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**Activity #8: Poisson Random Variables**

**Statistics**

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1. During WWII, the city of London was bombed by the axis powers. To analyze the damage, city leaders partitioned the city into 576 regions, each with area  $0.25 \text{ km}^2$ . A total of 535 bombs fell on the city. We can model the number of bombs which fell in any given region using a Poisson random variable, where an "arrival" is one bomb hit and the "unit" is one region.
  - (a) Find the average number of bomb hits per region.
  - (b) Find the probability that a given region had exactly two bomb hits.
  - (c) Among the 576 regions, find the expected number of regions with exactly two bomb hits.
  - (d) In reality, 93 of the regions had exactly two bomb hits. How does this compare to our model's prediction?
2. For a recent period of 100 years, there were 530 Atlantic hurricanes. We can model the number of Atlantic hurricanes in a given year by a Poisson random variable, where an "arrival" is one hurricane and the "unit" is one year.
  - (a) Find the average number of hurricanes per year.
  - (b) Construct a table of values for the probability distribution for this model, giving the probability that in a given year there will be exactly  $k$  hurricanes, for  $k$  between 0 and 9.
  - (c) In reality, over this 100-year period there were 2 years with no hurricanes, 5 years with two hurricanes, and 4 years with nine hurricanes. How does this compare to the predictions of our model?

3. During a recent 46-year period, New York State had a total of 194 tornadoes measuring 1 or greater on the Fujita scale. We can model the number of such tornadoes in a given year using a Poisson random variable.
- (a) What is the expected number of tornadoes in a given year?
  
  
  
  
  
  
  
  
  
  
  - (b) What is the standard deviation of this random variable?