

Solutions to Math 477 “QUIZ” for Lecture 8

1. A company prices its tornado insurance using the following assumptions:

- In any calendar year, there can be at most one tornado.
- In any calendar year, the probability of a tornado is 0.2 .
- The number of tornadoes in any calendar year is independent of the number of tornadoes in any other year.

Using the company’s assumptions, calculate the probability that there are fewer than 3 torandoes in a 10-year period.

Sol. to 1: This is an example of the **Binomial Distribution** with $n = 10$ and $p = 0.2$, in other words $B(10, 0.2)$.

We need $P\{0 \leq X \leq 2\}$. Recall that $P\{X = k\} = \binom{n}{k} p^k (1 - p)^{n-k}$. We have

$$\begin{aligned} P\{0 \leq X \leq 2\} &= P(X = 0) + P(X = 1) + P(X = 2) = \binom{10}{0} (0.2)^0 (0.8)^{10} + \binom{10}{1} (0.2)^1 (0.8)^9 + \binom{10}{2} (0.2)^2 (0.8)^8 \\ &= (0.8)^{10} + 10 \cdot (0.2)^1 (0.8)^9 + (10 \cdot 9) / 2 \cdot (0.2)^2 (0.8)^8 = (0.8)^{10} + 10 \cdot (0.2)^1 (0.8)^9 + 45 \cdot (0.2)^2 (0.8)^8 = 0.6777995264 \dots \end{aligned}$$

Ans. to 1: The probability that there are fewer than 3 torandoes in a 10-year period is 0.6777995264 . . .

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