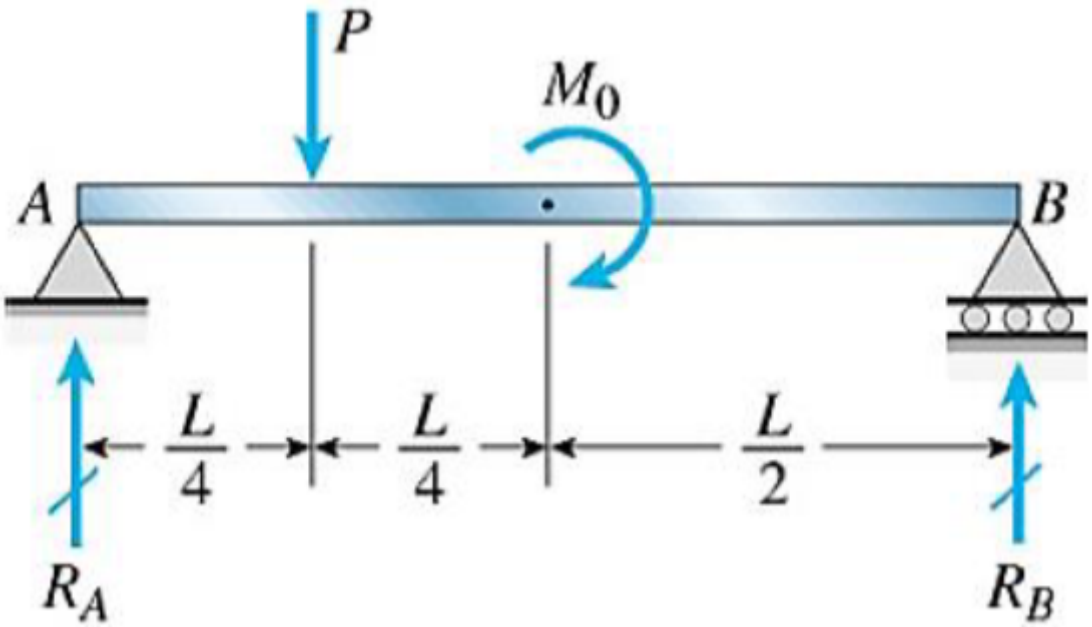
EX_4

EX_4
- EX 4.1
- EX 4.2
- EX 4.3
- EX 4.4
- EX 4.5
- EX 4.6
- EX 4.7
- EX 4.8
- EX 4.9
- EX 4.10
- EX 4.11

EX 4.1

A simply supported beam loads P and M0 Determine V and M at:

(a) just to the left of the beam's midian
(b) just to the right of the beam's midian



$$\begin{cases} R_A + R_B = P \\ R_A L + M_0 = \frac{3}{4} PL \end{cases} \Rightarrow \begin{cases} R_A = \frac{3}{4} P - \frac{M_0}{L} \\ R_B = \frac{1}{4} P + \frac{M_0}{L} \end{cases}$$

for the left part on the beam

$$V_L = R_A - P$$

$$= -\frac{P}{4} - \frac{M_0}{L}$$

$$M_L = R_A \cdot \frac{L}{2} - P \cdot \frac{L}{4} = \frac{3}{8} PL - \frac{M_0}{2} - \frac{1}{4} PL = \frac{1}{8} PL - \frac{M_0}{2}$$

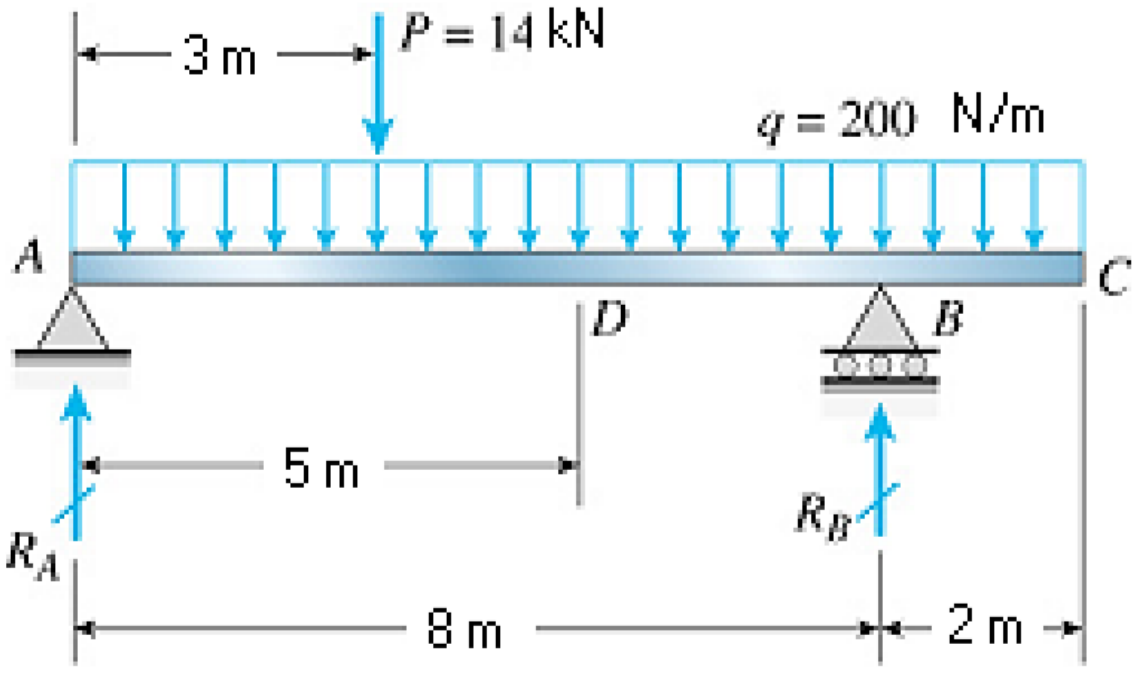
for the right part on the beam

$$V_R = V_L = -\frac{P}{4} - \frac{M_0}{L}$$

$$M_R = M_L + M_0 = \frac{1}{8} PL + \frac{M_0}{2}$$

EX 4.2

Calculate V and M at point D



$$\begin{cases} R_A + R_B = 14 + 0.2\times10 = 16 \\ R_B \cdot 8 = 0.2\times10\times5 + 14\times3 \end{cases} \Rightarrow \begin{cases} R_A = 9.5\ kN \\ R_B = 6.5\ kN \end{cases}$$

$$V_D = R_A - P - 2\,q\,L_{AD}$$

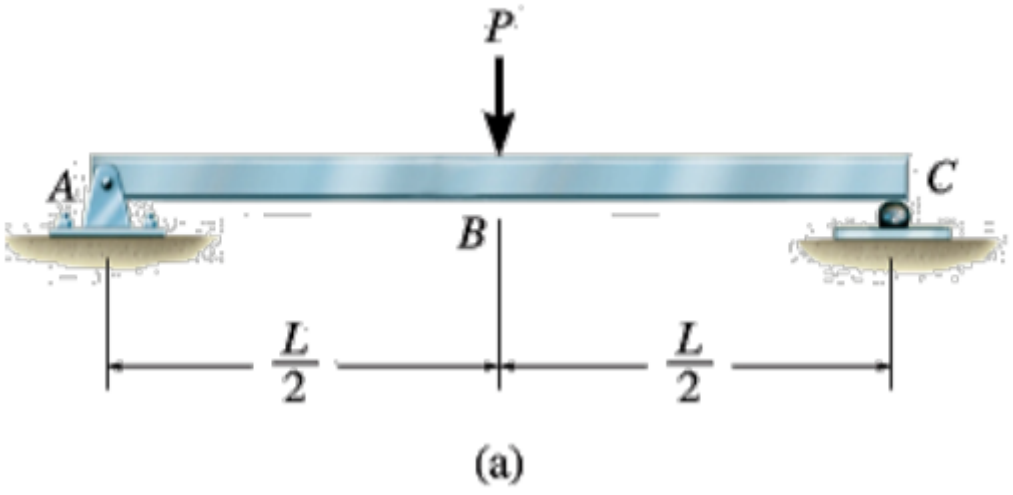
$$= 9.5 - 14 - 0.2\times5 = -5.5\ kN$$

$$M_D = R_A L_{AD} - P(L_{AD}-3) - \tfrac{1}{2} q L_{AD}^2$$

$$= 9.5\times5 - 14\times2 - 0.1\times5^2 = 17\ kN\cdot m$$

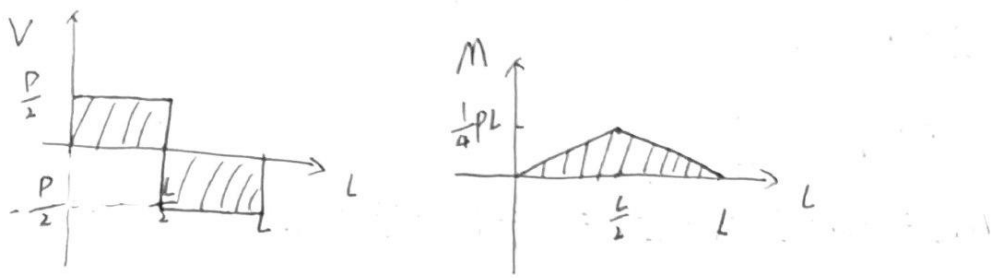
EX 4.3

Draw the shear and moment diagrams for beam shown below.



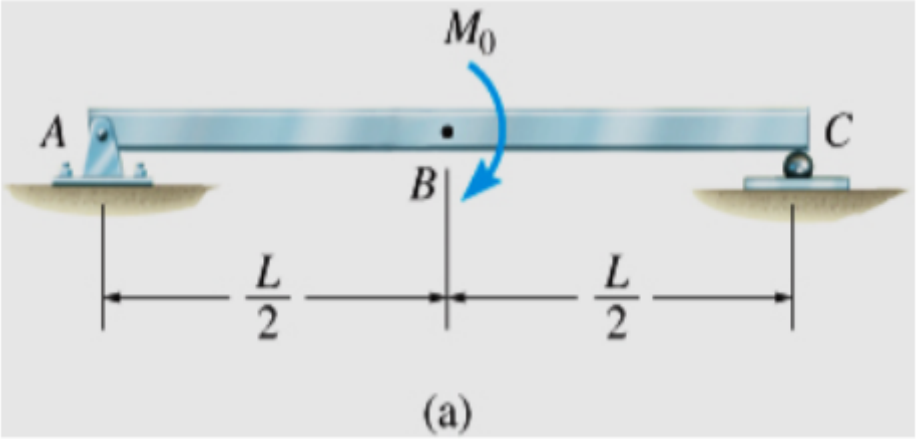
(a)

$$\begin{cases} R_A + R_C = P \\ R_C\, L = P \cdot \frac{L}{2} \end{cases} \Rightarrow \begin{cases} R_A = \frac{P}{2} \\ R_C = \frac{P}{2} \end{cases}$$

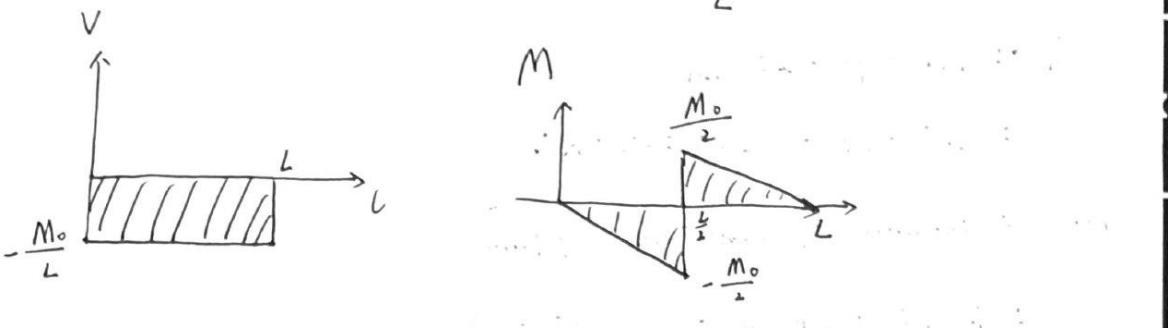


EX 4.4

Draw the shear and moment diagrams for beam shown below.

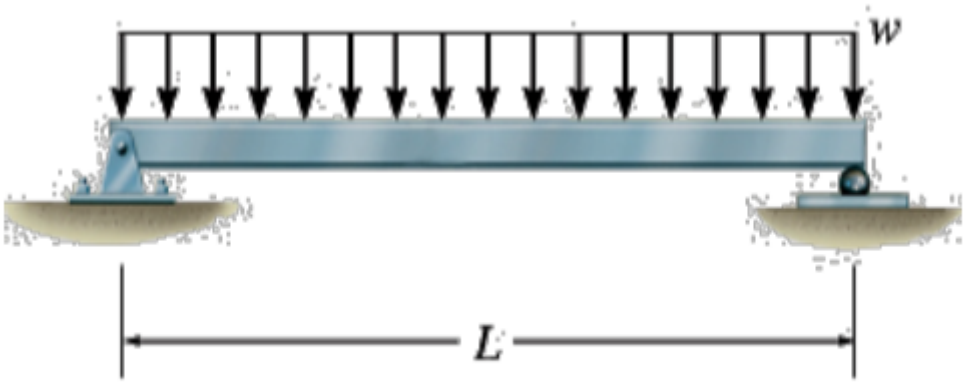


$$R_C + R_A = 0 \quad \Big\} \Rightarrow \quad \begin{cases} R_A = -\frac{M_0}{L} \\ R_C = \frac{M_0}{L} \end{cases}$$
$$R_C\, L = M_0 \quad \Big\}$$



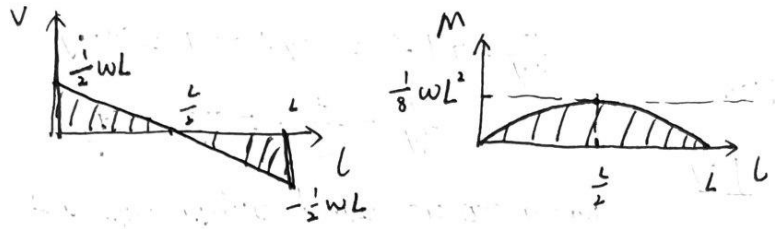
EX 4.5

Draw the shear and moment diagrams for beam shown below.



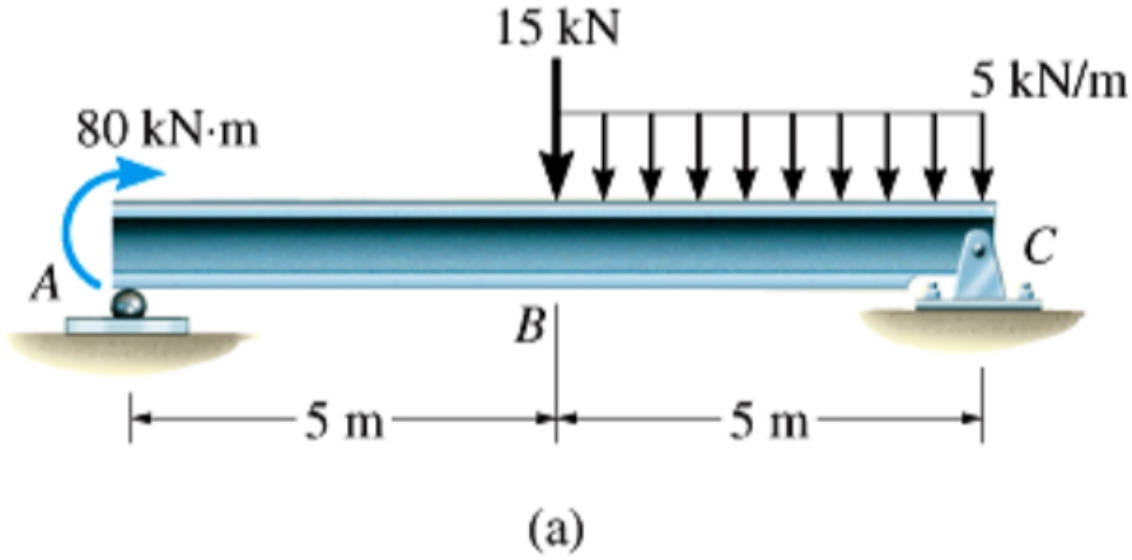
(a)

$$R_L + R_R = wL \quad \Rightarrow \quad R_L = \frac{1}{2}wL$$
$$R_R L = \frac{1}{2}wL^2 \quad \Rightarrow \quad R_R = \frac{1}{2}wL$$

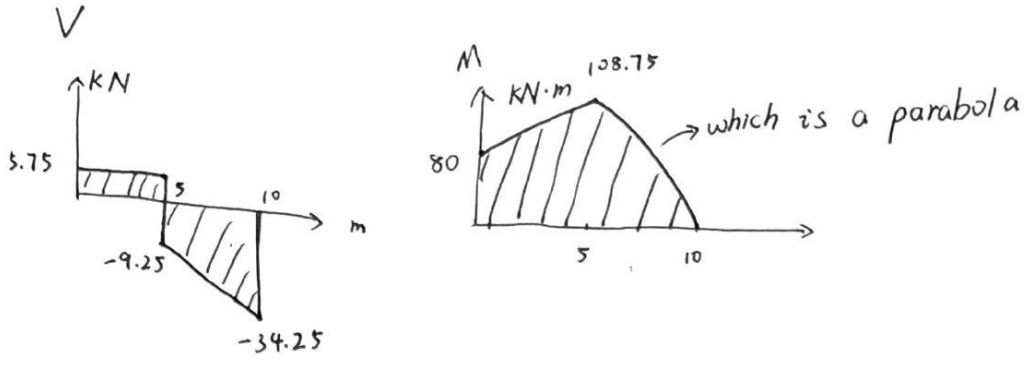


EX 4.6

Draw the shear and moment diagrams for beam shown below.

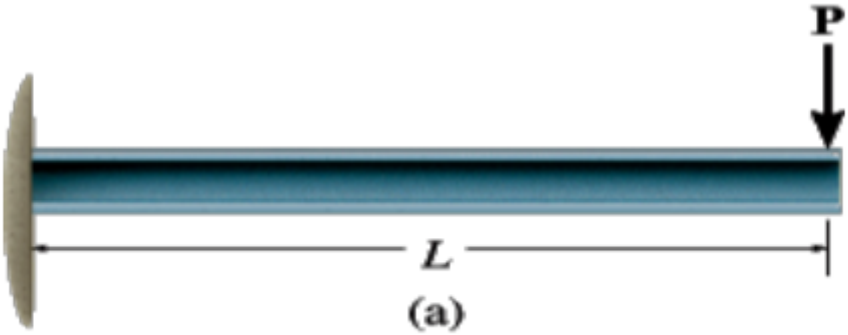


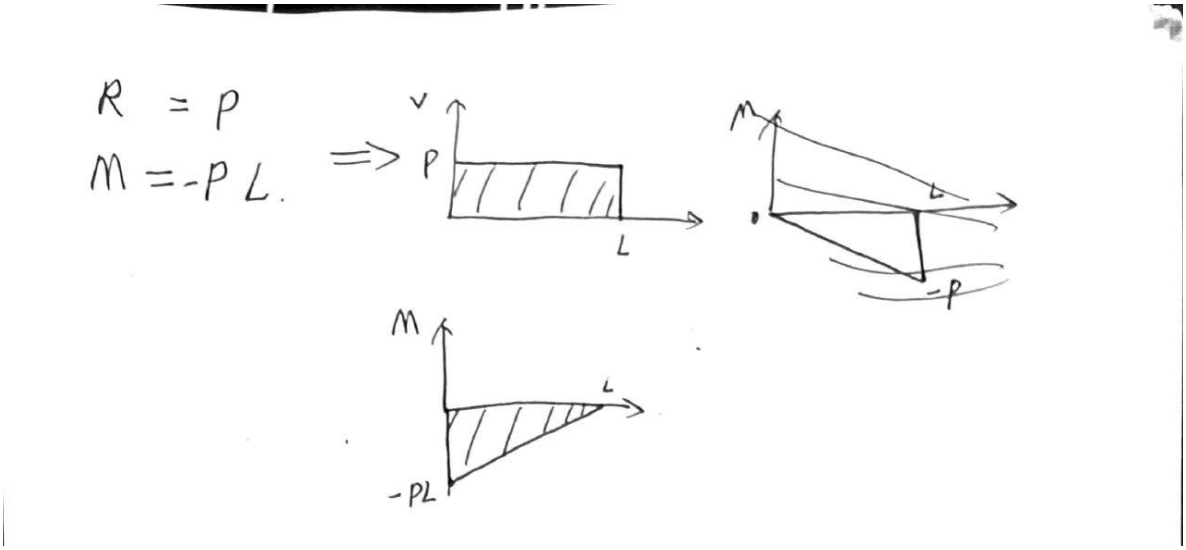
$$R_A + R_C = 15 + 5 \times 5$$
$$\text{@}\ 10R_A + 80 = 15 \times 5 + 5 \times 5 \times \frac{1}{2} \times 5 \quad \Rightarrow \quad R_A = 5.75\ kN, \quad R_C = 34.25\ kN$$



EX 4.7

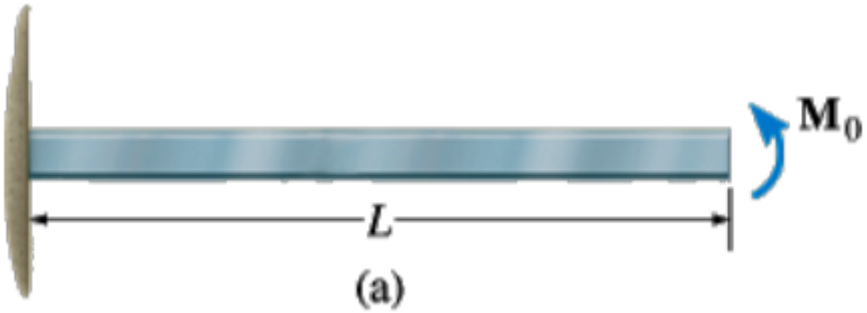
Draw the shear and moment diagrams for beam shown below.

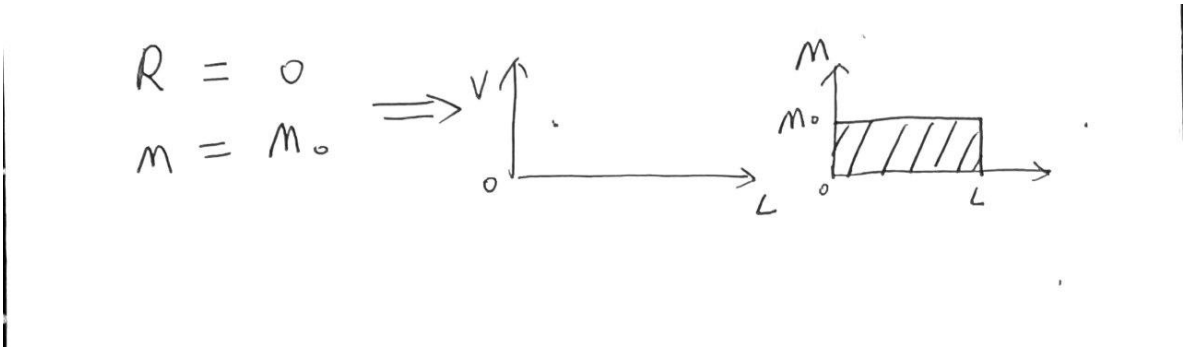




EX 4.8

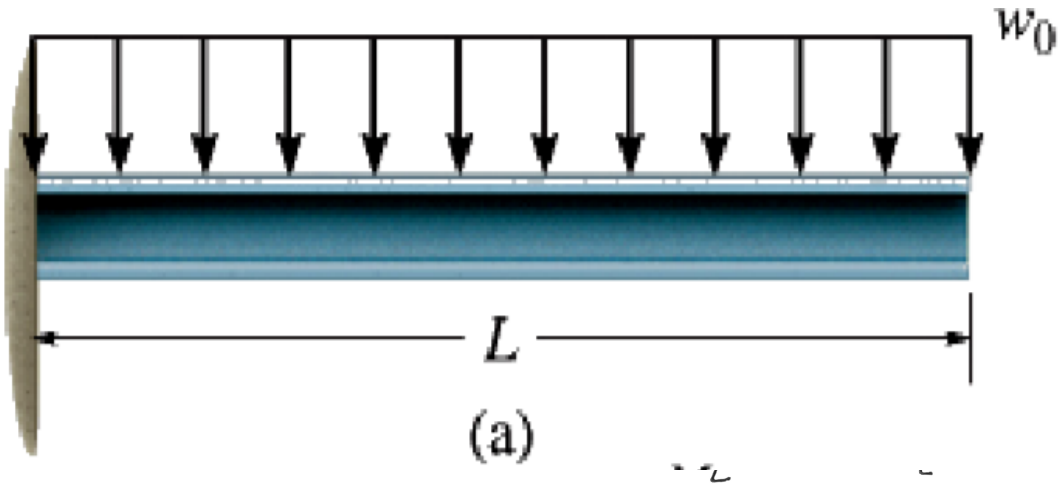
Draw the shear and moment diagrams for beam shown below.





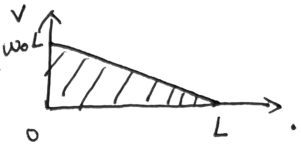
EX 4.9

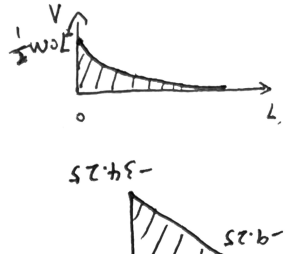
Draw the shear and moment diagrams for beam shown below.



$R = w_0 L$

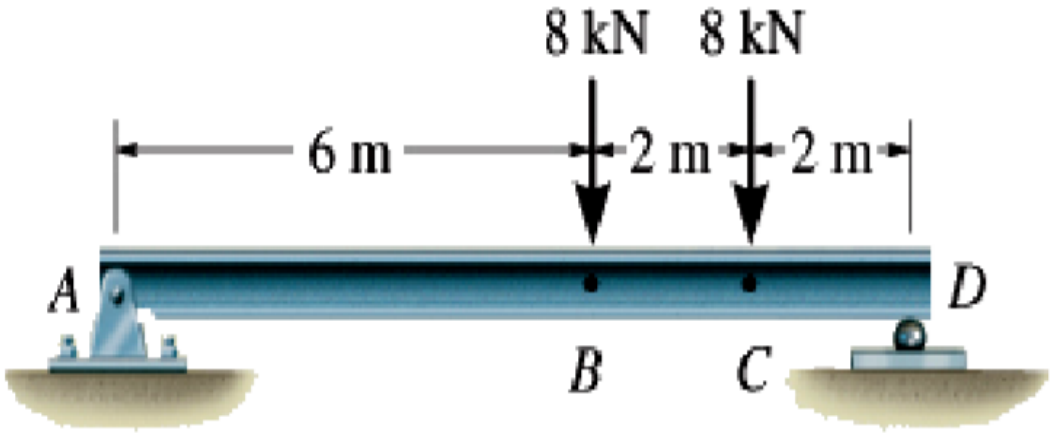
$M = \frac{1}{2} w_0 L^2$ $\Rightarrow$





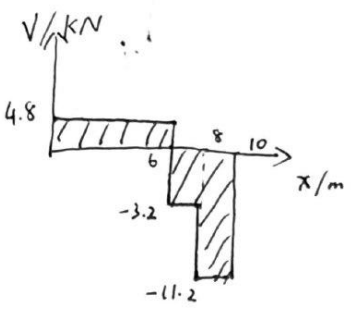
EX 4.10

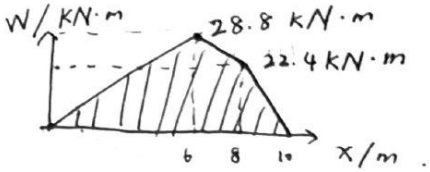
Draw the shear and moment diagrams for beam shown below.



$R_A + R_D = 16$

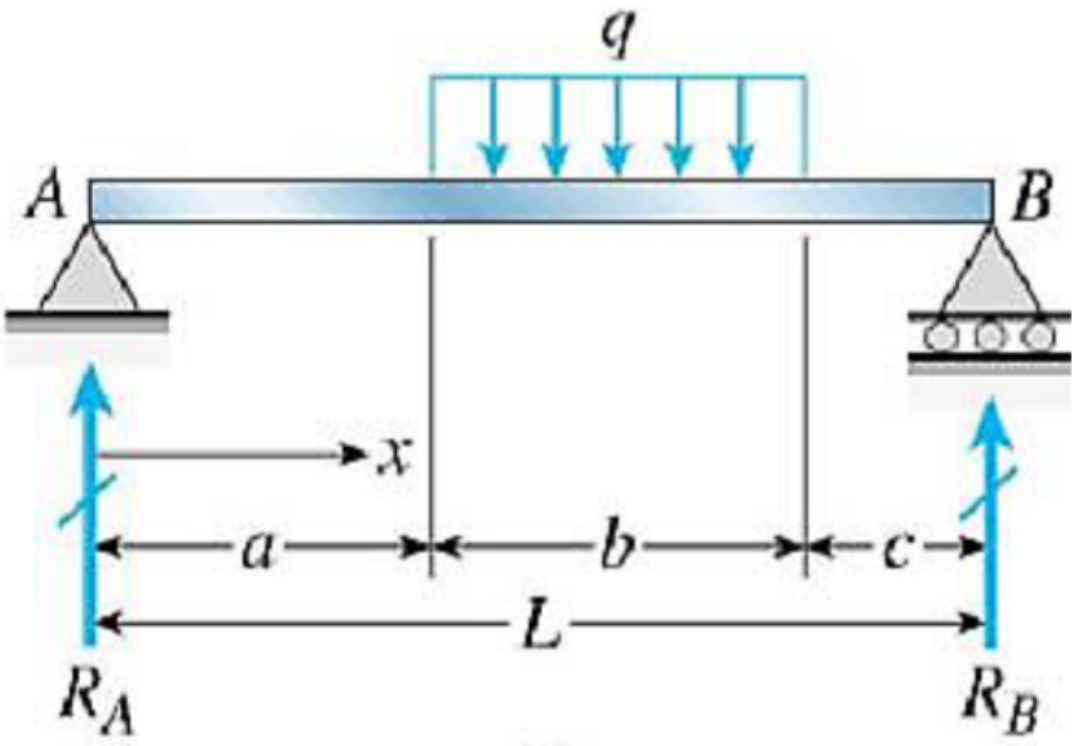
$10 R_D = 8 \times 6 + 8 \times 8$ $\Rightarrow$ $R_A = 4.8\ kN$, $R_D = 11.2\ kN$





EX 4.11

Draw the shear and moment diagrams for beam shown below.



$$R_A + R_B = qb$$

$$R_B \, L = qb\left(a + \frac{b}{2}\right) \quad (L = a+b+c)$$

$$\Rightarrow \begin{cases} R_A = \dfrac{qb(b+2c)}{2L} \\ R_B = \dfrac{qb(2a+b)}{2L} \end{cases}$$