CMGT 350	Quiz #3	Fall 2022

SHOW ALL WORK FOR FULL CREDIT.

Name: Solution

1. Complete the following for the loads shown acting on the beam

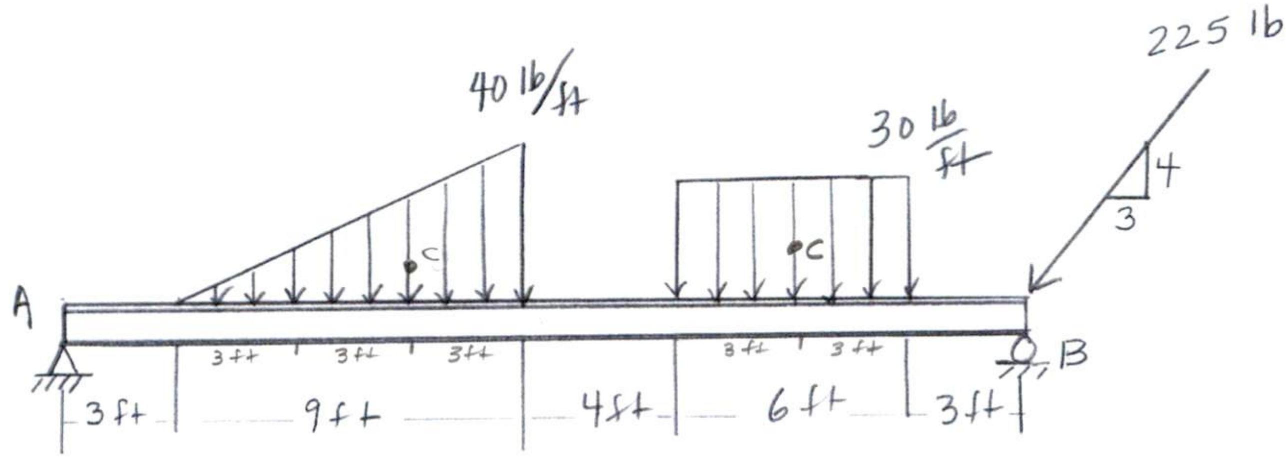
   A. Calculate the equivalent concentrated force for the triangularly distributed load.

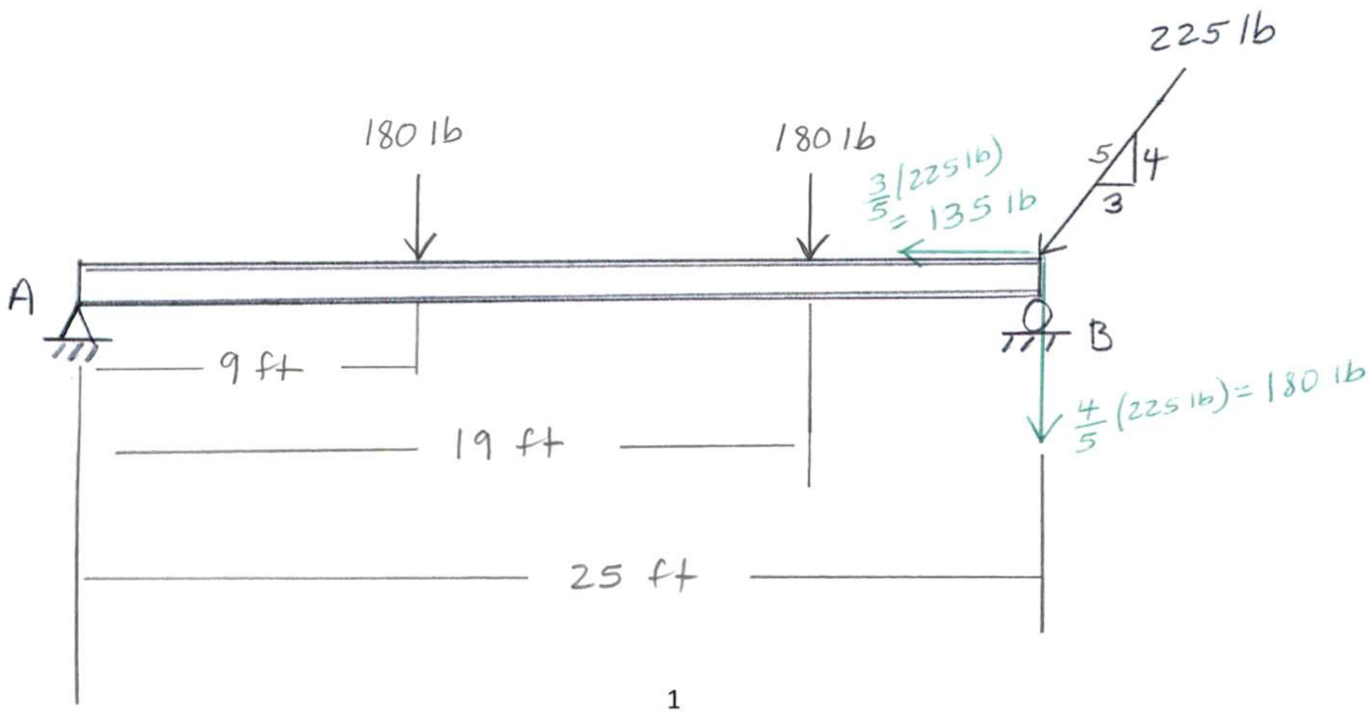
   $$F = \frac{1}{2} w b = \frac{1}{2}\left(\frac{40\,lb}{ft}\right)(9\,ft) = 180\,lb \downarrow$$

   B. Calculate the equivalent concentrated force for the uniformly distributed load

   $$F = w b = \frac{30\,lb}{ft}(6\,ft) = 180\,lb \downarrow$$

   C. Complete the beam drawing shown below by replacing the distributed loads with their equivalent concentrated forces. Resolve the 225lb load into its horizontal and vertical components. Indicate all distances. Round all answers to whole numbers.





2. Determine the magnitude, direction, and location of the resultant for the non-concurrent force system shown. Locate the resultant with respect to point A. Round all answers to whole numbers.

Magnitude

$R_x = \sum F_x = -135\text{ lb} = 135\text{ lb} \leftarrow$

$R_y = \sum F_y = -180\text{ lb} - 180\text{ lb} - 180\text{ lb} = -540\text{ lb} = 540\text{ lb} \downarrow$

$R = \sqrt{R_x^2 + R_y^2} = \sqrt{135\text{ lb}^2 + 540\text{ lb}^2} = 557\text{ lb}$

R = 557 lb

The Resultant R lies in QUAD 3

Direction

$\alpha = \tan^{-1}\left|\dfrac{R_y}{R_x}\right| = \tan^{-1}\left|\dfrac{540\text{ lb}}{135\text{ lb}}\right| = 76°$

Θ is determined by which Quadrant the Resultant lies in.

$\Theta = 180° + 76° = 256°$

Location

Resultant Force

Black Forces

$\underbrace{R_y \bar{x}}_{\text{Resultant Force}} = \underbrace{\sum M_A}_{\text{Black Forces}}$

$540\text{ lb}\ \bar{x} = 180\text{ lb}(9\text{ ft}) + 180\text{ lb}(19\text{ ft}) + 180\text{ lb}(25\text{ ft})$

$\bar{x} = \dfrac{9540\text{ lb}\cdot\text{ft}}{540\text{ lb}}$

$= 18\text{ ft}$ to the right of point A

ANS.

R = 557 lb ↶ 256° located 18 ft to the right of point A