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Handwrite

2.66

(a)
$P = 2\% + 30\% = 32\%$

(b)
$P = 32\% + 25\% + 30\% = 87\%$

(c)
$P = 1 - P(b) = 13\%$
or
$P = 5\% + 6\% + 2\% = 13\%$

(d)
$P = 1 - P_{day} = 1 - (5\% + 32\%)$
$= 63\%$

2.82

(a) $P = (P_h \cup P_w) = P_h + P_w - P_{both}$
$= 0.2 + 0.28 - 0.15 = 0.33$

(b) $P(\text{wife} \mid \text{husband}) = \frac{P(\text{wife} \cap \text{husband})}{P(\text{husband})}$
$= \frac{0.15}{0.2} = 0.75$

(c) $P(\text{husband} \mid \text{wife}) = \frac{P(\text{wife} \cap \text{husband})}{P(\text{wife})}$
$= \frac{0.15}{0.28} = 0.536$

2.90

(a) $P(C \mid A \cap B) = \frac{P(A \cap B \cap C)}{P(A \cap B)}$

$P(B \mid A) = \frac{P(A \cap B)}{P(A)}$

$P(C \mid A \cap B) \cdot P(B \mid A) \cdot P(A)$

$= \frac{P(A \cap B \cap C)}{P(A \cap B)} \cdot \frac{P(A \cap B)}{P(A)} P(A) = P(A \cap B \cap C)$

$P(A \cap B \cap C) = 0.2 \times 0.75 \times 0.3 = 0.045$

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

1. $P(C \mid A' \cap B') = \frac{P(A' \cap B' \cap C)}{P(A' \cap B')}$ $P(B' \mid A') = 1 - P(B \mid A') = 0.8$

$P(B' \mid A') = \frac{P(B' \cap A')}{P(A')}$ $P(A') = 1 - P(A) = 1 - 0.7 = 0.3$

$P(C \mid A' \cap B') \cdot P(B' \mid A') \cdot P(A') = \frac{P(A' \cap B' \cap C)}{P(A' \cap B')} \cdot \frac{P(A' \cap B')}{P(A')} P(A')$

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

2. $P(C \mid A \cap B') = \frac{P(A \cap B' \cap C)}{P(A \cap B')}$ $P(B \mid A) = 0.75$

$P(B' \mid A) = 1 - P(B \mid A) = 1 - 0.75 = 0.25$

$P(C \mid A \cap B') \cdot P(B' \mid A) \cdot P(A) = \frac{P(A \cap B' \cap C)}{P(A \cap B')} \cdot \frac{P(B' \cap A)}{P(A)} \cdot P(A)$

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

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

$= (0.9 \times 0.8 \times 0.7) + (0.8 \times 0.25 \times 0.3) = 0.564$

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

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

$P(C \mid A' \cap B) = \frac{P(A' \cap B \cap C)}{P(A' \cap B)}$ $P(B \mid A') = \frac{P(A' \cap B)}{P(A')}$

$P(A' \cap B \cap C) = \frac{P(A' \cap B \cap C)}{P(A' \cap B)} \cdot \frac{P(A' \cap B)}{P(A')} \cdot P(A')$

$= 0.15 \times 0.2 \times (1 - 0.3) = 0.021$

$P(C) = 0.095 + 0.021 + 0.564 = 0.630$

(d) River polluted - A fishing is permitted - C
sample tested did not detect pollution - B'

$P(A \mid B' \cap C) = \frac{P(A \cap B' \cap C)}{P(B' \cap C)} = \frac{0.8 \cdot 0.25 \cdot 0.3}{0.564} = 0.106$

2.100

2.100

E: malfunction is caused by other human error

$$P(C|E) = \frac{P(E|C)P(C)}{P(E|A)P(A) + P(E|B)P(B) + P(E|C)P(C)}$$

$$= \frac{\frac{5}{10} \times \frac{10}{43}}{\frac{7}{18} \times \frac{18}{43} + \frac{7}{15} \times \frac{15}{43} + \frac{5}{10} \times \frac{10}{43}} = \frac{5}{19}$$

$$= 0.263.$$

2.126

2.126

(a)

E: found a job in same field new company

$$P = \frac{P(E|U)P(U)}{P(E|U)P(U) + P(E|U')P(U')} = \frac{\frac{13}{59} \times \frac{59}{100}}{\frac{13}{59} \times \frac{59}{100} + \frac{10}{41} \times \frac{41}{100}}$$

$$= \frac{13}{23} = 0.565$$

(b)

$$P(Un|U) = \frac{2}{59} = 0.034$$

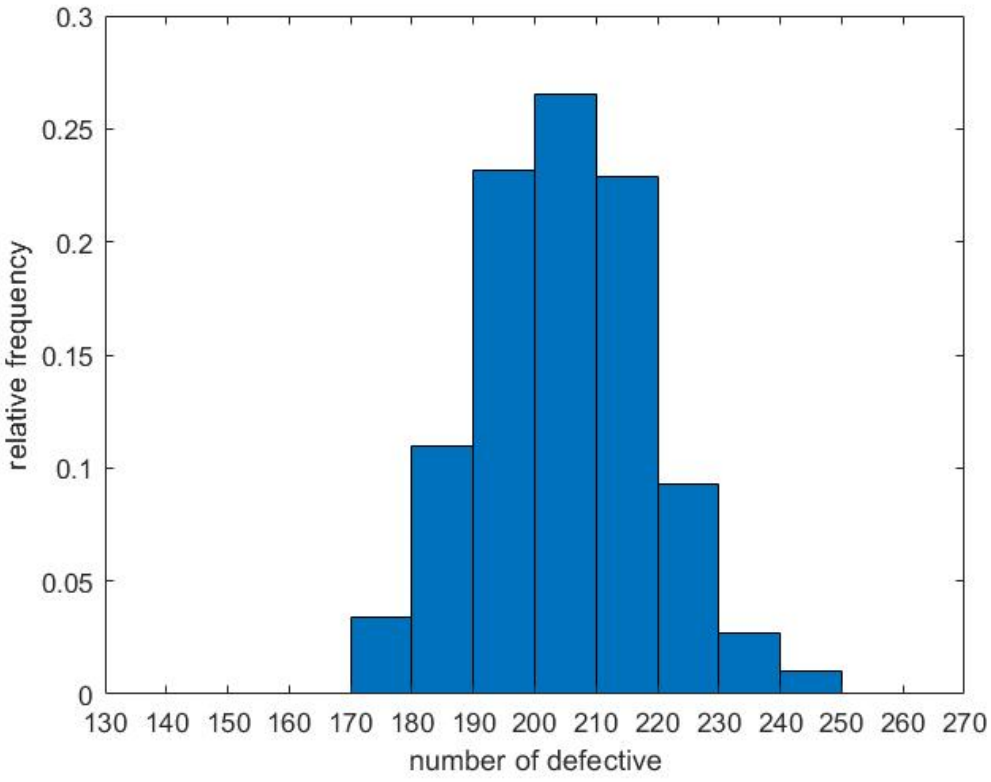
Matlab

1(a)

```
Columns 153 through 171

     0     0     0     0     0     0     0     0     0     0     0     1     0     0     0     0     0     0

Columns 172 through 190

     0     0     0     0     0     0     1     0     0     0     0     0     0     0     0     0     0     0
```

(因為太大了不想占版面，所以只有放一小部分有 0 和 1 的地方作為代表。)

1.(b)



1000 次的 number of defective 的部分結果：

```
B =

  Columns 1 through 18

   197   178   198   206   203   193   202   202   197   201   204   205   184   201   199   187   173   189

  Columns 19 through 36

   210   183   200   206   227   206   183   182   210   184   186   204   213   196   197   216   190   208

  Columns 37 through 54

   206   209   201   173   197   199   198   203   210   197   206   188   187   188   206   209   207   222

  Columns 55 through 72

   203   203   194   214   215   208   190   194   187   201   200   216   181   219   204   220   214   193

  Columns 73 through 90

   226   214   166   206   211   197   230   197   214   207   226   203   194   169   212   184   174   197

  Columns 91 through 108

   200   199   202   188   202   192   215   174   187   205   173   174   207   225   179   184   212   171
```

從 relative frequency 可以發現，大部分 number of defective 在 190~220 附近，其中以 200~210 最多(以這張圖來說)，而且基本上 defective rate 在 (2±0.5)%內，壞掉商品大約分布在 150~250 之間(以本題的生產數量搭配它的 defective rate)。

1(c)

用 function 計算的十次 P(B3|A)與其平均值：

```
1.(c)
0.1902
0.202
0.2101
0.1917
0.1955
0.2173
0.21
0.2016
0.2164
0.2107
P(B3|A)=0.2046
```

理論上的

P(B3|A)=(25000*0.02)/(30000*0.02+45000*0.03+25000*0.02)=0.2041

和模擬出來的平均結果接近，而最大誤差為每個機器的 defective rate 均

±0.5%的時候，所以單次產生的 P(B3|A)在 0.19~0.22，甚至更廣一些的範圍之

間都是有可能的。