

KhataBook Assignment

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1. Find number of employees inside the Office at current time

```
select count(distinct employee_id) as no_of_employees_inside_office from employee
where (action='in' and cast(Created as time) <=(SELECT CURRENT_TIME)) or
(action='out' and cast(Created as time) >=(SELECT CURRENT_TIME));
```

2. Find number of employees inside the Office at “2019-05-01 17:20:00”

```
select count(distinct employee_id) as no_of_employees_inside_office from employee
where cast(created as date)='2019-05-01'and ((action='in' and cast(Created as time)
<='17:20:00') or (action='out' and Created >='17:20:00'));
```

3. Measure amount of hours spent by each employee inside the office since the day they started (Account for current shift if she/he is working)

```
SELECT employee_id,(max_out_hour-min_in_hour)*.0001 as amount_of_hours_spent
FROM (select employee_id,sum(cast(created as time)) as min_in_hour , row_number()
over() as rownum
      from employee where action='in' group by employee_id)s
JOIN (select sum(cast(created as time)) as max_out_hour , row_number() over()
rownum
      from employee where action='out' group by employee_id) t ON t.rownum =
s.rownum;
```

4. Measure amount of hours spent by each employee inside the office between “2019-04-01 14:00:00” and “2019-04-02 11:00:00”

```
SELECT employee_id,(max_out_hour-min_in_hour)*.0001 as amount_of_hours_spent
FROM (select employee_id,sum(cast(created as time)) as min_in_hour , row_number()
over() as rownum
      from employee where (action='out' and cast(Created as time) >='14:00:00')and
      (action='in' and cast(Created as time) <='14:00:00') and (cast(created as
date)='2019-04-01') group by employee_id)s
JOIN (select sum(cast(created as time)) as max_out_hour , row_number() over()
rownum
      from employee where (action='in' and cast(Created as time) <='11:00:00') and
      (action='out' and cast(Created as time) >='11:00:00') and (cast(created as
date)='2019-04-02') group by employee_id) t
ON t.rownum = s.rownum;
```

2. There are 10 stacks of 10 coins each, where each coin weighs 10gms. However, one of the stacks is defective, and that stack contains coins which weigh 9gms. Determine the minimum number of weights needed to identify the defective stack.

The minimum number of weights to identify the defective stack is **1**

I will start to pick coins from each stack in such a manner that I pick 1 coin from the first stack , 2 coins from the second stack , 3 coins from the third stack and so on picking 10 coins from the tenth stack.

Now, total coins I picked for weighting are

$$1 + 2 + 3 + 4 + 5 + 6 + 7 + 8 + 9 + 10 = 55$$

So, If our none of coins were not affected their weight would by

$$\begin{aligned}\text{Number of coins} * \text{weight of each coin} &= 55 * 10 \\ &= 550 \text{ gms}\end{aligned}$$

Now, since one stack is defective so the weighing machine will not show 550 gms it would be less than 550 gms

Now, if it shows 549 gms the defective stack is first because there is a defect of 1 gms from actual that means 1 coin of 9 gms will be picked up and we picked 1 coin from first, so the defective stack is first.

If weighing machine 548 gms the defective stack will be second because 530 gms weights from 53 coins and 18 gms weights from 2 defective coins and since 2 coins picked from the second stack , the defective stack is second.

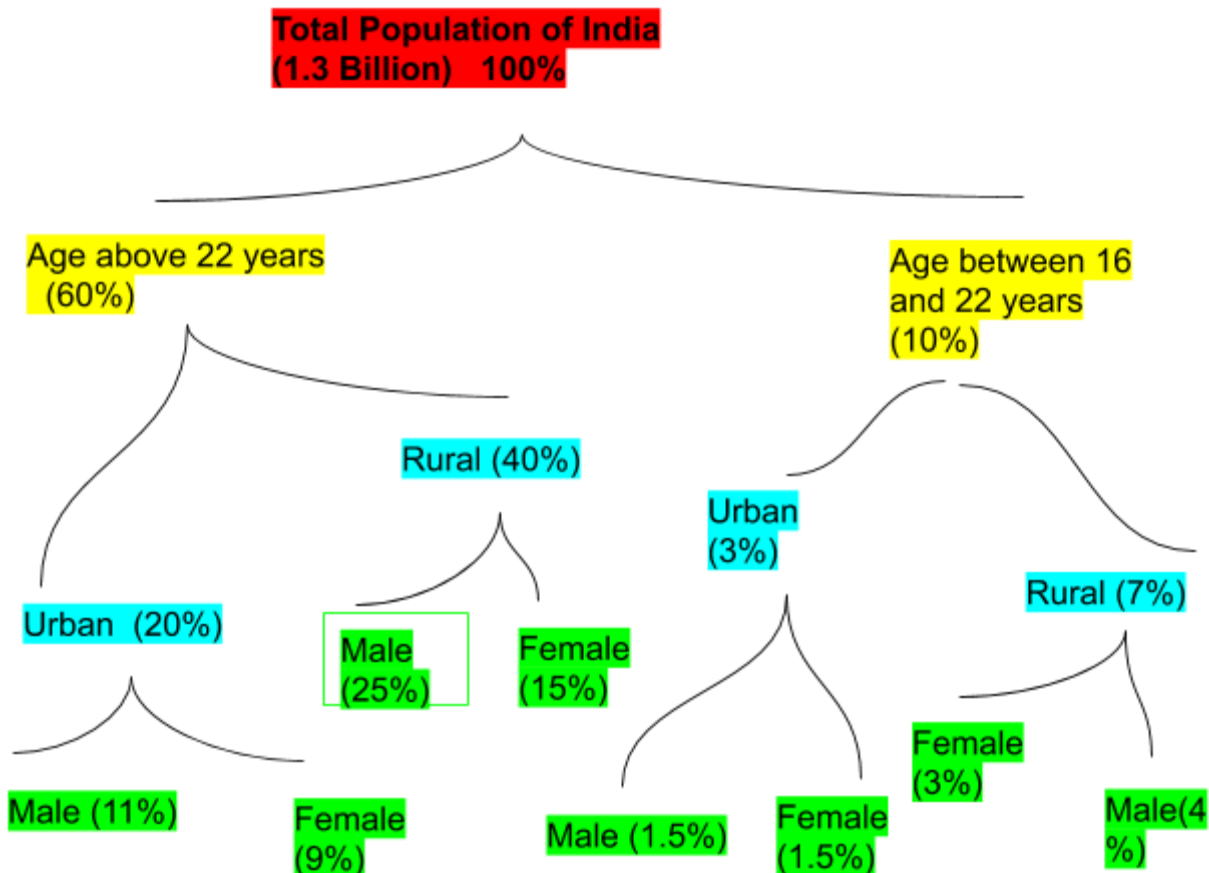
Similarly :

I we can say that If 9th stack is defective the weighing machine will show 541 gms

$$= 9 * 9 + (55 - 9) * 10$$

So, this way in only weighting once we can determine which row is defective.

3. Estimate the number of cigarettes consumed monthly in India.



- Here I am assuming that the age group less than 16 years consume very less cigarettes so, we can neglect that estimation in this calculations
- Here from daily life observations we can see that male consume more cigarettes as compared to females.
- The consumption of cigarettes in urban areas is more than rural due to the cost of cigarettes.
- The ratio of male to female is close to 1 in urban and it is less than 1 in rural families.

Now, per month consumption of cigarettes :

	Urban (Male)	Urban (Female)	Rural (Male)	Rural (Female)	Urban (Male)	Urban (Female)	Rural (Male)	Rural (Female)
Avg. cigarettes pm	30	15	5	2	20	10	2	1
Population	0.11*1.3	0.9*1.3	0.25*1 .3	0.15*1.3	0.015* 1.3	0.015*1. 3	0.03* 1.3	0.04*1.3
Number of cigarettes pm	3960000,00 0	1620000 000	15000 00000	36000000 00	36000 00000	1800000 000	96000 00000	3600000000

From the above table If we add the **total number of cigarettes per month comes to 8.1 trillion.**

4. There are 5 pirates in a ship. Pirates have hierarchy C1, C2, C3, C4 and C5. C1 designation is the highest and C5 is the lowest. These

pirates have three characteristics: a. Every pirate is so greedy that he can even take lives to make more money. b. Every pirate desperately wants to stay alive. c. They are all very intelligent. There are a total of 100 gold coins on the ship. The person with the highest designation on the deck is expected to make the distribution. If the majority on the deck does not agree to the distribution proposed, the highest designation pirates will be thrown out of the ship (or simply killed). Only the person with the highest designation can be killed at any moment. What is the right distribution of the coins proposed by the captain so that he is not killed and does make the maximum amount?

For this problem you have to start this considering 2 pirates at first C1 and C2.

So, since C2 has a higher designation he is expected to distribute so to get maximum he will take all 100 gold coins and the C1 got 0 coins because 2 people each got 1 vote.

When there are three pirates:

C1, C2 and C3 : C3 will tell C1 if his proposal is not accepted then C2 will get all coins and C1 will leave nothing. So, he will bribe C1 with 1 gold coin and will get his proposal accepted.

C1 : 1 C2: 0 C3: 99

When there are 4 Pirates:

If there are 4 pirates then C4 needs one more vote to get his proposal accepted. So, he will tell C2 that if his proposal gets rejected then he will get nothing (Money will be divided into C1 and C3). So, he will bribe C2 with 1 gold coin and will get his proposal accepted.

C1:0 C2: 1 C3: 0 C4: 99

Now, come to our question in which there are 5 Pirates, you can infer from above:

C5 needs 2 more votes to get his proposal accepted. So, he will discuss with C1 and C3 that if he will die C1 and C3 will get nothing. And bribe them with 1 coin each and himself kept 98 coins.

C1: 1 C2: 0 C3: 1 C4: C5:98

5. (1) What are the possible factors, I should consider to come up with the total time taken on each road?

To calculate the total time taken :

- The average speed of a person on different roads.
- The distance of the path he has to travel on different roads.
- At which time I am reaching the signal or halt time because if reached there at red signal then I have to wait but If I reached there and got green signal

5. (2) Which road should one take to reach the main road so as to minimize the time taken? And what is the difference in total time taken by the two alternate routes?

If he takes road A :

$$\begin{aligned}\text{Time taken} &= \text{distance} / \text{avg speed} \\ &= 1/30 \text{ hour} \\ &= 60/30 \text{ minutes, 2 minutes}\end{aligned}$$

If he takes road B

$$\begin{aligned}\text{Time taken} &= 1.3/30 \\ &= 60 * 1.3 / 30 \\ &= 2.6 \text{ minutes, 2 minutes 36 seconds}\end{aligned}$$

So, to minimize the time taken one should take the road A. The time difference between total time taken between two routes is 36 seconds.

5. (3) Recently, one of the junction (say, X) on road A got too crowded and a traffic signal was installed on the same. The traffic signal was configured for 80 seconds red and 20 seconds green. Let's denote the seconds of signal as R1 R2 R3 ... G1 G2 G3 . Here, R1 denotes 1 sec after signal switched to red. Does it still makes sense to take road A, or to switch to road B provided the average speed on the road A is still the same except the halt at signal?

Now, time taken on road A will be:

The probability of getting R1,R2, R3 will be same as getting G1,G2 and G3 so time taken in halt at signal will be

$$(1+2+3+4+\dots+78+79+80) / (\text{total time for red and green signals})$$

$$= (80 * 81) / 2 * (80+20)$$

$$= 32.4 \text{ seconds}$$

That is still less than 36 seconds So, It makes sense to take the road A.

5. (4) If I reach the signal at R1, I will be in the front rows to be released once the signal turns green. Whereas, if I reach the signal at R80, I might have to wait for some time even after signal turns green because the vehicles in the front rows will block me for some seconds before I start. Let's take some realistic guesses for the wait time after the signal turns green. R1 – R 10 : 0 sec , R11-R20 : 3 sec , R21 – R60 : 10 sec, R61 – R80 : 15 sec, G1-G15 : 5 sec, G15-G20 : 0 sec Does it still makes sense to take road A, or to switch to road B provided the average speed on the road A is still the same except the halt at signal?

So, Now average time taken by me to halt on signals by taking road A :

$$\{ 1 + 2 + 3 + 4 + 5 + \dots + 80 \} + 10*3 + 40 * 10 + 20*15+ 15 * 5 \} / (80+20) = 40.15$$

seconds

And since the travelling time 2 minutes is not changing so, total time will be

2 minutes and 40.15 seconds which is greater than 2 minutes 36 seconds, so now to minimize the time it will be better to take the road B.