2.23

its a sequence of throwing a die and drawing a letter randomly

1st scenario — 2nd scenario

no. of possibility of first scenario = 6

" of second scenario = 26

total points in sample space = 6×26

$= \underline{156 \text{ way}}$

} → Counting sample points via multiplication rule

2.25

given

shoes → 5 different styles with each available in 4 different colors

now we need to find ways to show case these shoes

5 way		4 way
A		X Y Z K
B		X Y Z k
c	X	X Y Z k
D		X Y Z k
E		" "

Graphical sample

5×4

$= \boxed{20 \text{ way}}$

} → Counting sample points via multiplication rule

2.47

8 candidates

3 positions

or

$${}^{8}C_{3} \text{ ways} = \frac{8!}{3!\,(8-3)!} = \frac{8!}{3!\,5!} \qquad \left\{ {}^{n}C_{r} = \frac{n!}{r!\,(n-r)!} \right\}$$

$$= \frac{8\times7\times6}{3!} = \frac{8\times7\times6}{3\times2}$$

$$= \boxed{56 \text{ ways}}$$

Counting via combination, here order doesn't matter pg 59

Q.49

(a) The summation of all propablities should equal to 1, Here is not

(b) if $P(rain) = 0.40$

$P(no\ rain) = 1 - P(rain)$

$= 0.60$

Here its saying its 0.52 which violates axiom of probability

(c) Probability can't be negative

(d) no. of Heart cards in deck = 13

no. of black cards in deck = 26

probability of selecting heart and Black card = $\boxed{\frac{39}{52} = 3/4}$

$\therefore$ the error is that they have given probability as $\frac{1}{8}$

error

2.53

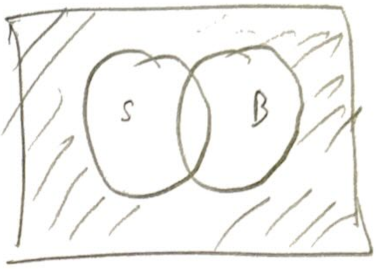
american industry in Shanghai, China $\rightarrow P(S)$

" in Beijing, China $\rightarrow P(B)$

$P(S) = 0.7$

$P(B) = 0.4$

$\boxed{P(S \cup B) = 0.8}$



(a) in both cities

i.e $P(S \cap B)$

$P(S \cup B) = P(S) + P(B) - P(S \cap B)$

$0.8 = 0.7 + 0.4 - P(S \cap B)$

$0.8 = 1.1 - P(S \cap B)$

$\boxed{0.3 = P(S \cap B)}$

(b) in neither cities =

$P\,c\,(S \cup B) = 1 - P(S \cup B)$

$\boxed{P\,c(S \cup B) = 0.2}$

2.63

(a) Probability that PC in Bedroom

= P (Adult Bedroom) + P(child Bedroom) + P (Other Bedroom)

$= \boxed{0.32}$

(b) Probability that not in a bedroom = 1 − P(PC in Bedroom)

$= 1 - 0.32$

$= \boxed{0.68}$

(c) Since office or den has the highest probability i.e 0.40 amongst the all, we can expect it there.

2.73

These problems — Conditional probability

P(R|D) → Probability that convict committed armed robbery given that they pushed dope

P(D'|R) → probability that a convict not pushed dope given that they committed armed robbery

P(R'|D') → probability that convict not committed armed robbery given that they have not not pushed dope

2.83

Event → entering the Leroy Caverns has Canadian license → A P(A) = 0.12

→ Camper → B ⟹ 0.28

→ Camper with canadian license → $A \cap B = 0.09$

(a) find

Condition probability

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

Camper with Canadian no plate $= \frac{0.09}{0.28} = \frac{9}{28} = \boxed{0.32}$

(b) $P(A|B) = \frac{P(A \cap B)}{P(A)} = \frac{0.09}{0.12} = \frac{9}{12} = \frac{3}{4} = \boxed{0.75}$

(c) $P(\bar{A} \cup \bar{C}) = 1 - P(A \cap C)$

$= 1 - 0.09$

$= \boxed{0.91}$

2.89

given

two fire engine operating independently $\begin{cases} \to A \\ \to B \end{cases}$ availability of two engine

probability when a specific engine is available when needed $\to$ $P(A) = P(B) = 0.96$

$P(\bar{A}) = 0.04 = P(\bar{B})$

(a) neither is available

$$P(\bar{A} \cap \bar{B}) = P(\bar{A}) \times P(\bar{B})$$
$$= 0.04 \times 0.04$$
$$= \boxed{0.0016}$$

(b) atleast one available

$$P(\text{atleast one available}) = 1 - P(\text{neither available})$$
$$= 1 - 0.0016$$
$$= \underline{0.9984}$$

2.95

$P(C) = 0.05$ (probability that a person has cancer)

$P(\bar{C}) = 0.95$ (probability that it does not have cancer)

$P(D|C) = 0.78$ (true positive)

$P(D|\bar{C}) = 0.06$ (false positive)

to find $P(D)$ {after diagnosis have cancer}

Law of total probability

$$P(D) = P(D|C) \times P(C) + P(D|\bar{C}) \times P(\bar{C})$$

$$= 0.78 \times 0.05 + 0.06 \times 0.95$$

$$= 0.096$$

2.97 what is the probability that person diagnosed as having cancer actually has cancer

$\Rightarrow$ This is the case of Bayes Rule

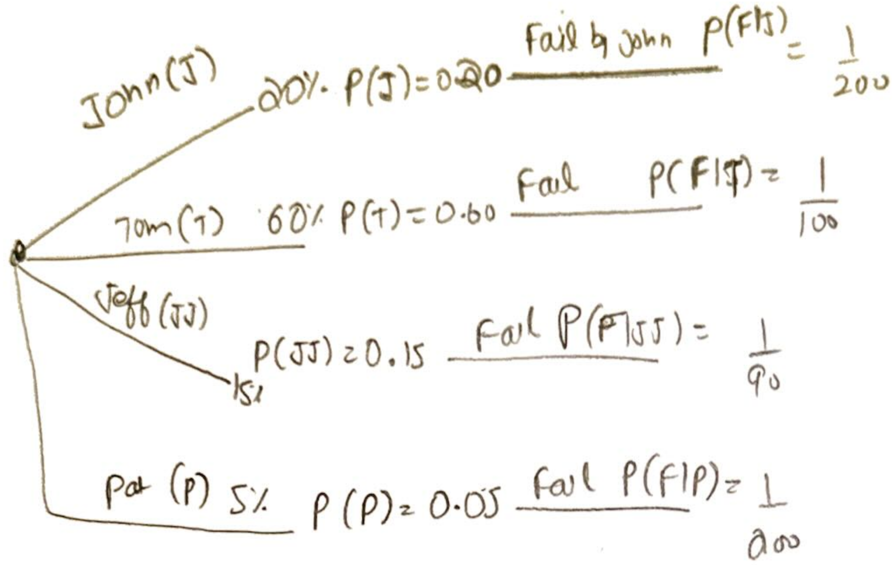
to calculate $\rightarrow P(C|D)$

according to Bayes theorm

$$P(C|D) = \frac{P(D|C) \times P(C)}{P(D)} = \frac{0.78 \times 0.05}{0.096} = 0.40625$$

2.99

fail → F



to find $P(J|F)$ Bayes Rule

$$P(J|F) = \frac{P(F|J) \times P(J)}{P(F)}$$

finding $P(F)$ by law of total probability

$$P(F) = P(J) \times P(F|J) + P(T) \times P(F|T) + P(JJ) \times P(F|JJ) + P(P) \times P(F|P)$$

$$= \frac{0.20 \times 1}{200} + \frac{0.60 \times 1}{100} + \frac{0.15 \times 1}{90} + \frac{0.05 \times 1}{200}$$

$$= \frac{0.25}{200} + \frac{1.20}{200} + \frac{0.15}{90}$$

$$= \frac{1.45}{200} + \frac{0.15}{90}$$

$= 0.00725 + 0.001667$

$= 0.0089167$

$\therefore$ according Bayes Rule

$$p(J|F) = \frac{\frac{1}{200} \times 0.20}{0.0089167} = \frac{0.001}{0.0089167} = \underline{\underline{0.11214911}}$$