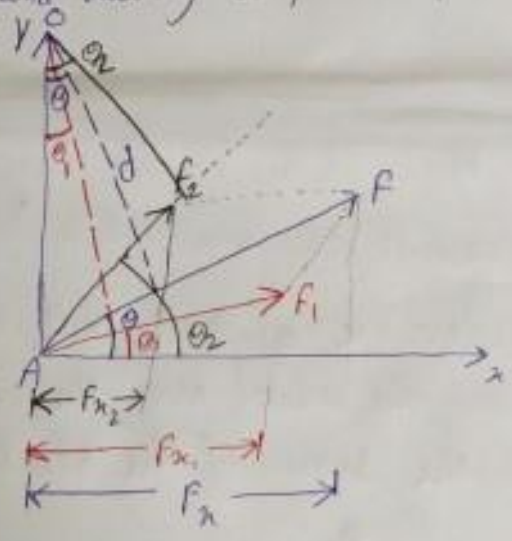
VARIGNON'S THEOREM

Varignon's Theorem : Law of moments

"Moment of a resultant of two forces, about a point lying in the plane of the forces, is equal to the algebraic sum of moments of these two forces about the same point."

Proof:

Consider a force F acting at a point A and having component F_1 and F_2.



Moment of the force F about O,

$$F \cdot d = F\, OA \cos\theta = OA(F\cos\theta)$$
$$= OA\, F_x \quad - (i)$$

Moment of the force F_1 about O,

$$F_1 d_1 = F_1 (OA \cos\theta_1)$$
$$= OA (F_1 \cos\theta_1) = OA\, F_{x_1} - (ii)$$

Moment of the force F_2 about O,

$$F_2 d_2 = F_2 (OA \cos\theta_2) = OA (F_2 \cos\theta_2)$$
$$= OA\, F_{x_2} \quad - (iii)$$

Adding (ii) and (iii)

$$F_1 d_1 + F_2 d_2 = OA(F_{x_1} + F_{x_2})$$
$$= OA(F_x)$$

(∵ The sum of x-components of the forces F_1 & F_2 = x component of the resultant F)

$$\boxed{F_1 d_1 + F_2 d_2 = Fd}$$

Equations of equilibrium:

$$\sum F_x = 0$$
$$\sum F_y = 0$$
$$\sum M = 0$$