

Example $\alpha = 3, \beta = 8$

$$F_X(a) = 360 \left(\underbrace{\left(\frac{1}{8} - \frac{2}{7} + \frac{1}{10} \right)}_{= \frac{1}{360}} - (1-a)^8 \left(\frac{1}{8} - \frac{2}{7}(1-a) + \frac{1}{10}(1-a)^2 \right) \right)$$
$$= 1 - 360(1-a)^8 \left(\frac{1}{8} - \left(\frac{2}{7}\right)(1-a) + \left(\frac{1}{10}\right)(1-a)^2 \right)$$

E.g. $P(X \leq \frac{1}{2}) = F_X(\frac{1}{2}) = 1 - 360(\frac{1}{2})^8 \left(\frac{1}{8} - \left(\frac{2}{7}\right)\left(\frac{1}{2}\right) + \left(\frac{1}{10}\right)\left(\frac{1}{4}\right) \right)$

$$= 1 - \frac{360}{256} \cdot \frac{7}{180}$$
$$= 1 - \frac{7}{128}$$
$$= \frac{121}{128}$$

What else?

$$E(X) = \frac{3}{3+8} = \frac{3}{11}$$

$$\text{Var}(X) = \frac{(3)(8)}{((3+8)^2(3+8+1))} = \frac{2}{121}$$