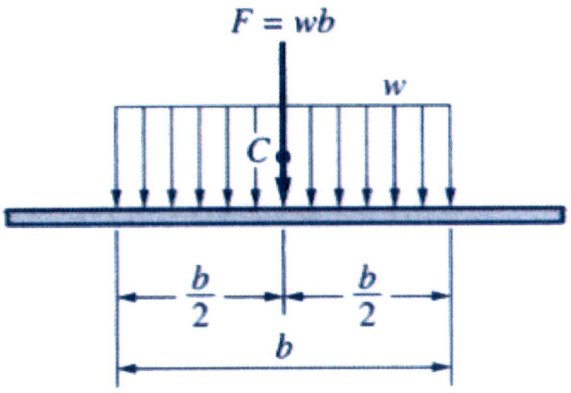
2-11
Resultant of Distributed Line Loads

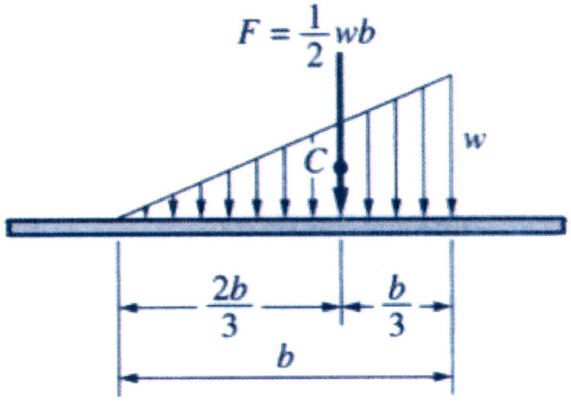
Distributed Load
A distributed load occurs whenever the load applied to a body is not concentrated at a point. A distributed load could be exerted along a line, over an area, or throughout an entire solid body.

Load Intensity
A distributed load along a line is characterized by a load intensity expressed as force per unit length.
Units:
U.S. lb/ft
S.I. N/m or kN/m

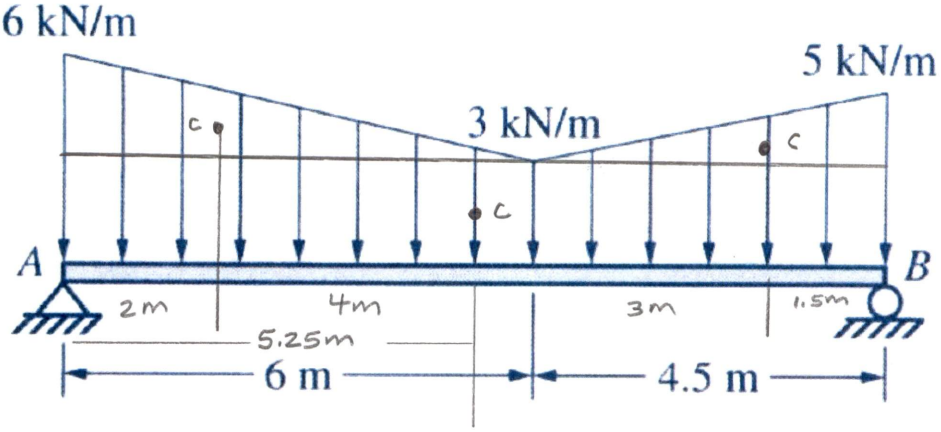
Uniform Load
A distributed load with constant load intensity w is called a uniform load.



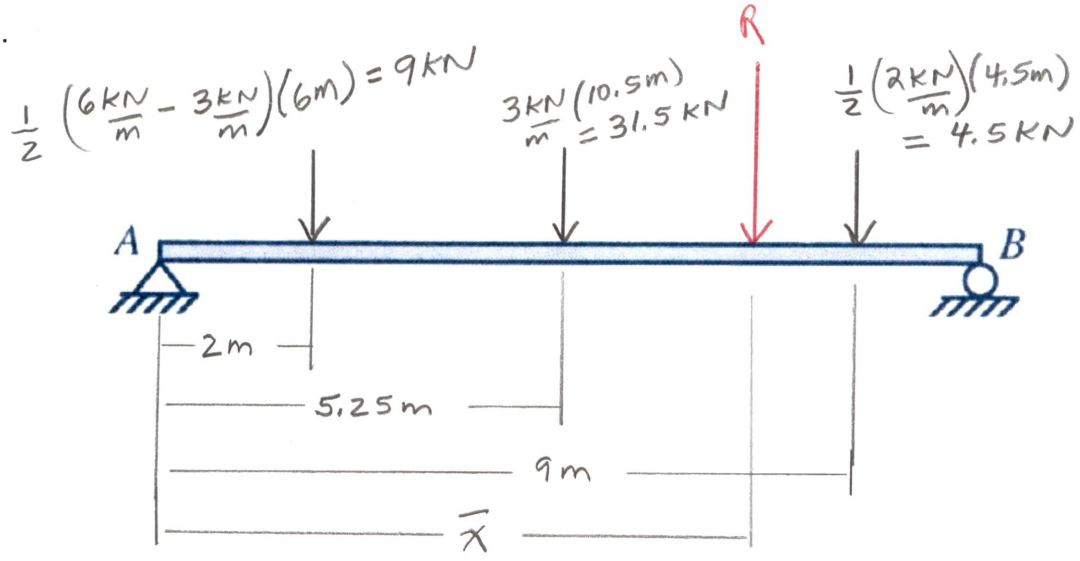
Triangular Load
A triangular load is a distributed load whose intensity varies linearly from zero to a maximum intensity w.



Example 7: Replace the loading on the beam with an equivalent resultant force and specify its location with respect to point A.



Solution.



magnitude

$R_x = 0$

$R_y = -9kN - 31.5kN - 4.5kN = -45kN = 45kN \downarrow$

$R = 45\,kN$

Direction

$\theta = 270°$ or $\downarrow$

Location

$$R_y \bar{x} = \Sigma M_A$$

$$\bar{x} = \frac{9kN(2m) + 31.5kN(5.25m) + 4.5kN(9m)}{45kN}$$

$$= \frac{223.875\,kN\cdot m}{45kN} = 4.975\,m \text{ to the right of Point A}$$

$R = 45\,kN \downarrow$ located 4.975 m to the right of Point A