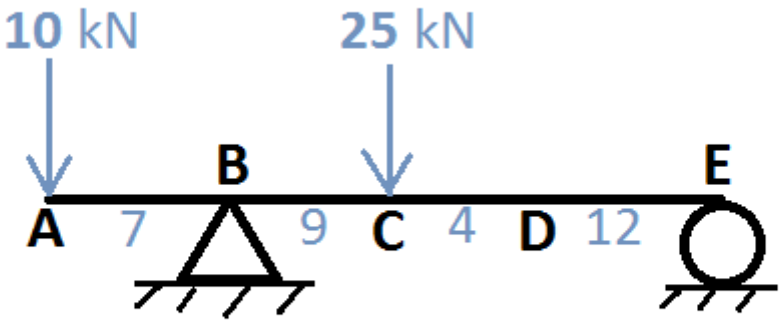
Lecture 3- Homework

Question: **Find Δ_D of the following simply-supported structure.**



Solution:

The equation we work with is $\Delta=\int \frac{M_0\, M_1}{EI}\, dx$,

Where $\mathbf{M_o}$ = bending moment distribution due to actual or real loading

$\mathbf{M_1}$ = bending moment distribution due to virtual or unit loading

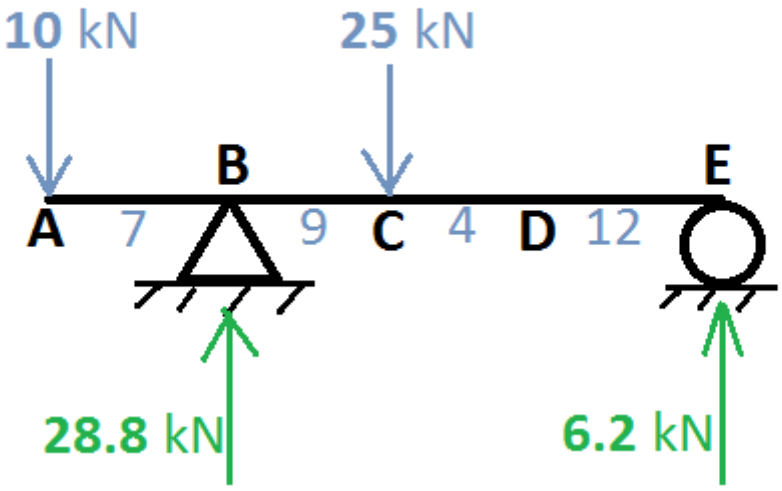
E = modulus of elasticity of the material of beam

I = moment of inertia of beam section

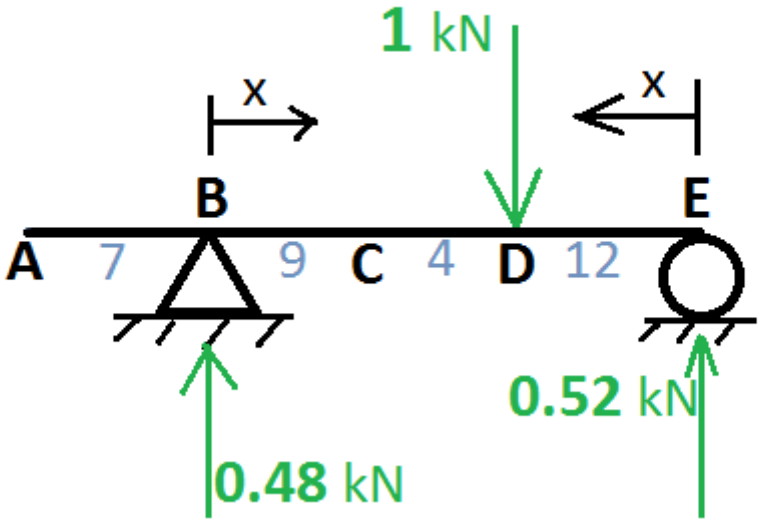
L = beam span

$\mathbf{\Delta_D}$ = deflection at point D

The diagram for M_0 is-



The diagram for M_1 is-



We know that $\Delta = \int \frac{M_0 M_1}{EI} dx$

Hence,

$$EI\,\Delta_D = \int_0^{9\ \mathbf{B\to C}} \{28.8x - 10(x+7)\} * (0.48x)dx + \int_0^{4\ \mathbf{C\to D}} \{-25x + 28.8(x+9) - 10(x+16)\} * \{0.48(x+9)\}dx + \int_0^{12\ \mathbf{E\to D}} (6.2x * 0.52x)dx$$

= 832.032 + 1817.344 + 1857.024

= 4506.4

$$\therefore\ \Delta_D = \frac{4506}{EI}$$

Done by: Ms. Sama Ahmed

Checked by: Dr. Latifee, December 9, 2015