

PROB. 5.110

FIND \bar{x} .

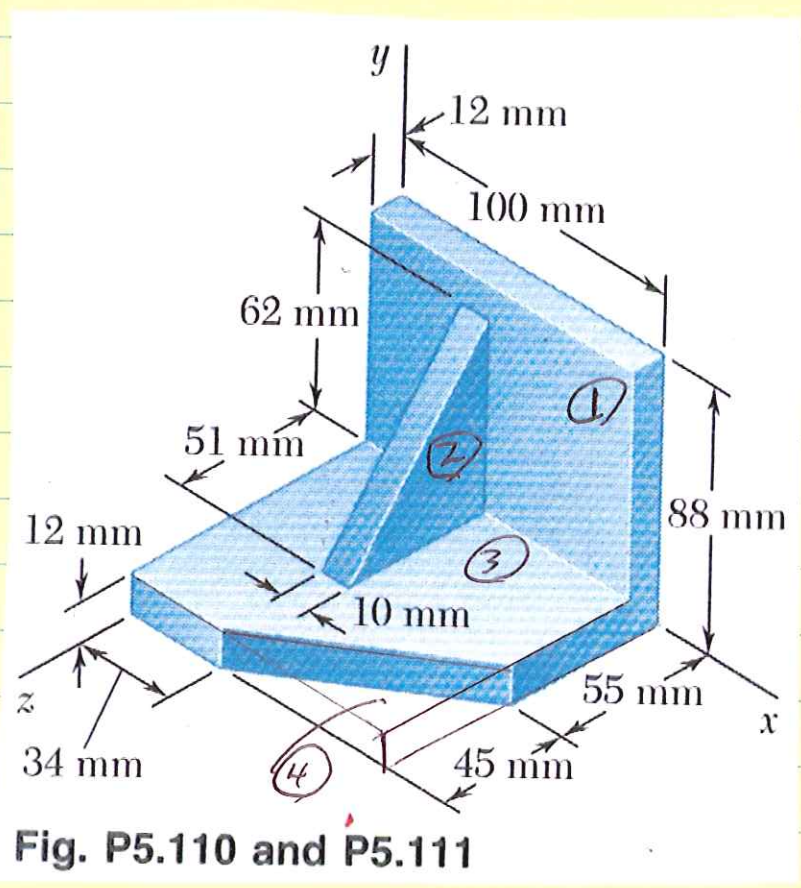


Fig. P5.110 and P5.111

$$\bar{x} = \frac{\sum \bar{x}_i V_i}{\sum V_i}$$

VOLUME 1: $V_1 = (12)(88)(100) = 1.056 \times 10^5 \text{ mm}^3$

$\bar{x}_1 = \frac{1}{2}(100) = 50 \text{ mm}$, $\bar{x}_1 V_1 = 5.28 \times 10^6 \text{ mm}^4$

VOLUME 2: $V_2 = \frac{1}{2}(51)(62)(10) = 1.581 \times 10^4 \text{ mm}^3$

$\bar{x}_2 = 34 + \frac{1}{2}(10) = 39 \text{ mm}$, $\bar{x}_2 V_2 = 6.166 \times 10^5 \text{ mm}^4$

PROB. 5.110 CONT

(2)

$$\text{VOLUME 3: } V_3 = (45 + 55 - 12)(100)(12) = 1.056 \times 10^5 \text{ mm}^3$$

$$\bar{x}_3 = \frac{1}{2}(100) = 50 \text{ mm}, \quad \bar{x}_3 V_3 = 5.28 \times 10^6 \text{ mm}^4$$

$$\text{VOLUME 4: } V_4 = -\frac{1}{2}(45)(100 - 34)(12)$$

$$V_4 = -1.782 \times 10^4 \text{ mm}^3$$

$$\bar{x} = \frac{1}{3}(100 - 34) = 22 \text{ mm}, \quad \bar{x}_4 = 100 - 22 = 88 \text{ mm}$$

$$\bar{x}_4 V_4 = -1.39 \times 10^6 \text{ mm}^4$$

$$\bar{X} = \frac{5.28 \times 10^6 + 6.166 \times 10^5 + 5.28 \times 10^6 - 1.39 \times 10^6}{1.056 \times 10^5 + 1.581 \times 10^4 + 1.056 \times 10^5 - 1.782 \times 10^4}$$

$$\bar{X} = \frac{9.787 \times 10^6}{2.092 \times 10^5} = \underline{46.78 \text{ mm}}$$