

140. Key: B

Let X equal the number of hurricanes it takes for two losses to occur. Then X is negative binomial with “success” probability $p = 0.4$ and $r = 2$ “successes” needed.

$$P[X = n] = \binom{n-1}{r-1} p^r (1-p)^{n-r} = \binom{n-1}{2-1} (0.4)^2 (1-0.4)^{n-2} = (n-1)(0.4)^2 (0.6)^{n-2}, \text{ for } n \geq 2.$$

We need to maximize $P[X = n]$. Note that the ratio

$$\frac{P[X = n+1]}{P[X = n]} = \frac{n(0.4)^2 (0.6)^{n-1}}{(n-1)(0.4)^2 (0.6)^{n-2}} = \frac{n}{n-1} (0.6).$$

This ratio of “consecutive” probabilities is greater than 1 when $n = 2$ and less than 1 when $n \geq 3$. Thus, $P[X = n]$ is maximized at $n = 3$; the mode is 3.