Binomial and Normal Distribution Practice

Key

1. Inland Revenue audits 5% of all companies every year. The companies selected for auditing in any one year are independent of the previous year's selection. During the next 5 years,

$\to p = .05$ $\quad \to n = 5$

a) What is the probability that a company will be selected for auditing exactly twice? $P(X=2)$

binompdf(5, .05, 2) = .021

b) What is the probability that a company will be audited no more than twice? $P(X \le 2)$

binomcdf(5, .05, 2) = .999

c) What is the exact probability that a company will be audited at least once in the next 4 years?

$\to$ now $n = 4$

$P(X \ge 1) = 1 - P(X \le 0)$

$= 1 -$ binomcdf(4, .05, 0) = .185

2. The probability that a driver must stop at any one traffic light coming to Myers Park High School is 0.2. If there are 10 sets of traffic lights on the journey.

$\to n = 10$ $\quad p$

a) What is the probability that a student must stop at exactly 7 of the 10 sets of traffic lights? $P(X=7)$

binompdf(10, .2, 7) = .000786

b) What is the probability that a student will be stopped at 3 or more of the 15 sets of traffic lights? $P(X \ge 3)$

$1 - P(X \le 2) = 1 -$ binomcdf(10, .2, 2) = .322

c) Find the mean and the standard deviation for the distribution.

$\mu = 10(.2) = 2 \qquad \sigma = \sqrt{10(.2)(.8)} = \sqrt{1.6} = 1.26$

3. The finish times for marathon runners during a race are normally distributed with a mean of 195 minutes and a standard deviation of 25 minutes.

$\mu = 195$
$\sigma = 25$

a) What is the probability that a runner will complete the marathon within 3 hours? $\to$ or 180 min.

$P(-\infty < X < 180) =$ normalcdf(-9999, 180, 195, 25) = .274

b) Calculate to the nearest minute, the time by which the first 8% runners have completed the marathon.

$P(X < t) = .08 \qquad$ invNorm(.08, 195, 25) = 160 minutes

c) What proportion of the runners will complete the marathon between 3 hours and 4 hours?

$P(180 < X < 240) =$ normalcdf(180, 240, 195, 25) = .690

4. The download time of a resource web page is normally distributed with a mean of 6.5 seconds and a standard deviation of 2.3 seconds.

$\mu = 6.5$
$\sigma = 2.3$

a) What proportion of page downloads take less than 5 seconds?

$P(X < 5) = P(-9999 < X < 5) = .257$

b) What is the probability that the download time will be between 4 and 10 seconds?

$P(4 < X < 10) = .797$

c) How many seconds will it take for 35% of the downloads to be completed?

$P(X < t) = .35 \qquad$ invNorm(.35, 6.5, 2.3) = 5.61

5. The scores on the most recent math test were normally distributed with a mean of 88. If 72% of students scored at least a 60, find the variance of the distribution.

$P(X > 60) = .72$

invNorm(.28, 0, 1) = -.583 (z)

$-.583 = \dfrac{60 - 88}{\sigma}$

$\sigma = 48$, so variance $= 48^2 = 2304$