統計分析手法
2014
小テスト 2

- **1**: The 1980 U.S. population, broken down by region and attitude to legalization of marijuana, roughly turned out as follows (note that all proportions add up to 100%):

	In Favor (F)	Opposed ($\bar{F}$)
East (E)	7.8%	22.2%
All except East ($\bar{E}$)	18.2%	51.8%

  a. What is $Pr(F)$, the probability that an individual drawn at random will be in favor of legalization?
  b. What is $Pr(F|E)$?
  c. Is F independent of E?

- **2**: In the 1984 U.S. presidential election, approximately 60% voted Republican and 40% voted Democratic. Calculate the probability that a random sample would correctly forecast the election winner – that is, that a majority of the sample would be Republicans, if the sample size were:
  a. $n = 1$
  b. $n = 3$
  c. $n = 9$.

- **3**: **a.** The workers in a large meat packing plant earn annual incomes with mean $\mu = \$30,000$ and standard deviation $\sigma = \$9000$. A labor lawyer plans to randomly sample 25 incomes from this population. Her sample mean $\bar{X}$ will be a random variable that will only imperfectly reflect the population mean μ. In fact, the possible values of $\bar{X}$ will fluctuate around an expected value of [ ] with a standard error of [ ], and with a distribution shape that is [ ].

  b. The lawyer is worried that her sample mean will be misleadingly high. A statistician assures her that it is unlikely that $\bar{X}$ will exceed μ by more than 10%. Calculate just how unlikely this is.

- **4** For each of the following joint distributions, calculate the covariance σ_{XY} and the correlation ρ_{XY}.

a.

x \ y	0	1
0	0.2	0
1	0.4	0.2
2	0	0.2

b.

x \ y	1	2
0	0.06	0.04
1	0.30	0.20
2	0.24	0.16

c.

x \ y	1	2	3
0	1/8	0	0
1	0	2/8	1/8
2	0	2/8	1/8
3	1/8	0	0

d. In parts **b** and **c**, are X and Y independent?
e. Looking beyond these particular examples, which of the following statements are true for any X and Y?
1. If X and Y are independent, then they must be uncorrelated.
2. If X and Y are uncorrelated, then they must be independent.

[**Formulas**]

- Let S, the total number of "successes" in n independent trials. When each trial has probability π of success, the probability of s successes in n trials is

$$p(s) = \binom{n}{s} \pi^s (1-\pi)^{n-s}$$