# Stat13 Homework 3

http://www.stat.ucla.edu/~dinov/courses_students.html

(30 points, student scores will be converted to scores out of 100)

## Suggested Solutions

**Problem 1 (15 points)**

X = number of malfunction disk drives
X ~ Binomial(n,p)

P(X=x) = $\binom{n}{x} p^x (1-p)^{n-x}$ where $\binom{n}{x} = \frac{n!}{x!(n-x)!}$

A, n = 10 (1 pt), p = 4% = 0.04 (1pt)

B, Assumptions:
- each trial has only 2 outcomes: function / malfunction (1 pt)
- constant p => same value for each trial (1 pt)
- independence => results are independent of each other (1 pt)

C, Yes (1 pt)

D,

Notation: nCr = $\binom{n}{r}$

1, P(X=0) = $_{10}C_0 * (0.04)^0 * (0.96)^{10}$ = 0.6648 (2 pts)
2, P(X=1) = $_{10}C_1 * (0.04)^1 * (0.96)^9$ = 0.277 (2 pts)
3, P(X≥2)= 1-P(X<2) = 1-P(X≤1) = 1-[P(X=0)+P(X=1)] = 1 - [0.6648+0.277] = 0.0582 (2 pts)
4, P(3≤X≤6): (3 pts)

method 1:
= P(X=3) + P(X=4) + P(X=5) + P(X=6) = 0.006213

method 2:
= P(X≤6) – P(X<3)
= P(X≤6) – P(X≤2)
= 0.999999982331 – 0.993786284008
= 0.006213

**Problem 2 (10 points)**

**Notation: Hus B = husband's blood type B**

A, Since husband's blood type independent of wife's blood type,
P(Hus B) = 11% (1 pt)

B, Due to independence,
P(Hus A and Wife A) = P(Hus A) * P(Wife A) = 30% * 30% = 9% (2 pts)

C, P(at least 1 AB) : (3 pts)

Method 1:
= P(Hus not AB and Wife AB) + P(Hus AB and Wife not AB) + P(Hus AB and Wife AB)

= (90%) (10%) + (10%) (90%) + (10%) (10%) = 19%

Method 2: (Using complement rule)
= 1 – P(Hus not AB and Wife not AB)
= 1 – (90%)(90%) = 19%

D, P(same blood type) = P(Hus O and Wife O) + P(Hus A and Wife A) + P(Hus B and Wife B) + P(Hus AB and Wife AB)
= (49%)(49%) + (30%)(30%) + (11%)(11%) + (10%)(10%)
= 35.22% (4 pt)

**Problem 3 (5 points)**

Total number of members = 275
Total number of females = 150
Total number of males = 125

A, P(female) = 150/275 = 0.545 (1 pt)
B, P(female and 4-5 times) = 37/275 = 0.1345 (1 pt)
C, P(male or 4-or-more) = P(male) + P(4-or-more) – P(male and 4-or-more)
= 125/275 + (26+6+37+11)/275 – (26+6)/275
= 173/275
= 0.629 (3 pts)

OR

P(male or 4-or-more) = 1 – P(Complement) = 1 - P(Female and in group-A-or-B)=
= 1 - P( {Female and in group-A} or {Female and in group-B})=
= 1 – (34/275 +68/275) = 1 – 0.371
= 0.629 (3 pts)