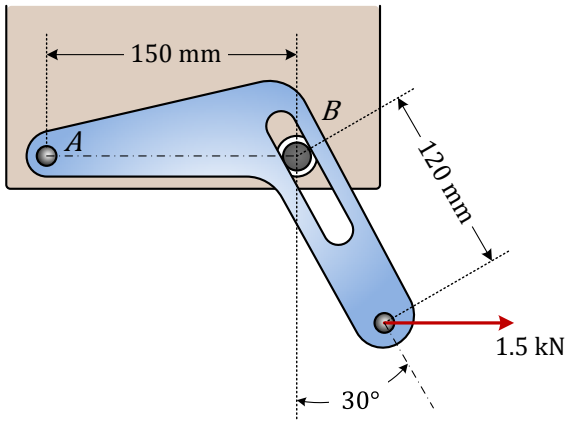
Question 2.12.

Calculate the magnitude of the force supported by the pin at A under the action of the 1.5 kN load applied to the bracket. Neglect friction in the slot.



Solution

$+\circlearrowleft \sum M_B = 0$

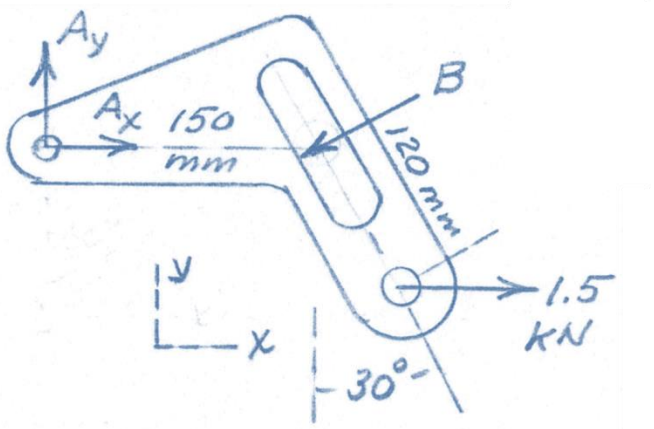
$1.5(120\cos 30°) - 150(A_y) = 0$

$A_y = 1.039 \text{ kN}$

$+\uparrow \sum F_y = 0$

$1.039 - B\sin 30° = 0$

$B = 2.078 \text{ kN}$



$+\rightarrow \sum F_x = 0$

$A_x + 1.5 - 2.078\cos 30° = 0$

$A_x = 0.3 \text{ kN}$

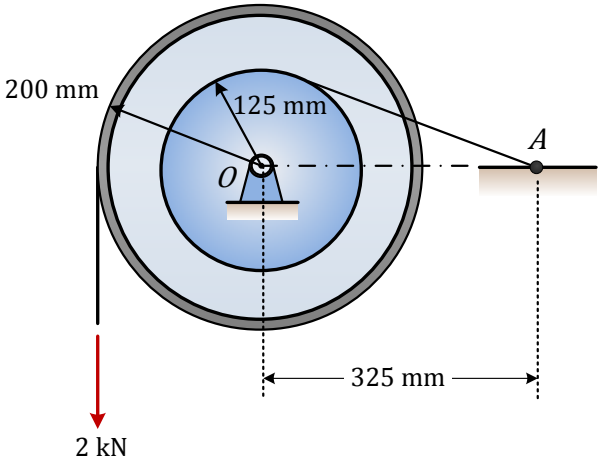
$A = \sqrt{(A_x)^2 + (A_y)^2}$

$A = \sqrt{(0.3)^2 + (1.039)^2}$

$A = 1.082 \text{ kN}$ (Answer)

Question 2.13.

The two light pulleys are fastened together and form an integral unit. They are prevented from turning about their bearing at O by a cable wound securely around the smaller pulley and fastened to point A. Calculate the magnitude R of the force supported by the bearing O for the applied 2 kN load.



Solution

$+\circlearrowleft \sum M_O = 0$

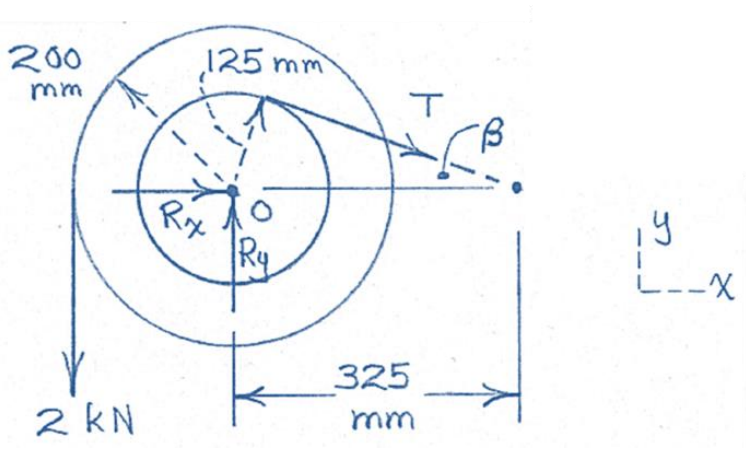
$2(200) - T(125) = 0$

$T = 3.2 \text{ kN}$

$+\rightarrow \sum F_x = 0$

$R_x + 3.2\left(\frac{12}{13}\right) = 0$

$R_x = -2.95 \text{ kN}$



$+\uparrow \sum F_y = 0$

$R_y - 2 - 3.2\left(\frac{5}{13}\right) = 0$

$R_y = 3.23 \text{ kN}$

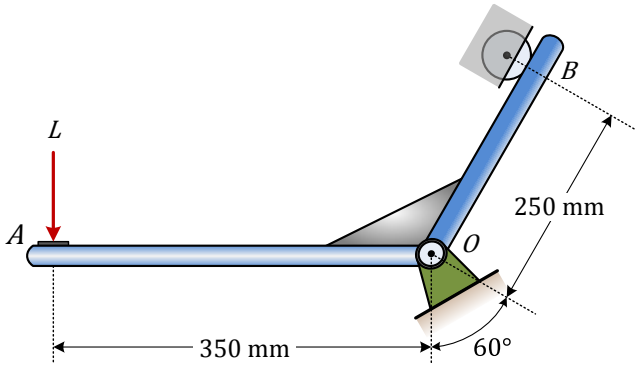
$R = \sqrt{(R_x)^2 + (R_y)^2}$

$R = \sqrt{(-2.95)^2 + (3.23)^2}$

$R = 4.38 \text{ kN}$ (Answer)

Question 2.14.

The pin at O can support a maximum force of 3.5 kN. What is the corresponding maximum load L which can be applied to the angled bracket AOB?



Solution

$+\circlearrowleft \sum M_O = 0$

$-B\ (0.25) - L\ (0.350) = 0$

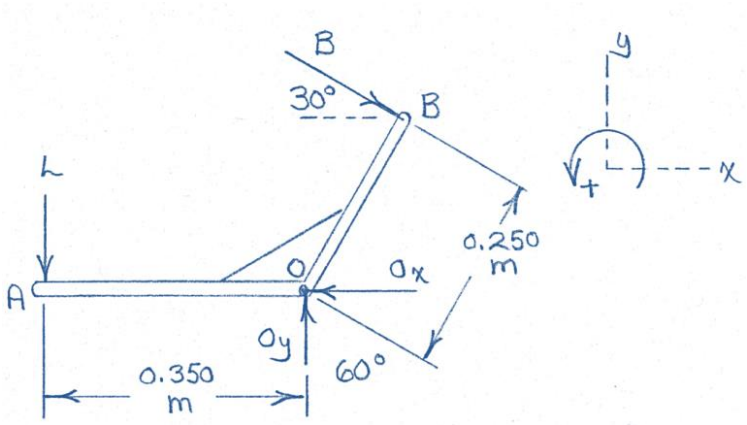
$B = 1.4\ L$

$+\rightarrow \sum F_x = 0$

$-O_x + B\cos 30° = 0$

$O_x = (1.4\ L)\cos 30°$

$O_x = 1.212\ L$



$+\uparrow \sum F_y = 0$

$O_y - B\sin 30° - L = 0$

$O_y = (1.4\ \mathrm{L})\sin 30° + L$

$O_y = 1.7\ L$

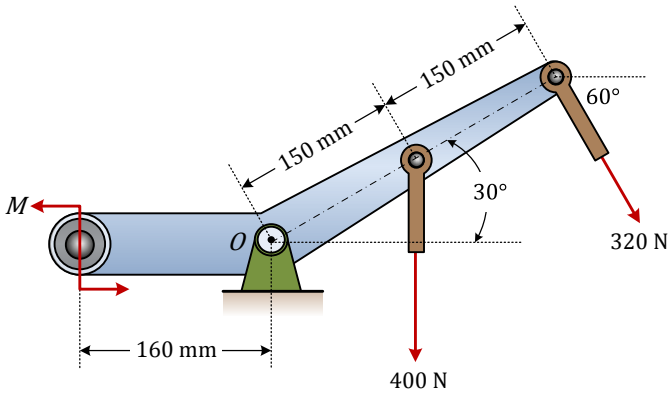
$O = \sqrt{(O_x)^2 + (O_y)^2}$

$3.5 = \sqrt{(1.212\ L)^2 + (1.7\ L)^2}$

$L = 1.676$ kN (Answer)

Question 2.15.

If the resultant of the two forces and couple M passes through point O, determine M.



Solution

$+\circlearrowleft \sum M_O = 0$

$M - 400\,(0.15\cos 30°) - 320\,(0.3) = 0$

$M = 148$ N. m (Answer)