[redacted]

IT3031 - Take home Assignment II

1. Nine percent of men cannot distinguish between the colors red and green. This is the type of color blindness that causes problems with traffic signals. If six men are randomly selected for a study of traffic signal perceptions, find the probability that exactly two of them cannot distinguish between red and green.

$P(X=2)\ \binom{n}{x} p^x (1-p)^{n-x}$ → binormial

dbinorm (x, n, prob) ⇒ dbinorm (2, 6, 0.09)

= 0.08331 //

2. The Telektronic company purchases large shipments of fluorescent bulbs and uses this acceptance sampling plan. Randomly selected and test 24 bulbs, then accept the whole batch if there is only one or none that doesn't work. If a particular shipment of thousands of bulbs actually has a 4% rate of defects, what is the probability that this whole shipment will be accepted?

Randomly select bulbs (n) = 24

Number of defect bulbs (probability) = 0.04

$P(X \leq 1)$ ⇒ pbinorm (1, 24, 0.04)

= 0.7508 //

3 Radioactive atoms are unstable because they have too much energy. When they release their extra energy; they are said to decay. When studying cesium 137, it is found that during the course of decay over 365 days, 1,000,000 radioactive atoms are reduced to 977,287 radioactive atoms.

a) find the mean number of radioactive atoms lost through decay in a day

$$\mu = \frac{1000000 - 977287}{365} = 62.227$$

b) find the probability that on a given day, 50 radioactive atoms decayed.

$P(X = 50)$ $\quad \lambda = 62.227$

dpois(x, λ)

dpois(50, 62.227) ⇒ 0.0155 //

(4) Out of 100 bulbs produced by a manufacturing company, 35 are white light bulbs and the rest are yellow light bulbs. If 10 bulbs randomly drown without replacement find the probability that 6 out of these 10 would be a white light bulbs.

White light bulbs (W) = 35

yellow light bulbs (Y) = 65

Total (T) = 100

Randomly Selected bulbs (n) = 10

$$(X=6) \Rightarrow \frac{\binom{W}{x}\binom{Y}{n-x}}{\binom{T}{n}} = \frac{\binom{35}{6}\binom{65}{4}}{\binom{100}{10}}$$

dhyper(6, 35, 65, 10)

≈ 0.06348 //

(5) A consignment of 20 microprocessors has arrived. 4 out of the 20 in the consignment are actually defective. To check the consignment the buyer randomly check 3 microprocessors. find the probability that the buyer find two or more defective processors in the check he conduct

defective microprocessors (d) = 4 Total (T) = 20

nondefective microprocessors, (d') = 16 n = 3

$$P(X \geq 2) \Rightarrow \frac{\binom{d}{x}\binom{d'}{n-x}}{\binom{T}{n}}$$

phyper (2, 4, 16, 3, lower.tail = FALSE)

= 0.00350 //

6) If a production line has a 20% defective rate. what is the average number of inspections to obtain the first defective? X = number of failures to 1st success

$$E(X) = \frac{(1-p)}{p} = \frac{1-0.2}{0.2} = \frac{0.8}{0.2} = 4$$

↑ mean no of failures

Mean number of inspections to obtain the first defective = 4 + 1 = 5 //

7) An oil compary has determined that the probability of finding oil at a particular drilling operation is 0.10. What is the probability that it would drill 4 dry wells before finding oil at the fifth one?

No of failures to the finding 1st oil well (X) = 4

dgeom (4, 0.1)

= 0.06561 //

8. Suppose that the amount of time one spends in a bank is exponentially distributed with mean 10 minutes. What is the probability that a customer will spend more than 15 minutes in the bank?

$\lambda = 1/10$
$= 0.1$

pexp (15, 0.1, lower.tail = FALSE)
$= 0.2231$ //

9) Enginners must consider the breadths of male heads when designing motorcycle helmets. Men have head breadths that are normally distributed with a mean of 6.0 in. and standard deviation of 1.0 in. Due to financial constraints, the helmets will be designed to fit all men except those with head breadths that are in the smallest 2.5% or largest 2.5%. find the minimum and maximum head breadths that will fit men.

$\mu = 6$ inches
$\sigma = 1$ inches

Smallest 2.5% → qnorm(0.025, 6, 1, lower.tail = TRUE)
= 4.0400 inches

largest 2.5% → qnorm (0.025, 6, 1, lower.tail = FALSE)
= 7.9599 inches