Homework #1 CS1156x

Q1: (1) Learning VS Design - Design (we have distribution)

(2) Learning VS Design - Learning (search for H)

(3) Reinforced Learning.

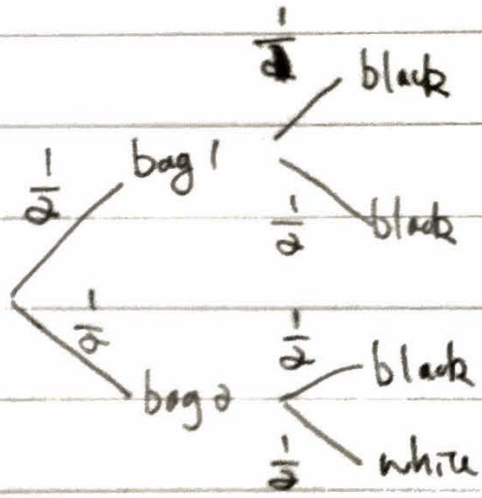
Q2: (1) "No pattern" - there are algorithms

(2) Potential Pattern

(3) "No pattern" - there are distributions

(4) Potential Pattern

Q3:



$P(\text{bag 1 is chosen}) = \frac{1}{2}$

$P(\text{bag 2 is chosen}) = \frac{1}{2}$

$P(\text{black} \mid \text{bag 1 is chosen}) = 1$

$P(\text{black} \mid \text{bag 2 is chosen}) = \frac{1}{2}$

$P(\text{white} \mid \text{bag 2 is chose}) = \frac{1}{4}$

$$P(\text{bag 1 is chosen} \mid \text{black}) = \frac{P(\text{bag 1 is chosen} \sqcap \text{black})}{P(\text{black})}$$

Bayes theorm $$= \frac{P(\text{black} \mid \text{bag 1 is chose})\, P(\text{bag 1 is chose})}{P(\text{black})}$$

$$= \frac{1 \times \frac{1}{2}}{\frac{3}{4}} = \frac{2}{3}$$

Q4: Binomial: $C_{10}^{10}(0.45)^{10}(0.55)^{0} = 3.405 \times 10^{-4}$

Q5: 1 - P(none of the samples have $D=0$)

= 1 - P(all of the samples have at least 1 red marbles)

= 1 - [1 - P(~~all of the~~ one sample ~~have~~ has no red marbles)]^{100}

~~= P(all of the samples have no red marbles)~~

= 0.28863 = $1-(1-P_{\text{from Q4}})^{100}$ = $1-(1-3.405\times10^{-4})^{100}$

I. I. D. R. V.

Q6:

Y_n			y_n	f_1	f_2	f_3	f_4	f_5	f_6	f_7	f_8
0	0	0	0	✗	✗	✗	✗	✗	✗	✗	✗
0	0	1	1	✓	✓	✓	✓	✓	✓	✓	✓
0	1	0	1	✓	✓	✓	✓	✓	✓	✓	✓
0	1	1	0	✗	✗	✗	✗	✗	✗	✗	✗
1	0	0	1	✓	✓	✓	✓	✓	✓	✓	✓
1	0	1	?	✗	✗	✗	✗	✓	✓	✓	✓
1	1	0	?	✗	✗	✓	✓	✗	✗	✓	✓
1	1	1	?	✗	✓	✗	✓	✗	✓	✗	✓

[a] $1\times3 + 3\times2 + 3\times1 + 1\times0 = 12$

[b] $1\times3 + 3\times2 + 3\times1 + 1\times0 = 12$

[c] $1\times3 + (1+1+1)\times2 + (1+1+1)\times1 + 0$

[d] same.