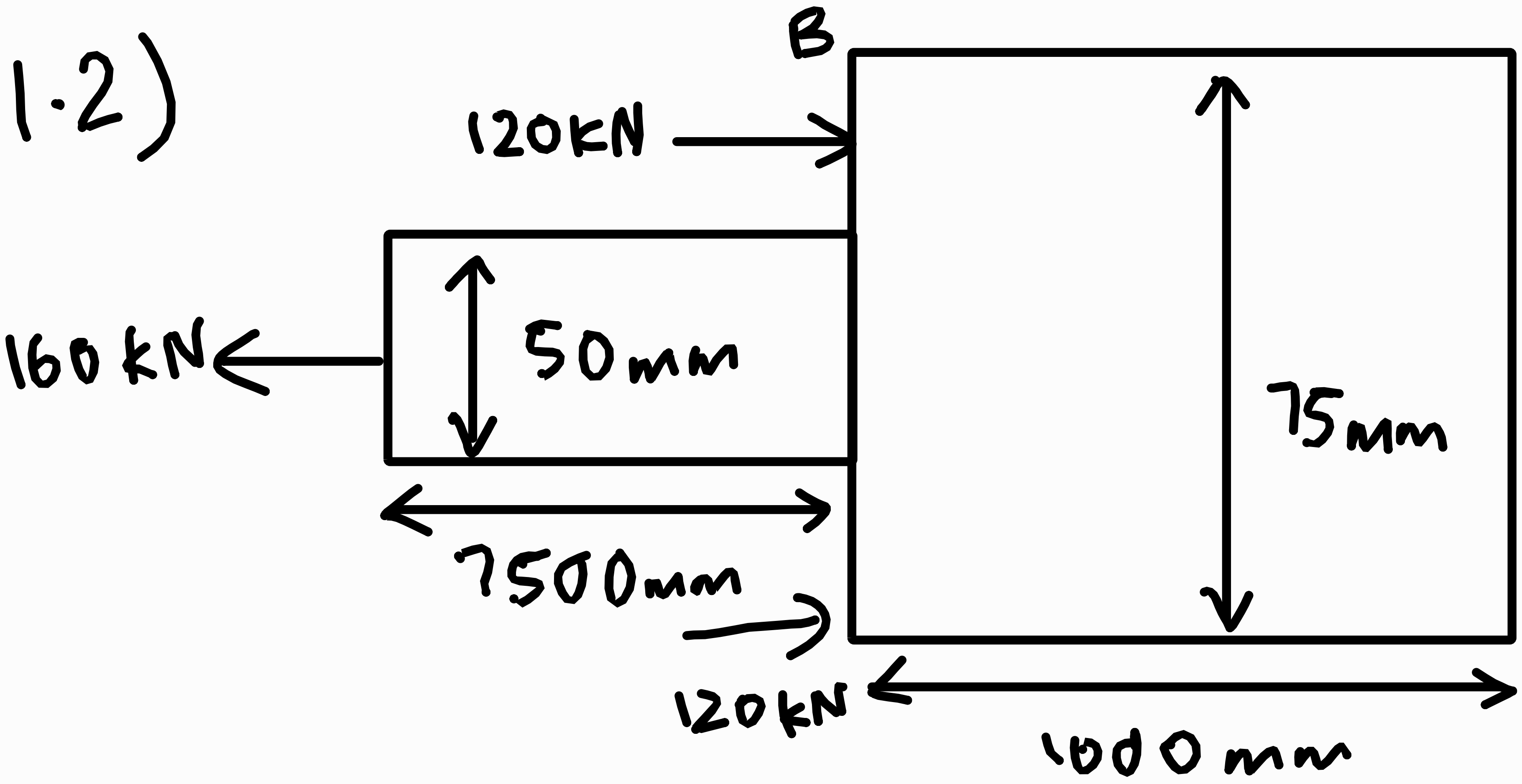
1.2)



At the midsection of AB,

$F_{AB} = 160\text{kN}$ for equilibrium

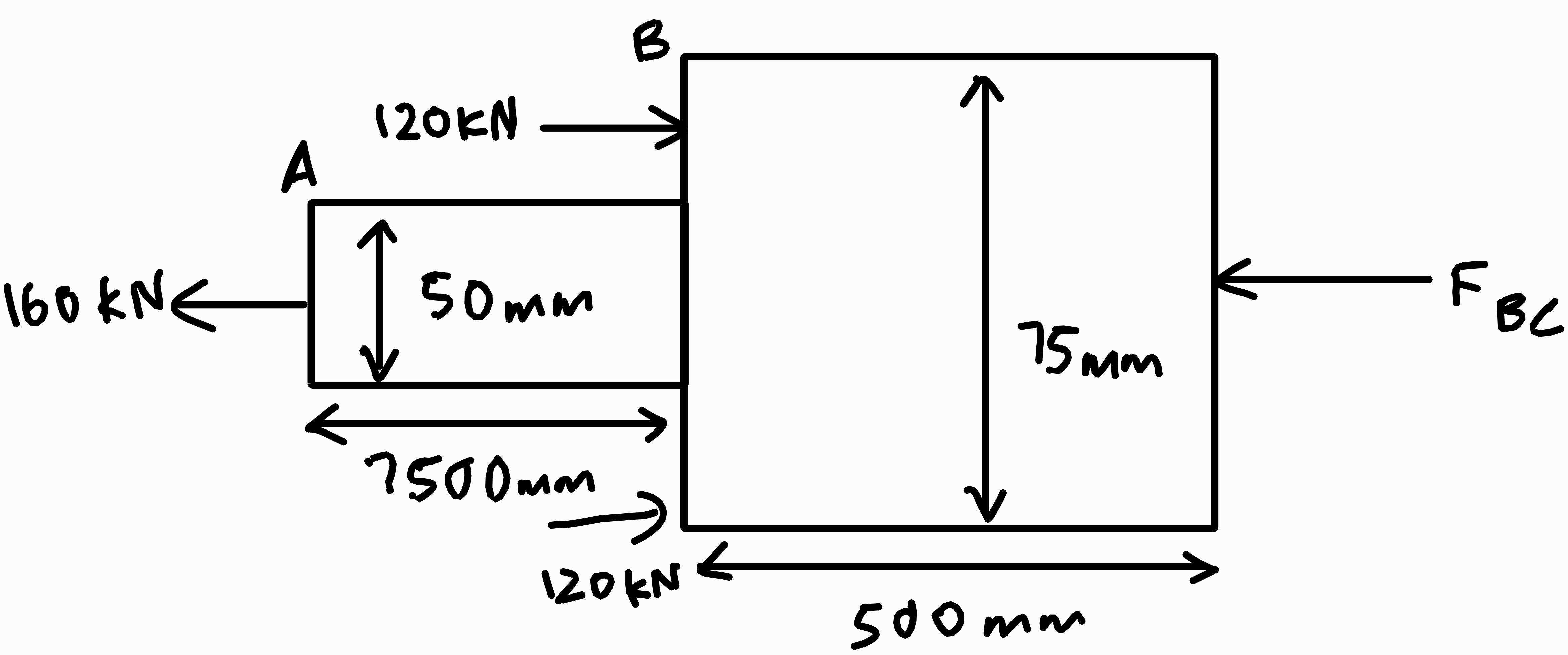
Normal stress: $\sigma_{AB} = \dfrac{F_{AB}}{A_1}$

$$= \frac{+160\times 10^3}{\pi\left(\frac{50}{2}\times 10^{-3}\right)^2}$$

$$= 81.48733086\,\text{MPa}$$

$$\approx 81.5\,\text{MPa}$$

At the midsection of BC,



1.2) For equilibrium,

$$F_{BC} + 160 = 120 + 120$$

$$F_{BC} = 80\,kN$$

Normal stress: $\sigma_{BC} = -\dfrac{F_{BC}}{A_2}$

$$= -\frac{80 \times 10^3}{\pi\left(\frac{75}{2} \times 10^{-3}\right)^2}$$

$$= -18.10829575$$

$$\approx -18.1\,MPa$$

1.55) $\tau_{allowable} = \dfrac{\tau_{ultimate}}{3}$

The moment created due to P will result in the largest force at A.

Hence:

$$\tau_{allowable} = \frac{\frac{1}{2}F_A}{\pi\left(\frac{8}{2}\times10^{-3}\right)^2}$$

$$\frac{\tau_{ultimate}}{3} = \frac{\frac{1}{2}F_A}{\pi(0.004)^2}$$

$$100\times10^6\pi(0.004)^2 = \frac{3}{2}F_A$$

$$F_A = 3351.032164$$

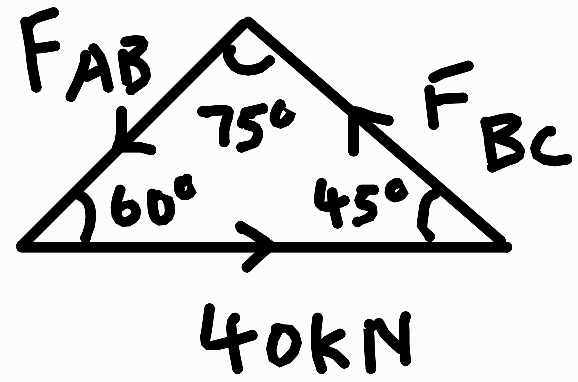
$$F_A(200\times10^{-3}) = P(180\times10^{-3})$$

$$3351.032164(200\times10^{-3}) = P(180\times10^{-3})$$

$$P = 3723.369071\,N$$

$$\approx 3.72\,kN$$

1.60)



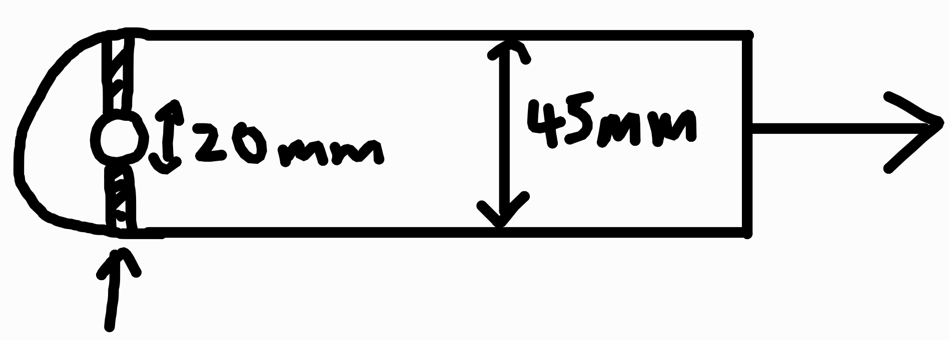
Using the law of sines,

$$\frac{F_{AB}}{\sin 45^\circ} = \frac{F_{BC}}{\sin 60^\circ} = \frac{40}{\sin 75^\circ}$$

$F_{AB} = 29.2820323 \text{kN}$

$F_{BC} = 35.8630189 \text{kN}$

Since AB is in tension,

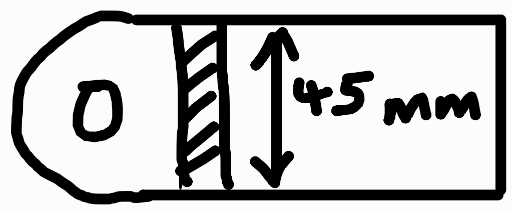


The effective width of the cross sectional area is the shaded region, which is:

$$W_{AB} = (45-20)$$
$$= 25\text{mm}$$

$$\sigma_{AB} = \frac{F_{AB}}{A_{AB}}$$
$$= \frac{29.2820323 \times 10^3}{W_{AB} \times 12 \times 10^{-3}}$$
$$= \frac{29.2820323 \times 10^3}{25 \times 10^{-3} \times 12 \times 10^{-3}}$$
$$= 97606774.34 \text{Pa} \approx 97.6 \text{MPa}$$

1.60) Since BC is in compression,



The effective width for the cross sectional area is the shaded region, which is 45mm.

$$\sigma_{BC} = \frac{-F_{BC}}{45\times10^{-3}\times12\times10^{-3}}$$

$$= -\frac{35.86301899\times10^{3}}{540\times10^{-6}}$$

$$= -66412997.94\,Pa$$

$$\approx -66.4\,MPa$$