1.

four green & four blue parakeets can be placed adjacently in the following way.

$\boxed{G}$ $\boxed{B}$ $\boxed{G}$ $\boxed{B}$ $\boxed{G}$ $\boxed{B}$ $\boxed{G}$ $\boxed{B}$

or

$\boxed{B}$ $\boxed{G}$ $\boxed{B}$ $\boxed{G}$ $\boxed{B}$ $\boxed{G}$ $\boxed{B}$ $\boxed{G}$

No. of ways $= \dfrac{4! \times 4!}{8!} \times 2 = \dfrac{\cancel{4}\times\cancel{3}\times\cancel{2}\times 1\times\cancel{2}}{\cancel{8}\times 7\times\cancel{6}\times 5} = \dfrac{1}{35}$ //

2.

(a) $P(8 \text{ functioning cores}) = (0.70)^8$
$= 0.058$ //

(b) $P(\text{Great}) = P(1\times F, 7\times D) + P(2\times F, 6\times D) + P(3\times F, 5\times D)$
$= (0.7)(0.3)^7 + (0.7)^2(0.3)^6 + (0.7)^3(0.3)^5$
$= 0.00015 + 0.00036 + 0.00083$
$= 0.00134$

$P(\text{Advanced}) = P(4\times F, 4\times D) + P(5\times F, 3\times D) + P(6\times F, 2\times D) + P(7\times F, 1\times D)$
$= (0.7)^4(0.3)^4 + (0.7)^5(0.3)^3 + (0.7)^6(0.3)^2 + (0.7)^7(0.3)$
$= 0.00194 + 0.00453 + 0.01058 + 0.02471$
$= 0.04176$

$P(\text{Extreme}) = \cancel{(0.7)^8}\ P(8\times F)$
$= (0.7)^8$
$= 0.05764.$ //

(c) The ratio of the three models should be => 1 : 31 : 43

$$E(x) = \frac{1}{75} \times 1000 \times 50 + \frac{31}{75} \times 1000 \times 100 + \frac{43}{75} \times 1000 \times 1000$$

$$= 666.67 + 41333.34 + 573333.34$$

$$= \$ \ 615333.34$$

3.

(a). Let G be the event of accused being guilty

Let V_i be the event of i^{th} judge voting guilty

so, $\bar{V_i}$ will be the event of i^{th} judge voting innocent.

(a) $P(G/V_1) = \dfrac{P(V_1|G) \times P(G)}{P(V_1)}$

$$= \frac{0.7 \times 0.7}{0.7 \times 0.7 + 0.3 \times 0.2}$$

$$= 0.89$$

(b) $P(G|V_1, V_2, V_3) = \dfrac{P(V_1, V_2, V_3|G) \cdot P(G)}{P(V_1, V_2, V_3)}$

$$= \frac{P(V_1/G) . P(V_2|G) \ P(V_3|G) \ P(G)}{P(V_1 \ V_2 \ V_3)}$$

$$= \frac{(0.7)^4}{(0.7)^4 + (0.2)^3 (0.3)}$$

$$= 0.99$$

(c). $$P(V_3 \mid \bar{V}_1, \bar{V}_2) = \frac{P(\bar{V}_1, \bar{V}_2, V_3)}{P(\bar{V}_1, \bar{V}_2)}$$

$$= \frac{(0.3)(0.3)(0.7)(0.7) + (0.8)(0.8)(0.2)(0.3)}{(0.3)(0.3)(0.7) + (0.8)(0.8)(0.3)}$$

$$= \frac{0.0441 + 0.0384}{0.063 + 0.192}$$

$$= 0.32$$

4.

(a).

$$
\begin{tikzcd}
R_1 \arrow[d] & R_2 \arrow[d] & R_3 \arrow[d] & R_4 \arrow[d] \\
D_1 \arrow[r] & D_2 \arrow[r] & D_3 \arrow[r] & D_4
\end{tikzcd}
$$

C.I Assumption:-

Next day's probability of raining is independent of today's recieved signal if we know what actually happened today.

(b).

$$P(D_4) = P(D_4 | R_4) \cdot P(R_4) \cdot P(D_4 | D_3) \cdot$$
$$P(D_3 | R_3) \cdot P(R_3) \cdot P(D_3 | D_2)$$
$$P(D_2 | R_2) \cdot P(R_2) \cdot P(D_2 | D_1) \cdot P(D_1)$$

Eliminating D_1 :-

$$\tau(D_2) = \sum_{D_1} P(D_1) \cdot P(D_2 | D_1)$$
$$= (0)(0.65) + (1)(0.25)$$
$$= 0.25.$$

Eliminating R_2 :-

$$\tau'(D_2) = \sum_{R_2} P(R_2) \cdot P(D_2 | R_2)$$
$$= (1)(0.6) + (0)(0.4)$$
$$= 0.60.$$

Eliminating D_2 :-

$$\tau(D_3) = \sum_{D_2} \tau(D_2) \cdot \tau'(D_2) \cdot P(D_3 | D_2)$$

$$= (0.25)(0.6)(0.65) + (0.75)(0.40)(0.25)$$

$$= 0.1725$$

Eliminating R_3 :-

$$\tau'(D_3) = \sum_{R_3} P(R_3) \cdot P(D_3 | R_3)$$

$$= (0)(0.6) + (1)(0.4)$$

$$= 0.4$$

Eliminating D_3 :-

$$\tau(D_4) = \sum_{D_3} \tau(D_3) \cdot \tau'(D_3) \cdot P(D_4 | D_3)$$

$$= (0.1725)(0.4)(0.65) + (0.6)(0.25)(0.8275)$$

$$= 0.169$$

Eliminating R_4 :-

$$\tau'(D_4) = \sum_{R_4} P(R_4) \cdot P(D_4 | R_4)$$

$$= (1)(0.6) + (0)(0.40)$$

$$= 0.6$$

$$P(D_4) = \tau(D_4) \cdot \tau'(D_4)$$

$$= 0.101$$