

Problem 140

X : number of hurricanes it takes for 2 losses to occur

$X \sim$ Negative Binomial ($r=2, p=.4$)

$$P(X=n) = \binom{n-1}{r-1} \cdot p^r \cdot (1-p)^{n-r}$$
$$= (n-1) \cdot (.4)^2 \cdot (.6)^{n-2}$$

Mode \Rightarrow max $P(X=n)$

Must satisfy 2 conditions: ① $\frac{P(X=n+1)}{P(X=n)} < 1$

② $\frac{P(X=n)}{P(X=n-1)} > 1$

1) $\frac{n \cdot (.4)^2 \cdot (.6)^{n-1}}{(n-1) \cdot (.4)^2 \cdot (.6)^{n-2}} = \frac{n}{n-1} (.6) < 1 \Rightarrow n > 2.5$

2) $\frac{(n-1) \cdot (.4)^2 \cdot (.6)^{n-2}}{(n-2) \cdot (.4)^2 \cdot (.6)^{n-3}} = \frac{n-1}{n-2} (.6) > 1 \Rightarrow n < 3.5$

$n=3$

B