靜宜大學企管系『統計學』小考七

日期：2004 年 11 月 24 日

1. Health issues are a concern of managers, especially as they evaluate the cost of medical insurance. A recent survey of 200 executives at Elvers Industries, a large insurance and financial firm located in the Southwest, reported the number of pounds by which the executives were overweight. Compute the mean and the standard deviation. (10%)

Pounds Overweight	Frequency (f)
0 up to 4	18
4 up to 8	46
8 up to 12	73
12 up to 16	42
16 up to 20	21

Pounds Overweight	Frequency (f)	代表數（X）	Xf	X^2	X^2f
0 up to 4	18	2	36	4	72
4 up to 8	46	6	276	36	1656
8 up to 12	73	10	730	100	7300
12 up to 16	42	14	588	196	8232
16 up to 20	21	18	378	324	6804
	200		2008		24064
	（N）		（ΣX）		（ΣX^2）

$$N = 200, \Sigma X = 2008, \Sigma X^2 = 24064$$

$$\mu = \frac{\Sigma X}{N} = \frac{2008}{200} = 10.04$$

$$\sigma^2 = \frac{\Sigma X^2 - \frac{(\Sigma X)^2}{N}}{N} = \frac{24064 - \frac{(2008)^2}{200}}{200} = 19.5184$$

$$\sigma = \sqrt{19.5184} = 4.42$$

2. Recent crime report indicate that 3 motor vehicle thefts occur each minute in the United States. Assume that the distribution of thefts per minute can be approximated by the Poisson probability distribution.

(a) Calculate the probability exactly four thefts occur in a minute. (5%)

(b) What is the probability there are no thefts in two minutes? (5%)

(c) What is the probability there is at least one theft in two minutes? (5%)

(a) $\lambda = 3$, 卜瓦松分配 (時間間隔一分鐘), $P(x=4) = \frac{3^4}{4!}e^{-3} = 0.1680$

(b) $\lambda = 6$, 卜瓦松分配 (時間間隔兩分鐘), $P(x=0) = e^{-6} = 0.0025$

(c) $\lambda = 6$, 卜瓦松分配 (時間間隔兩分鐘), $P(x \geq 1) = 1 - P(x=0) = 0.9975$

3. Barry Bonds of the San Francisco Giants had the highest batting average in the 2002 Major League Baseball season. His average was .350. So assume the probability of getting a hit is .350 for each time he batted. In a particular game assume he batted three times.

(a) What is the probability of getting three hits in a particular game? (5%)

(b) What is the probability of not getting any hits in a game? (5%)

(c) What is the probability of getting at least one hit? (5%)

$n=3, p=0.350$, 二項分配

$(a) P(x=3)=C_3^3\times 0.350^3\times 0.650^0=0.0429$

$(b) P(x=0)=C_0^3\times 0.350^0\times 0.650^3=0.2746$

$(c) P(x\geq 1)=1-P(x=0)=0.7254$

4. The Ludlow Wildcats baseball team, a minor league team in the Cleveland Indians organization, plays 60 percent of their games at night and 40 percent during the day. The team wins 65 percent of their night games and 75 percent of their day games. According to today's newspaper, they won yesterday. What is the probability the game was played at day? (10%)

	win	loss	
day	0.4×75%		0.40
night	0.6×65%		0.60
	P(win)		

	win	loss	
day	0.3		0.40
night	0.39		0.60
	0.69		

貝氏定理：

$$P(day|win)=\frac{P(day \text{ and } win)}{P(win)}=\frac{0.3}{0.69}=0.4348$$

5. A federal study reported that 8 percent of the U.S. workforce has a drug problem. A drug enforcement official for the States of Indiana wished to investigate the statement. In his sample of 16 employed workers:

(a) How many would you expected to have a drug problem? (5%)

(b) What is the standard deviation? (5%)

(c) What is the likelihood that none of the workers sampled has a drug problem? (5%)

(d) What is the likelihood that at least one has a drug problem? (5%)

$n=16, p=0.08$, 二項分配

$(a) \mu=np=16\times 0.08=0.128$

$(b) \sigma=\sqrt{np(1-p)}=\sqrt{16\times 0.08\times 0.92}=1.0852$

$(c) P(x=0)=C_0^{16}\times 0.08^0\times 0.92^{16}=0.2634$

$(d) P(x\geq 1)=1-P(x=0)=0.7366$

6. Among the 100 applicants for a job, only 60 are actually qualified. If six of the applicants are randomly selected for an in-depth interview, find the probability that only two of the six will be qualified for the job and the expected number of qualified applicants that will be selected for an in-depth interview and its standard deviation? (10%)

$N=100, S=60, n=6,$超幾何分配

(1) $P(x=2)=\frac{C_2^{60}C_4^{40}}{C_6^{100}}=0.1357$

(2) $\mu=n\frac{S}{N}=6\times\frac{60}{100}=3.6$

(3) $\sigma=\sqrt{n\frac{S}{N}\frac{N-S}{N}\frac{N-n}{N-1}}=\sqrt{6\times\frac{60}{100}\times\frac{40}{100}\times\frac{94}{99}}=1.1693$

7. A two-pair consists of 2 cards of one face value and another 2 cards of another face value. What is the probability of getting a two-pair from a deck of a poker? (10%)

two-pair ≡兩張同數字（一對）加上兩張同數字（一對）

$n(\text{全部牌組})=C_5^{52}$

$n(\text{一對})=C_1^{13}C_2^4,\ n(\text{一對})=C_1^{12}C_2^4$

$P(\text{full house})=\frac{n(\text{一對})\times n(\text{一對})\times(\text{剩下44張牌})}{n(\text{全部牌組})}=\frac{C_1^{13}C_2^4\times C_1^{12}C_2^4\times 44}{C_5^{52}}=0.0951$

8. The six numbers you pick 5 numbers out of 42 (1 to 42) and one Powerball out of 35 (1 to 35) have to exactly match the winning numbers (5 numbers + Powerball) of a lottery in order to win the jackpot (first price). What is the expected number of times that you have to play to first win the jackpot? (10%)

$n(\text{全部組合})=C_5^{42}C_1^{35}=29773380$

中樂透機率 $p=\frac{1}{n(\text{全部組合})}=\frac{1}{29773380}$

$p=\frac{1}{29773380}$,幾何分配

$\mu=\frac{1}{p}=29773380$