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Geometric and Poisson Worksheet

1. The probability for (geometric distribution)

a) $p = 0.40$, success occurs on trial $n = 3$

b) $p = 0.75$, success occurs on trial $n = 5$

c) $p = 0.30$, success occurs on trial $n = 2$

2. Find the probability for (Poisson distribution)

a) Given $n = 200$, probability of success on a single trial $p = 0.04, r = 8$ successes

b) Given $n = 150$, probability of success on a single trial $p = 0.06$, $r \leq 2$ successes

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3. Susan is taking western civilization this summer on a pass/fail basis. The department teaching the course has a history of passing 77% of the students in western civilization each term. Let $n = 1, 2, 3, \ldots$ representing the number of times a student takes western civilization until the *first* passing grade is received. (geometric distribution)

   a) What is the probability that Susan passes on the first try ($n = 1$)

   b) What is the probability that Susan passes on the second try ($n = 2$)?

   c) What is the probability that Susan needs three or more tries to pass ?

   d) What is the expected number of attempts a student needs to pass the course?

4. proximately 3.6% of all untreated apples get a disease called bitter pit. Where the core of the apple gets soggy due to overwatering or a calcium deficiency in the soil. Let n represent the first apple chosen at random that has bitter pit. (geometric distribution)
   a) Find the probabilities that $n = 3, n = 5, and\ n = 12$

   b) Find the probability that $n \geq 5$

   c) What is the expected number of apples that must be examined to find the first one with bitter pit?

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5. USA Today reports that the U.S. annual birthrate is about 16 per 1000 people, and the death rate is about 8 per 1000 people. Let random variable r represent either the number of births (or deaths) for a community of a given population size. (Poisson distribution)

   a) In a community of 1,000 people, calculate the annual probability of 10 births.

   b) In a community of 1,000 people, calculate the probability of 10 deaths.

   c) In a community of 1,500 people, calculate the probability of 16 deaths.

   d) In a community of 750 people, calculate the probability of 16 births.

6. Much of Trail Ridge Road in Rocky Mountain National Park is over 12,000 feet high. In winter, the road is closed when severe weather conditions exist. A study shows that gale force winds of 32 – 90 miles per hour occur on average once every 60 hours at a Trail Ridge Road weather station. Let $r = frequency$ with which the gale force winds occur in a given time interval. (Poisson distribution)
   a) For an interval of 108 hours, what are the probabilities that $r = 2\ , 3\ , and\ 4$

   b) What is the probability of $r < 2$ in part a ?

   c) For an interval of 180 hours, what are the probabilities that $r = 3\ , 4\ , and\ 5$?

   d) What is the probability of $r < 3$ in part c ?

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7. Parkfield, California, has been dubbed the world's earthquake capital because it sits on the notorious San Andreas fault. Since 1857, Parkfield has had a major earthquake on the average of once every 22 years.
(Poisson Distribution - round to hundredths)

   a) Compute the probability of at least 1 major earthquake in the next 22 years.

   b) Compute the probability of no major earthquakes in the next 22 years.

   c) Compute the probability of at least on major earthquake in the next 50 years.