PROBLEM: Compute the values of bending moment and deflection at A, B, C, D, and E in the cantilever beam AE built into a rigid support at E.

SOLUTION:

(1) Tabluate the values of point loads W.

The sign must be included, upward loading being positive. The factors column is used to keep all numerical work as simple as possible.

(2) From the W values and one shear value, compute chord shears.

As the shear to the left of A is known to be zero, all shear values are found by adding across from left to right as indicated by the arrows.

(3) Compute values of moment increment in each chord.

This line is booked separately to show the effect of unequal chords. Moment increment in each chord = chord shear × chord length.

(4) From moment increments and one value of moment, compute node moments.

As $M_A = 0$, moments are found by adding across from left to right.

(5) Sketch the form of the M/I diagram.

This is an important step as it indicates the correct way to apply the concentration formulae.

(6) Compute Y'', the concentration of y'', at each node.

Trapezoidal formulae apply all through. As chord lengths are unequal the $W_{BA} = (h/6)(2w_{BA} + w_{AB})$ formula (see Fig. 1.9) is used to give Y'' at each side of each node. These are added to give the total Y'' at each node.

(7) From Y'' and one slope value, compute chord slopes.

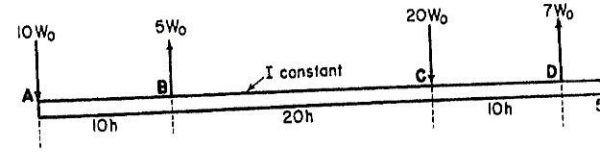
As $y'_E = 0$, chord slopes are found by subtracting from right to left as indicated by the arrows. This step is similar to step (2).

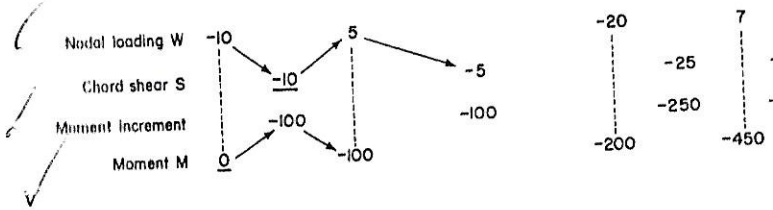
(8) Compute values of deflection increment in each chord.

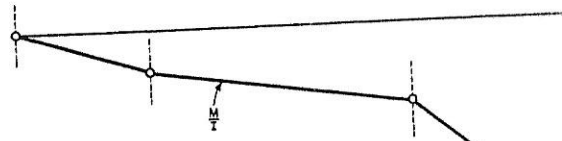
This is similar to step (3). Deflection increment in each chord = chord slope × chord length.

(9) From deflection increments and one value of deflection, compute deflections.

This is similar to step (4). As $y_E = 0$, deflections are found by subtracting as indicated by the arrows.







Nodal concentration $y'' = Y''$.

$\frac{M}{EI} = y''$	0	-100		-200	-450
Nodal concentration of $y''=Y''$		-20 -80		-100 -85	-110
		-100		-185	-182
Chord slope y'	543.5		443.5	256.5	
Deflection increment	543.5		887.0	256.5	
Deflection y	1727.25	-1183.75		-296.75	-38.7

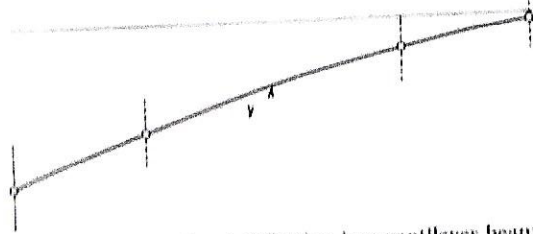


Figure 1.3. Moment and deflection in a cantilever beam