

b3

SAMPLE PROBLEM 2/15

5 WAYS TO SOLVE:

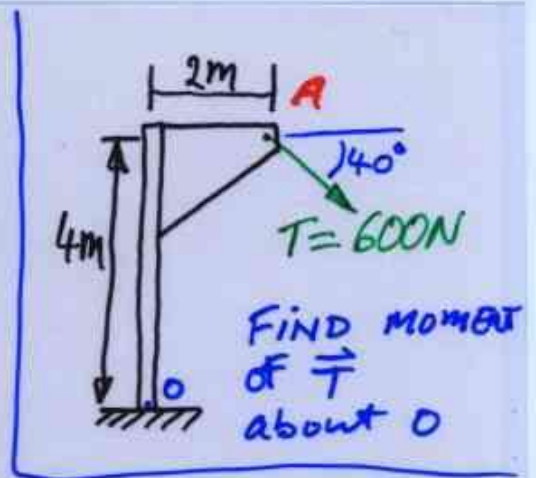
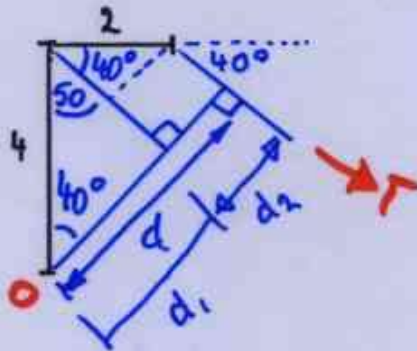
I GEOMETRY

$$d_1 = 4 \cos(40^\circ)$$

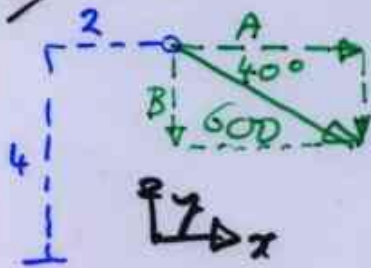
$$d_2 = 2 \sin(40^\circ)$$

$$d = d_1 + d_2 = 4.35 \text{ m}$$

$$\Rightarrow \vec{M}_O = \underline{2610 \text{ Nm}} \text{ CLOCKWISE. OR } \underline{-2610 \text{ Nm}} \text{ (RIGHT HAND RULE)}$$



II COMPONENTS:



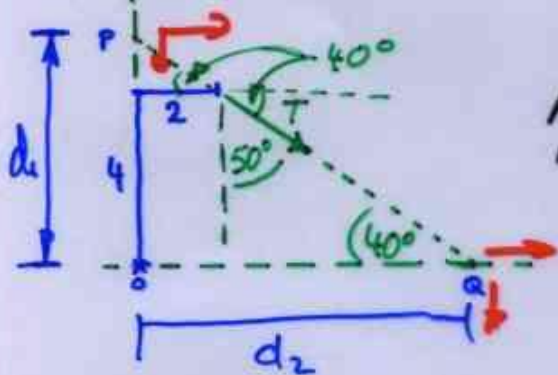
$$\vec{T} = (600)(\cos 40^\circ)\hat{i} + (600)(\sin 40^\circ)\hat{j}$$

$$\vec{T} = 460\hat{i} + 386\hat{j}$$

TOTAL MOMENT IS NOW:

$$(460)(4) + (386)(2) = \underline{2610 \text{ Nm}} \text{ (DIRXN AS BEFORE)}$$

III TRANSMISSIBILITY + COMPONENTS

FORCE \vec{T} CAN BE MOVED ALONG LINE OF ACTION TO P OR QAT P ONLY \hat{i} COMPONENT HAS MOMENT" Q " \hat{j} " " "

$$\text{At P: } \vec{M} = (460)(d_1)$$

$$= (460)(2 \cdot \tan(40^\circ) + 4)$$

$$= \underline{2610 \text{ Nm}}$$

$$\text{At Q: } \vec{M} = 460 d_2 = \frac{386}{\sin 40^\circ} (2 + 4 \tan(50^\circ))$$

$$= \underline{2610 \text{ Nm}}$$

IV CROSS PRODUCT:

$$\vec{M}_O = \vec{r} \times \vec{F} = (2\hat{i} + 4\hat{j}) \times (\hat{i} \cos 40^\circ + \hat{j} \sin 40^\circ) 600$$

$$\vec{M}_O = \underline{-2610 \hat{k}} \text{ N}\cdot\text{m} \text{ NOTE SIGN}$$