二項分布 (Binomial distribution)

- $f(x) = \binom{n}{x} p^{x} (1-p)^{n-x}$
 - o n 是樣本數
 - o p 是成功機率
- R 具有四個函數來生成二項分佈
 - (size 是試驗的次數, prob 是單次試驗成功的機率)
 - o dbinom(x, size, prob) 可用來算每個點的機率密度分佈。已知單次試驗成功機率為 p,在 n 次白努力試驗中有 x 次成功的機率。
 - pbinom(x, size, prob) 可用來算事件的累積機率。
 # Probability of getting 26 or less heads from a 50 tosses of a coin.
 #正面向上小於等於 26 次
 >pbinom(26,50,0.5)

pbinom(x, size, prob, lower.tail=T) 計算 P(≤x) 的情況 # pbinom(x, size, prob, lower.tail=F) 計算 P(>x) 的情況

- qbinom(p, size, prob) 在已知機率的情況下,求試驗中成功次數。
 # How many heads will have a probability of 0.25 will come out when a coin is tossed 50 times.
 >qbinom(0.25,50,1/2)
- rbinom(n, size, prob) 用於生成具有給定參數值的指定大小之隨機樣本。
 # Find 8 random values from a sample of 150 with probability of 0.4.
 >rbinom(8,150,.4)
- 例題
 - According to the American medical research, 75% of adults believe that an unattractive smile will hurt career success. Assuming 25 adults are randomly selected, what is the probability that 15 or more people will agree with the statement?

p.smile <-dbinom(15:25,25,0.75) plot(15:25, p.smile, pch=19, main = "Binomial") sum(p.smile)

#計算 15 到 25 每個點的離散機率函數
#x 軸範圍
#資料來自 p.smile
#點的樣式
#設定 Binomial 為標題

- 作業
 - 1) Assume that the probability of a girl dressing up as Elsa in Disneyland is
 0.34. Now, there are 1581 girls in Disneyland. We say the girls are not interacting with each other.

- a. What's the probability of at least one-third of the girls dressing up as Elsa?
- b. Create a matrix showing the probability of 23, 145, 333, 465, 885 and 1121 girls dressing as Elsa (with the number of the dressed-up girl in the first column and the corresponding probability in the second column). And write the matrix in a file called "prob.txt" in the R working directory.
- 2) Suppose there are n multiple choice questions in a test. Each question has c possible answers, and only one of them is correct. The total score is t (in points).
 - a. Write a function p.fun. The function has four input variables n ,c ,t and x, where n ,c ,t and x are positive integers. The function output is the probability of getting x or more points on the test if a student attempts to answer every question at random.
 - b. Suppose there are 50 multiple choice questions in a math test. Each question has four possible answers, and only one of them is correct. The total score is 130 (in points). Use the function p.fun to compute the probability that a student pass the test (get 60 points or more on the test) if he/she attempts to answer every question at random. Write down the R command(s).