# ARCH 314
# STRUCTURE I

RECITATION SESSION 10
FACULTY: Prof. Peter Von Buelow
GSI: Faezeh Choobkar
FALL 2025

# Welcome to recitation session

**Introduction:**

Faezeh Choobkar (PhD student)
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Office hours: by appointment

**Outline:**

Quick Recap
Provide the solution for the assignment
Answering student's questions
Recitation lab

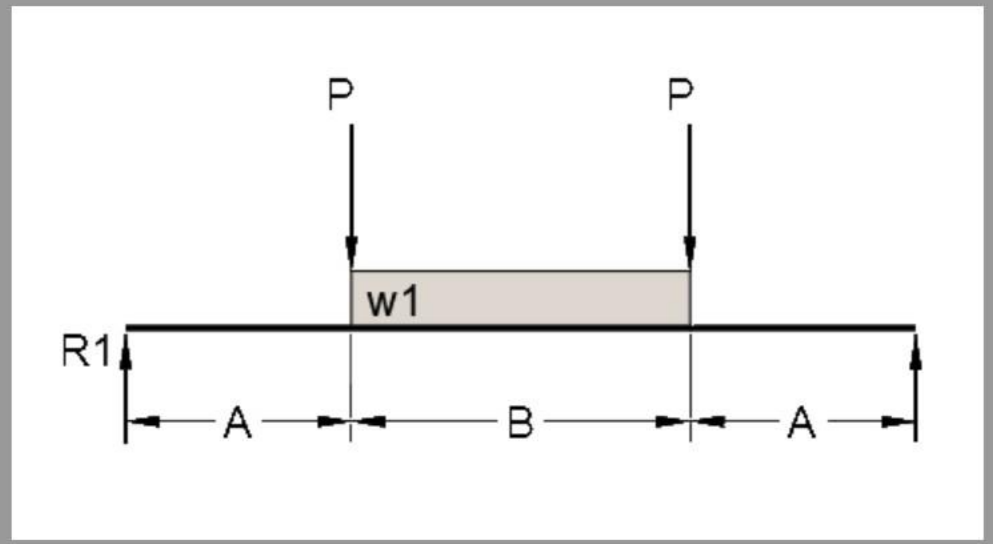
## Problem Set

### 14. Beam Deflection

For the given simple span beam, use shear, moment, slope and deflection diagrams to determine the slope at each end, the deflection at points A and B distance from left, and the maximum deflection at the centerline. Remember to divide out EI to get deflection in inches. Be sure to correct errors at each step to maintain accuracy.

DATASET: 1 -2- -3-

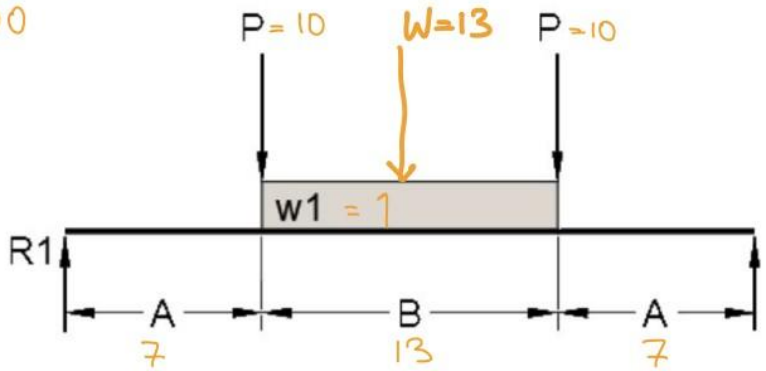
| | |
|---|---|
| Length A | 7 FT |
| Length B | 13 FT |
| Point Load P | 10 KIPS |
| Uniform Load w | 1 KLF |
| Modulus of Elasticity | 29000 KSI |
| Moment of Inertia | 460 IN^4 |



## Problem Set

E = Module of Elasticity = 29000

I = Moment of interia = 460




$$\Sigma M_1 = 0$$

$$P(A) + W\left(A + \frac{B}{2}\right) + P(A+B) - R_2(A+B+A) = 0$$

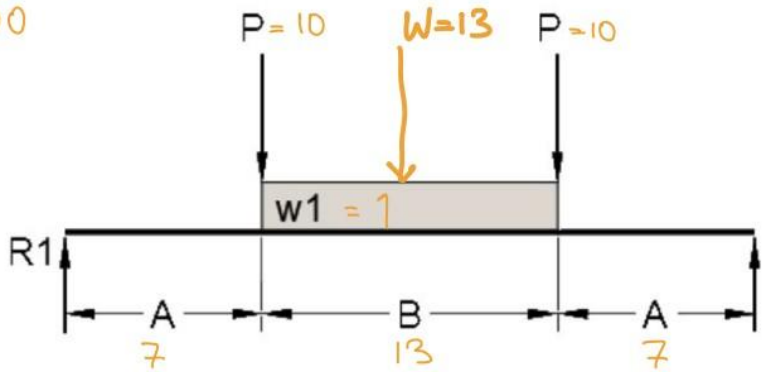
$$10(7) + 13\left(7 + \frac{13}{2}\right) + 10(13+7) - R_2(27) = 0$$

$$R_2 = 16.5$$

## Problem Set

E = Module of Elasticity = 29000

I = Moment of interia = 460



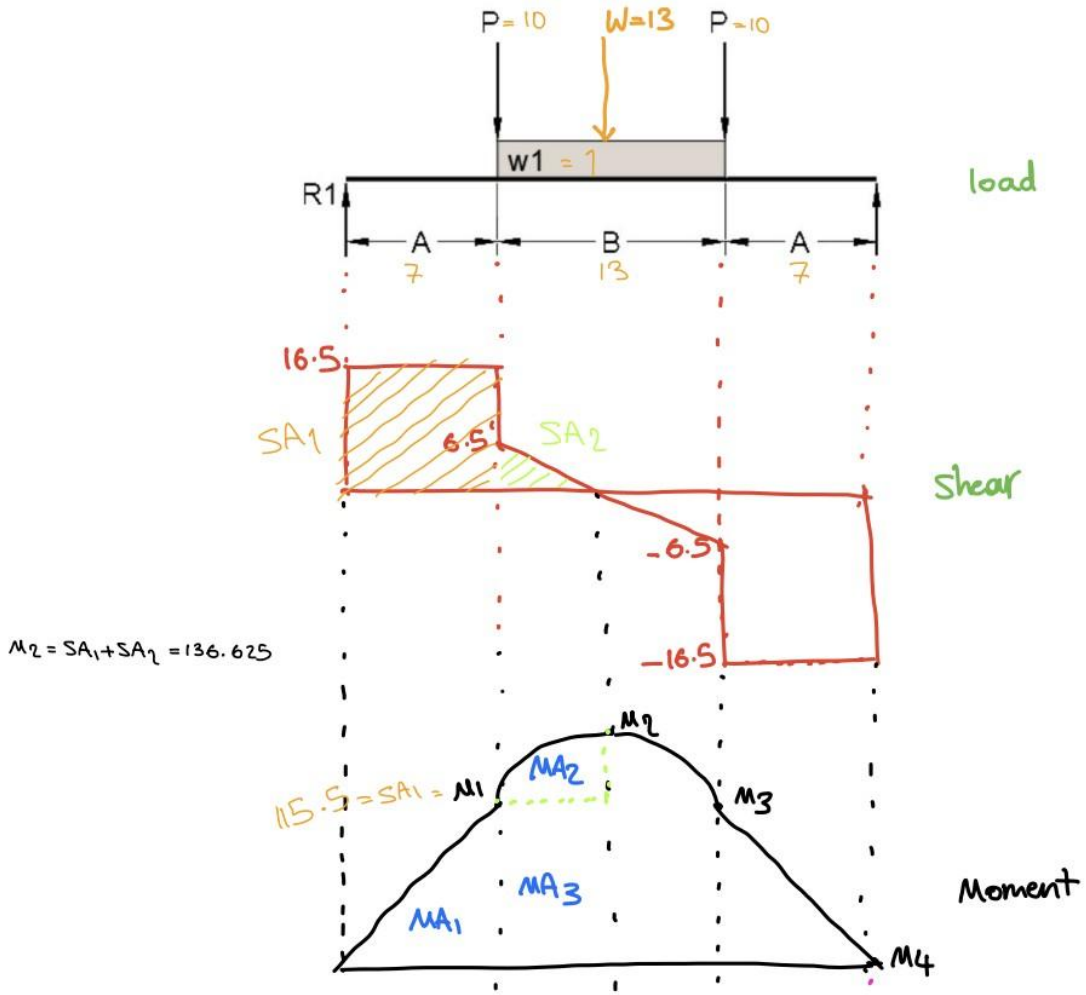

$\Sigma F_y = 0$

$R_1 + R_2 - P - P - w = 0$

$R_1 + 16.5 - 10 - 10 - 13 = 0$

$R_1 = 6.5$

## Problem Set







Area under Moment Diagram:

$MA_1 = \frac{1}{2}(115.5)(7) = 404.25$

$MA_3 = 115.5(6.5) = 750.75$

$MA_2 = \frac{2}{3}\left(\frac{13}{2}\right)(136.625 - 115.5) = 91.54$

## Problem Set

$A = MA_1 + MA_2 + MA_3 = 1246.54$

$B = MA_2 + MA_3 = 842.29$

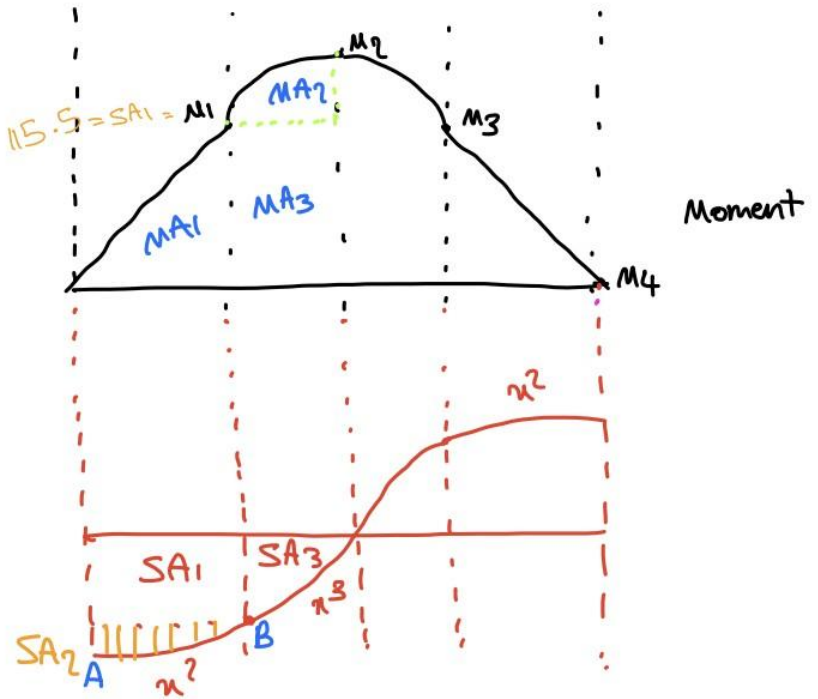
$SA_1 = (842.29)(7) = 5896.03$

$SA_2 = \frac{2}{3}(7)(1246.54 - 842.29) = 1886.5$

$SA_3 = \frac{5}{8}(6.5)(842.29) = 3421.80$

Centerline Deflections:

$$\delta = \frac{SA_1 + SA_2 + SA_3}{EI} = \frac{11204.33 \times 12^3}{13340 \times 10^3} = 1.45$$



Structures II

Arch 314

Name 1 _____

Name 2 _____

Name 3 _____

# Deflection

**Description**

This project uses observation and calculation to understand how a cantilever member deflects under load.

**Goals**

To observe the bending behavior of a cantilever through physical modeling.
To find the deflection using the diagram method.
To verify the deflection using beam equations.

**Procedure**

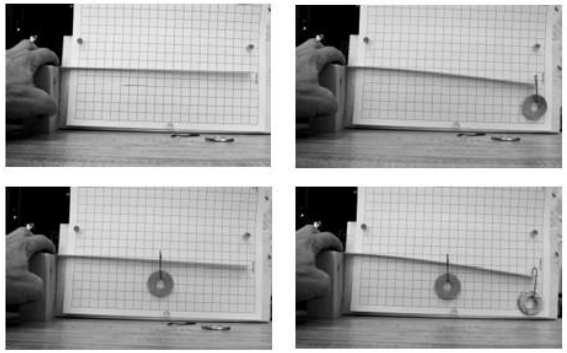
1. Hold the 1/16"x1/2" basswood stick flatwise on the 2x4 support as shown.
2. Load first the free end, and measure the deflection against the graph paper (small squares = 0.1 inch).
3. Repeat the procedure for a load at the half point and at both points.
4. For each load measure and record a deflection.
5. Use the diagram method to calculate the deflection for the point load at the end.
6. Finally, calculate the deflection for the end load case with the equation below.

**Basswood Properties**

E = 1,650,000. psi
$I_y$ = 0.0000102 $in^4$
$P_1$ = 0.035 lbs.
L = 10.5 in

**Equations:**

$$I = \frac{bd^3}{12} \qquad \delta = \frac{Pl^3}{3EI}$$



**Due**

During recitation