Continuous random variable

$$f(x) = \frac{1}{b-a} \quad \text{for} \quad a < x < b$$

$$\int_a^b \frac{1}{b-a} \, dx$$

$$= \frac{x}{b-a} \Big|_a^b = \frac{b}{b-a} - \frac{a}{b-a}$$

$$= \frac{b-a}{b-a} = 1 \; /\!/$$

$f(x)$ is a valid distribution because the total area is equal to 1 and $f(x)$ is never negative.

$$E(X) = \mu = \int_a^b x \, \frac{1}{b-a} \, dx$$

$$= \frac{1}{b-a} \, \frac{1}{2} \, x^2 \Big|_a^b = \frac{b^2}{2(b-a)} - \frac{a^2}{2(b-a)}$$

$$= \frac{b^2 - a^2}{2(b-a)} \; /\!/$$