$f(x) = \frac{x}{160,000} \quad 0 \leq x \leq 400$

$(800-x)/160,000 ; \quad 400 \leq x \leq 800$

$P(X < a) = \int_0^a \frac{x}{160,000} dx + \int_{400}^{a} \frac{800-x}{160,000} dx$

$\frac{1}{160,000} \left\{ \frac{a^2}{2} + \left[800x - \frac{x^2}{2} \right]_{400}^{a} \right\}$

$\frac{1}{160,000} \left\{ \cancel{\frac{a^2}{2}} + 800a - \cancel{\frac{a^2}{2}} - (800)(400) + \frac{(400)^2}{2} \right]$

$\frac{1}{160,000} \left[800a - 320000 + 80000 \right]$

$\frac{1}{160,000} \{ 800a - 240000 \} = 0.50$

$800a - 240000 = 80000.0$

$800a = 80000 + 240000$

$800a \quad 320000$

$\boxed{a = 400}$

$P(X < b) = \int_0^b \frac{x}{160,000} du + \int_{400}^{b} \frac{800-x}{160,000} dx = 0.90$

$800b - 240000 = (0.9)(160,000)$

$900b - 24000 = 144000.0$

$800\,b = 384000$

$b = 3840 \quad 480$

$\boxed{b = 480}$

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$$\bar{x} = \int_0^{800} x f(x)\,dx = \int_0^{400} \frac{x^2}{160{,}000}\,dx + \int_{400}^{800} \frac{x(800-x)}{160{,}000}\,dx$$

$$\frac{1}{160{,}000}\left\{\int_0^{400} x^2\,dx + \int_{400}^{800} (800x - x^2)\,dx\right\}$$

$$\frac{1}{160000}\left\{\left[\frac{x^3}{3}\right]_0^{400} + \left[\frac{800x^2}{2} - \frac{x^3}{3}\right]_{400}^{800}\right\}$$

$$\frac{1}{160{,}000}\left\{\frac{(400)^3}{3} + 400(800)^2 - \frac{(800)^3}{3} - 400(400)^2 + \frac{(400)^3}{3}\right\}$$

$$\frac{1}{160{,}000}\left\{\frac{2(400)^3}{3} + 400(800\right.$$ $$\boxed{\bar{x} = 400}$$

$$\boxed{\text{Median} = 400}$$

$$E(X^2) = \int_0^{400} \frac{x^3}{160{,}000}\,dx + \int_{400}^{800} \frac{x^2(800-x)}{160{,}000}\,dx$$

$$\frac{1}{160{,}000}\left\{\frac{(400)^4}{4} + \left[800\left(\frac{x^3}{3}\right) - \frac{x^4}{4}\right]_{400}^{800}\right\}$$

$$\frac{1}{160{,}000}\left\{\frac{(400)^4}{4} + 800\left(\frac{(800)^3}{3}\right) - \frac{(800)^4}{4} - \frac{800(400)^3}{3} + \frac{(400)^4}{4}\right.$$

$$\frac{1}{160{,}000}\left\{\frac{(400)^4}{2} + \frac{(800)^4}{12}(1) - \frac{(800)(400)^3}{3}\right\}$$

$186\,666.67$

variance $= E(X^2) - (E(X))^2$

$= 186666.67 - 4160000$

$\boxed{\text{value} = 1{,}167}$

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