

**2.66** Factory workers are constantly encouraged to practice zero tolerance when it comes to accidents in factories. Accidents can occur because the working environment or conditions themselves are unsafe. On the other hand, accidents can occur due to carelessness or so-called human error. In addition, the worker's shift, 7:00 A.M.–3:00 P.M. (day shift), 3:00 P.M.–11:00 P.M. (evening shift), or 11:00 P.M.–7:00 A.M. (graveyard shift), may be a factor. During the last year, 300 accidents have occurred. The percentages of the accidents for the condition combinations are as follows:

Shift	Unsafe Conditions	Human Error
Day	5%	32%
Evening	6%	25%
Graveyard	2%	30%

If an accident report is selected randomly from the 300 reports,

- what is the probability that the accident occurred on the graveyard shift?
- what is the probability that the accident occurred due to human error?
- what is the probability that the accident occurred due to unsafe conditions?
- what is the probability that the accident occurred on either the evening or the graveyard shift?

(a)

$$P = \frac{300 \times 2\% + 300 \times 30\%}{300}$$

$$= 32\%$$

(b)

$$P = 32\% + 25\% + 30\%$$

$$= 87\%$$

(c)

$$P = 5\% + 6\% + 2\%$$

$$= 13\%$$

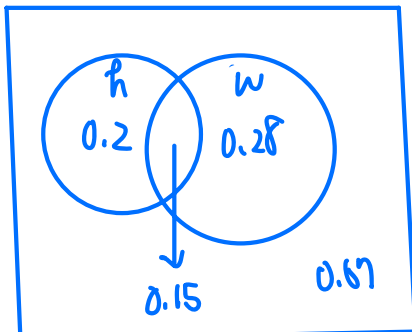
(d)

$$P = 6\% + 25\% + 2\% + 30\%$$

$$= 63\%$$

**2.82** For married couples living in a certain suburb, the probability that the husband will vote on a bond referendum is 0.2, the probability that the wife will vote on the referendum is 0.28, and the probability that both the husband and the wife will vote is 0.15. What is the probability that

- at least one member of a married couple will vote?
- a wife will vote, given that her husband will vote?
- a husband will vote, given that his wife will not vote?



(a)

$$P = 0.2 + 0.28 - 0.15$$

$$= 0.33$$

(b)

$$P = \frac{0.15}{0.2} = 0.75$$

(c)

$$P = \frac{0.2 - 0.15}{1 - 0.28} = \frac{5}{72}$$

$$= 0.07$$

**2.90** Pollution of the rivers in the United States has been a problem for many years. Consider the following events:

$A$ : the river is polluted,

$B$ : a sample of water tested detects pollution,

$C$ : fishing is permitted.

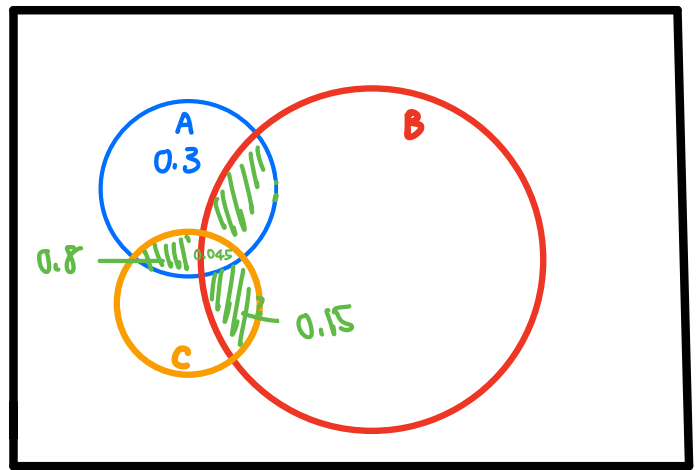
Assume  $P(A) = 0.3$ ,  $P(B|A) = 0.75$ ,  $P(B|A') = 0.20$ ,  $P(C|A \cap B) = 0.20$ ,  $P(C|A' \cap B) = 0.15$ ,  $P(C|A \cap B') = 0.80$ , and  $P(C|A' \cap B') = 0.90$ .

(a) Find  $P(A \cap B \cap C)$ .

(b) Find  $P(B' \cap C)$ .

(c) Find  $P(C)$ .

(d) Find the probability that the river is polluted, given that fishing is permitted and the sample tested did not detect pollution.



(a)

$$P(B \cap A) = P(A)P(B|A)$$

$$= 0.3 \cdot 0.75$$

$$= 0.225 \quad (P(A) \cdot P(B))$$

$$P(A \cap B \cap C) = P(A \cap B)P(C|A \cap B)$$

$$= 0.225 \times 0.2$$

$$= 0.045 \quad (P(A) \cdot P(B) \cdot P(C))$$

$$P(B \cap A') = (1 - 0.3) \cdot 0.2$$

$$= 0.14$$

$$P(A' \cap B \cap C) = 0.021$$

$$P(A \cap B') = P(A) - P(A \cap B)$$

$$= 0.075$$

$$P(A \cap B' \cap C) = 0.075 \times 0.8$$

$$= 0.06$$

(b)

$$P(B' \cap C) = P((A \cup A') \cap B' \cap C)$$

$$= P(A \cap B' \cap C) + P(A' \cap B' \cap C)$$

$$= 0.06 + 0.504$$

$$= 0.564 \quad \#$$

$$P(A' \cap B') = P(A') - P(A' \cap B)$$

$$= 0.56$$

$$P(A' \cap B' \cap C) = 0.504$$

(c)

$$P(C) = P(B' \cap C) + P(B \cap C)$$

$$= 0.564 + P(A \cap B \cap C) + P(A' \cap B \cap C)$$

$$= 0.564 + 0.045 + 0.021 = 0.63 \quad \#$$

(d)

$$P(A | B' \cap C) = \frac{A \cap B' \cap C}{B' \cap C} = \frac{0.06}{0.564} = 0.1064$$

**2.100** A regional telephone company operates three identical relay stations at different locations. During a one-year period, the number of malfunctions reported by each station and the causes are shown below.

	Station	A	B	C
Problems with electricity supplied		2	1	1
Computer malfunction		4	3	2
Malfunctioning electrical equipment		5	4	2
Caused by other human errors		7	7	5

Suppose that a malfunction was reported and it was found to be caused by other human errors. What is the probability that it came from station C?

**2.126** During bad economic times, industrial workers are dismissed and are often replaced by machines. The history of 100 workers whose loss of employment is attributable to technological advances is reviewed. For each of these individuals, it is determined if he or she was given an alternative job within the same company, found a job with another company in the same field, found a job in a new field, or has been unemployed for 1 year. In addition, the union status of each worker is recorded. The following table summarizes the results.

	Union	Nonunion
Same Company	40	15
New Company (same field)	13	10
New Field	4	11
Unemployed	2	5

- If the selected worker found a job with a new company in the same field, what is the probability that the worker is a union member?
- If the worker is a union member, what is the probability that the worker has been unemployed for a year?

$$A+B+C = 18+15+10 = 43$$

$$P = \frac{\frac{5}{43}}{\frac{7+7+5}{43}} = \frac{5}{19}$$

$$\text{Union} + \text{Nonunion} = 59 + 41 = 100$$

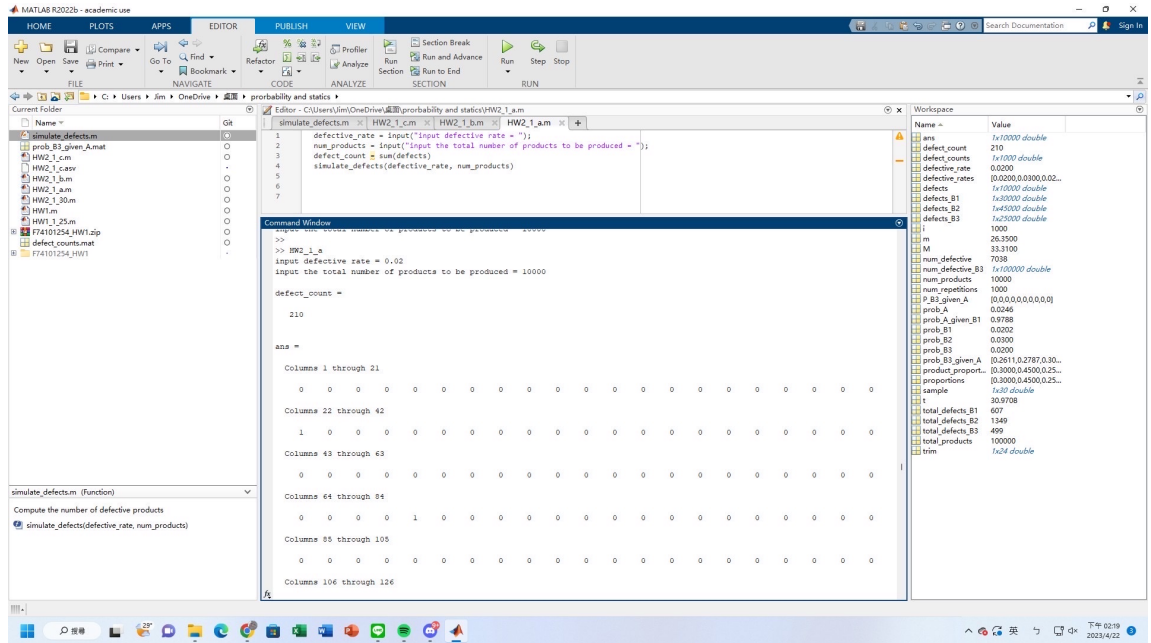
$$(a) \quad P = \frac{\frac{13}{100}}{\frac{23}{100}} = \frac{13}{23}$$

$$(b) \quad P = \frac{\frac{2}{100}}{\frac{59}{100}} = \frac{2}{59}$$

# Matlab HW 2

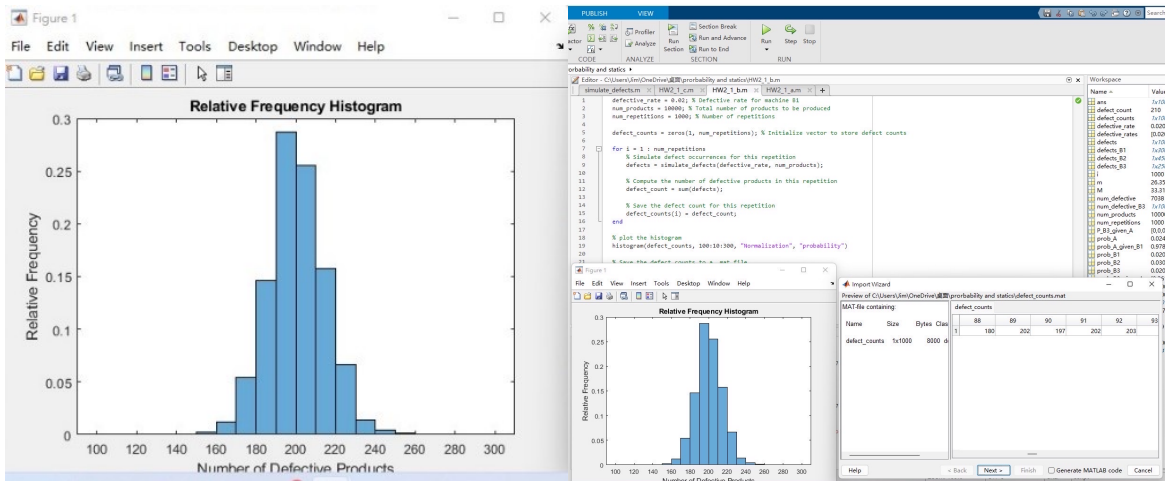
1. (a)

defect\_count 為所有 defective product 的和  
如圖所示為 210, defective rate 為  $\frac{210}{10000} = 0.021$   
與 input 進去的 defective rate 相近



1. (b)

左圖為 relative frequency Histogram  
右圖之右下為 1000 組的 defective products



1. (c)

by example 4.21 and 4.22 , we can know the theoretical value is  $\frac{10}{49} \approx 0.2041$   
 但在經過運算後發現，我算出之10組數據與實際數據有些微的差距

