

Last updated May 25, 2016.

1. [First Pass; 3.F01.37] For watches produced by a certain manufacturer:

- Lifetimes follow a single-parameter Pareto distribution with  $\alpha > 1$  and  $\theta = 4$ .
- The expected lifetime of a watch is 8 years.

You are given the following information about a single-parameter Pareto:

- $f(x) = \frac{\alpha\theta^\alpha}{x^{\alpha+1}}, x > \theta$
- $F(x) = 1 - \left(\frac{\theta}{x}\right)^\alpha, x > \theta$
- $E[X] = \frac{\alpha\theta}{\alpha-1}$

Calculate the probability that the lifetime of a watch is at least 6 years.

A. 0.44

B. 0.50

C. 0.56

D. 0.61

E. 0.67

.....

First we find  $\alpha$

$$E[X] = 8$$

$$\frac{\alpha(4)}{\alpha - 1} = 8$$

$$\alpha = 2$$

Then we need to find  $S_0(6)$

$$S_0(x) = 1 - F_0(x)$$

$$S_0(x) = 1 - \left(1 - \left(\frac{4}{x}\right)^2\right) = \left(\frac{4}{x}\right)^2$$

$$S_0(6) = \left(\frac{4}{6}\right)^2 = \boxed{0.444}$$