

## MATHEMATICS 201-510-LW

Business Statistics

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# X – The Poisson Distribution

1. The number of accidents in Sainte-Foy follows a Poisson distribution with average of 0.6 accidents per day.
  - a) Let  $x$  denote the number of accidents that will occur in this city on a given day. Write the probability distribution for  $x$  and sketch the probability histogram.
  - b) Find the mean, variance and standard deviation of the probability distribution developed in part (a).
  - c) Find the probability that no accident will occur in this city on a given day.
  - d) Find the probability that at least one accident will occur in this city on a given day.
2. Air Canada receives an average of 9.7 complaints per day from its passengers. Find the probability that on a certain day Air Canada will receive exactly seven complaints, assuming the number of complaints follows a Poisson distribution.
3. On average, 12.5 rooms stay vacant per day at Hotel Stats. Find the probability that on a given day exactly three rooms will be vacant assuming the number of vacancies follows a Poisson distribution.
4. A large proportion of small businesses in Quebec fail during the first few years of operations. On average, 1.3 businesses file for bankruptcy per day in Quebec. Assume the number of bankruptcies follows a Poisson distribution.
  - a) Find the probability that exactly three businesses will file for bankruptcy on a given day in Quebec.
  - b) Find the probability that the number of businesses that will file for bankruptcy on a given day in Quebec is less than three.
5. The reception office at Math Corporation receives an average of 4.9 phone calls per half hour. Assume the number of complaints follows a Poisson distribution.
  - a) Find the probability that exactly six phone calls will be received at this office during a certain hour.
  - b) Find the probability that between 5 and 8 (inclusively) phone calls will be received at this office during a certain hour.
  - c) Find the probability that exactly 8 phone calls will be received during the next two hour.
6. The number of runs scored by a college baseball team follows a Poisson distribution with a mean of 4.4 runs per game. Find the probability that the team scores exactly 10 runs in the next two games.

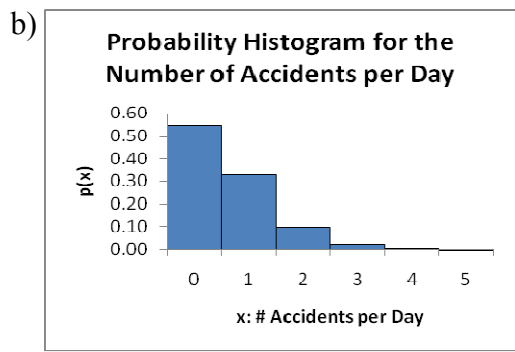
7. A certain newspaper contains an average of 1.1 typographical errors per page. Assuming the number of typographical errors follows a Poisson distribution.
  - a) Find the probability that a randomly selected page of this newspaper will contain exactly 4 typographical errors.
  - b) Find the probability that a randomly selected page of this newspaper will contain more than 3 typographical errors.
  - c) Find the probability that there will be 10 errors in a 5-page section of the newspaper.
  
8. The number of defects in an assembly line is follows a Poisson distribution with an average of eight defects per hour.
  - a) Find the probability that 5 defects come off of the assembly line in the next hour.
  - b) Find the probability that fewer than 5 defects come off of the assembly line in the next hour.
  - c) Find the probability that 5 or fewer defect come off of the assembly line in the next hour.
  - d) Find the probability that the assembly line produces anywhere from 6 to 10 (inclusively) defects in the next hour.
  
9. On a typical day at a small town hospital, 3 mothers give birth. Find the probability that there are at least 10 births in the next two days at the hospital if the number of births follows a Poisson distribution.

## ANSWERS

1. a)

$x$ # accidents	$p(x)$
0	0.5488
1	0.3293
2	0.0988
3	0.0198
4	0.0030
5	0.0004

- d) 0.5488      e) 0.4512
2. 0.0982
  3. 0.0012
  4. a) 0.0998      b) 0.8571
  5. a) 0.0682      b) 0.3225
  6. 0.1157
  7. a) 0.0203      b) 0.0257
  8. a) 0.0916      b) 0.0996
  9. 0.0839



$\mu = 0.6$  accidents  
 $\sigma^2 = 0.6$  accidents<sup>2</sup>  
 $\sigma = 0.775$  accidents

- c) 0.1170
- c) 0.0285
- c) 0.1912      d) 0.6246