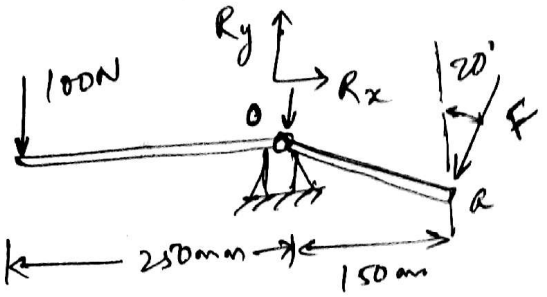
Quiz 1 Solution

Que-1 In planar system, there are 3 independent equilibrium equations -

$$\Sigma F_x, \Sigma F_y \text{ \& } \Sigma M = 0$$

FBD



oa = x,
x = 159.626 mm

(a) The force in the connecting link
- Take moment about O, $\Sigma M_O = 0$

$$100 \times 250 = F \times 159.626$$

$$\boxed{F = 156.62\,N}$$

(b) The force exerted by the lever on the bearing at O,

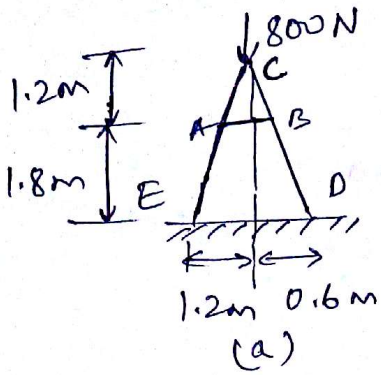
$$\Sigma F_x = 0; \quad \Sigma F_y = 0;$$

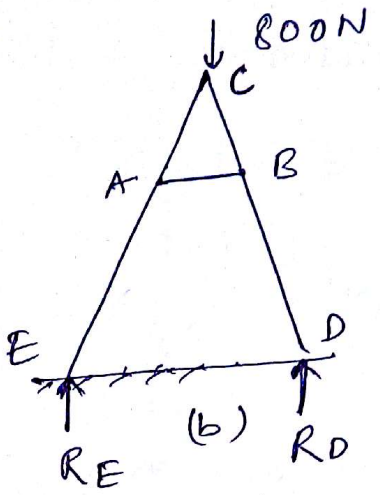
$$F\sin 20 = R_x \; ; \quad \boxed{R_x = 53.57\,N}$$

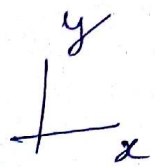
$$\Sigma F_y = 0;$$

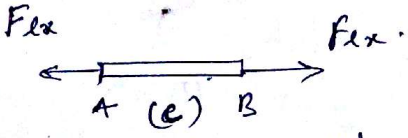
$$100 + F\cos 20 = R_y; \quad \boxed{R_y = 247.18\,N}$$

Que-2 FBD of the ladder with the man on the of it.

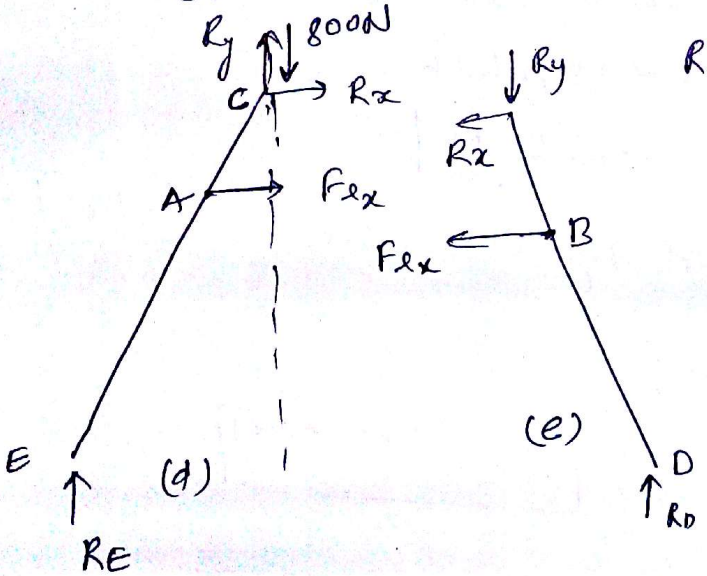








F_{ex} – force in link AB, x-direction.



R_x, R_y are reaction force at point C in x & y direction respectively.

Assumptions - a> Neglect the weight of the ladder.
b> Joints are frictionless
c> Neglect friction b/w ladder & floor

– 3 eq^{lm} equation are; $\Sigma F_x = 0$; $\Sigma F_y = 0$; & $\Sigma M = 0$

~~$\Sigma F_x = 0$~~; $\Sigma F_y = 0$; $R_E + R_D = 800$

Take moment about point D, figure (b)

$\Sigma M_D = 0$; $1.8 R_E - 0.6(800) = 0$

$R_E = 267$ N

$$R_D = 800 - R_E = 533\ N$$

$\Sigma F_x = 0$; $R_x + F_{ex} = 0$ [figure (d)]

$\Sigma F_y = 0$; $R_y + R_E = 0$

$$R_y = -267\ N$$

Take moment about point E,

$-R_x \times 3 + R_y \times 1.2 - F_{ex} \times 1.8 = 0$

$$F_{ex} = 267\ N$$