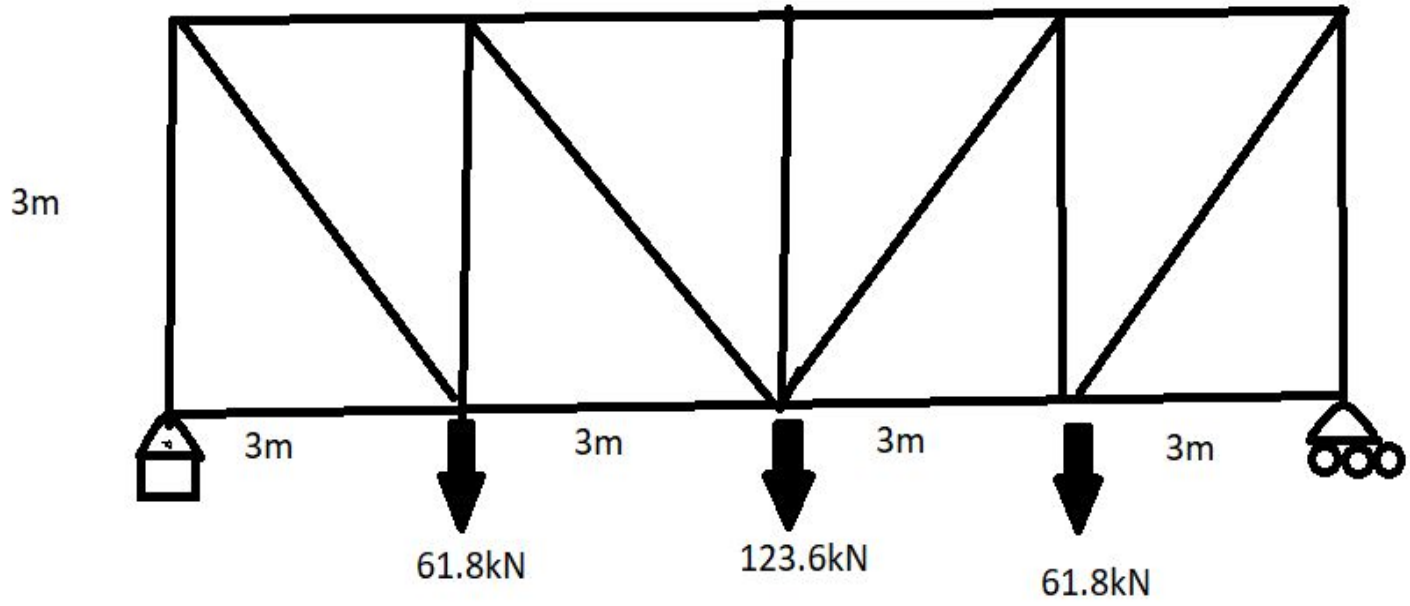
# Design Goal of the Truss

- Footbridge across the Soca river located in Slovenia.
- The Pratt Truss can span great distances and uses steel materials for construction
- They are many hiking scenes that across the Soca river that can be reached, but need to cross the river in order to hike in other places.
- Allows hikers additional routes for the exploration across the river

# Geometric Design of the Truss



# Selection of Materials

- A36 Grade Steel
- Density: 7850 kg/m^3

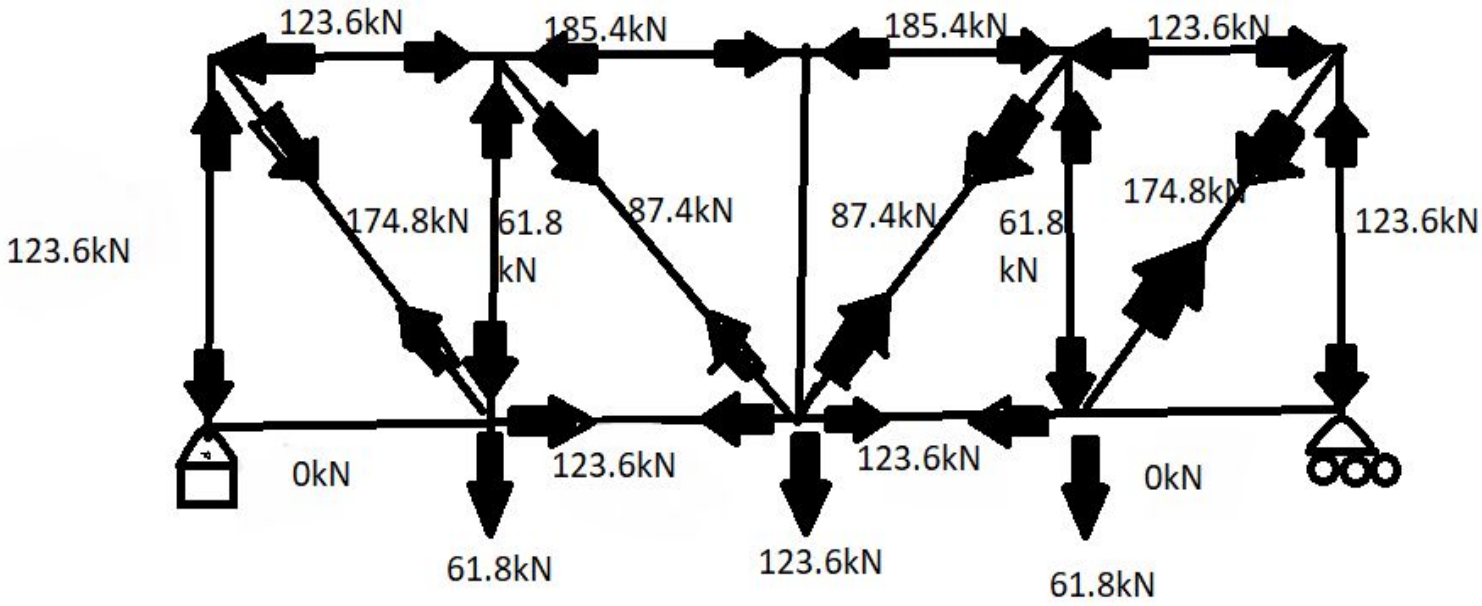
# Loads on the Truss

- The area of the bridge is:
- 3 m x 12 m = 36 $m^2$
- 36 $m^2$ x 5 x 70 kg x 9.81 $m/s^2$ = 123,606 N, or 123.6 kN in the middle - if the bridge was full of people (5 people per $m^2$), this is the maximum weight it could support, while not being too crammed.
- There are also 61.8 kN loads on pins on the sides of the middle pin

# Weight of Members Relative to Load

- Volume of largest truss: 0.065 m x 0.07 m x 3x $\sqrt{(2)}$ m = 0.0193 $m^3$
- Density of A36 steel - 7850 $kg/m^3$
- Weight of largest truss: 0.0193 $m^3$ x 7850 $kg/m^3$ x 9.81 $m/s^2$ = 1486.57 N
- 1486.57 / 2.5% / 1000 = 59.46 kN < 61.8 kN
- Conclusion: all members weigh less than 2.5% of the smallest load, and are, therefore, negligible

# Calculation of Forces in Members



# Calculation of Stresses in Members

- Solid A36 steel members with dimensions 0.065 m x 0.07 m
- Cross sectional area of 0.00455 $m^2$
- Stress = Axial Load/Cross sectional area
- In highest load member:
  - Axial Load = 185.4 kN = 185,400 N
  - 185,400 N / 0.00455 $m^2$ = 41,200,000 Pa = 41.2 MPa
- Yield stress for A36 steel is 250 MPa, thus all members are well below yield stress

# Euler's Load

- A36 Young's modulus = 200 GPa (200,000,000,000 Pa)
- 3 m truss: $E = \pi^2(200{,}000{,}000{,}000\ Pa) \times (0.065^3 \times 0.07)/12)/9 = 351{,}353\ N = 351.353\ kN$

# Thank You