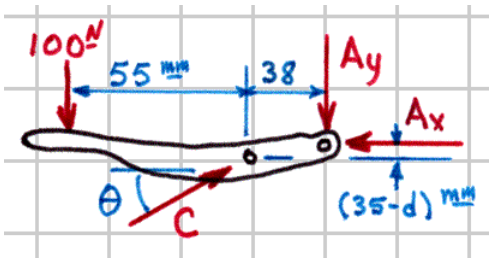
**1-70**

From a free-body diagram of the top handle




$$\circlearrowleft \Sigma M_A = 0: \quad 93(100) - 38(C\sin\theta) + (35-d)(C\cos\theta) = 0$$

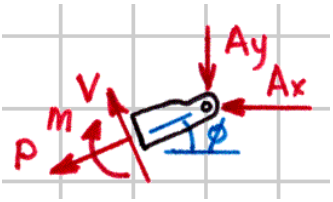
$$C = \frac{9300}{38\sin\theta - (35-d)\cos\theta}$$

Note that $\tan\theta = d/40$; therefore $d = 40\tan\theta$ and

$$C = \frac{9300}{38\sin\theta - 35\cos\theta + 40\sin\theta} = \frac{9300}{78\sin\theta - 35\cos\theta}$$

$$\rightarrow \Sigma F_x = 0: \quad C\cos\theta - A_x = 0 \qquad A_x = C\cos\theta$$

$$\uparrow \Sigma F_y = 0: \quad C\sin\theta - A_y - 100 = 0 \qquad A_y = C\sin\theta - 1000$$




Next, from a free-body diagram of the part of the top handle to the right of section *a–a* the equations of equilibrium give

$$[ \quad \Sigma F_x = 0: \quad P + A_x\cos\phi + A_y\sin\phi = 0$$

$$\wedge \quad \Sigma F_y = 0: \quad V + A_x\sin\phi - A_y\cos\phi = 0$$

$$\circlearrowleft \Sigma M_{cut} = 0: \quad A_x(18\tan\phi) - M - 18A_y = 0$$

$$P = \left(-A_x\cos\phi - A_y\sin\phi\right) \text{ N} \quad \text{.....Ans.}$$

$$V = \left(A_y\cos\phi - A_x\sin\phi\right) \text{ N} \quad \text{.....Ans.}$$

$$M = \left[A_x(18\tan\phi) - 18A_y\right] \text{ N}\cdot\text{mm} \quad \text{.....Ans.}$$