Housekeeping

- **Tuesday**
  - Q 5 start day
- **Wednesday**
  - PL 18
- **Thursday**
  - ME 19
- **Friday**
  - Oct 28: last class day TAM 210 (review?)
  - Oct 30,31: TAM 210 office hours 5-7pm 112 Transp Building
- **Sunday**
  - WA 10 (last 210 WA)
- **Next week**
  - TAM 211 usual stuff
  - TAM 210 FINAL (Nov 1 – Nov 5) – sign up on CBTF

The tunnel ends!! (for some)
Quiz 4

Test statistics

<table>
<thead>
<tr>
<th>Statistic</th>
<th>Value</th>
</tr>
</thead>
<tbody>
<tr>
<td>Number of students</td>
<td>562</td>
</tr>
<tr>
<td>Mean score</td>
<td>68.1%</td>
</tr>
<tr>
<td>Standard deviation</td>
<td>27.2%</td>
</tr>
<tr>
<td>Minimum score</td>
<td>0.0%</td>
</tr>
<tr>
<td>Median score</td>
<td>77.5%</td>
</tr>
<tr>
<td>Maximum score</td>
<td>100.0%</td>
</tr>
<tr>
<td>Number of 0%</td>
<td>6 (1.1% of class)</td>
</tr>
<tr>
<td>Number of 100%</td>
<td>46 (8.2% of class)</td>
</tr>
</tbody>
</table>
Draw the shear and moment diagrams for the simply supported beam.
Slide 3

Start from left:

1. \( A_y \rightarrow V \) shift
   - constant \( w \)
     - \( \Rightarrow V = f(x) \)

2. \( w \) is neg slope \( V \)
   - \( \Rightarrow \) neg
   - \( \Delta V = \int w \)
     - \( \Delta V = wa \)

3. No change

4. \( \downarrow B_y \Rightarrow \) shift \( V \)
   - No change

\[ V(x) \]

\[ M(x) \]
Slide 3

**Bending**

1. $M = 0$
2. $V = f(x)$
   - $M = f(x^2)$
   - Slope + \[ b/c \] $V > 0$
   - Slope - \[ b/c \] slope $V(-)$

$V \rightarrow \text{const}, \therefore M = f(x)$
- $V < 0: \text{slope } M(-)$
- $\Delta M_3 = \int_3^4 V(x)$

$\Delta M_1 = \int_1^2 V(x)$

$\Delta M_2 = \int_2^3 V(x)$

$\Delta M_3 = \int_3^4 V(x)$
Draw the shear and moment diagrams for the beam.
SLIDE 9

1. $A_N \rightarrow \text{shifts } V$
2. No $\Delta$
3. No $\Delta$
4. 100 lb \( \rightarrow \text{shifts } V \downarrow$

1. $M_A \rightarrow \text{shifts } M$
   
   $M = \int M = -M A$

2. $M = f(x)$
   
   $V = \text{constant}$
   
   $\Delta M = \int V(x) dx$

3. $800 \text{ lb} \rightarrow \text{shifts } M$

4. $V = \text{constant}$
   
   $M = f(x)$
   
   $\Delta M = \int V(x) dx$
Draw the shear and moment diagrams for the beam.
Wherever there is an external concentrated force, or a concentrated moment, there will be a change (jump) in shear or moment respectively.
Relations Among Load, Shear and Bending Moments

Consider the simply supported beam.

- Subject to several concentrated forces, moments, distributed loads

The shear force is given by $\Delta f$:

\[ V - (V + \Delta V) + \Delta x w(x) = 0 \]

\[ \Delta V = w(x) \Delta x \]

In the limit of $\Delta x \to 0$

\[ \frac{dv}{dx} = w(x) \]

\[ \Delta V = \int w(x) \, dx \]

Slope of shear = distributed load intensity

Change in = area under shear load curve

$\Delta x$
Relations Among Load, Shear and Bending Moments

Consider the simply supported beam subject to several concentrated forces, moments, distributed loads

Consider the beam element.

\[ M(x) = \int V(x) \, dx \]

\[ \frac{dM}{dx} = V \]

\[ \Delta M = \int V(x) \, dx \]

Slope of moment diagram = Shear

Change in moment = Area under Shear diagram
Wherever there is an external concentrated force, or a concentrated moment, there will be a change (jump) in shear or moment respectively.

The shear force is 
\[ \Delta V = f \]

\[ V - V - \Delta V + F = 0 \]

The moment is 
\[ \Delta M = M_0 \]

\[ M + \Delta M - M - M_0 - \Delta x V = 0 \]