AI

Homework

Task 1

Constants: B_1 B_2 B_3 $\} \rightarrow B$

R_1 R_2 R_2 $\} \rightarrow R$

P_1 P_2

Predicate: move(R): move 2 red from P_2 to P_1

move(B): move 2 blue from P_2 to P_1

move(X): move 1 red and 1 Blue from P_1 to P_2

at(a, b, c): a number of b ball is in c bucket

states: at(3, R, P_1)

at(3, B, P_2) $\} \rightarrow$ precondition

action:

move(R)

move(B)

move(X)

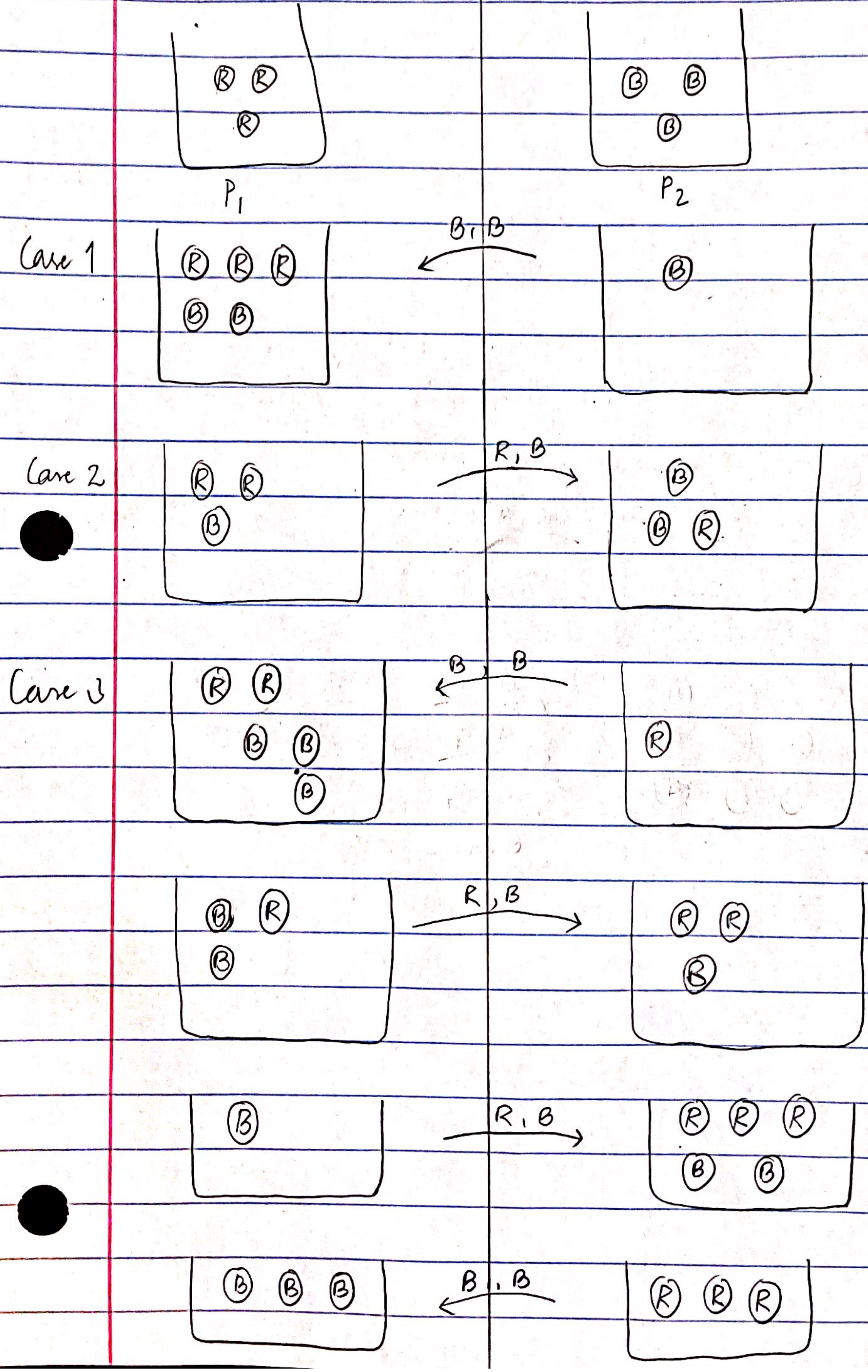
effect

at(3, B, P_1)

at(3, R, P_2)

QN (1)

Ans:



R R R
B B B
P_1
P_2
Case 1
B, B
R R R B B
B
Case 2
R, B
R R B
B B R
Case 3
B, B
R R B B B
R
R, B
B R B
R R B
R, B
B
R R R B B
B, B
B B B
R R R

Task

2

Here, JUNGLE

there are 4 predicates, each predicates takes at most 3 arguments [1, 3] and 5 constants

Possible arguments is

at least $= 4 \times 5^1 = 20$

at most $= 4 \times 5^3 = 500$

So,

number of possible unique states :

at least $= 2^{20}$

at most $= 2^{500}$

Task
3

a) $P(\text{Color Green}) = 0.36$

$P(\text{not Green}) = 1 - 0.36 = 0.64$

$P(\text{Truck}) = 0.24$

$$P(\text{not Green} \mid \text{Truck}) = \frac{0.64 \times 0.24}{0.24} = 0.64$$

b) $P(\text{Color Green} \mid \text{Truck}) = 1 - 0.64 = 0.36$

$P(\text{Color Green}) = 0.36$

Here,

$P(\text{Color Green} \mid \text{Truck}) = P(\text{Color Green})$

Therefore, vehile and color are totally independent from each other.

Task

4

a)

Variable	Possible values	Number
A	8	1
B	5	10
C	6	1

By Joint distribution $= 8^1 \times 5^{10} \times 6^1$

$= 468750000$

But

we need to store $= (468750000-1)$ values

b) $P(A) = 8-1 = 7$ values

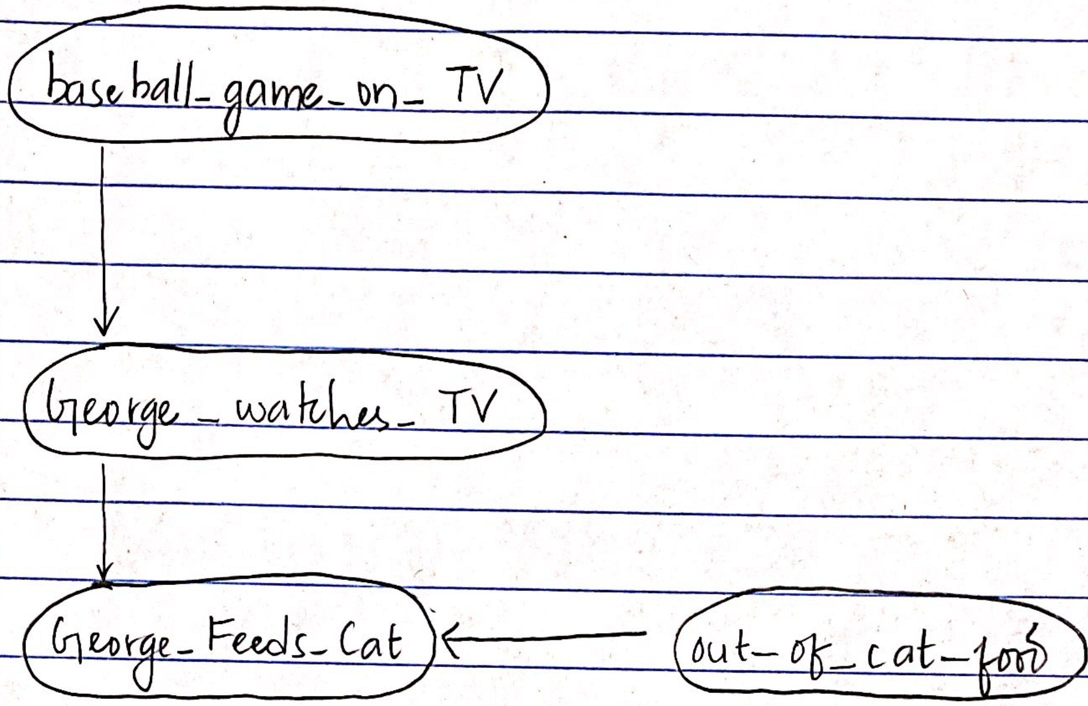
$P(B) = 10 \times (5-1) = 40$ values

$P(C) = 6-1 = 5$ values

We need to store $= 7 \times 40 \times 5$

$= 1400$ numbers

⑤


baseball_game_on_TV
George_watches_TV
George_Feeds_Cat
out_of_cat_food

Task

T 6

P(baseball_game_on_TV) = 0.3041 A

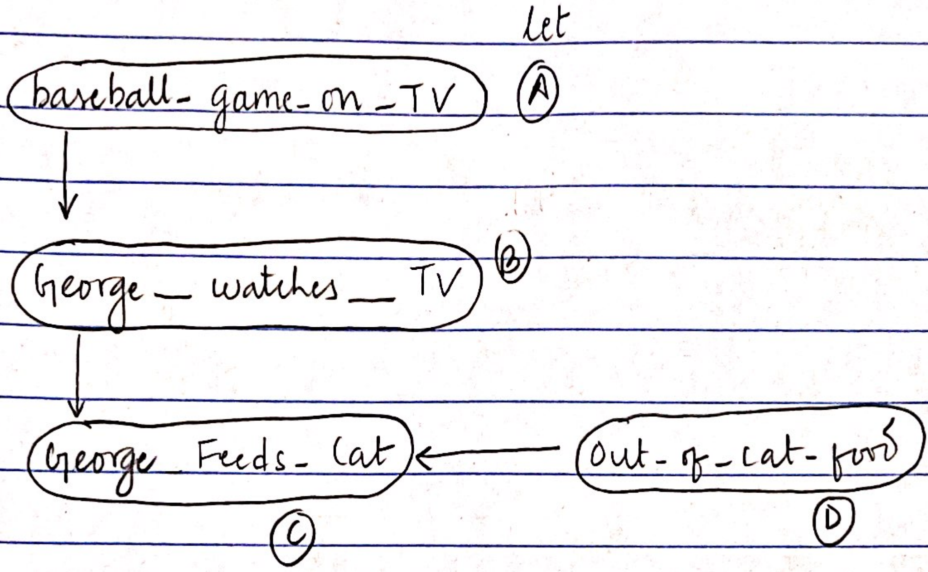
P(out_of_cat_food) = 0.1699 D

P(baseball_game_on_TV) A	P(George_watches_TV) B
T	0.9279
F	0.11811

P(George_watches_TV) B	P(out_of_cat_food) D	P(George_feeds_cat) C
T	T	0.0416
T	F	0.7064
F	T	0.31576
F	F	0.95876

Task

7



$P(A \mid \neg C)$

$= \dfrac{P(A, \neg C)}{P(C)}$ Taking Numerator

$= P(A, \neg C, B, D) + P(A, \neg C, \neg B, \neg D) +$
$P(A, \neg C, \neg B, D) + P(A, \neg C, B, \neg D)$

$= P(A) \times P(\neg C \mid B, D) \times P(B \mid A) \times P(D) +$
$P(A) \times P(\neg C \mid \neg B, \neg D) \times P(\neg B \mid A) \times P(\neg D) +$
$P(A) \times P(\neg C \mid \neg B, D) \times P(\neg B \mid A) \times P(D) +$
$P(A) \times P(\neg C \mid B, \neg D) \times P(B \mid A) \times P(\neg D)$

$= 0.3041 \times (1 - 0.0416) \times (0.9279) \times 0.1699 +$
$0.3041 \times (1 - 0.95876) \times (1 - 0.9279) \times (1 - 0.1699) +$
$0.3041 \times (1 - 0.31576) \times (1 - 0.9279) \times 0.1699 +$
$0.3041 \times (1 - 0.7064) \times (0.9279) \times (1 - 0.1699)$

≈ 0.1111

Taking denominator

$P(C) = P(C, B, D, A) + P(C, B, \neg D, A) + P(C, B, D, \neg A)$
$P(C, \neg B, \neg D, \neg A) + P(C, B, \neg D, \neg A) + P(C, \neg B, D, A)$
$P(C, \neg B, \neg D, A) + P(C, \neg B, D, \neg A)$

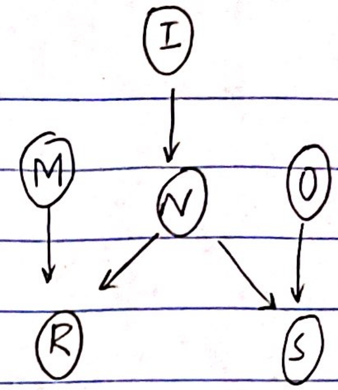
$= P(C) \times P(B|A) \times P(D) \times P(A) +$
$P(C) \times P(B|A) \times P(\neg D) \times P(A) +$
$P(C) \times P(B|A) \times P(D) \times P(\neg A) +$
$P(C) \times P(\neg B|A) \times P(\neg D) \times P(\neg A) +$
$P(C) \times P(B|A) \times P(\neg D) \times P(\neg A) +$
$P(C) \times P(\neg B|A) \times P(D) \times P(A) +$
$P(C) \times P(\neg B|A) \times P(\neg D) \times P(A) +$
$P(C) \times P(\neg B|A) \times P(D) \times P(\neg A)$

$= x$ (say)

Now,
Finally

$= \frac{0.1111}{x}$

Task 8



a) For Node N

Parents	I
Children	R, S
Children Other Parents	M, O

So,

Markov blanket of Node N = I, R, S, M, O

b)

$P(I, D)$

$= P(I, D) \times P(D)$

$= 0.5 \times 0.5$

$= 0.25$

c) $P(M, \text{not}(C), H)$

$$= \frac{P(M, \neg C, H)}{P(H)}$$

$$= \frac{P(M|H) \times P(\neg C) \times P(H|\neg C)}{P(H, C) + P(H, \neg C)}$$

$$= \frac{0.1 \times 0.4 \times 0.1}{0.6 \times 0.6 + 0.1 \times 0.4} = \frac{0.004}{0.36 + 0.04} = 0.01$$