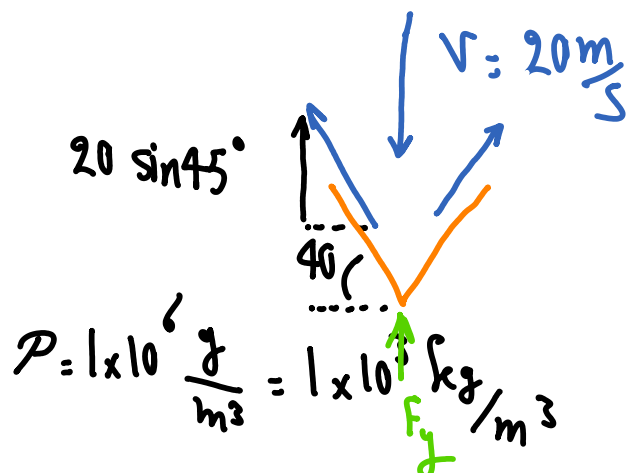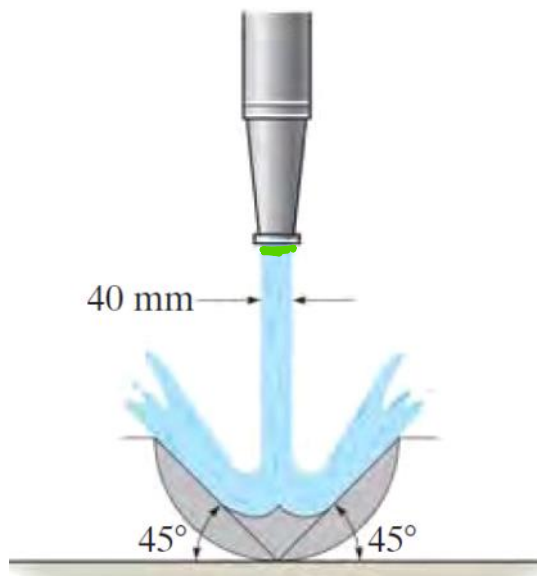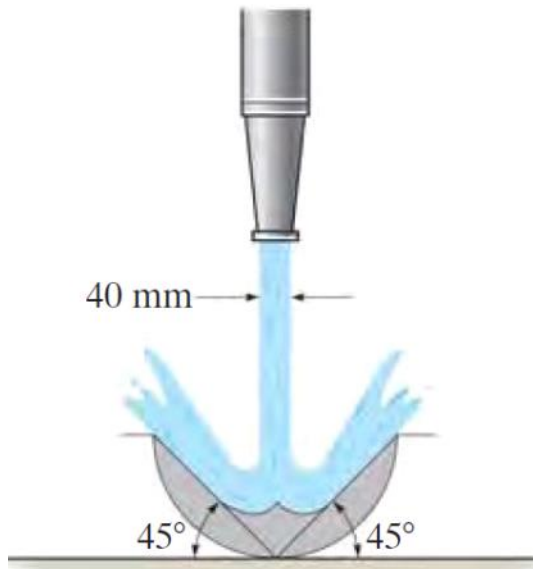**The nozzle has a diameter of 40 mm. If it discharges water uniformly with a downward velocity of 20 m/s against the fixed blade, determine the vertical force exerted by the water on the blade. $\rho_w = 1$ Mg/m³.**

40 mm

45°   45°

40 mm

45°   45°

$$V = 20 \frac{m}{s}$$

$20 \sin 45°$

40

$$P = 1 \times 10^6 \frac{g}{m^3} = 1 \times 10^3 \frac{kg}{m^3}$$

F_y

$$\sum F_y = \dot{m}(V_B - V_0)$$

$$R = \dot{m}'(V - V_0)$$

$$\dot{m} = \rho V A = 1000 \times 20 \times \pi \left(\frac{0.04}{2}\right)^2 = 25.13 \frac{kg}{s}$$

$$V_0 = 20 \downarrow$$

$$V = 20 \sin 45 \uparrow$$

$R = m'(v - v_0)$ $v = 20\sin 45 \uparrow$

$\Sigma F_y = 25.13(20\sin 45 - (-20)) = 858\ N \Rightarrow \boxed{F_y = 858\ N}$