Homework 2

1. (15 points) Lily has applied to both NYCU and NTHU.
She thinks the probability that NYCU will admit her is 0.4, the probability that NTHU will admit her is 0.5, and the probability that both will admit her is 0.2.
Make a Venn diagram. Then answer these questions.

(a) What is the probability that neither university admits Lily?

(b) What is the probability that she gets into NTHU but not NYCU?

(c) Are admission to NYCU and admission to NTHU independent events? Why or why not. Provide your calculations.

2. (15 points) A company retains a psychologist to assess if job applicants are suited for assembly line work.
The psychologist classifies applicants as A_1 (well suited), A_2 (marginal), or A_3 (not suited).
The company is concerned about event B: an employee leaves the company within one year of being hired.
Data on all people hired in the past 5 years gives these probabilities:
$P(A_1) = 0.4$
$P(A_2) = 0.3$
$P(A_3) = 0.3$
$P(A_1 \text{ and } B) = 0.1$
$P(A_2 \text{ and } B) = 0.1$
$P(A_3 \text{ and } B) = 0.2$

(a). What is P(B), the probability that an employee leaves within one year.

(b). Given an employee is evaluated as “marginal”, what is the (conditional) probability that he/she will leave the company within one year of being hired.

(c). Given an employee is evaluated as “well suited”, what is the (conditional) probability that he/she will continue to work at the company after the first year?

3. (15 points) Consider three traits: 高矮, 顏色（黃綠), 表皮 (round/wrinkled) of a pea plant. In the pea plant, tallness (T) is dominant to shortness (t); yellow seeds (Y) are dominant to green (y); and the round shape (W) is dominant to wrinkled (w).
Suppose that two plants are cross matched:
One has genotype TTYYWw and the other has genotype TtYyWw.

(a). Find the probability that the cross match will result in a tall pea plant.

(b). Find the probability that the cross match will result in a tall, yellow and wrinkled pea plant.

(c). Find the probability that the cross match will result in a green pea plant.

4. (15 points, 使用軟體) Alcohol abuse has been described by college presidents as the number one problem on campus, and it is an important cause of death in young adults. A survey of 17,096 students in U.S. four-year colleges collected information on drinking behavior and alcohol-related problems.
The researchers defined "frequent binge drinking" as having five or more drinks in a row three or more times in the past two weeks.
Here is the two-way table classifying students by gender and whether or not they are frequent binge drinkers:

	Gender	
Frequent binge drinker	Men	Women
Yes	1630	1684
No	5550	8232

(a). (5 points) Enter the table information into R. Show the probabilities of the four cells in a table.
(b). (10 points) Using the bar plots to present the "conditional" probabilities:

$P(\text{frequent drinker}|\text{men})$, $P(\text{not frequent drinker}|\text{men})$ → one bar

$P(\text{frequent drinker}|\text{women})$, $P(\text{not frequent drinker}|\text{women})$ → the other bar

c. Compare the drinking behavior for male and female students（不計分）
R 的指令可參考 Lecture 3 講義（兩個 bars 併排, 高度都是 1）