Index

13. Estimate the number of people travelling in Delhi metro in a single day - 36

14. Estimate the number of Sherlock Holmes copies sold in India this year - 38

15. Estimate the number of Gulaab Jamun sold in India on a single day - 41

16. Number of cars crossing Delhi-Gurgaon Toll in a day - 45

17. Estimate the revenue of a MCD outlet - 47

18. Estimate the number of TV / Refrigerator / ACs sold in Delhi in an year - 50

19. Number of iphones sold in India - 55

20. Number of paracetamol tablets sold in Delhi - 58

21. Estimate the number of lakes in the world - 61

22. Estimate the size of the tyre industry (SUV cars) in India in 2020. - 67

23. Number of roses sold in Delhi on 14th February - 66

24. Number of Footballs sold in India - 69

25. Number of students attending 10^{th} / 12^{th} / College in India — 72

26. Number of Golf balls that can fit in this room — 74

27. Number of hair on your scalp — 77

28. ~~Num~~ Amount of paint required to paint this room — 78

29. Estimate the number of dogs in Delhi — 80

30. Estimate the number of lens manufactured in ~~De~~ India — 83

31. Estimate the number of sauce sold in Europe — 86

32. Estimate the number of super-speciality hospitals in Delhi — 88

33. Estimate the number of rakhi sold online in India — 90

34. Estimate the number of auto-rickshaws in Delhi — 92

35. Estimate the maternity clothes market in Delhi — 94

36. Estimate the number of light bulb currently in use in Delhi — 96

37. Estimate the annual size of sports shoes industry in India — 101

38. Estimate the market size of chewing gum in India — 104

39. Estimate the number of movie released in India annually — 109

40. Estimate the average numbers of hours air conditioners are run in Delhi over a year — 111

41. Estimate the revenue of hotel / lodge in Goa in a year — 113

42. Estimate the average distance run by a football in an average match — 116

43. Estimate the amount of power consumed in your house in a day — 118

44. Estimate the number of youtube video streamed in Delhi on a day — 122

45. Estimate the amount of data consumed by Delhi on a single day — 125

46. Estimate the revenue of Haldirams. food chain in India in a single day. — 127

47. Estimate the number of SRK fans in India. — 130

48. Amount of money drawn from an ATM machine in Delhi in one day — 132

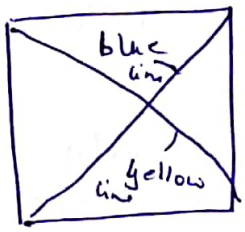
Guesstimates.

(I) Number of Petrol Pumps in Delhi.

↳ Approach – Petrol Pumps are located at the sides of the the roads, generally, major roads and highways. So, we will estimate the length of the road (major roads & highway) and then place two petrol pumps at a suitable distance.

Area of Delhi

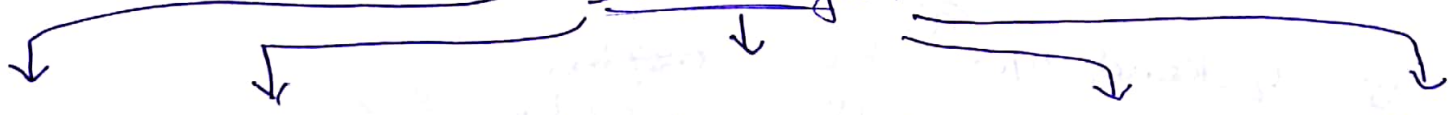
Assume Delhi to be a square with metro's blue and yellow line being as shown in the figure.



we assume that there 30 stations each in both the metro routes and average distance b/w two stations being 2 km.

∴ approx area of Delhi = $\frac{1}{2} \times 60 \times 60 = 1800$ sq km

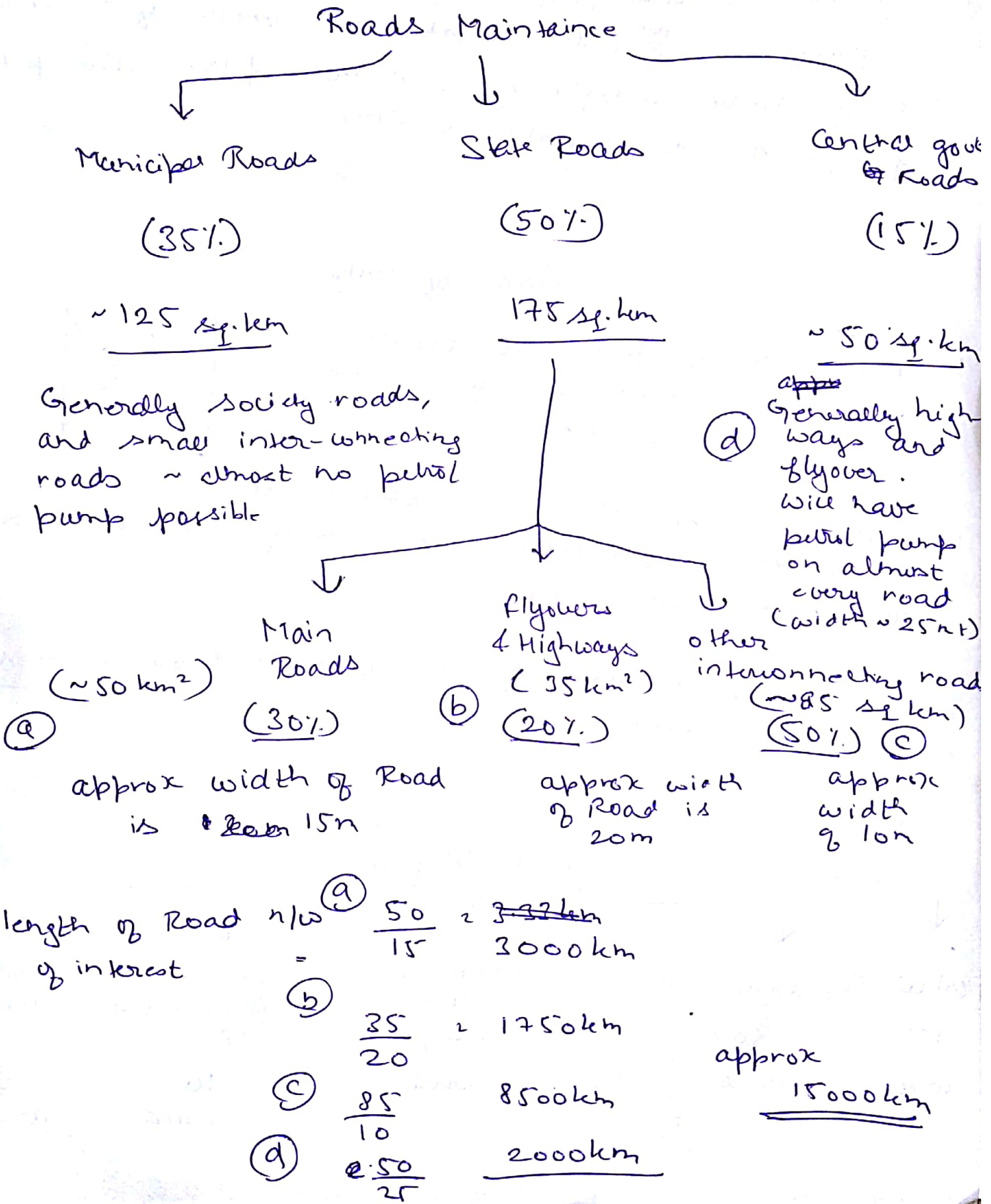
Delhi Region

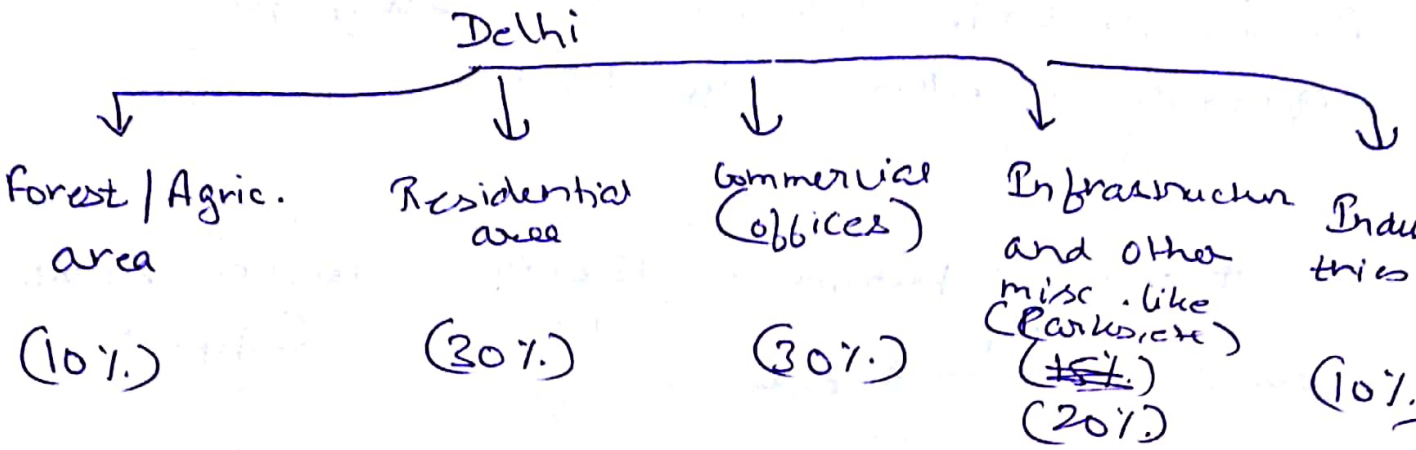


Area of Roads in Delhi = 20% of 1800 km²

= 360 sq km

(~350 sq. km)





(a)

Approx. number of petrol pumps in a residential area ⇒ 50/ward ⇐ Approx number of petrol pumps in a commercial area

(b)

Petrol pumps in an agri/forest area ⇒ 30/ward (more number of diesel pumps will be present than petrol pumps) — tractors, pumps require diesel to run and not petrol pumps.

Other areas like Parks, misc. areas etc ⇒ 20/wards ⇐ # of petrol pumps in industries.

(a) 6 (30 + 30) × 50 × 235 × $\frac{1}{100}$

= 30 × 235 = 7050 pumps

(b) 10 × 30 × 235 × $\frac{1}{100}$ = 705 pumps

(c) 30 × 20 × 235 × $\frac{1}{100}$ = 1410 pumps

9165 pumps

Average distance between two petrol pumps is generally 1 - 2 km say 1.5 km

$\therefore$ # of petrol pumps in Delhi $= \frac{15000}{1.5} = 10000$ pumps (approx)

Note, if average distance was taken 1 km, then there would have been 15K pumps and if the was an average distance of 2 km, there would have been 7.5 K pumps. Either number is good.

But, if the interviewer said that 10K is a big number, then by taking average distance of 2 km we can scale it down and if its a smaller number by taking average distance of 1 km, we can scale up the number.

Approach - II

Delhi

- 7 parliamentary seats (Central govt) → 1X
- 70 legislative seats (State Govt) → 10X
- 235 wards (municipal council) → approx 35X
  - → 3.5X

Note again if we are asked to scale up or scale down a number we can do so by increasing or decreasing the numbers of petrol pumps per ward in different regions.

How did ~~we get~~ we get to this ? number, of say, 50 pumps/ward in a commercial area?

- we can defend this by saying that we have estimated this based on what we saw during our visit to Connaught Place.

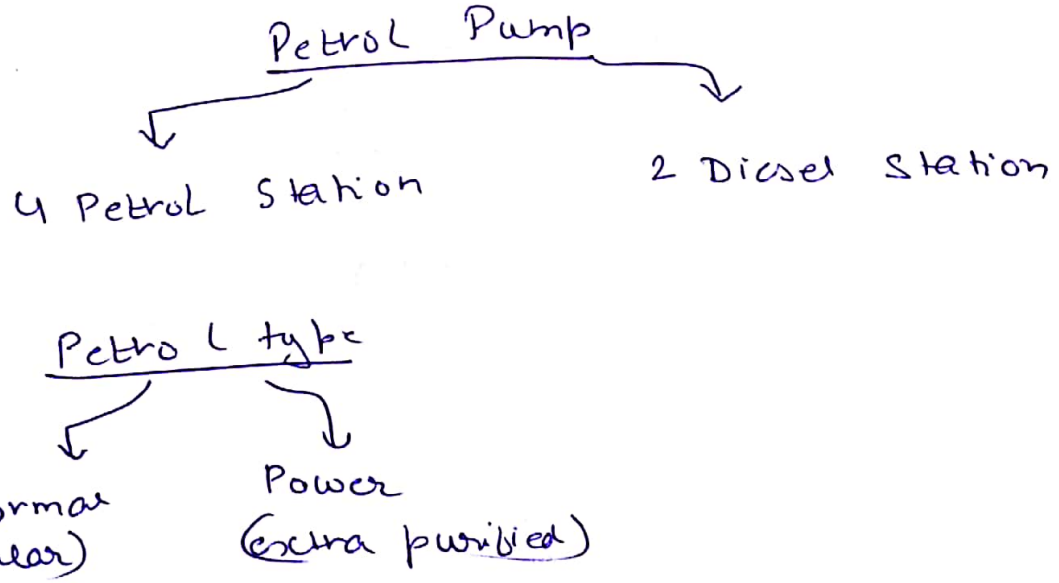
Note- splitting the region is constituencies, legislative assembly seats or ~~number~~ municipal wards ~~in~~ can be a very useful technique.

(II) Estimate the amount of revenue generated by a single petrol pump.

→ Note - Here revenue implies money generated. If the question was framed as the sales generated by a petrol pump, then there we should ask a clarifying question as to what they mean by sales - revenue (money generated by sales) or the amount of petrol sold (in litres).

Also a good clarifying question can be to be sure that we need to ~~estimate~~ consider ~~that~~ the petrol pump to sell only petrol or do we need to consider diesel or gas (CNG) sales as well.

Let us consider that the petrol pump sells petrol and diesel.



We will assume that petrol pump is operational for 20 hours, starting from 6AM - 2AM. (6AM - 12AM & 12AM - 2AM)

Also, we will asume that average time taken to serve a customer is 90 seconds or 40 customers can be served by a station in one hour.

However, the petrol pump never runs at full efficiency

(Assuming a working day)

~~2 AM~~ 6AM - 2AM

6AM - 11 AM
School & office traffic
occupancy @ 80%.

11 AM - 2AM
relatively low traffic
occupancy @ 50%.

2AM - 7PM
School & office traffic
occupancy @ 80%.

7PM - 11PM
relatively thin traffic
@ 60%.
people going out for dinner, movie & those return. from jobs

11 PM - 2AM
Selective people are out of their home
occupancy @ ~~40%~~ 30%.

Not - If there would have been a weekend then the traffic in the morning & ~~evening~~ will be low. That will be compensated as in the afternoon & evening when people move out to travel.

Also Generally people purchase in fixed denomination such as 50, 100, 200, 500, 1000, 2000

50, 100, 200 — two-wheelers generally

500, 1000, 2000 — cars & truck generally

Approach - first we will calculate the number of distinct transcations made and then we will differentiate on the transaction size.

# of transcation = # of hrs × occupancy × max. feed rate × # of station

$= 5 \times 0.8 \times 40 \times 6 + 3 \times 0.5 \times 40 \times 6 + 5 \times 0.8 \times 40 \times 6 + 4 \times 0.6 \times 40 \times 6 + 3 \times 0.4 \times 40 \times 6$

$= 40 \times 6 (4 + 1.5 + 4 + 2.4 + 1.2)$

$= 40 \times 6 \times 12.7$

$= 76.2 \times 40 = 3048$ transcations / day

~ 3000 transcation

out of these 2000 were petrol based and 1000 were diesel based (as there were 4 petrol & 2 diesel station.)

we assume that diesel transcation = 500 for 33% time, 1000 for 33% time, 2000 for 33% time

∴ weighted average ~ 1200

Revenue generated from diesel station = 1200 × 1000

= 1200000

= 1200 K or 12 Lac

Petrol

- 70% two wheelers — approx 100 / trans.
- 30% cars
  - Regular — 2/3 of total — approx 750 / trans.
  - power — 1/3 of total — approx 750 / trans.

$4 \times 2000 \times 0.7 \times 100$ + $4 \times 2000 \times 0.3 \times 750$

$4 \times 2000 \times 70$ $= 600 \times 750$

$4 \times 140\text{k}$ + $4 \times 450\text{k}$ = 1800k

$= 560\text{k}$ (~~300k~~ 1200k + ~~150k~~ 600k
from Regular from Power)

Total Revenue from Petrol station = 2360k

Total Revenue = 2360k + 1200k = 3560k

or 35.61gc Revenue

Additional Help.

Amount of diesel sold (in L) = $\frac{1200\text{k}}{\text{avg. price of diesel}}$

diesel cost say 50/L.

$= \frac{1200}{50}$ k litres = 24000 L

Amount of petrol sold (in L) = $\frac{1200\text{ k}}{70}$ + $\frac{600\text{ k}}{75}$

(Regular) (Power)

$\approx$ 17000 L 8000 L

$\therefore$ total of 25000 L

Note Remember to differentiate as much as possible.

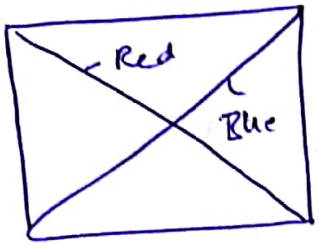
~~Note~~ Notice that diesel is used by heavy duty vehicles such as buses, trucks, SUV, etc. so they will be refueling in larger quantities than ~~compa~~ bikes and other two-wheelers.

Also note than the # of two-wheelers is much higher than the # of four-wheelers. Hence, the spend by these two categories being different, affects the revenue generated.

Also notice that we have considered the money spent on each transaction. In India, generally we refuel based on a fixed domination. We don't go out to refuel with the ~~mid~~ mindset that we need to purchase 10L of fuel for the car or so on.

(III) Estimate the length of Road in Delhi.

↳ Approach again, we will begin by estimating the total area → area of Roads → length of the Road.



Assume Delhi to be a square & Red Yellow & Blue metro lines run in diagonally to each other each having 30 stations situated in Delhi with an average distance b/w them to be 2km

$\therefore$ Area of Delhi $= \frac{1}{2} \times (\text{diagonal})^2 = \frac{1}{2} \times (2 \times 30)^2$

$= 1800$ sq.km

Delhi Area

- Residential (30%)
- Commercial (20%)
- Forest / Agri (10%)
- Roads (20%)
- Others such as park, temples, malls, industries (20%)

$\therefore$ Area of Delhi Roads $=$ 20% of 1800 sq.km

$= 360$ sq.km

Types of Roads

- (50%) Maintained by MCD — These are small roads interconnecting roads, in-roads to society & other residential/commercial area
- (30%) Maintained by State Govt — These are larger main roads & highways & flyovers
- (20%) Maintained by central govt. — These are used to connect one state to another. These are National highways & Flyovers

Approx width of Nationals highways and Flyover = 25 mtrs (they are broader as they are multi-lane highways & expressways)

(a) ∴ length of Road = $\frac{0.2 \times 360}{25} \times 1000$

$= 8 \times 360 = 2880$ km

Approx/ average width of State owned roads = 15 mts (they are generally smaller in width than NH)

(b) ∴ length of Road = $\frac{0.1 \times 360}{15} \times 200$

$= 7200$ km

Approx width of roads maintained by MCD = 10 mtr (they are generally smaller feeder roads & in-roads to society)

(c) ∴ length of road = $\frac{0.5 \times 360}{10} \times 1000$

$= 18000$ km

Total length = a + b + c

$= 2880 + 7200 + 18000$ km

$= 28080$ km

Ans → 28080 km

(IV) Estimate the number of planes at the Delhi Airport.

↳ Note that here, we have to tell the number of planes currently standing at the airport, i.e; at this very moment.

Delhi Airport

Terminal-1	Terminal-2	Terminal-3
This has, say 3 runways.	This has, say 3 runways	This, say, has 6 runways

Since it is broad-day light, the airport is expected to run at near full operational capablity.

let us assume that the time to take-off / land a plane is 2 minutes. Further, the time taken to (de)board the passenger and luggage is roughly 1 hr.

This means, currently we can

$$12 \text{ runways} \times 8 \cdot \frac{1\text{ hr}}{2\text{ min.}}$$ planes which are (de) boarding or taking off / landing

$\Rightarrow 12 \times 30 = \underline{360 \text{ planes.}}$

Additionally we can assume a certain percentage of planes (say additional 10%.) which may be running late or are parked due to technical glitches.

$\therefore$ Total number of planes $= 360 + 0.1 \times 360 = \underline{396 \text{ planes}}$

(V) Estimate the number of ~~passengers~~ ~~to flying~~ ~~from Delhi planes~~ flights starting from / terminating to Delhi in a day.

Delhi Airport

Terminal-1 (3 runways) | Terminal-2 (3 runways) | Terminal-3 (6 runways)

Average time for take/off or landing = 2 minutes (say)

∴ approximately 30 planes can land or take off from a runway in one hour

% efficiency of airport

11 PM - 6 AM	6 AM - 12 PM	12 PM - 5 PM	5 PM - 11 PM
(7 hrs) relatively low number of flight	(6 hrs) moderate number of flight	(5 hrs) high number of flight	(6 hrs) high no. of flight
(70%)	(90%)	(100%)	(100%)

Note - Here the fact that Delhi airport is highly crowded has been taken into a/c. So even relatively low number of flights will include a descent to good occupancy.

$= 7 \times 0.7 \times 30 \times 12 + 0.9 \times 6 \times 30 \times 12 + 11 \times 30 \times 12$

$= 30 \times 12 (4.9 + 5.4 + 11)$

$= 30 \times 12 \times 21.3$

$= 639 \times 12 = 7668$ flights

11
6290
639
639
7668

around 7500 flights / 8000 flights

Additional Question Estimate the number of people flying in/flying out from Delhi in a day.

Type of booking

- Economy class: 7 column x 20 rows (140 passenger)
- Economy Plus (First Class): 4 column x 15 row, 60 passenger
- Business class: ~25 passengers

∴ Total = 225 passenger (max. capacity)

let the average occupancy be 80%. then

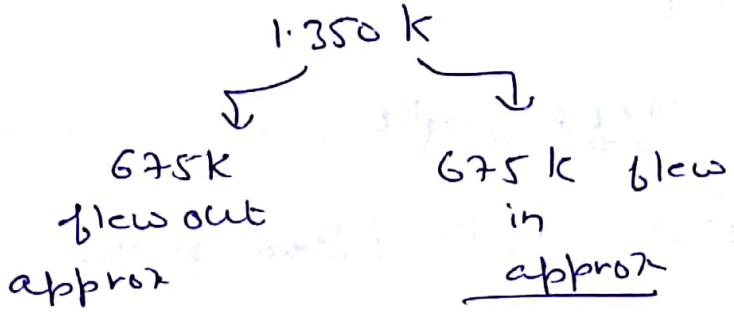
∴ 180 passengers

∴ people flying daily = 180 x 7500

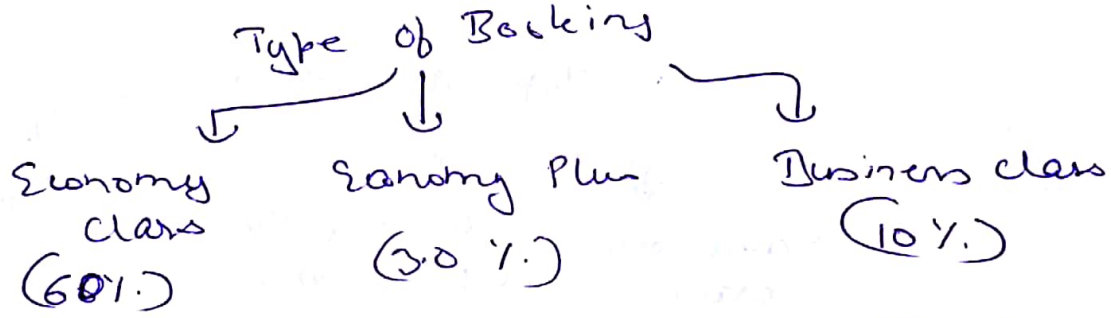
= 1350k

or 1.35 million people

Note out of these approx half are those who flew into Delhi and other half is those who flew out of Delhi



Additional follow up question — Estimate the revenue generated by all of these flight ticket sales.



average ticket price — 5000/- 12000/- 25000/-

weighted average = 3000 + 3600 + 2500

= 9100/- or 9000 approx.

Revenue Generated = 1.35 × 9000 million

= 13.15 billion rupees.

vi) Estimate the number of planes flying over India at this very moment.

↳

# of planes flying over India

- All domestic flights & International flights originating / terminating in India
- Flying over Indian Airspace (other international flights)

Part-I – Domestic flights & Int. flight originating / terminati in India.

# of Tier-1 city (like Delhi, Mumbai etc)	# of Tier-2 cities	# of tier-3 cities
20 cities.	approx. 2 cities per state ≈ 2×29 ~ 60 cities	approx 4 per state ≈ 120 cities
100% of them have airport and with many terminal & runways. (approx 2 terminal & 3 runways each)	80% of them to have airports with single terminal and 3 (approx) runways	20% of them to have airport with a single term. & 2 runways. ← only rich states may have them also small state like Goa do not need them

∴ available runways ≈ $20 \times 1 \times 2 \times 3$ + $80 \times 0.6 \times 1 \times 3$ + $120 \times 0.2 \times 1 \times 2$

≈ 120 + 144 + 48

≈ approx 300 pl runways.

Now let the runway operate at say 75%. efficiency.

$\sim 0.75 \times 300 \sim 225$ runways.

average time to take-off : 2 minutes

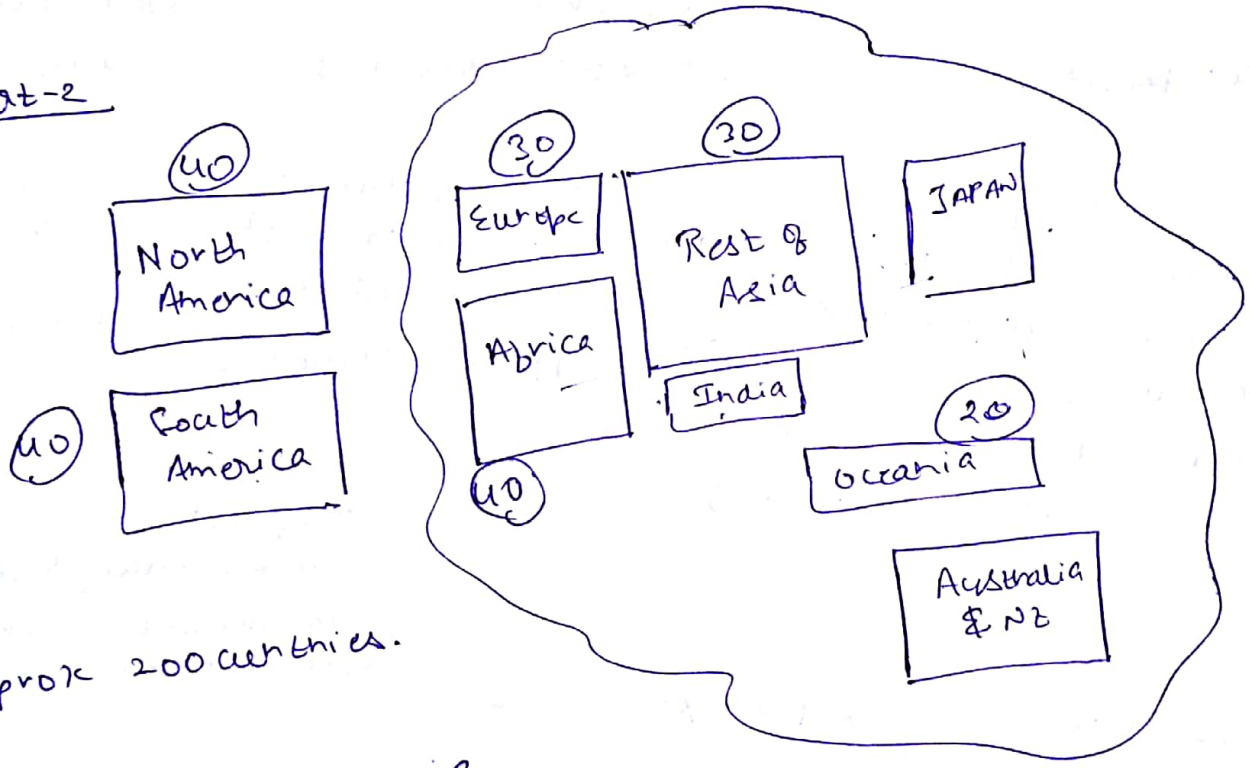
further to incorporate planes currently flying we take an average flight duration of 90 minutes.

$\Rightarrow$ per runway approx 45 flights/planes may in in Indian airspace

$\Rightarrow 225 \times 45$

$\sim 900 + 112 \sim 1012$ flights/planes.

Part-2



Approx 200 countries.

Europe to ~~be~~ Oceania
Europe to Aus & NZ
Africa to Oceania

and also we assume that each country in europe travels to each country in oceania with at least a flight in 30 minutes (which is also roughly the time for which the plane may be flying over India)

Europe to oceania and vice versa : $30 \times 20 \times 2$

$= 1200$

Europe to Australia and Nz & vice versa : $30 \times 2 \times 2$

$= 120$

Africa to ~~cost~~ oceania & vice versa : ~~30~~ $40 \times 20 \times 2 \times \frac{1}{2}$

Infras, Economic & safety/security issues ← not all country in Africa will be having flights

$= 800$

∴ Total Int. Planes = $120 + 1200 + 800 = 2120$ planes

Total Plane = Domestic + Int.

$= 1012 + 2120$

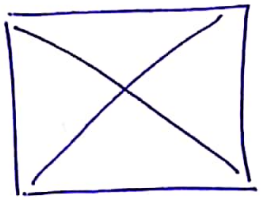
$= \underline{3132 \text{ planes.}}$

Note - here private planes have not being considered also government official planes are also ~~so~~ not consider.

VII) Estimate the number of Trabbic lights in Delhi. 20

↳ Aproach – estimate road n/w and then estimate the traffic lights.

Area of Delhi $= \frac{1}{2} \times 60 \times 60$ sq. km



$= 1800$ sq. km

- Residential (25%)
- Commercial (25%)
- Forest/ Agri. (10%)
- Industry & other misc like parks. (20%)
- Roads

∴ area of Roadways $= 20\%$ of 1800 km^2

$= 360$ sq. km

Industry 10%.

others like hosp., museums, railway station, parks, etc (10%.)

Types of Roads

- Maintained by Municipal co-operation (In-roads, service roads, community, society roads, etc) (35%.) 125 km^2
- Maintained by State Govt (main roads, flyover, bypass, highway) (50%.) 175 km^2
- maintained by central govt (like flyover & national highway) (15%.) 50 km^2

(175 sq km)

State Roads

Main Roads (30%) (a)

almost 100% of Roads to have a Traffic light at an approx distance of 2 km.

~50 km²

width of Road = 15 mt

Flyovers & highways (20%) (b)

almost all flyover to have a Traffic light an approx distance of 4 km

~35 km²

width of Road = 20 mtrs

other inter-connecting road (50%) (c)

around 30% of them to have Traffic light at an approx distance of 2 km

85 sq km²

width of Road = 10m

Central Roads (50 km²)

(d)

50 km²

all of them to have a traffic light at a distance of 8 km.

width of Road = 25 mt.

(a) = $\frac{50 \times 1000}{15 \times 2}$ ≈ 1666

(b) $\frac{35 \times 1000}{20 \times 4}$ = 4375

(c) $\frac{85 \times 100 \times 0.3}{2 \times 10}$ = 12750

(d) $\frac{50 \times 1000}{8 \times 25}$ = 150

19,441

19,441 Traffic lights

17.5
8.5
3

8500
4250
12750

VIII) Estimate the number of CCTV cameras in Mumbai.

↳ Approach - ~~city~~ where are CCTV cameras used?
- They are used for safety & surveillance

- Banks
- Hospitals
- Malls
- Office
- School
- Markets (by police for monitoring) in general
- Houses (some houses may have them for safety)
- Shops
- Colleges.

Population of Mumbai = approx ~~20~~ 21 million (or 2 crores)

Age-wise segration of population

- Infants (upto 3 yrs) (5%) $\left(\frac{3}{100}\right)$ → 0.63 million
- School Going age (4 to 18 yrs) 30% $\left(\frac{3}{10}\right)$ → 6.3 million
- ~~College going~~ (18 - 30 yrs) (33%) $\left(\frac{1}{3}\right)$ → 7 million
  - 25% can go to college
    - ~~25~~ 80% went to college
    - 20% didn't get college
  - Rest go to job
- 30-50 yrs (16.6%) $\left(\frac{1}{6}\right)$ → 3.5 million
- 50 and above (16.6%) $\left(\frac{1}{6}\right)$ → 3.5 million

Assuming we have a bank for every 10000 person → # of branch banks = 14000 / 1816

=

assuming 80% of these eligible have an account in bank

$$\frac{14000}{10,000} \times 1000 \times 0.8$$

= 11,200 bank branches

let each branch has approx 15 cameras = 11,200 × 15 = 11200 + 5600

(a) = 16800 cameras

Assuming we have a hospital for each 15000 persons

$$= \frac{7 \quad 200}{21 \times 1000 \times 1000} \\ 15 \times 1000$$

= 1400 hospitals

Each hospital has around 50 cameras.

(b) = 1400 × 50 = 70000 cameras.

Assuming we have a school for every 8 × 50 × 14 = 400 × 14 = 5600 students ≈ 6000 student

$$= \frac{6300}{6}$$

= 1050 schools

Let each school has Approx 40 cameras = 1050 × 40 = 42000 cameras

(c)

Assuming we have a college for every 20000 students

$$\frac{7 \times 1000 \times 1000}{20000} \times \frac{1}{4} \times \frac{4}{5}$$

= 700 colleges

Let Each college has 50 CCTV = 50 × 700
= 35000 cameras.

21 million

- 25% below working age
- working (60%) → 12.6 million
- Retired (15%)

12.6 million

- 6.3 million males → all working
- 6.3 million females → $\frac{1}{3}$ working

∴ Total working people = 6.3 + 2.1
= 8.4 million

(8.4 million) working people

- offices 75% (6.3 million)
- shops (25%) (2.1 million)

an office per 1000 person at an average and 100 cameras per office

$= \frac{6300 \times 100}{500}$

1260000

1.26 lac

A shop for every 10 person and 10 CCTVs per shop

$= \frac{2100 \times 1000 \times 10}{10}$

= 2.1 million or 21 lac

Population = 21 million

average family size in India is b/w 4 to 5

⇒ 4 to 5 million family (4.5 million, say)

4.5 million Household

Below Poverty Line	Low-middle Income	middle Income	High Income
(10%)	(40%)	(30%)	(20%)
None will have cameras installed.	30% to have cameras (average @ 5 cameras)	80% should have cameras (average 5 cameras)	All of them will have cameras. average @ 10 cameras per home
	1.8 x 1.5 mill. = 2.7 million	4 x 1.35 mill = 6.4 million	0.9 x 10 = 9 million camera

18.1 million cameras for houses.

Total = 16.8K + 70K + 42K + 35K + 126K + 2100K + 18100K.

20490K

or 20.490 million CCTVs installed.

Now, if the number seems too large to be true, then some of our assumptions are wrong. May be there are not enough households who have CCTVs installed.

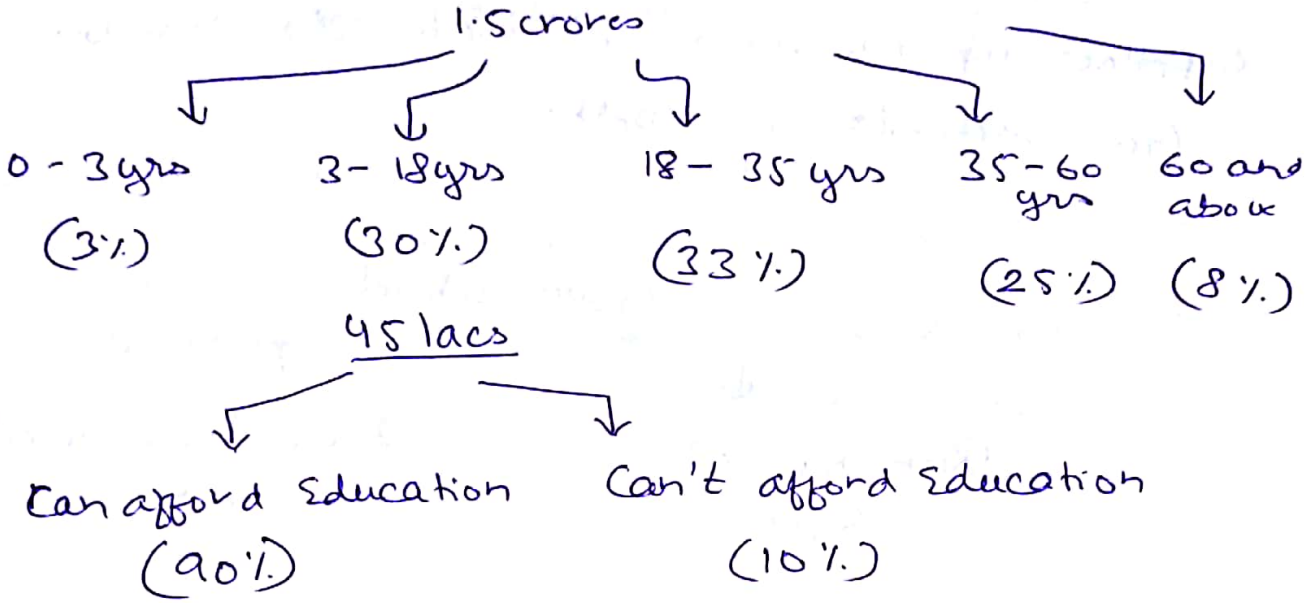
Also note that we have assumed that every shop has a CCTV installed. That's not a correct assumption. Every office having a CCTV is justified but not every shop/house will have it.

Also, the average number of cameras that we thought are required in a house/shop/etc may be incorrect. In fact, they are incorrect. We need additional data to be sure. But, we must demonstrate to the interviewer that we have thought of it.

Also, note this is a very important question as it uses several segregation techniques. such as age split, economic split, also it uses a short-cut to estimate the number of hospitals, schools, etc.

IX) Estimate the number of schools in Delhi

↳ population of Delhi = 1.5 crores



~ 40 lacs → people attending school.

# of class - 1 to 12th, nursary - I, II ∴ 14 classes

# of sections - 10

# of students / section = 50

∴ No. of student / school = 50 × 10 × 14
= 7000

# of schools = $\frac{40,00,000}{7000}$ = 5700 schools (approx)

↳ follow up Question
Estimate the number of teachers teaching in school.

Take teacher to student ratio of 40 students / teacher

∴ People attending school = 40 lac

∴ number of teachers = $\frac{40}{40}$ lac or 1 lac.

↳ Follow up Question - estimate the number of Govt. schools in Delhi

Govt school

- Run by state Govt
- Run by central Govt.

Delhi
- 7 Parliamentary seats
- 70 legislative seats / 275 council wards.

If we have at an average of 10 schools / ward then state govt operates around 235 × 10 or 2350 schools

The central govt has 7 Parliamentary seats, if we have 70 schools / seat, then central govt. Operate

70 × 7 ~ ~~560~~ 490 schools

∴ Total govt schools = 2350 + 490

= 2840 schools.

# of private schools = 5700 - 2840 = 2660 schools

Other follow up questions can be — Estimate the number of benches, fans, chairs, etc in schools located in Delhi.

For these break down # of schools to # of classrooms

14 class x 10 sections = 140 classes

Also, there are practices labs. So we assume that are 10 computer labs, 2 chemistry, 2 physics lab and then 10 more classrooms for drama, music, instrumentation and so on. (Around 25 labs)

Then we have staff room for teachers which will have chairs, benches and fan. Cabins of Division head, Vice Principle, Principle, Receptionist area, parents / visitors waiting facility, etc

There will chairs / benches / fans for security gaurd - bus driver, conductors, and other staff members such as sweepers and cleaners.

Note this type of synthesis is critical when we are buying / selling a school building along with its infrastructure. These type of calculations help to estimate the true worth of the product.

(X) Estimate the number of hospitals in Delhi. (30)

↳

Hospitals

- charitable or (meant for everyone but generally target the poor)
- State / govt. owned
- Private hospitals (Generally target the rich)

Delhi Population 1.5 crores

- Below Poverty Line (10%) 15 lac → can't afford private
- low-middle Income (45%) 67.5 lac → can't afford private
- middle Income (35%) 52.5 lac → 50% can afford private → ~25 lac
- High Income (10%) 15 lac → all can afford private → 15 lac

~25 lac + 15 lac = 35 lac

Now assuming that we have a bed for every 1000 person = $\frac{3500000}{1000}$

3500 beds

Assuming 30 beds/hospital = $\frac{3500}{30}$ = roughly 120 private hospital

Govt owned hospitals

Delhi

(Central) → 7 constituencies → 15 central govern. hospitals / constituencies

15 × 7

= 105 hospitals

(State) → 70 legislative assembly seats → 3 state govt. hospitals for legislative seat

3 × 70

210 hospitals

(MCD) → 238 wards → These generally have clinics and hence are not hospitals

Number of govt. operated hospitals = 105 + 210

(b) = 315 hospitals

Number of charitable hospitals – 1 per legislative assembly

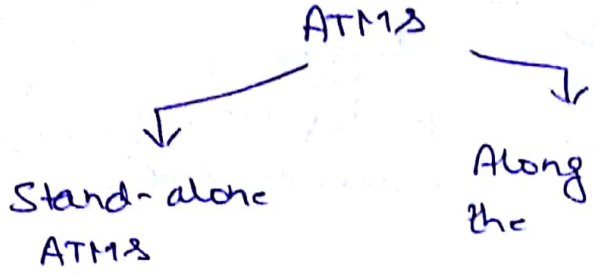
(c) = 70 in total

∴ Total number of hospitals = 120 + 315 + 70

= 505 hospitals.

(XI) Estimate the number of ATM is Delhi.

↳



population of Delhi = 1.5 crores

and 25% aged below

⇒ 75% elligible to open account

say 90% of those elligible do have an account.

$$\Rightarrow \frac{9}{10} \times \frac{3}{4} \times 1.5 \text{ crores}$$

$$= \frac{27}{40} \times 1.5 \text{ crores} \quad \text{or} \quad 67.5\% \text{ of } 1.5 \text{ crores}$$

⇒ roughly 1 crore people.

Now let there be a bank branch for every 5000 people, then

$$\frac{1\,00\,00\,000}{5000} = 2000 \text{ bank branches}$$

say out of these 60% do have an ATM along with the branch

$$\Rightarrow \frac{60}{100} \times 2000 \quad \text{or} \quad 1200 \text{ ATMs.}$$

(a)

Stand-alone ATMs

- Metro stations
- Markets
- Hospitals
- ~~Colleges~~. ~~Others~~ others (like college area, residential area, etc)

Metro stations:

5 metro routes

Each have an approx 35 stations

2 ATMs at average on either sides (there are two sides)

$\therefore 5 \times 35 \times 4$

$= \underline{700 \text{ ATMs}}$

Hospitals:

one bed per 1000 person

$\Rightarrow \frac{15000000}{10000}$

30 beds / hospitals

$= \frac{15000}{30} = 500$ hospitals

3 ATMs / hospitals

$= \underline{1500 \text{ ATMs}}$

70 constituencies, we take an average 2 markets/ constituency and 2 ATMs per market

$= 70 \times 2 \times 2 = 280$ ATMs

Similar for residential areas, 2 per constituency.

$= 2 \times 70 = 140$ ATMs.

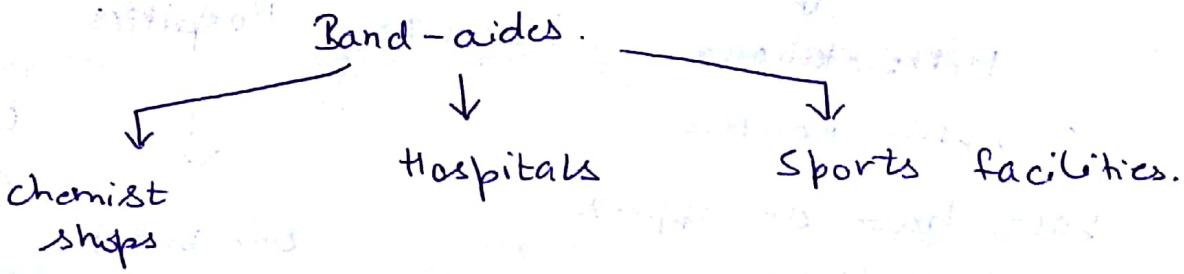
# of standalone ATM $= 700 + 280 + 1500 + 140$

$= 2760$ ATMs (b)

Total number of ATMs $= 2760 + 1200 = \underline{3960 \text{ ATMs}}$

XII) Estimate the number of band-aides ~~is~~ sold in India. daily.

↳



assuming that we have a bed for every 120,000 persons and for a population 120 crores., we have

$$\frac{120\,00\,00\,000}{120\,000} = 100000 \text{ beds.}$$

for every hospital, let the average number of beds be

and ~~still~~ since we a shortage of hospitals, I assume that 5/6th of the total is always occupied.

= 100k beds.

These patients will require say, 2 band-aides/day

⇒ 200k band-aides.

But not all of them requires band-aides, so let 80% of them needs it.

⇒ 80% of 200k ⇒ 160k band-aides.

(a)

Also, if we assume that one hospital at an average has 20 beds, the

$$\text{\# of hospitals} = \frac{100\text{K}}{20} \text{ or } 5000 \text{ hospitals}$$

If each hospital on a daily basis perform 200 tests (blood) then, we have

$$5000 \times 200 = 1000\text{K} \text{ band-aides.}$$

(b)

Now if we assume that there exists a chemist shop for every 20K people, then

$$\frac{12000000}{20000} = 60000 \text{ shops}$$

If each shop sells 15 band-aides at an average, then

$$15 \times 60\text{K} \text{ or } 900\text{K band-aides}$$

(c)

India has approx 550 constituencies and if we take at an average 2 sports facilities per constituency we have $2 \times 550 = 1100$ ~~constituencies~~ sports facilities

If each sports facility uses 50 band-aides a day

$$\therefore 50 \times 1.1\text{K} = 75\text{K band-aides.}$$

(d)

$$\text{Total number of band-aides} = 160\text{K} + 1000\text{K} + 900\text{K} + 75\text{K}$$

$$= 2135\text{K}$$

$$\text{or } 2.135 \text{ million}$$

XIII) Estimate the number of people traveling in Metro (Delhi Metro).

↳ # of Metro Routes = 5

# of metro lanes = 2 per route = 10 lanes.

# of stations = approx 40 per Route

= 40 × 10 = 400 metros.

# of coaches in a Metro = 8 per metro rail

⇒ 8 × 400 = 3200 coaches.

Frequency of metro = one metro / 2 min
= 30 metro / hr

Operating hours = 20 hours (approx)

⇒ 20 × 30 × 3200

= 600 × 3.2K

= 1920K or 1.92 million.

Now maximum capacity of a metro coach
= 200

Occupancy of Delhi Metro

5 - 7AM	7 - 11AM	11AM - 5PM	5PM - 9PM	9 - 1AM
2 hrs	4 hrs	6 hrs	4 hrs	4 hrs
(60%)	(100%)	(70%)	(100%)	(60%)

weighted average of occupancy $= (1.2 + 4 + 4.2 + 4 + 2.4) \times \frac{1}{20}$

$\frac{15.8}{20} \sim 80\%$.

Daily Ridership of Delhi Metro $= 0.192$ million $\times 200 \times 80\%$.

$= 0.192$ million $\times 160$

$= 30.70$ million ridership

However the question is number of people travelling by Delhi metro and not daily ridership.

So if we assume that a single person travels to and fro from Delhi metro, then we need to count two ridership as one person. However, not everyone may do that. Suppose 80% of the total people use metro for round-trip journey and 20% for a single-sided journey.

$\therefore$ average ridership per person $= 0.8 \times 2 + 0.2 \times 1$

$= 1.8$

$\frac{3.4}{2}$

# of people using Delhi Metro $= \frac{30.70}{1.8}$ million

~ 17 million people

XIV) Estimate the number of copies of Sherlock Holmes sold in India. this year.

↳ Digital copy or Hard-copy?

(Hard-copy only)

First hand or Second hand?

↓

First hand.

Language → Regionally translated language or English

↓

(English only.)

Languages spoken (1.2 crores)

(25%) English speaking

Non-English speaking (75%)

⇒ 300 million can speak / write or are proficient in the language

(we can also state that India has the second-largest pool of English speaking people, after the U.S.)

Economic Status

Below Poverty Line (15%)

Low income (40%)

Middle Income (30%)

High Income (15%)

∴ 85% can afford a book → 85% of 300 million
= 255 million.
say 250 million

Age-wise split

Below 12yrs	12yrs – 18yrs	18 – 30 yrs	30 – 50 yrs	50 years and above
(20%)	(25%)	(30%)	(20%)	(15%)
↓	↓	↓	↓	↓
50 million	37.5 million	75 million	50 million	37.5 million
↓	↓	↓	↓	↓
Barely can read a novel	25% interested in reading novel	20% interested	10%	5%

∴ 5 + 15 + 10 million = 30 million interested in reading a novel.

Types of novel

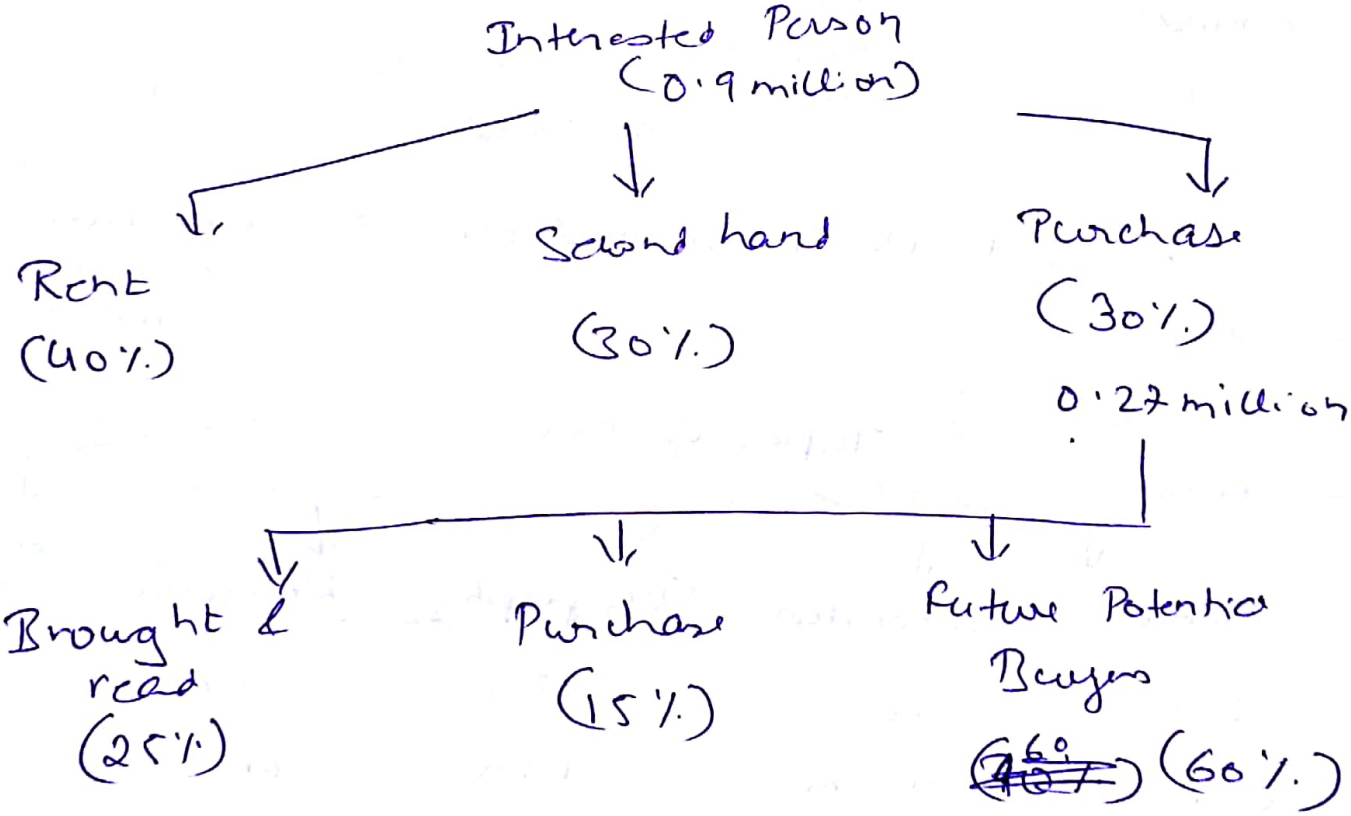
Crime	Adventure	Biography	Romantic	Misc others
20%	15%	15%	20%	10%
6m	4.5m	4.5m	6m	7m

→ say 15% may be interested in buying a sherlock holmes novel.

∴ 0.9 million (interested)

Now some people, out of those interested, may
- have brought & read all of the novels and hence may not buy.
- some will buy this year
- some may not buy this but can buy in the future.

Also, not every when interested buys a novel, they can rent it from a library or can buy a second-hand copy.



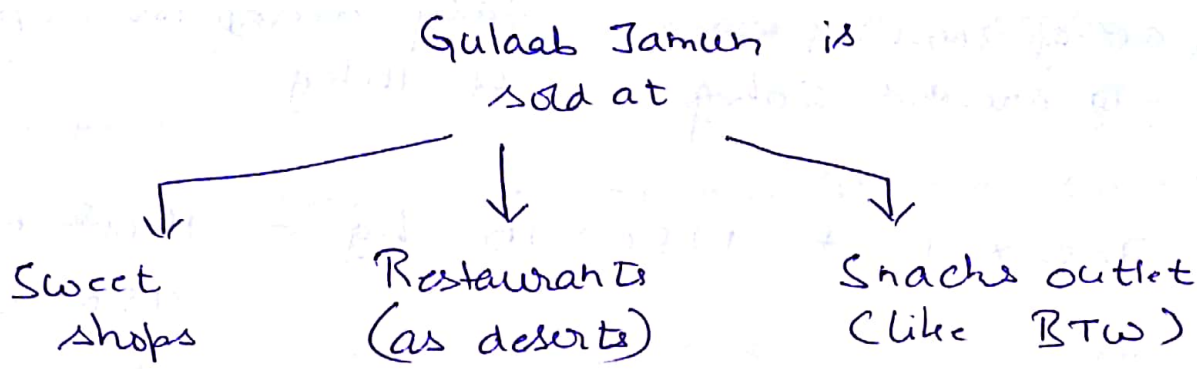
$0.27 \times 15\% / 100$

$= 0.0405$ million

or 40·5K copies

XVII) Estimate the number of Gulaab Jamun sold in Delhi on a single day.

↳

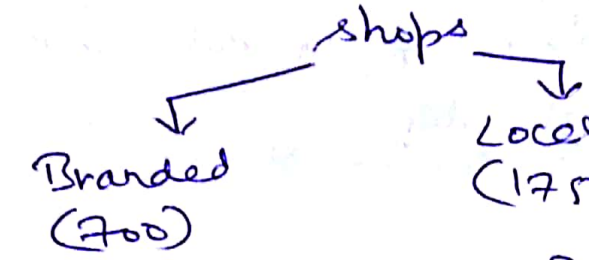


Now sale of Gulaab Jamun will be very different on a casual day when compared to a festival day like Diwaali, Rakhi, etc.
So we need to ask this to the interviewer for clarification. Let us ~~know~~, for now, assume that its a casual day.

There are seventy legislative assembly seats in Delhi And if I was to recall my seat (Karol Bagh) there are around 10 shops (which are branded) and another 25 shops which are local.

Taking this as a standard - we have around 700 standard shops and 1750 local shops

~~Let the branded be~~



daily average consumption of around 20kg

Daily average consumption of 10kg

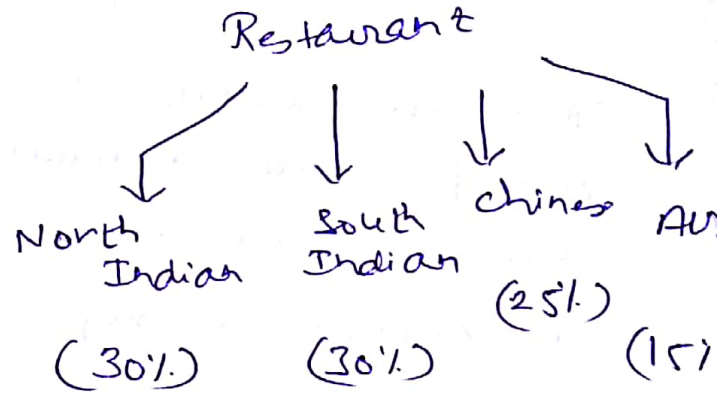
$\therefore$ $700 \times 20 + 1750 \times 10$ kg $= 14000 + 17500$
$= 31500$ kg

Let a single kg of Gulaab Jamun have 20 pieces

$\Rightarrow$ $31500 \times 20 = 630,000$ pieces (a)

Again we have 70 ~~constit~~ legislative seats and in my area (Karol Bagh) there are around 100 restaurants and at least 20 hotels.

All the hotels will have Gulaab Jamun on their menu. But not all restaurants are North Indian, hence all of them will not have Gulaab Jamun



$\therefore$ 45 restaurants & 20 hotels.

For 70 constituencies we have $= 45 \times 70 + 20 \times 70$
$= 3150$ restaurants and 1400 hotels

Now, we assume that hotel has at least 30 rooms with avg occupancy of 2 and out of them (43) 10% may order ₹ Gulaab Jamun (one/person)

Similarly we assume that a restaurant feeds 100 customers with avg customer size of 3 person and 10% of them order Gulaab Jamun (one/person)

$3150 \times 100 \times 3 \times \frac{1}{10}$ and $1400 \times 30 \times 2 \times \frac{1}{10}$

94500 ₹ from Restaurants = ₹400 from hotels

$\Rightarrow$ ~~500~~ 102,900 (b)

Snacks Shops

- Pizza
- Burger
- Indian Snacks ← only this segment needs to be estimated.
- Shakes, rolls, etc

Again in Karol Bagh, I can safely say that there 10 such Indian snacks shops which serves around 150 person. say 10% of them have Gulaab Jamun & we have 70 legislative seats

$\therefore 70 \times 10 \times 150 \times \frac{1}{10} \times 1 = 10500$ Gulaab Jamun

(c)

Total = (a) + (b) + (c)

= 630 000 + 102.9K + 10.5K

= @ 743.4 K Gulaab Jamuns / day

Note - Had it been a festive day then we need to simply increase the number of Gulaab Jamun sold by the sweet shops by several ~~factor~~ multiples..

Say for an example, selling 100 kg of Gulaab Jamun by a single sweet shop does not look impossible on a festive day.

Note - ~~Note~~ Sales of Gulaab Jamun in North Indian cities will be larger when compared to South Indian cities.

(XVI) Number of cars crossing Delhi-Gurgaon toll in a day.

↳ Population of Delhi = 1.5 crores.

Average family size : b/w 4 to 5

⇒ 40 to 50 lac family ⇒ 45 lac.

Type of occupation

Agriculture	Self business	Services.
(10%)	(20%)	(60%)
(4.5 lac)	(12.5 lac)	(= 27 lac)

Now, for a services family, we have ~~all~~ the

husband working – 100%

wife working – 60%

one of the child working – 40%

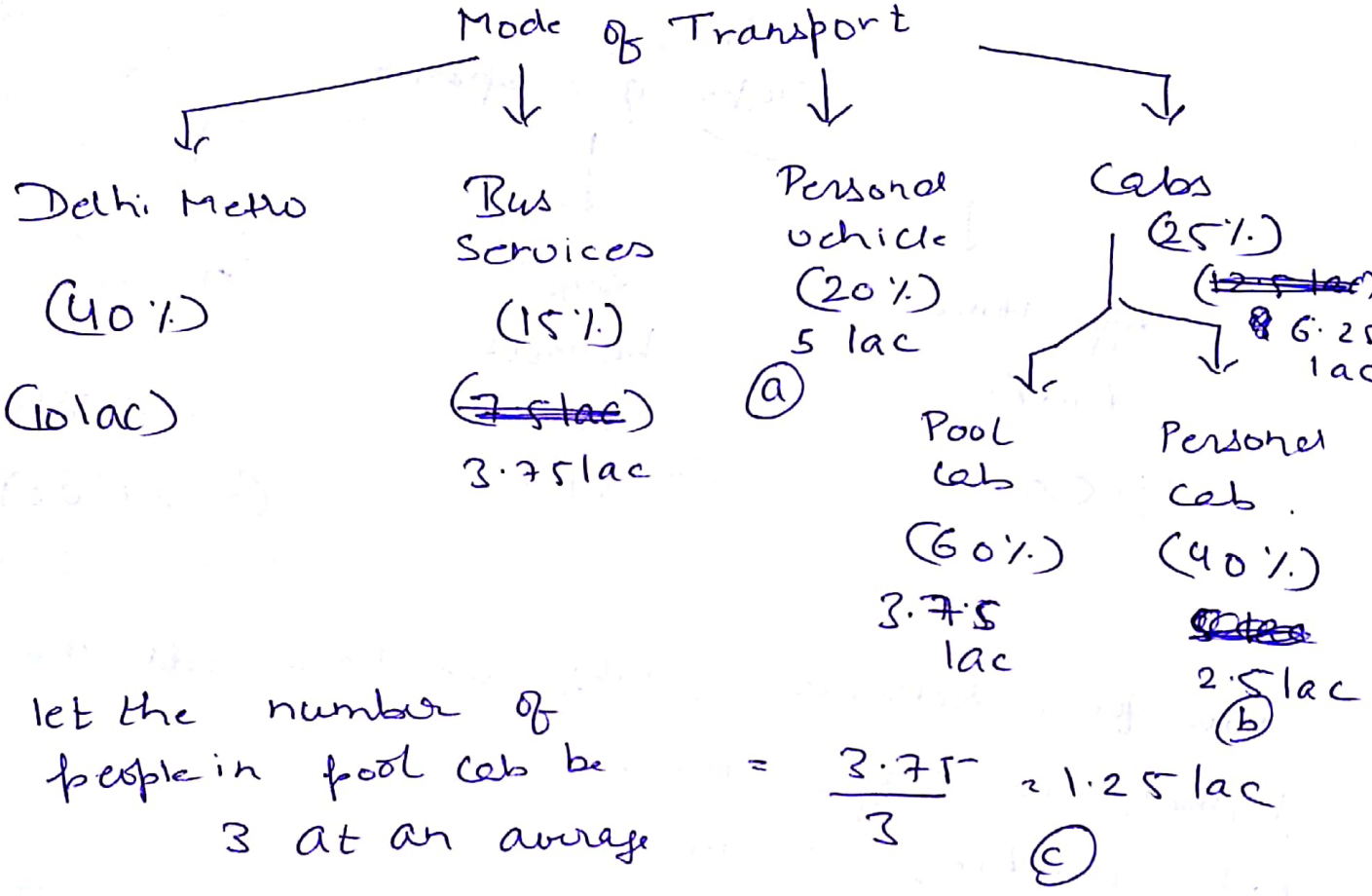
⇒ total working people = 2 × 27 lac = 54 lac

Place of working

Gurgaon	Delhi	Noida (Rest of NCR)
(40%)	(15%)	(35%)
(21.6 lac)	(8.1 lac)	(18.9 lac)

Also, there may be some people who may visit from Delhi to Gurgaon for schooling or shopping purpose.

so let the number of people = 25 lac
visiting D → G be



let the number of people in pool cab be 3 at an average $= \frac{3.75}{3} = 1.25$ lac (c)

Total number = (a) + (b) + (c)

= 5 + 1.25 + 2.5

= 8.75 lac cars.

Also, note this is the case for a working day. The situation will be different for a holiday (like Saturday or Sunday.)

XVII) Estimate the revenue of a McD outlet coming out from burger sales.

↳

Type of Sale

- online
- offline / dine-in / take away

~~which~~ Do we need to cover both?
No, only the offline ones.

The McD at my place has three biling/serving counter.

Average time to prepare the burger and bill for it is approx 2 min

∴ 30 burgers / hours / billing counter

Distribution of Sales

- 10AM - 1PM (60%)
- 1PM - 4PM (80%)
- 4PM - 7PM (75%)
- 7PM - 11PM (60%)

~~Assume~~ what McD sells

- Deserts/Drinks (20%)
- Fries/wraps (20%)
- Burgers (60%)

So 60% of the time a sale at McD implies sale of a burger.

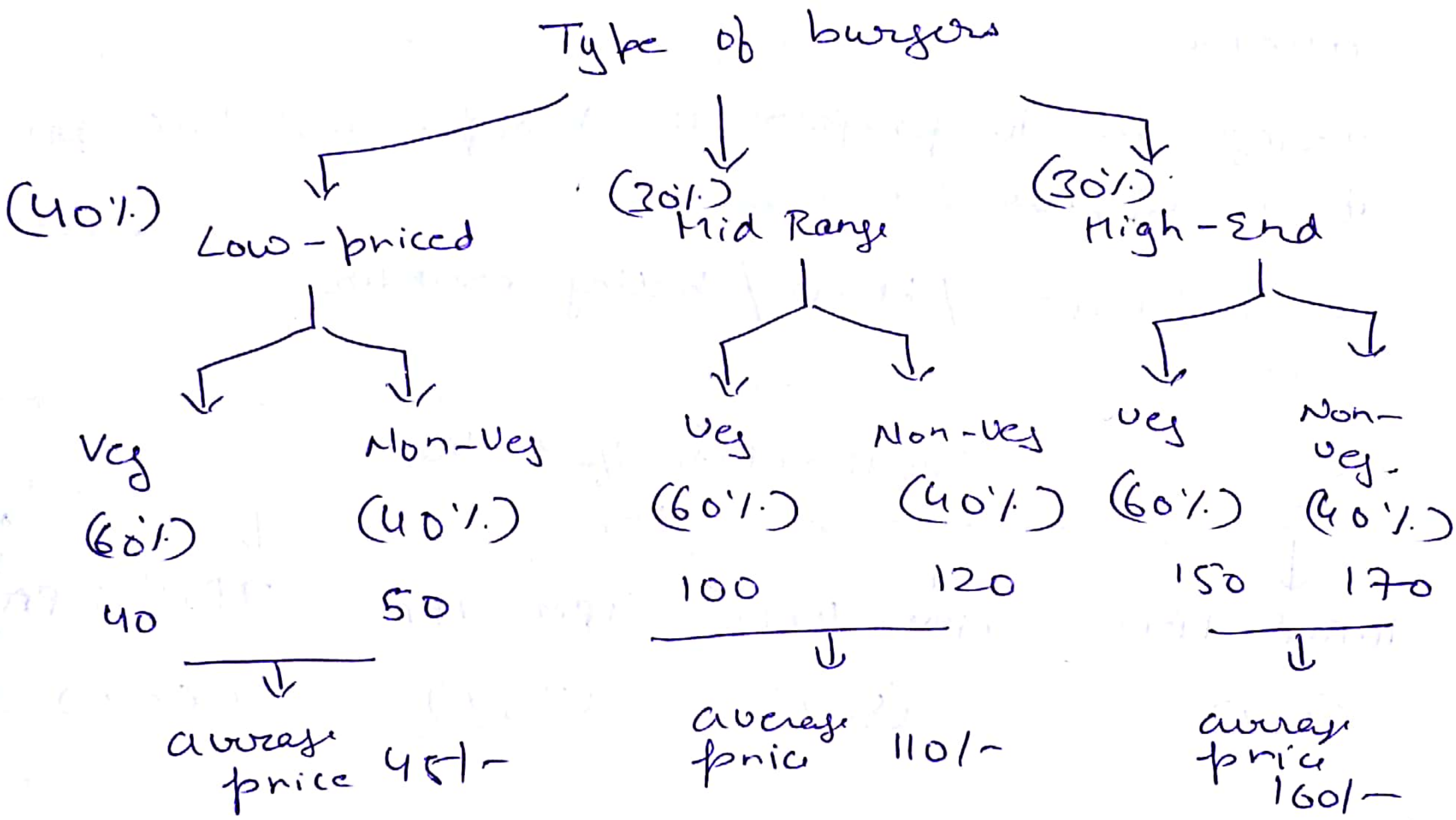
$= 0.6 \times 30(4 \times 0.6 + 3 \times 0.8 + 3 \times 0.75 + 4 \times 0.6) \times 4$

$= 0.6 \times 30 (4.8 + 2.4 + 2.25) \times 4$

$= 0.6 \times 30 (9.45) \times 4$

$= 72 \times 9.45 = \underline{680}$ burgers

$$\begin{array}{r} 9.45 \\ \times 72 \\ \hline 1890 \\ 66150 \\ \hline 680.40 \end{array}$$



weighted average price of a burger $= 0.4 \times 45 + 110 \times 0.3 + 0.3 \times 160$

$= 18 + 33 + 48$

$=$ ~~99~~ 99/-

∴ Total Revenue $= 68000 - 680$

$= 67320$/- daily.

Note- here also the sale / occupancy will vary depending upon whether we have Mon-Fri or Sat-Sun. Also, if the total Revenue was to be estimated, then the revenue from thics / wraps / meals / Coke / deserts needed to be taken care of.

Also, note that the choise of 4 counters was very random. It is a good thought to divide the meal as veg / non-veg when we are considering Indian consumers. This may not be required in the US / Europe markets.

The Question can be further extended to estimate the revenue for McD from Delhi Region. For this, simply assume around 1 to 2 Stores per 2 legislative assembly (that makes it 70 - 140 or 105, to take the average, Stores)

The same set of Questions can be extended to estimate the revenue of a restaurant. But for that you must ask whether the restaurant Operates in Budget, mid-tier or premium Segment and then proceed.

VIII) Estimate the number of TV / Refrigerators / AC's sold in Delhi in an year.

(Also estimate the revenue)

Refrigerators.

↳ Population of Delhi = 1.5 crores.

Average family size = 4 to 5

⇒ 40 to 50 lac family ∴ 45 lac family

Economic Distribution

Below poverty line	Low income	Middle Income	High Income
(15%)	(40%)	(30%)	(15%)
~~8.75~~ 6.75 lac	18 lac	13.5 lac	6.75 lac
↓	↓	↓	↓
no Refrig.	average 1 refrig.	Average 1.2 ref.	average 1.5 ref.

weighted average = $0 \times 0.15 + 1 \times 0.4 + 1.2 \times 30 + 1.5 \times 0.15$

$= 0.4 + 0.36 + 0.225$

$= 0.965$

∴ Number of Refrig. in Delhi (Households) = 0.965×45 lac

= 43 lacs

average life span = 15 yrs.
of a refb.

∴ units sold annually = $\frac{43 \text{ lac}}{15}$ or 2.9 lacs.
due to replacement

However, there are also first time buyers. Those people who brought ~~it~~ for the first time will be those who have been uplifted from poverty.
Say 5% of the people are uplifted from poverty.

= $6.75 \times \frac{1}{20}$ lac = $\frac{675K \times 5}{100}$

= $6.75K \times 5 = 32.25K$

∴ Total sales annually = 2.9 lac + 0.32 lac
= 3.22 lac

Other than this, refrigerators are brought for commercial ~~purs~~ purposes

Commercial Use
- Hotels
- Restaurants
- Storage facilities.

However, Generally they are not asked to be estimated.

Revenue generated by Rob. sales

Type of Rob

- Entry level: 40% of the market → average unit price → 15K
- Mid level: 40% of the market → average unit price → 40K
- High / Premium: 20% of the market → average unit price → 75K

Total Revenue = 3.22 × (0.4 × 15K + 0.4 × 40K + 0.20 × 75K) lac

= 3.22 lac × (6K + 16K + 15K)

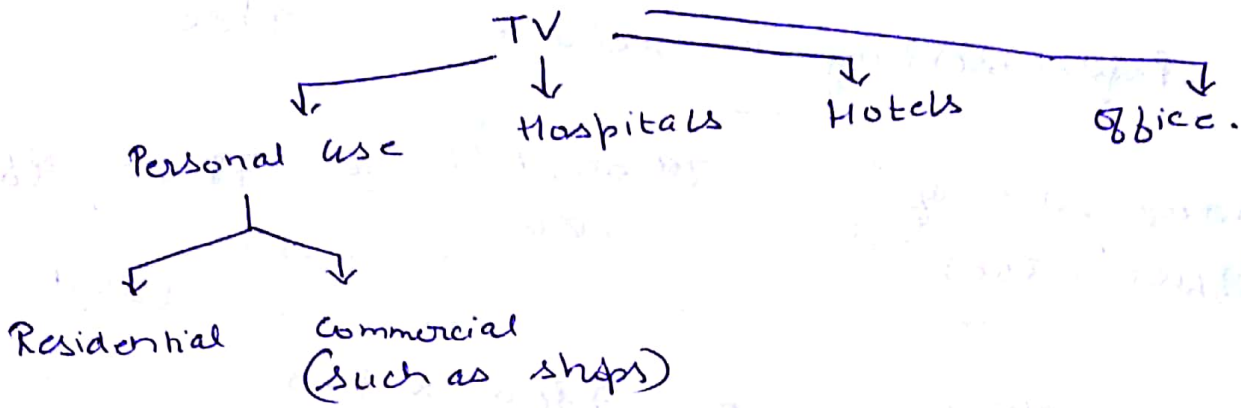
= 3.22 lac × 37 lac

= 120K lac = 1.2K crores

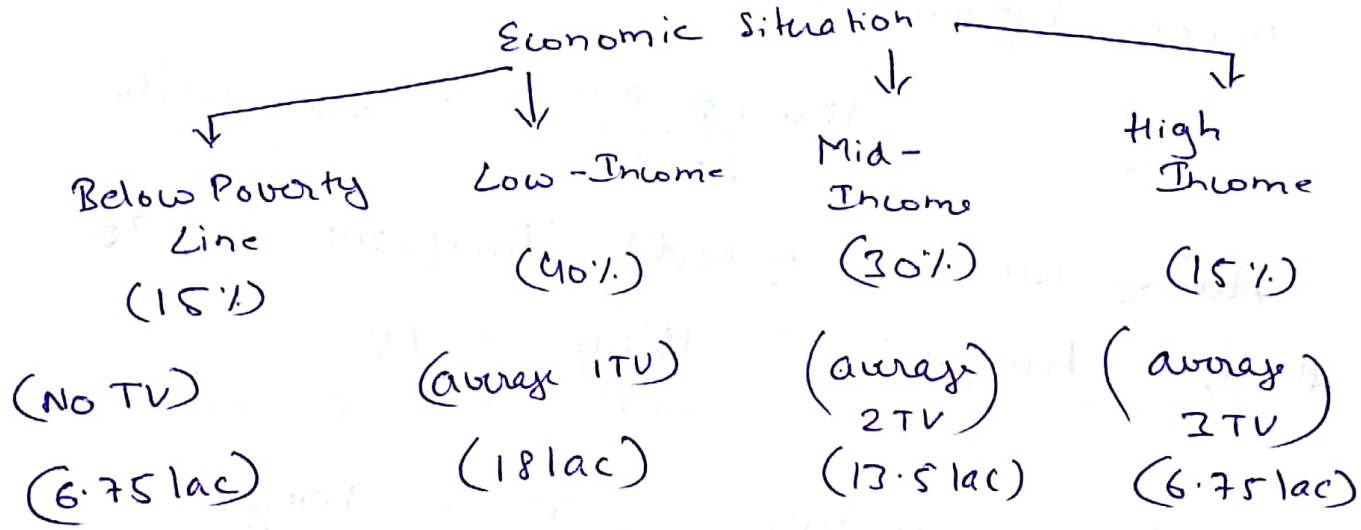
= 1200 crores.

(Roughly $2 billion)

↳ Second part is to estimate the # of TV sold in Delhi



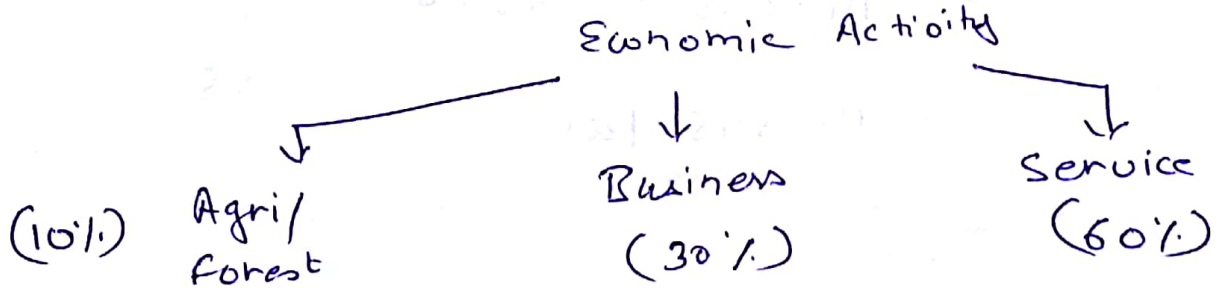
Population of Delhi = 1.5 crores ⇒ 45 lac family (average family size of 4.5)



Total number of TV = 18 x 1 + 27 + 20.25

= 65.25 lac

Average life span of TV = $\frac{65.25}{10}$ = 6.525 lac



let, half of the female be working
= 67.5 lac

∴ People working in service = 39 lac

Average size of office (Rs) = $\frac{39,00,000}{500}$ = 7800 offices

Average number of TV per office = 7800 × 100
= 780000 = 7.80 lac

Similary, let there be to a bed for every 10,000 person, then we have

$\frac{150\ 00\ 000}{10\ 000}$ = 1500 beds

Average number of beds / hospital = 20

of ∴ hospital = $\frac{1500}{20}$ = 75

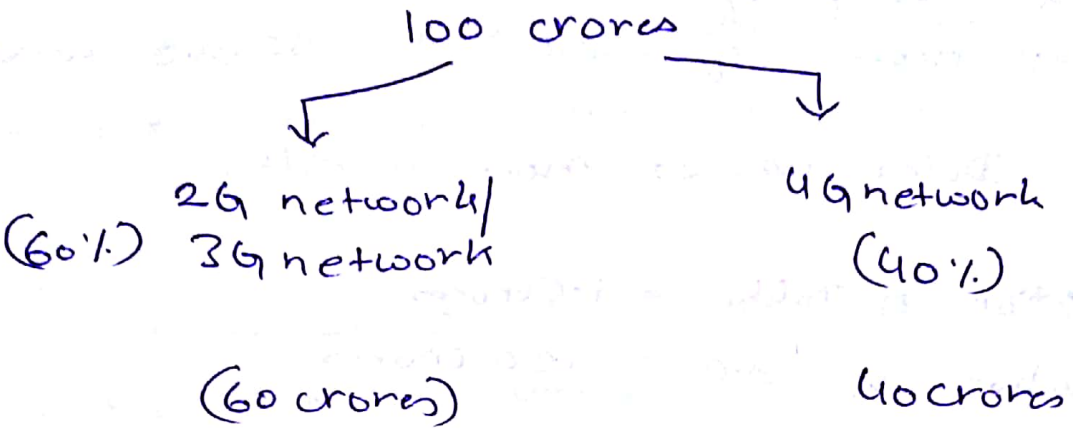
Average number of TV per hospital = 100

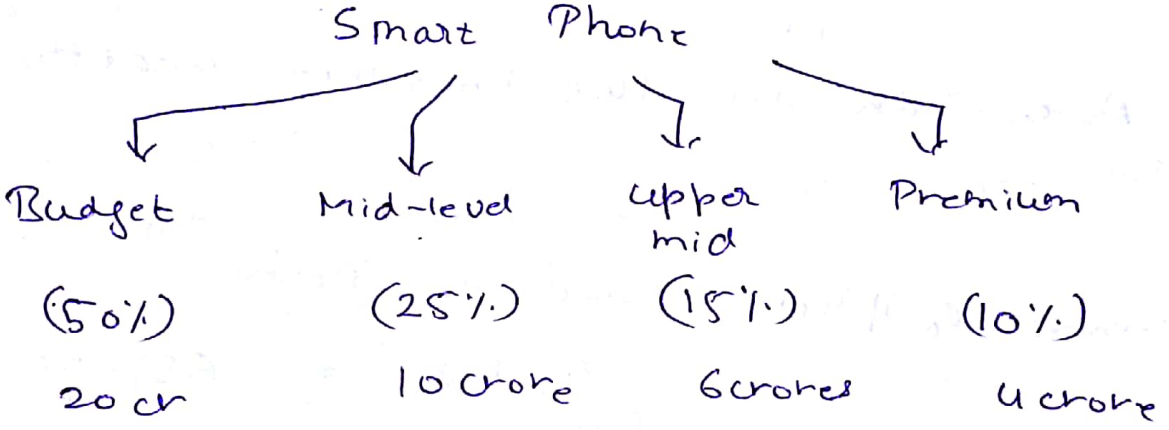
∴ 7500 TVs.

# of TV set = 6.525 lac + 7.80 lac
= 14.325 + 7500 lac
= 14.395 lac

XIX) Number of iphones sold in India.

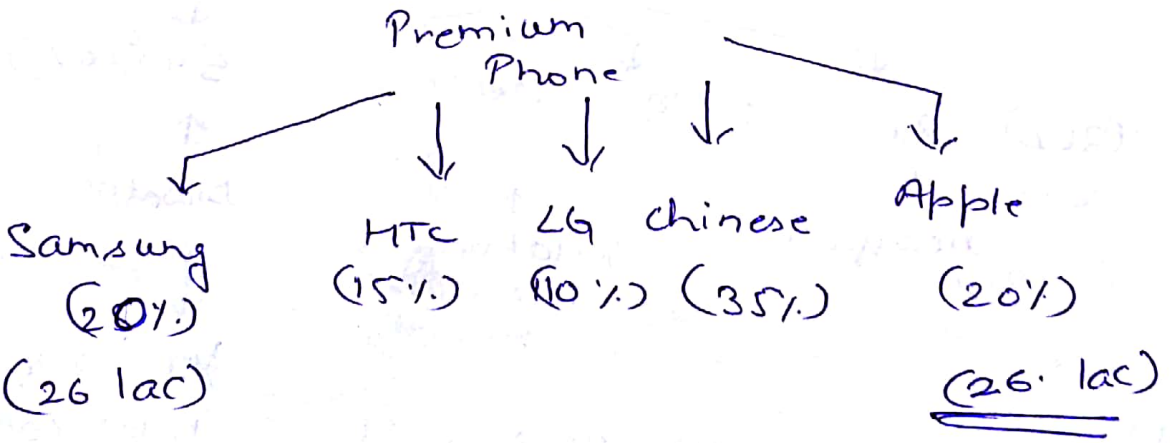
↳ ~~At~~ Number of mobile user = 100 crores





Average life of a smart phone = 3 years

$\therefore \frac{4}{3}$ = 1.33 crores phones.



Follow-up question – Number of iphones sold in Delhi

Average income of Delhi = 126000 annually
Average income of India = 65000 annually

∴ Delhi has 2x more wealth.

Population of Delhi = 1.5 crores
Population of India = 120 crores

∴ $\frac{120}{1.5}$ = 80

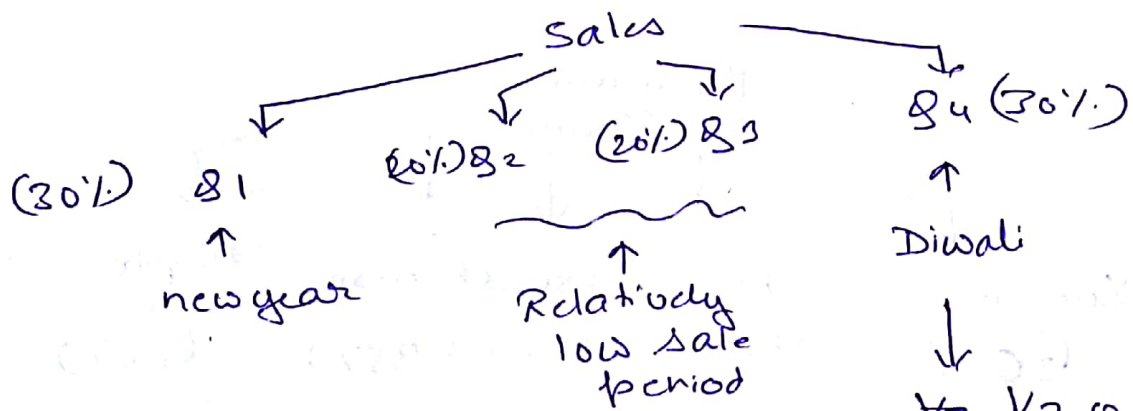
Also Delhi has two times more wealth,

∴ 40

Number of iphones sold in Delhi

= $\frac{26}{40}$ lac = 65,000 iphones.

Follow up question – number of iphones sold in Diwali ~~sa~~ period.



∴ iphone sold in Delhi in Diwali Sale = 65,000 × 30 × 1 / 100 ⇒

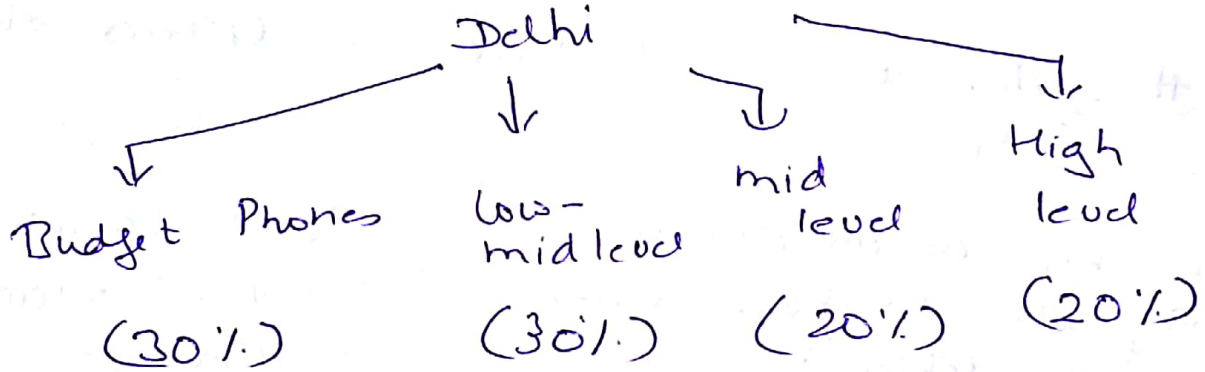
= 6,500 phones

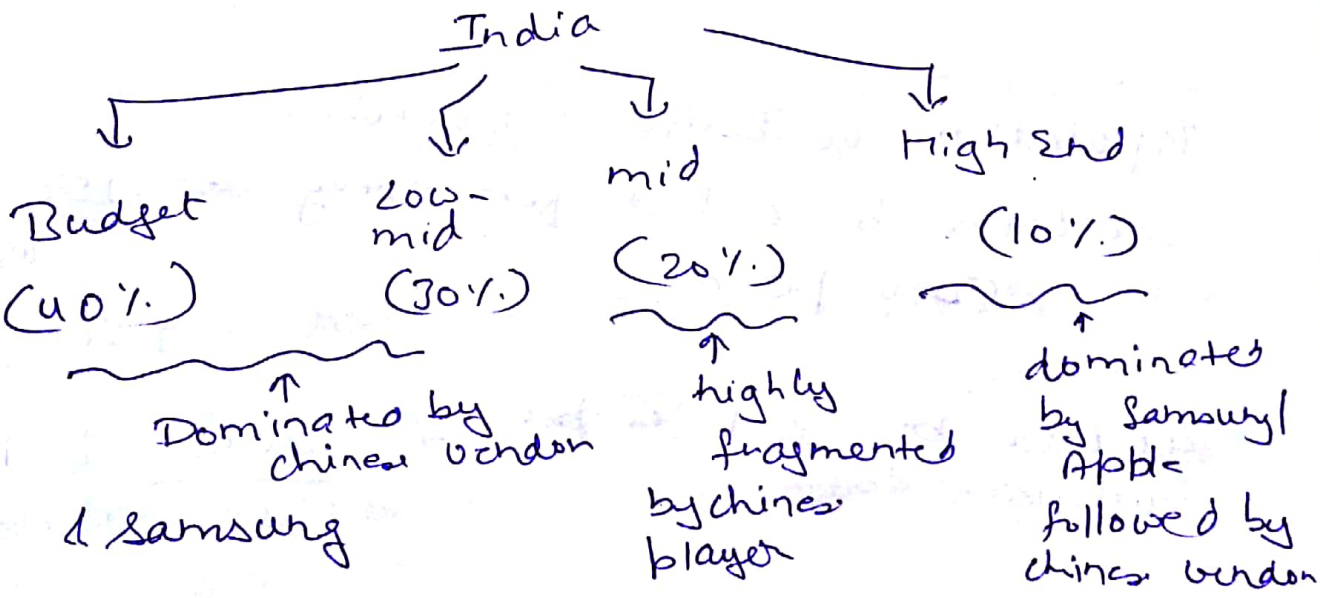
The Question can be further extended to estimate the number of iphones sold online v/s offline.

Also, instead of iphones, we can be asked to estimate the sale of a new Samsung / Google phone.

We can also be asked to estimate the revenue generated by a telecom company / telecom industry by offering only voice & data services.

The economic distribution for Delhi, Mumbai, Chennai, Kolkata, Hydrabad, etc will be similar





(XX) Number of Paracetamol tablets sold in Delhi (5P)

Places where they are sold

→ Hospitals

→ Chemist shops

Delhi (7 parliament. const.)
↓ legislature
70 constituency
↓
235 wards

In my ward, I can estimate that there are roughly 20 chemist shops

∴ # of chemist shop = 235 × 20 = 4700 shops

Each shop at an average may sell 10 strips (100 medicine tablets)

∴ Total tablet sold
= 4700 × 100
= 470000
or 470k tablets

(a)

Population of Delhi = 1.5 crores

Let there be a bed for every 5000 persons = $\frac{15000000}{5000}$

= 3000 beds

Let there be 30 beds per hospitals = $\frac{3000}{30}$ = 100 hospitals

If at an average a hospital sell 100 strips (1000 tablets), then

Tablets sold by Hospitals = $100 \times 1000 = 100k$ (b)

Total number of Tablets sold = $470k + 100k$

$= 570k$ tablets.

Not parameters like number of beds / 1000 person or so on are also general parameter which can help us to determine the quality of health-care in the country.

If the question was number of paracetamol sold in India, then take a that india has approx 550 constituencies

↓

approx 5000 state council seats

↓

35000 Municipal wards → 20 chemist shops / ward = 700k chemist shops

Similarly, Delhi has better medical facility than the national average. Hence we can take 10000 ~~persons~~ persons / bed to estimate hospitals.

Further notice that these variations are in general present for developing nations.

Developed Nation do not have these many discrepancy in the data.

If we, for Eg. had to estimate for the State of California, then

US population = 35 omicron

↓

50 states

↓

average population per State = 7 million

But since California is an Industrial State and near coastline, its population will be slightly higher than the average/mean value

So begin by taking 8 million citizens.

Also, we can estimate that one bed / 500 persons may be available in California or one bed/ 1000 persons. as its medical facilities will be better than Delhi.

(XXI) Estimate the number of lakes in the world.

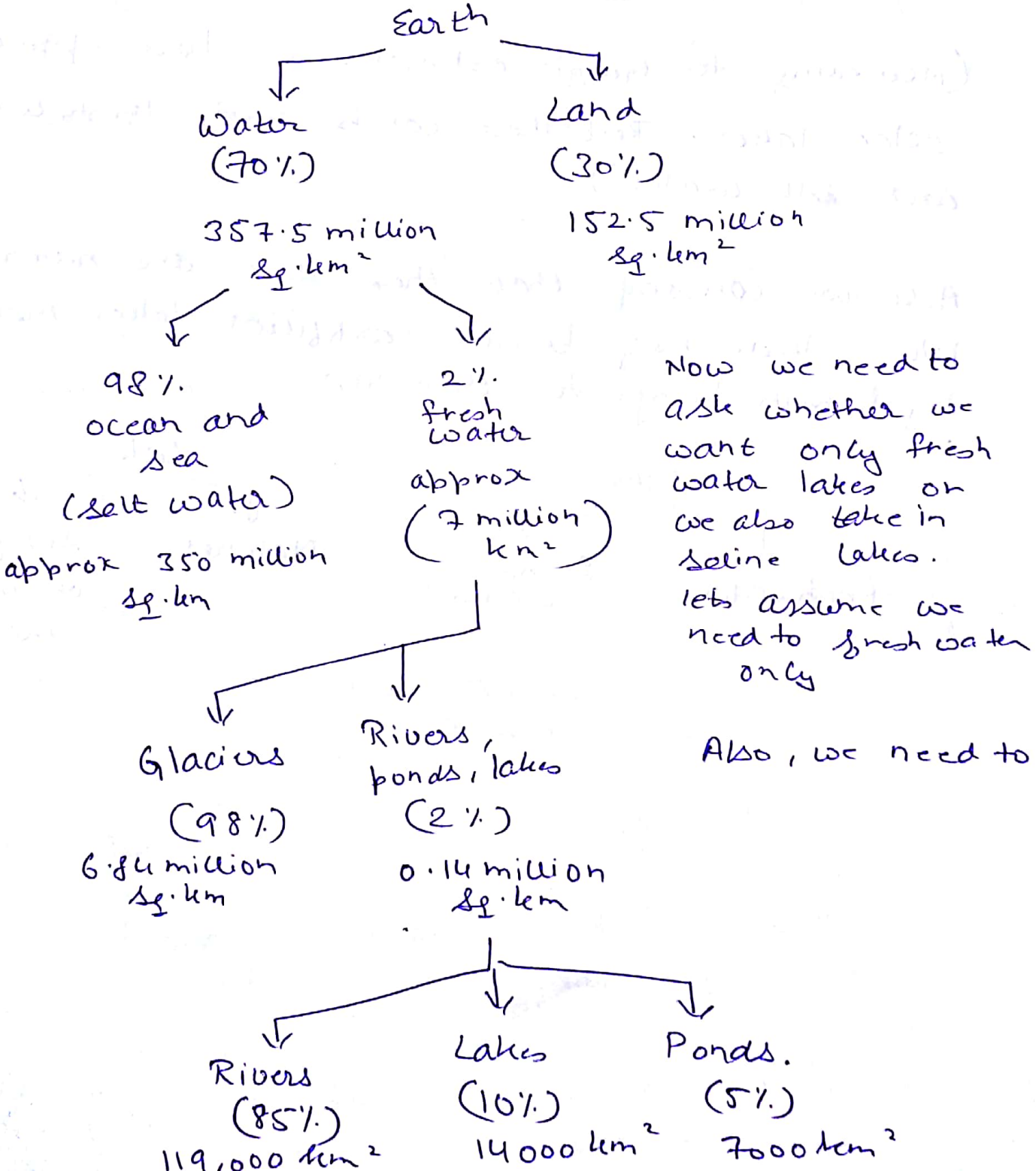
↳ Radius of Earth = 6400 km

$= 2^6 \times 100$ km

∴ Surface area of Earth $= 4 \times 3.14 \times 2^6 \times 2^6 \times 100 \times 100$ km^2

$= 12.56 \times 4096 \times 10{,}000$ km^2

Assuming Earth to be a perfect sphere $\sim$ 510 million km^2 (approx)



Now we need to ask whether we want only fresh water lakes or we also take in saline lakes. lets assume we need to fresh water only

Also, we need to

Now, let us take that an average size of a lake is 1200 mtr x 1200 mtr

$= 0.01 / km^2$

or $\frac{1}{100}$ lakes $/ km^2$

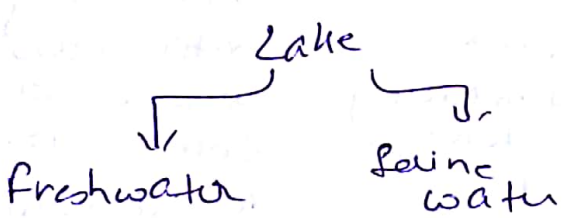
∴ Total number of lakes $= 14000 \times \frac{1}{100}$

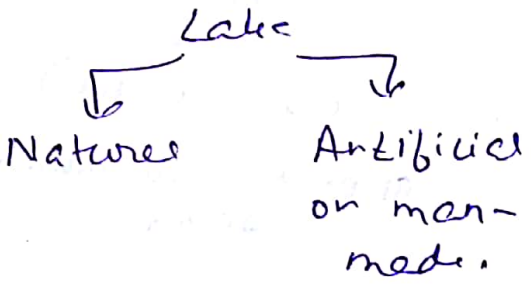
$= \frac{1400}{2}, \times 1000$ lakes

(14 lac lakes) $= 250,000$ lakes

(According to Google estimates, we have approx 20 lac lakes. But these can be both fresh water and salt water.)

Also, we can say that these lakes are natural lakes. There may be some artificial lakes made by human beings for their use





XII) Estimate the size of the tyre industry (SUV) in India in 2020?

↳

Tyres

- Replacement tyres for old vehicles
- Tyres for new SUV sold.

Population of India = 125 crores with average family size of 4 to 5 = 30 crores to 25 crores.

Say we take 27 crores families in India

So. Economic Distribution

- Below Poverty Line (15%) — No one will own a car
- Low Income (40%) — No one will own an SUV
- Mid-Income (35%)
- High Income (10%) — 2.7 crore — These people may own a new/used SUV

High-Income Groups

- ~~At least~~ one SUV (~~50%~~) (50%)
- two SUV (30%)
- Multiple SUVs (6%) — Say (3) average
- No SUV (10%)

∴ SUVs by High End people = 2.7 crores (0.5 + 0.6 + 0.3)

2.7 crores × 1.4 = 3.5 crores.

Assuming that average life of an SUV is 15 yrs, we have $\frac{3500}{15}$ lac SUVs sold

$= 20$ lac SUV

approx 2 million SUV

We have a total of 3.5 crores SUV and 20 lac (new) SUV in 2017

let the SUV segment grow by 10% per annum.

New units sold in 2018 = 22 lac

2019 = 24.2 lac

2020 = 26.5 lac

So we have 26.6 lac new SUV sold in India in 2020 and a total 4.2 crores SUV in the country

~~New SUV will need 5 tyres (4 tyre~~

Also, lets us assume that 12% of the new SUV sold in India (brought by Indians) are exported abroad.

∴ new SUV manufac. in India = 1.12×26.6 lac ≈ 30 lac

Each new SUV require 5 tyres (4 tyre + 1 extra) = 150 lac tyres for new SUVs.

Let every one of out 3.5 crore cars require a tyre (replacement) in an year.

$\Rightarrow \frac{350}{5} \times 1 = 70$ lac replacement tyres.

Total tyres = 150 lac + 70 lac
= 220 lac
(or 22 million tyre)

Revenue of the SUV tyre Industry – Let the average price of a tyre be 10,000

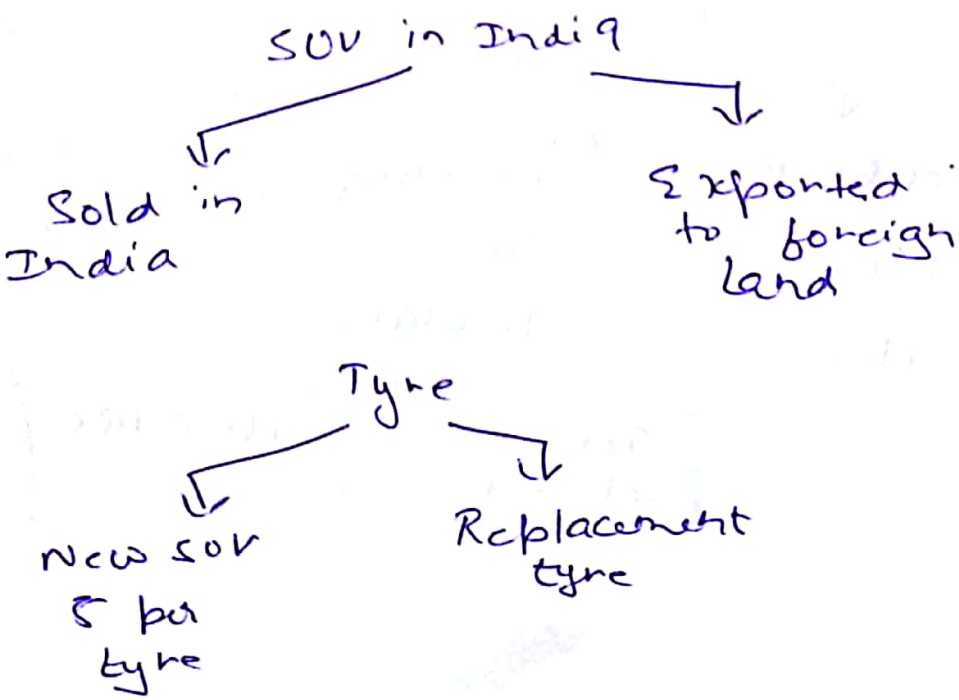
(If you don't know the price, then you can ask the interviewer)

∴ 220 million × 10,000

= ₹ 220 billion

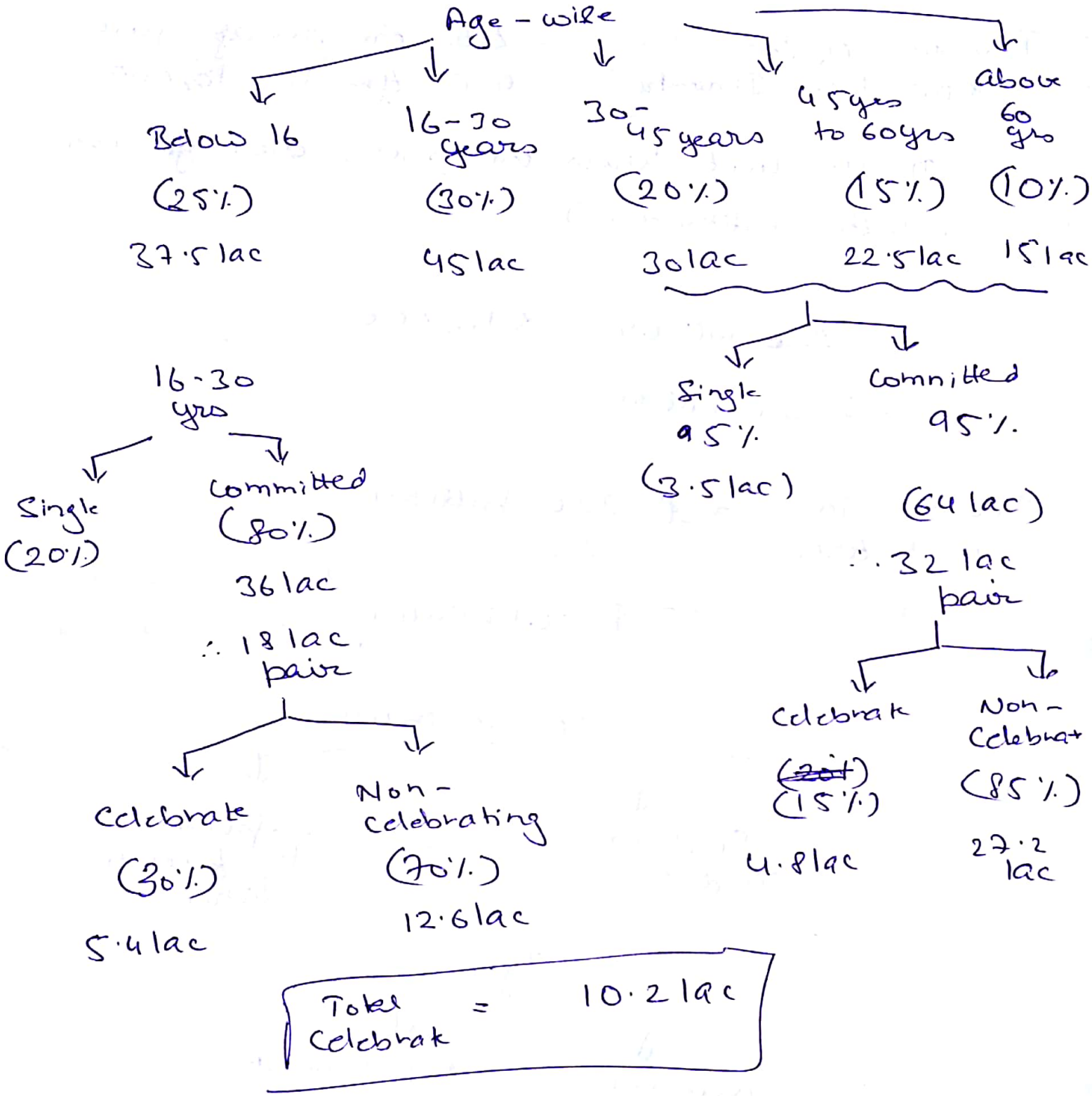
Revenue in US $ term = $ \frac{220}{60}$ billion

= $3.67 billion

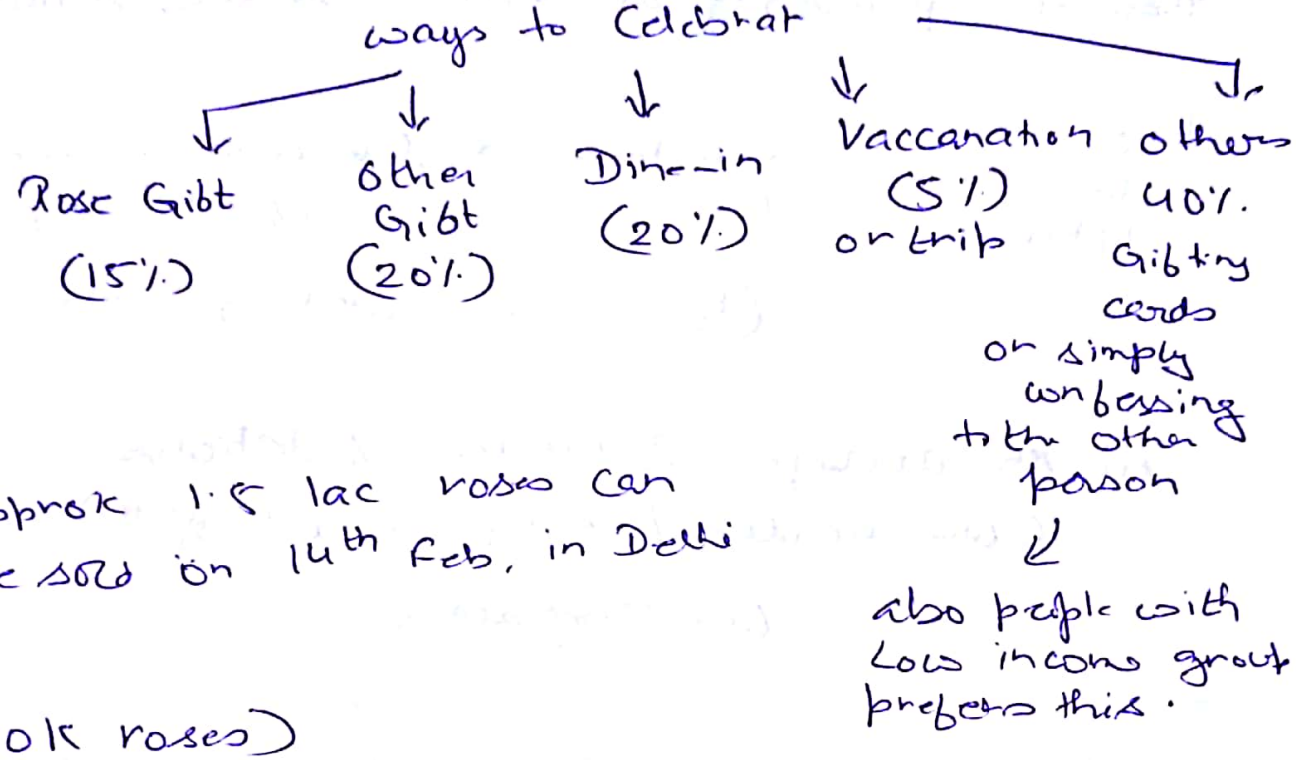


(XXIII) Number of roses sold in Delhi on 14th February.

↳ Delhi Population = 1.5 crores



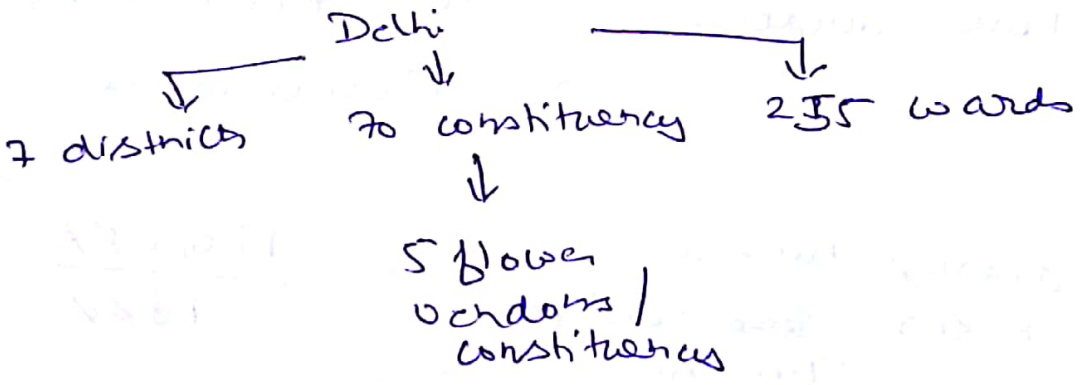
Now not everyone will celebrate Valentine's by gifting a rose



∴ approx 1.5 lac roses can be sold on 14th Feb, in Delhi

(150k roses)

Follow up Question → Estimate the number of roses sold by a flower vendor in Delhi on 14th Feb.



⇒ 350 vendors (shops)

(a)

But during the 14th Feb, various street vendors do also sell roses.

These are primarily at metro stations & markets

# of metro station = 5 metro lines × 40 average number of station / line

(b) ∴ 200 station

At an average 3 vendors / stations (one vendor / entry or exit gate)

= 600 vendors

Again for constituency, taking 2 markets per constituency approx 150 markets.

5 vendors per market. ⇒ 750 vendors (c)

∴ Total vendors = 350 + 600 + 750

= 1800 vendors

∴ average number of Roses ~~sold~~ sold per vendor = $\frac{150,000}{1800}$ = 83 roses

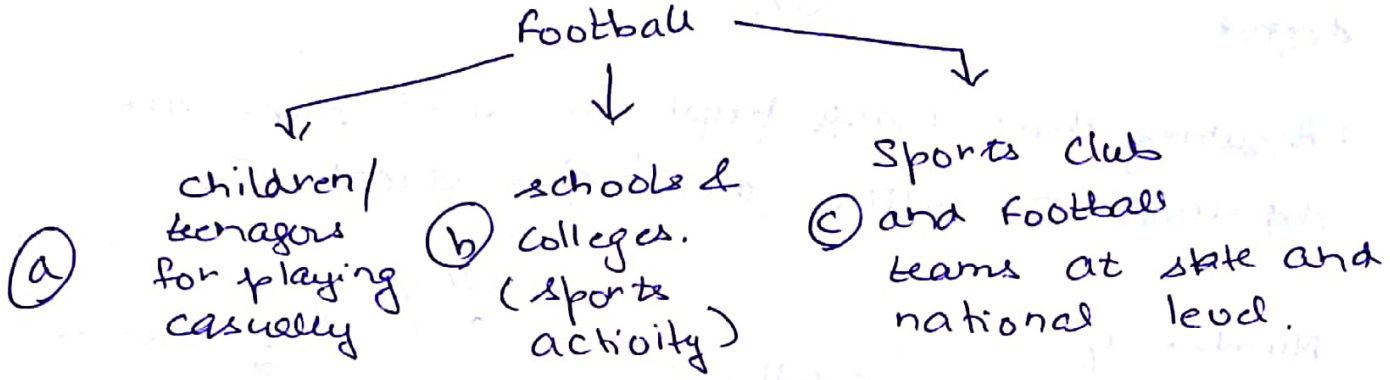
average revenue = average price × units sold

Taking average price to be 25 / rose = 25 × 83

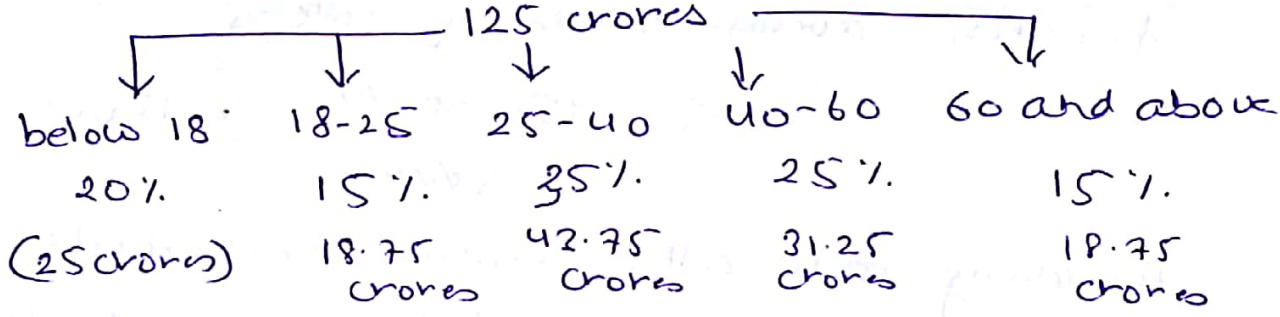
= $\frac{8300}{4}$ = ~~20~~ 2075 / vendor

XXIV) Number of football sold in India.

↳



Population of India = 125 crores.



Now, 14 classes for 10 sections with 50 students each ⇒ avg number of ~~schools~~ students in a school = $14 \times 10 \times 50 = 14 \times 500 = 7000$

$\therefore$ Number of school = $\frac{25,00,00,000}{7000} = 35700$ schools

Say 80% of these schools have football facility, and that they order 10 football each in a calendar year.

$= 35700 \times \cancel{10}^{2} \times \frac{4}{\cancel{5}} = 295600$

$\Rightarrow \underline{2.956 \text{ lac}}$ (a)

out of 18.75 crore people who can pursue higher education, say 40%. of them pursue a colleg degree.

(Assuming that many people in rural areas are depriced of getting the higher education).

Number of people pursuing a college $= \frac{37.5}{18.75} \times \frac{2}{5}$ crores

$= 7.5$ crores

Assuming that at average a college hosts 5000 persons, average number of colleges

$= \frac{7500000}{5000} = 15000$ colleges

Assuming each college orders 20 footballs and 90% of them has a football playing facility.

$\Rightarrow 15000 \times \frac{9}{10} \times 10 = 135000$ or 1.35 lac

India

- Indian Super League
- 35 state and UT
- National Team

Say 90% of state has a state football team and each state has at an average 30 clubs / sports facility where football can be played. And each club purchases 20 footballs annually.

$\therefore 30 \times 35 \times \frac{9}{10} \times 20$

$= 2100 \times 9$

$= 18900$

~ assume 20K as with National / state team.

Also Indian Super League, we have around 10 teams, each playing two with @ the other, followed by elimination rounds.

Each match requires two ball and approx 20 for making the players practice

$$\therefore \left(\frac{10 \times 9}{2} * + 5\right) \times 22 = 50 \times 22$$
$$= 1100 \text{ footballs}$$

Total number of football for sports clubs / stat & national team = 11000 + 18900 + 1100
= 21100 footballs

(c)

∴ Total number of footballs = (a) + (b) + (c)
= ~~24~~ 295K + 135K + 21.1K
= 451.1K footballs

or 4.511 lac football

XXV) Number of students attending 10^{th} / 12^{th} / college in India.

↳ population of India = 125 crores.

Age-wise split

Below 18 yrs	18-25 yrs	25-40 yrs	40-60 yrs	60 years & above
(25%)	(15%)	(25%)	(20%)	(15%)
31.25 crores	18.75 crores	31.25 crores	25 crores	18.75 crores

Now, if we assume uniform distribution of people in under 18 yrs age group, we have

$\frac{31.25}{18}$ crore people in 16^{th} yr. & 18^{th} yr.

= 1.73 crore people.

Economic - Status

Below Poverty Line	Low-Income	Mid-Income	High Income
(15%)	(40%)	(35%)	(10%)
↓	↓	↓	↓
can't study 10^{th}, 12^{th}, college due to affordibility	many in rural area may not be able to study 12^{th} class due to economic reason	Everyone goes to 10^{th}, 12^{th}. Almost 80% go to college	Everyone goes to 10^{th}, 12^{th}, college.

Many more can't go to college

10th Class → 0% from Low income + 90% from Low-income + 100% from mid-income + 100% from High Income

= 0·36 + 0·35 + 0·10

= 0·81

∴ 1.75 crore × 0·81 = 1·40 crore

12th class → 0% from low income + 70% from Low-income + 100% from mid-income + 100% from high Income

= 0·28 + 0·35 + 0·1

= 0·64

= 1.72 crore × 0·64 = 1.10 crore

College → 0% from low income + 20% from Low-income + 50% from mid-income + 70% from High income

= 0·08 + 0·175 + 0·07

= 0·325

= 0·325 × 18·75 × 20%

↳ These are those who want to go to college and do not have family business to support

= [illegible] crore

= 1·50 crore.

Also, not that for higher education, though every one in high-income category can afford college education in India, not everyone goes to indian university. Some may go abroad as well and hence the number 70%.

(XXVI) Number of Golf balls that can fit in the room.

↳ Assume the room to be approximately 4 mtrs wide and 6 mtrs long. The height of the room can be taken to 4 mtrs long.

(I came to this number as I know my height is 1.67 mtrs. So try to imagine how many people of your height can lie along the edges of the room.)

∴ Volume of the room = $4 \times 6 \times 4$

$= 96 \text{ mtrs}^2$

$\Rightarrow 96 \times 100 \times 100 \text{ cm}^2$

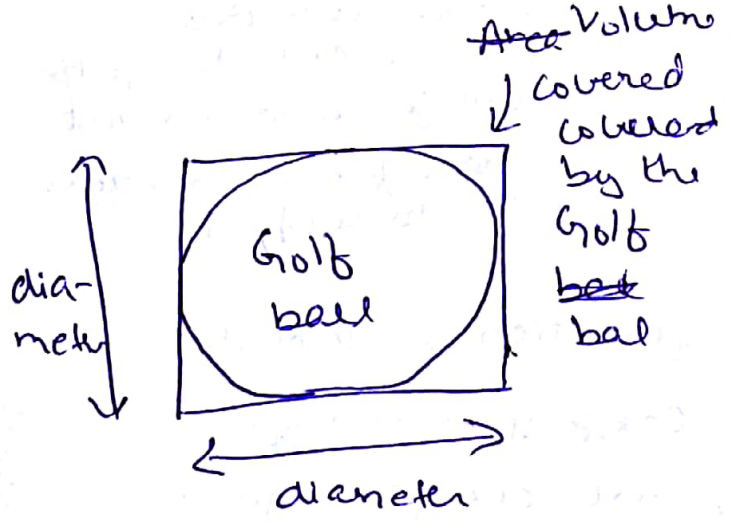
$\Rightarrow 960\text{K cm}^2$

Average diameter of a golf ball is say 5 cm.

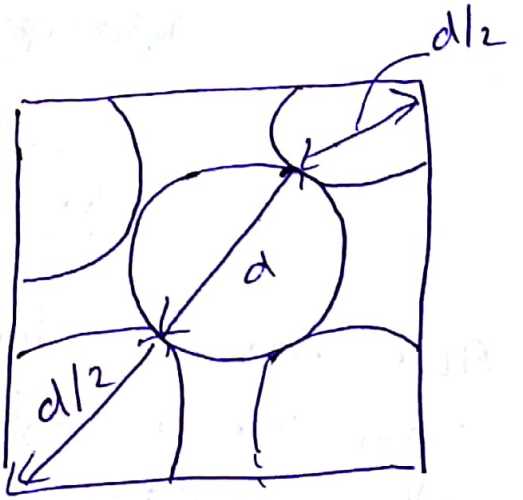
∴ Volume of the Golf ball = $3.14 \times \frac{4}{3} \times 125$

$= 1.046 \times 500$

$= 523.30 \text{ cm}^2$



way -I



way -II

In way-I, a cube of volume d^3 packs one golf ball.

In way-II, a cube of volume $\left[\frac{2}{\sqrt{3}}d\right]^3$ holds two Golf balls

$\Rightarrow \frac{1}{2}\frac{8}{3\times 1.73}d^3$ per ball $= 0.77\,d^3$ of volume per Golf ball

since $d = 5$ cm,

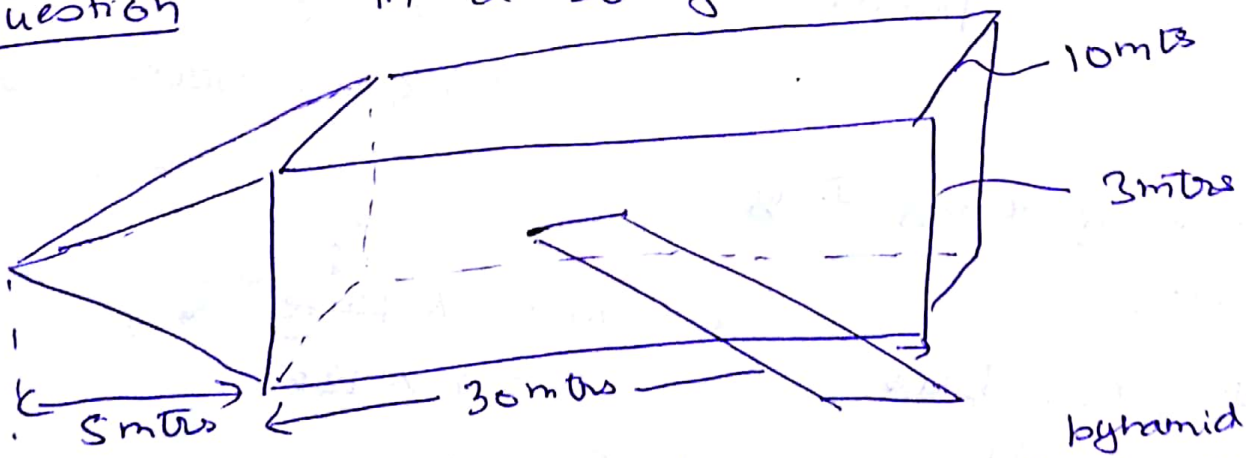
Number of balls in way-I $= \frac{960 \times 1000}{125} = 7680$ balls

Number of balls in way-II, $= \frac{960 \times 1000}{0.77 \times 125} = \frac{7680}{0.77}$

$\approx \frac{7680}{4} \times 5$

$= 1920 \times 5 = 9600$ balls

Alternative Question → As how many Golf balls can fit in a Boeing-747 plane.



Assume that the plane consists of a pyramid at the head followed by a cuboid as shown

Volume of the plane = $\frac{1}{3}$ × area of base × height + length × Breadth × height

$= \frac{1}{3} \times 10 \times 3 \times 5 + 30 \times 10 \times 3$

$= 950\ m^2$

$= 950 \times 100 \times 100\ cm^2$

$= 9500k\ cm^2$

Volume of Plane

- Occupied by cockpit, engine, seats and other critical Infra Structure (30%) → $2850k\ cm^2$
- Free / unoccupied (70%) → $6650k\ cm^2$

Assuming way-I of filling # of Golf balls possible $= \frac{6650 \times 8}{125}$

$= 53200$

$= 53,200$ balls

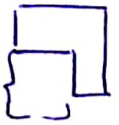
Assuming -way-II of filling # of Golf balls possible $= \frac{6650 \times 8}{0.77 \times 125}$

$= \frac{53200}{0.77} = 69,090$ balls

*XVII) Estimate the number of hair on your scalp.

↳ Estimating the area of the head

Assuming head to rectangular



Assuming that width (of the forehead) is 10 cm and length is 15 cm

area = 150 cm²

Assuming it to be curved (half of the curved surface area of the head)

50% of the curved surface area of the head.

Assuming that radius is 5 cm

$\frac{1}{2} \times 4 \times 3.14 \times 25$

= 167 cm²

Now assuming that 80% of the scalp is covered by hair, we have

120 cm² of area

we have 167 − 33.4 cm²

= 133.6 cm² of area

assuming the thickness of the hair to 2 mm (or 0.2 cm)

we have

$\frac{120}{0.2}$ = 600 hair

$\frac{167}{0.2}$ = 835 hair

(XXVIII) Amount of paint required to paint this room.

↳ Height of the walls = 4mtrs

length of the wall = 2 walls of 4mtrs
2 walls of 6mtrs

Area of the roof = 4×6 mtrs^2 = $24 m^2$ —

∴ Area of the walls = $4 \times (2+2+6+6)$
= $4 + 20 = 80 m^2$ —

Total area to be painted = $108 m^2$

Volume of paint required
= # of coats per coat × width of the stroke
× length of the stroke × depth of the stroke × percentage utilisized v/s percentage wastage.

Let there be three coats ~~with each coat having 1st at an average 3 strokes~~.

width of the paint brush = 15 cm
length of the 1st stroke = 50 cm
Depth of the coat = 0.1 cm

∴ $3 \times 1 \times 15 \times 50 \times 1$ cm^3 of paint for $15 \times 50 cm^2$ of area.

∴ 3 cm^3 of paint for $1 cm^2$ of area

Let's assume 10% is wasted.

∴ cm^3 of paint for $1 cm^2$ of area.
0.33 cm^3

Paint needed = $108 \times 100 \times 100 \times 0.10$ cm^3

Paint needed in Litre = $\frac{108 \times 100 \times 100 \times 0.10}{1000} \times 0.33$

= 360 Litre

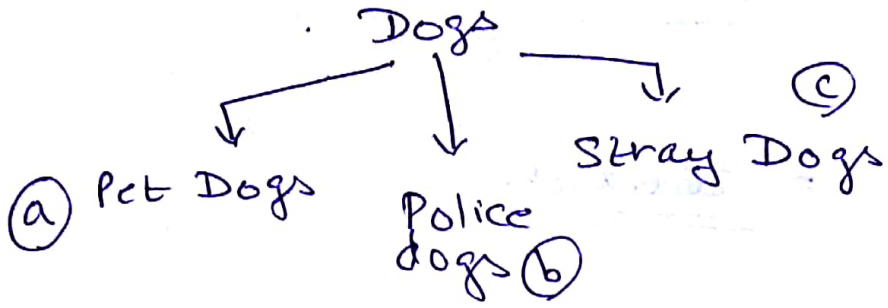
Assuming that a bucket of paint has 30L of paint ⇒ we will need 12 buckets of paint

Assuming that the cost of a single bucket is 500/ bucket

we will need 6000 worth of paint.

XxIX) Estimate the number of dogs in Delhi

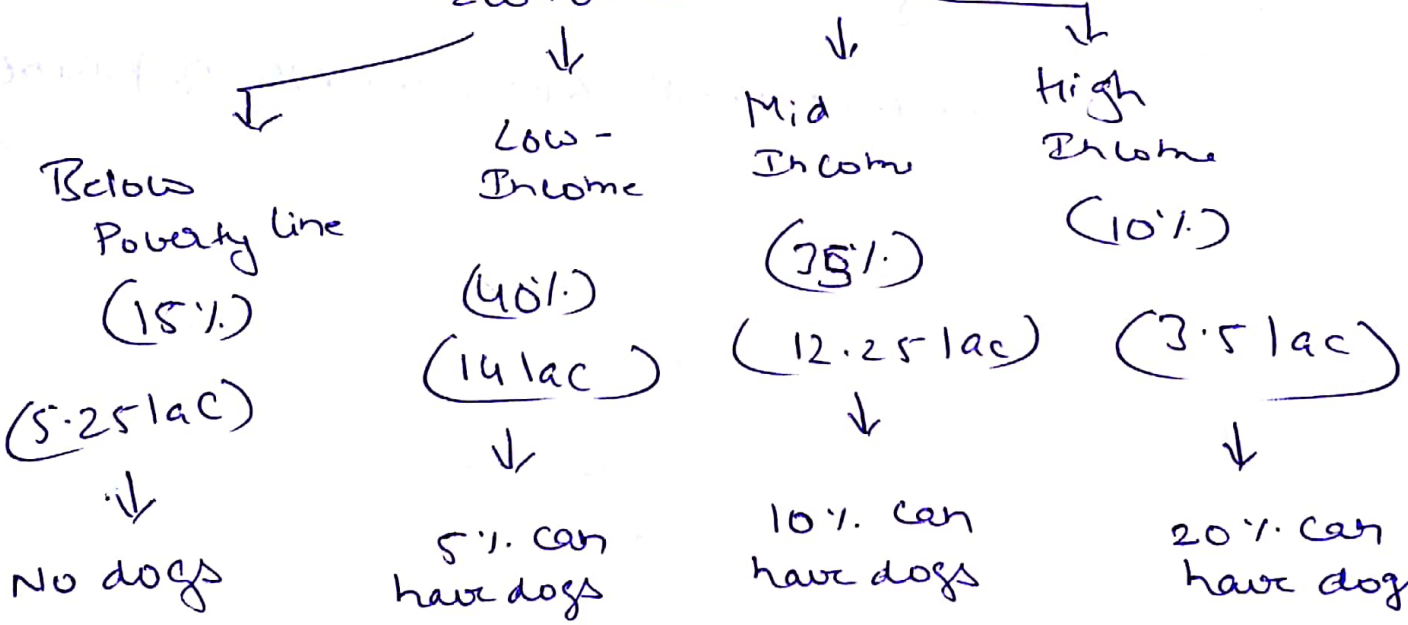
⇨



Population of Delhi = 1.5 crores or 150 lac

average family size is 4-5 ⇒ 30 to 37.5 lac family

∴ say 35 lac families



∴ # of families that can have dogs = 0.7 lac + 1.225 lac + 0.7 lac

= 2.625 lac

Now some people have more than one dog, let avg. average number of dogs per family be 1.1 dogs/family

$\therefore$ # of pet dogs = 2.625×1.1 lac

$= 2.625 + 0.2625$ lac

$= 2.8875$ (a)

~ 2.90 lac dogs (pet dogs)

Stray dogs = average population density × area of Delhi

area of Delhi estimated = 1800 sq. km

average population per km^2 = 20 (by analysing the area around you)

$\therefore$ number of stray dogs = 36000 dogs. (b)

Police Dogs → ~~[illegible]~~

70 constituencies in Delhi

let there be 2 police station per constituency and 10 police booth per constituency.

At an average let there be ~~[illegible]~~ 5 dogs and 2 dogs respectively at a police station and a police booth.

Also, since not every booth has a dog, let 40% of police booth have dogs.

$70 \times 2 \times 5 + 70 \times 10 \times 0.4 \times 2$

$= 700 + 560$ doses

$= 1260$ doses (c)

Total number of doses

$=$ (a) + (b) + (c)

$= 2.90$ lac $+ 36K + 1.26K$

$= 327.26K$ doses

(XXX) Estimate the number of lenses ~~in India~~ manufactured in India.

↳ Population of India = 125 crores

let 20% of popk have eye-sight problem = 25 crores.

Note here lenses mean contact lens, if the question would have been sunglasses, then approach would have been different.

let a person buy a new glasses / lens pair once in 10 months ⇒ lens/glasses pair sold = 25 crores × $\frac{12}{10}$ = 30 crores annually.

Type of lens

- Manufactured in India (Generally Mid level quality)
- Imported from china (Low to mid Quality)
- Imported from Europe / US (High quality)

Note here the question was, the number of lens manufactured in India and not sold in India.

A different question can be to estimate the market size of premium lens in India.

Economic - Status

- Below Poverty Line (15%) — These won't buy lens.
- Low Income (40%)
- Mid Income (35%)
- High End (10%)

These will buy the lens

$4 : 3.5 : 1$

$\therefore 8 : 7 : 2$

$\frac{30 \times 8}{17}$ low income category = 14 crores (approx)

$\frac{30 \times 7}{17}$ medium income category = 13 crores (approx)

$\frac{30 \times 2}{17}$ high-income = 2 crores (approx)

Low - Income

- 60% Chinese
- 40% Indian
  $= 0.4 \times 14$ (a)
  $= 5.6$ crore

Medium Income

- 30% Chinese
- 50% Indian
  0.5×17
  (b) $= 6.5$ crores
- 20% Europe/US

High Income

- Indian (30%)
  0.6 crore (c)
- US/Europe (70%)

∴ Total pair of lens manufactured in India = (a) + (b) + (c)

$= 5.6 + 6.5 + 0.6$ crore

$= 12.7$ crores

Alternate way to estimate the number of people using lens in India. (Total population is 125 crore)

Age wise categorisation

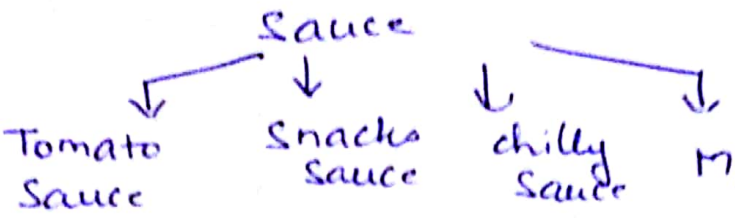
0-18 yrs	18-25 yrs	25 to 45 yrs	45 years and above
(25%)	(10%)	(35%)	(30%)
31.25 Crore	12.5 Crores	43.75 crore	37.5 Crore
↓	↓	↓	↓
20% people use lens	30% people use lens	30% people use lens	90% people use lens
6.25 crore	3.75 Crore	13 crore (approx)	33.75 crore

∴ Total = 10 + 13 + 33.75 crore

= 56.75 Crores

(XXXI) Estimate the amount of sauce sold in Europe.

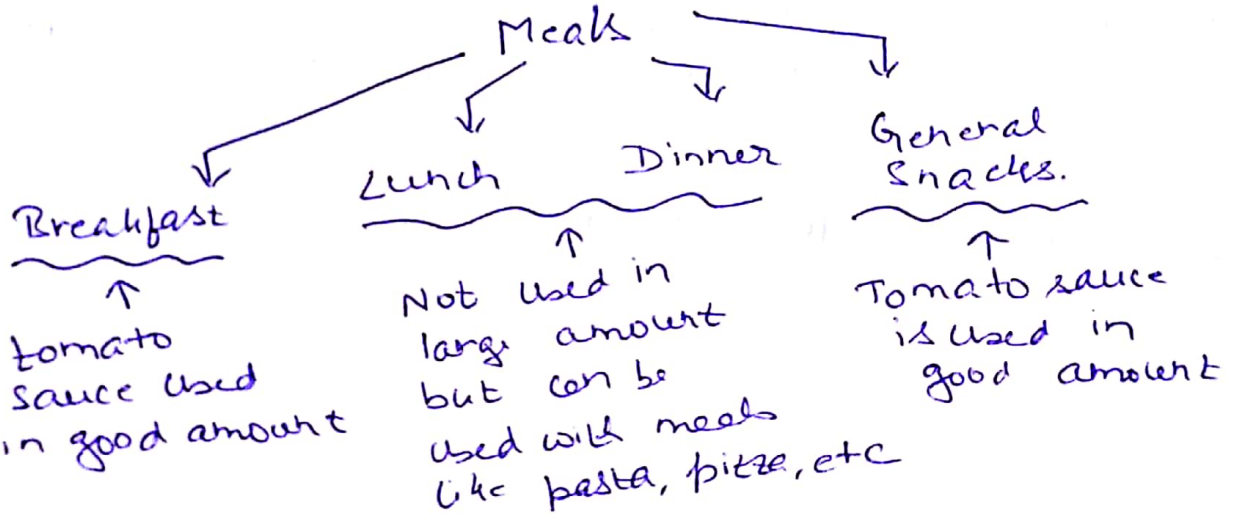
↳



Ask a clarifying question, generally a sub-branch needs to be estimated. Lets say we estimate Tomato ketch-up.

Note population of Europe is roughly 750 million.

Also, lets assume that we are looking at the sauce sold monthly.



Also, note that I assume that 1 kg tomato sauce can be used by a family of 5 for 15 servings. (Thinking about how much, my family consume)

∴ 1kg of Tomato sauce = 75 servings.

Breakfast → assuming that 50% of people consume tomato sauce.

Lunch → 10% of the people consume tomato sauce

Dinner → 10% of the people consume tomato sauce

Snacks → 70% of the people consume tomato sauce

Also, 90% of people have breakfast
90% of people have lunch
60% of people have dinner
50% of people have snacks

∴ 750 million × (0.5 × 0.9 + 0.1 × 0.9 + 0.1 × 0.6 + 0.7 × 0.5)

= 750 million × (0.45 + 0.09 + 0.06 + 0.35)

750 million × (0.95)

Amount of Ketch-up consumed in kg = $\frac{750 \text{ million}}{75} \times 0.95$ kg

= 95 million kg / day

∴ Average consumption per month = 95 × 30 million kg

= 285 million kg / month

∴ Annual consumption = 3.42 billion kg / yr

Annual Revenue = 3.42 billion × €1.5

(Taking average price of €1.5/kg) = €5.13 billion / year.

(XXXII) Estimate the number of super-speciality hospitals in Delhi.

↳ Note whenever you get a term that you don't fully understand, ask the interviewer to ~~fully~~ explain it to you

Super-speciality hospitals treats for a specific illness only. (like a centre for sight is a super-speciality hospital for illness pertaining to vision and eye-sight.)

Population of Delhi = 150 lac

- Below Poverty Line: 10% → 15 lac
- Low Income (40%) → 60 lac
- Mid Income (35%) → 32.5 lac
- High Income (15%) → 22.5 lac

15 lac + 60 lac → Can't afford and hence won't prefer

32.5 lac → 30% can prefer → 9.75 lac

22.5 lac → 100% can afford & prefer → 22.5 lac

∴ Total targetable market size = 32.25 lac people.

If I recall of a super-speciality hospital in my area, I can safely estimate that the hospital treats around 400 patients daily.

$\therefore$ around 400×365

$= 146000$ or 1.46 lac people annually

Assuming that a single person visits the hospital at an average of 4 times per illness we have 36500 patients unique to a hospital.

Also assuming the following

32.25 lac

- Did not visit a hospital once — 35% — 16.125 lac
- Did visit once/annually — 50% — 16.125 lac
- More than once/annually — 15% — average 2 visits/annual — 9.6 lac approx

$\therefore$ Total = 26 lacs approx

$$\#\text{ of hospitals (super-speciality)} = \frac{\text{Total patients}}{\text{Average strength managed by a hospital}}$$

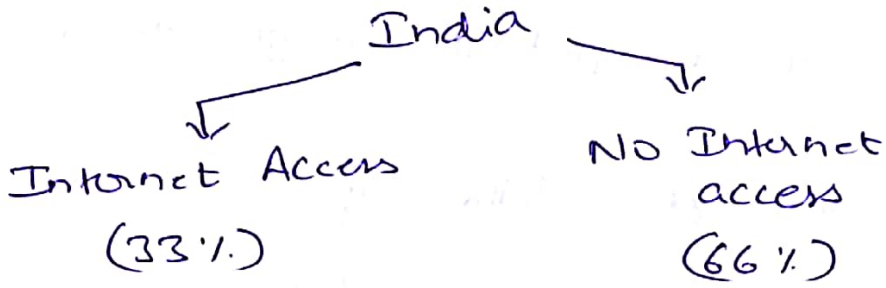
$$= \frac{26 \text{ lac}}{36500} = \frac{2600 \text{ K}}{36.5 \text{ K}}$$

$$= 71 \text{ super-speciality hospitals.}$$

(XXXIII) Estimate the number of rakhi sold online.

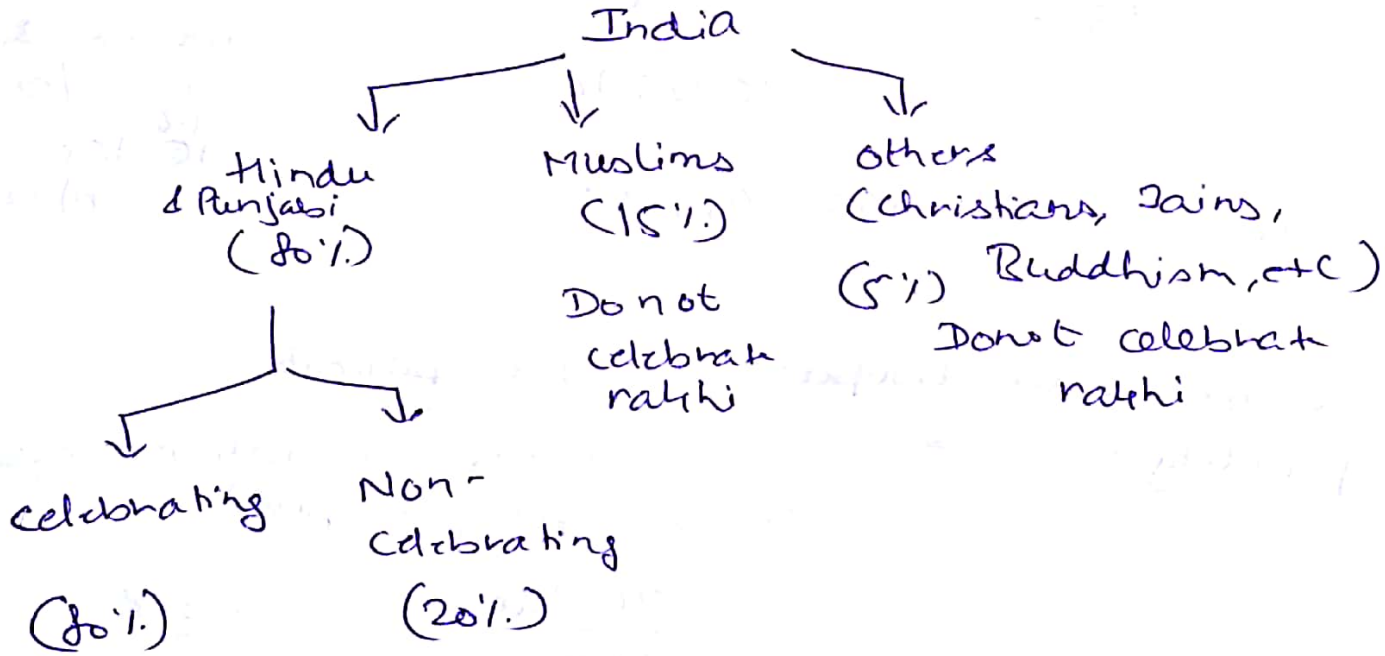
↳ Note that question doesnot specify where these rakhi's are sold.
In Delhi ? In India? Or Globally?

Lets assume the sale of rakhi online in India.



Total population = ~~1.2 Cr~~ 120 Crores

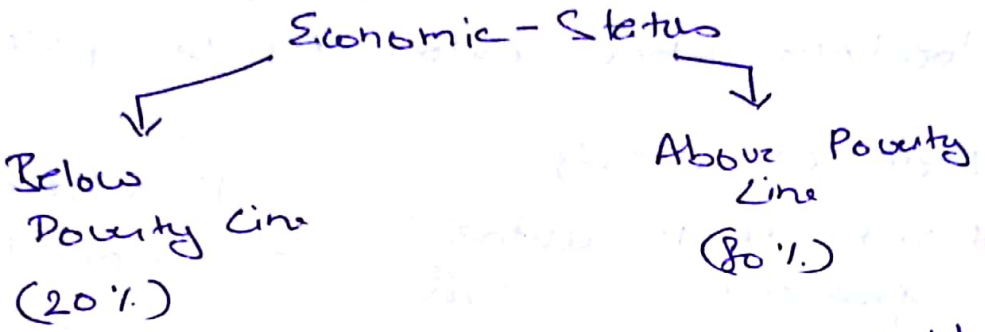
∴ 40 crore ppl have internet access



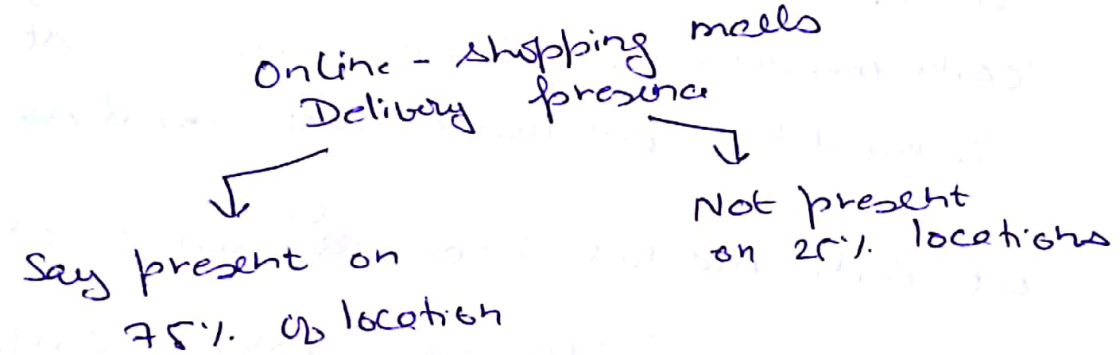
So out of 40 crores who have internet access, how

$40 \times 0.8 \times 0.8$ celebrate rakhi & have internet access

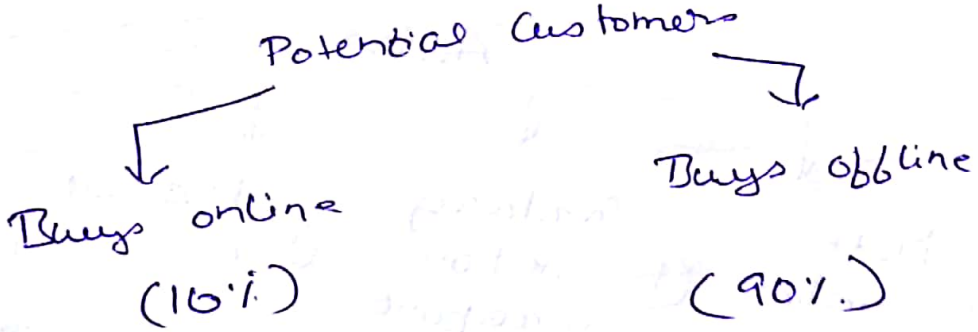
$= 25.6$ crores



$\Rightarrow$ 20 crores approx will purchase rakhi



$\therefore$ 15 crores are left.



$\Rightarrow$ 0.15 crores or 15 lac rakhis are sold online.

(XXXIV) Estimate the number of auto-rickshaws in Delhi

↳ Metro stations in Delhi = 5 metro routes (approx) × 40 stations × 2 Gates

= 5 × 40 × 2 = 400 possible locations where autos can be placed.

Let at an average there be 15 autos present (a)

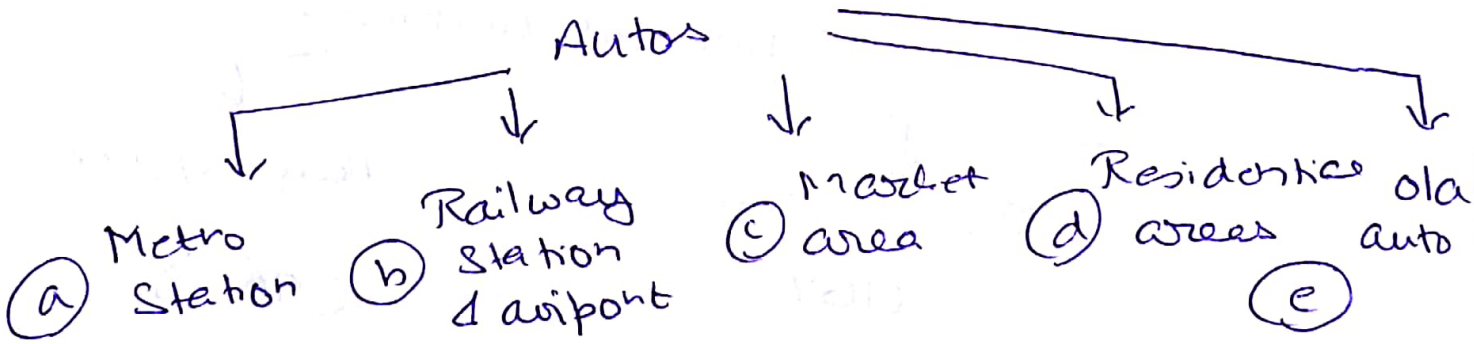
= 15 × 400

= 6000 autos

In Delhi, there are 70 constituency, and in each constituency if we assume at an average 3 markets, we have 210 markets.

Let each market have 50 autos at an average

∴ 50 × 210 = 10500 autos (b)



Now we have 3 Terminals & airport and 2 Railway Stations in Delhi.

assuming each terminal has 250 autos & railway has 200 autos

= 3 × 250 + 2 × 200

= 750 + 400

= 1150 autos (c)

we have 235 wards in Delhi and let there 10 colonies / ward. Each colony suppose has 10 autos

$\Rightarrow 235 \times 10 \times 10 = 23,500$ autos. (d)

To estimate the number of autos operated in Delhi by ola, I estimate the area of Delhi and then ~~recall~~ try to recall how many autos do I see in the app and for how much area

Estimate of Delhi Area $= \frac{1}{2} \times 60 \times 60 = 1800$ sq km

Estimate of the area shown in app $= 10$ sq. km

$= 5$

Average number of autos in that area $= \frac{1800}{10} \times 5$

∴ Number of autos operated by ola $= \frac{1800}{10} \times 5$

$= 900$ autos (e)

Total $= 6K + 10.5K + 1.1K + 23.5K + 0.9K$

$= 41.5K$ autos

(XXXV) Estimate the maternity clothes market in Delhi

↳ Delhi population = 1.5 crores

- Below 18 yrs (25%) → not applicable
- 18 yrs - 30 yrs (20%) 30 lac → 70% willing to marry (21 lac) → marry in 12 yrs period
- 30 - 40 yrs (15%) 22.5 lac → 20% marry in this age (4.5 lac) → marry in 10 years period
- 40 yrs and above (40%) 60 lac → 10% marry in this age (0.6 lac) → marry in around 15 years period.

∴ Average number of marriages in Delhi $= \frac{21}{12}$ lac $+ \frac{4.5}{10}$ lac $+ \frac{0.6}{15}$ lac

$= 1.75 + 0.45 + 0.04$ lac

$= 2.24$ lac

Economic - Status

- Below Poverty Line (15%)
- Low Income (40%) → average spend on a dress ₹ 8k
- Middle Income (35%) → average spend on a dress ₹ 20k
- High Income. (10%) → Average spend on a dress ₹ 30k

Average cost of the clothing = $(0.4 \times 8 + 0.35 \times 20) \times 1000$

$= 14.7\text{K} \sim 15\text{K}$ / dress

Also, generally 30 close relatives do wear traditional attire.

Total Revenue $= 30 \times 15{,}000 \times 2.24$ lac

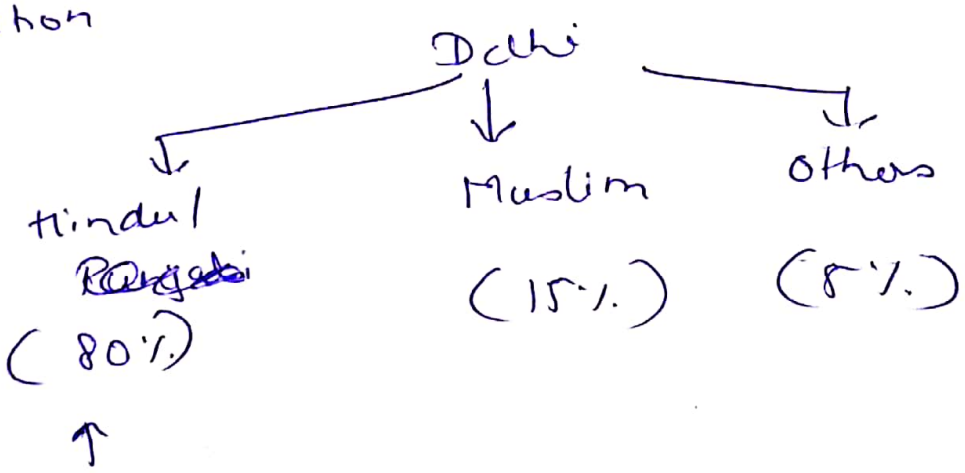
$= 4500 \times 2.24$ crores

$= 10080$ crores

$\therefore$ In US \$, $\frac{10080}{65}$ crores $= \underline{\underline{\$1.55}}$ billion

Here note that by market we interpreted revenue generated. It is advisable to ask clarifying question on this regard to be sure what the interviewer wants.

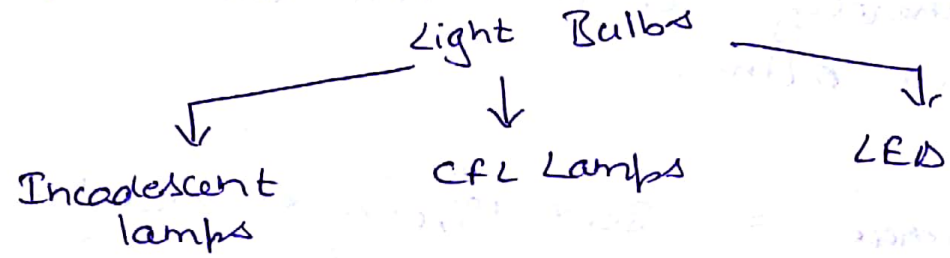
Note, we could have further used the following information



If only Hindu dresses were asked to estimate we would have taken 0.8 of that value.

(XXXVI) Estimate the total number of light bulbs currently in use in Dehi.

↳

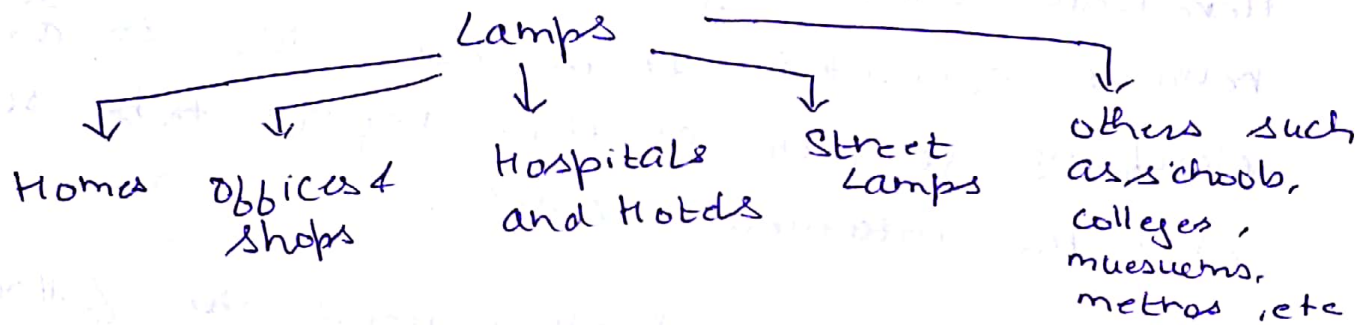


Cheapest but highest power consumption

somewhere in b/w the two.

Costlier but lowest power consumption

Lets say, we need to estimate only the LED Lamps.



(other places can be the lights in automobiles like cars, scooters, etc. and there can be many more place)

Now for street lamp, we need to estimate the road network and then assume that, say, 90% is well-lit by lamps. Next we assume a lamp at every 10 metres apart and each street lamp post has two bulbs.

Homes can be estimated by family numbers. (Lets look at this one in larger details.)

Number of people in Delhi = 150 lac people

Average number of people per house = 4 to 5

∴ 30 lacs to 37.5 lacs

⇒ 35 lac families.

Economic health

Below Poverty Line (15%)	Low-income (40%)	Mid Income (35%)	High Income (10%)
owns a house, 60%	100% of these own a house	at an average these hold 1.25 houses	at an average hold 2 homes.
These will be small apartments (1bhk, 2bhk)		an entire building on a 3bhk, 4bhk.	an entire building
(3.15 lac homes)	(14 lac homes)	(15.40 lac homes)	(7 lac homes)

2 LEDs for a bathroom

2 LEDs for a kitchen

3 LEDs for a bedroom

5 LED for a drawing room

∴ an apperthment say has 40 lamps

∴ 1bhk

= 5+3+2+2 = 12 lamps

2bhk

5+2+(2+3) + (+2+3) +2 = 19 lamps (20)

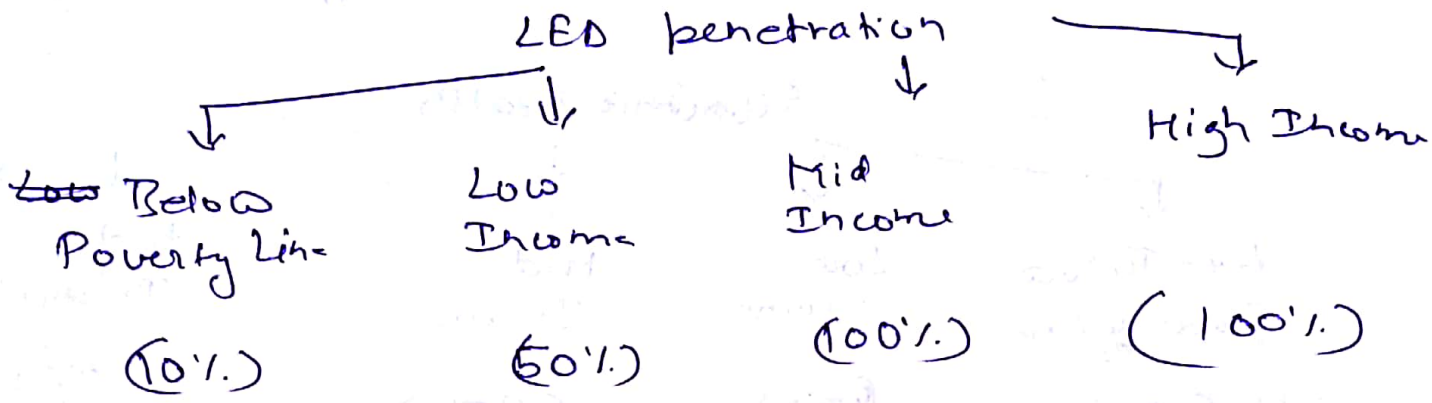
3bhk

= 19+5 lamps = 24 lamps (25)

4bhk

= 24+5 = 29 lamps (30)

Now also, a below poverty line and Low income people will refrain from buying an LED (due to high ~~in~~ investement)



(Also average lamps for 1bhk & 2bhk be 15 lamps)

$\therefore$ $0.1 \times 15 \times$ 2.15 lac $+$ $0.50 \times$ 15×14 lac $+$ $7.7 \times 25 + 7.7 \times 30$ lac $+$ 7×40 lac

$=$ 4.725 lac $+$ 105 lac $+$ $231 + 192.5$ lac $+$ 280 lac

$=$ 811.225 $=$ 811.225 lac

$=$ 8.11 Crores lamps

(For household purposes)

Average market revenue ~~for~~ ~~year~~ for current the year

~~Total~~ $=$ First time buyer $+$ Repeat order

Let the economy of Delhi grow by 8%. and let the lamps industry grow by say 10% due to various government schemes and push for LED Lamps.

(We know that the industry for incandescent lamp & CFL is shrinking.)

First Time buyers = 8.11 x 0.1 crore (b) on 80 lacs (approx)

Repeat buyers = $\frac{8.11 \text{ crores}}{\text{average life of the LED}}$ = $\frac{8.11 \times 4}{10}$ crores

Let average life of the LED be 2.5 yrs

(a) = 3.244 crores.

Total = (a) + (b) = 3.244 crore + 0.8 crore

= 4.044 crores LED Lamps.

to

Further Question can be estimate the revenue of the Industry. ∴ Note so far, we have only calculated for houses (residential purposes). To estimate the the lamps used throughout Delhi, a more rigorous approach is needed.

Type of CFL Lamps

Low wattage (4 watt, 5 watt, 7 watt)	Mid-wattage (7 - 12 watt)	High-wattage (12 watt above)
average price - 120/-	average price - 160/-	average price - 200/-
30% of the time used	50% of the time used	20% of the time used
In washroom, bathroom or may in kitchen	used in Bed room, kitchen, drawing, washroom	Generally in Drawing Room or other central area

$\therefore$ 4 crore $\times$ (0.3 $\times$ 120 + 0.5 $\times$ 160 + 0.2 $\times$ 200)

= 4 crore $\times$ (36 + 80 + 40)

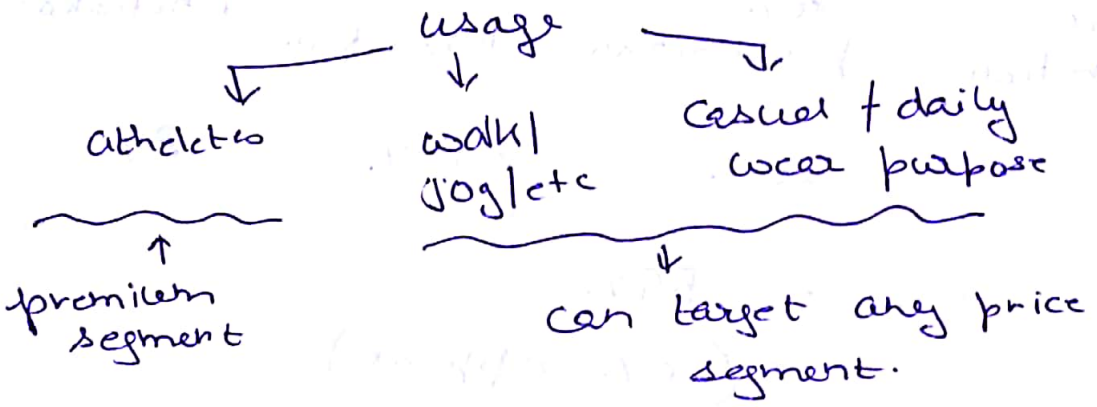
4 crore $\times$ 156

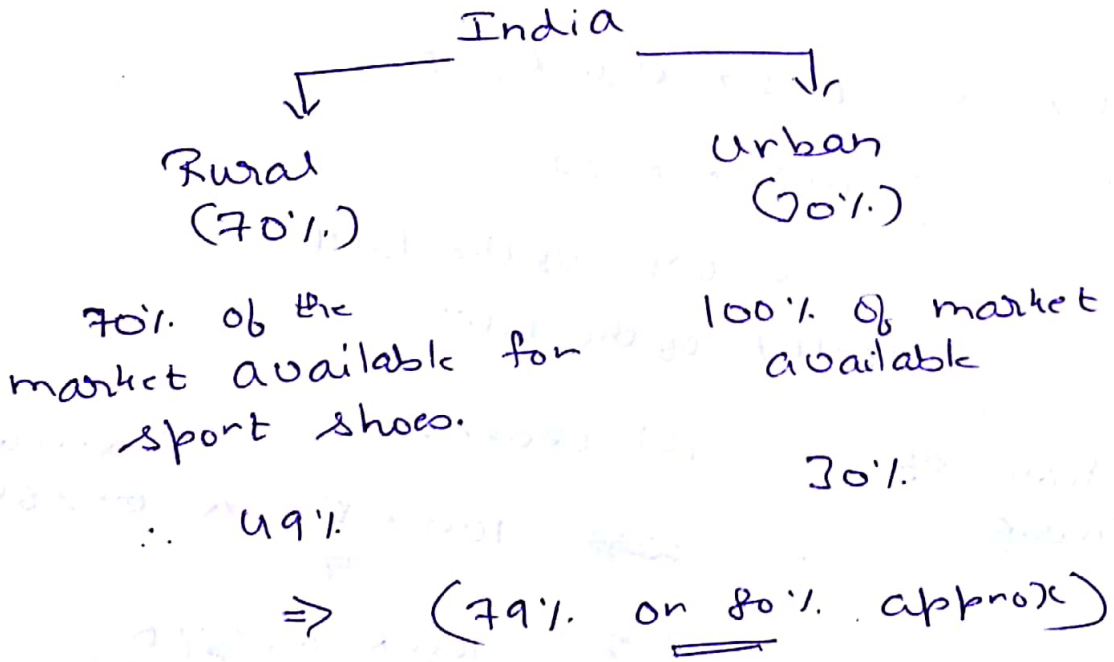
= 624 crores.

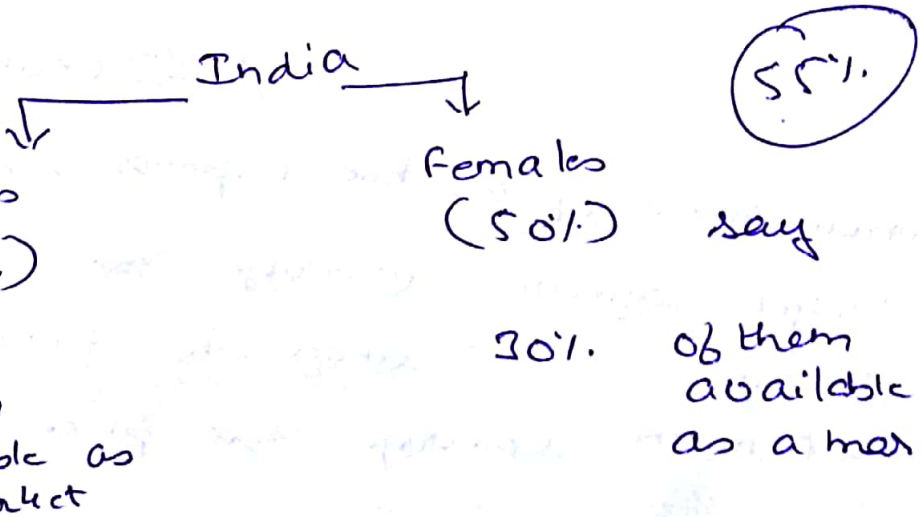
Note again this is the estimate for the residential use only.

(XXXVII) Estimate the annual size of sports shoes in India.

↳ Sport shoes are generally used by athelctes and by citizens for going to a walk or jtb. or for general day to day purpose.







∴

Age-wise segeration

below 15 years	15-30 yrs	30-45 years	45-60 years	60 years and above
~~(20%)~~ 25%	(25%)	(20%)	(20%)	(10%)
40% penetration	80% penetration	60% penetration	40% penetration	20% penetrat
15%	20%	14%	8%	2%

= 59%.

= (60% approx)

Weighted mean = $0.8 \times 0.6 \times 0.55$

= 0.8×0.33

= 0.264 of the total

26.4% of the total

population of India = 125 crores.

= ~~125~~ $100 \times \frac{5}{4} \times \frac{0.066}{0.264}$

= 100×0.330

= 33 crores

Average price of a shoe (sports shoes)

↳ Budget segment (average shoe price 500/-)

↳ Mid level (average shoe price 1200/-)

↳ ~~Per~~ Premium (average shoe price 3000/-)

let the average life of a sports shoe be 10 months.

∴ Number of shoes sold annually = 33 crores $\times \frac{6}{5}$

= 6.6 × 6 crores = 39.6 crores

Market - spent

Budget	Mid level	Premium
(60%)	(30%)	(10%)
average price = 500/-	1200/-	3000/-

∴ weighted average price = 0.6 × 500 + 0.3 × 1200 + 0.1 × 3000

= 300 + 360 + 300

= 960/-

Total market value = 39.6 crores × 960

= 38016 crores (INR)

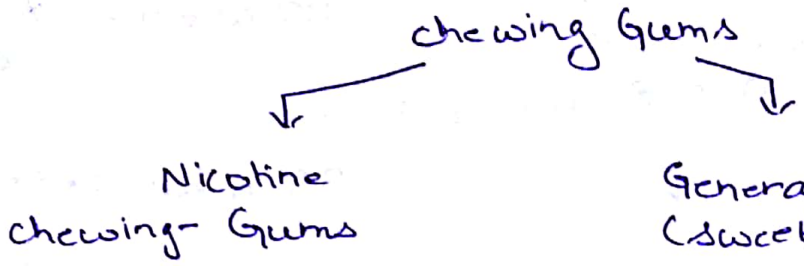
Taking the average US $ price to be ₹60

∴ $ $\frac{38.016}{6}$ billion

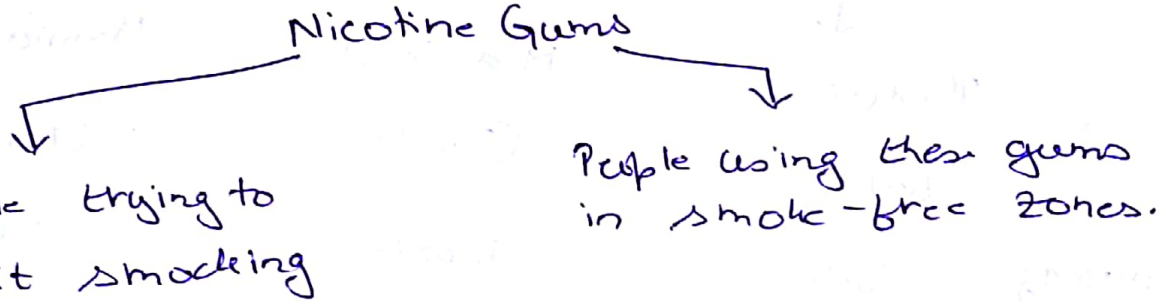
• $6.336 billion (US Dollar)

(XXXVIII) Estimate the market size of chewing gums in India (annually).

↳

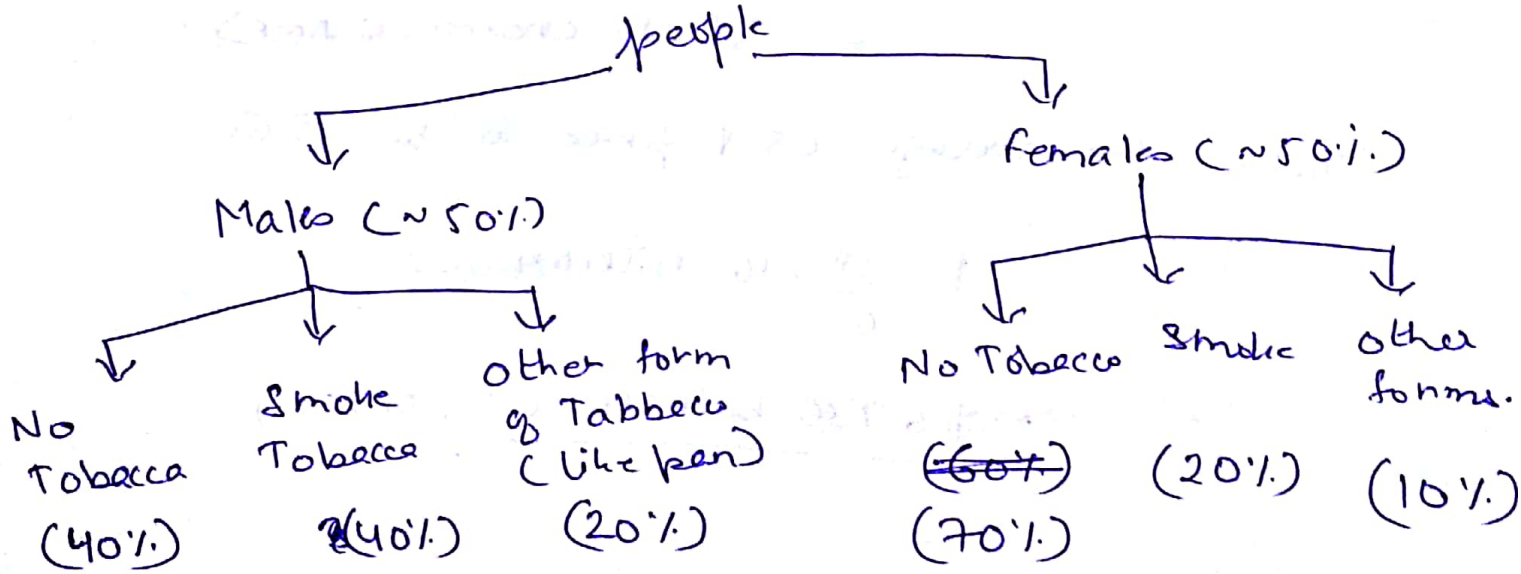


(which one needs to be estimated?)



Population of India = 125 crores → above 18 years (80%)
→ below 18 years (20%)

∴ 100 crore people above 18 years age



average number of smokers = $(0.4 \times 0.5 + 0.2 \times 0.5) \times 100$ crores

$= (0.2 + 0.1) \times 100$ crores

$= 300$ crores.

Say 20% want to quit smoking ~~that~~ and they consume at an avrag 3 chewing gums daily.

The Remaining 80% use @2 chewing gums, ~~once~~ every week.

$\therefore 30 \times 0.2 \times 3$ crores $+ 0.8 \times 30 \times 52 \times 2$ crores

0.8×312 crores

$\times 365$

9×730 crores $+ 249.6$ crores

$= 6570$ crores $+ 249.6$ crore chewing gums

$= 7069.4$ crores chewing gums.

~~If a single strip of gum contains 10 chewing~~

Let the avrg cost of a nicotine chewing gum be ₹2/pa piece

$\therefore$ Total Industry Revenue $= 14138.8$ crores (INR)

$= \frac{14138.8}{60}$ crores (USD)

$= \$ 2.35$ billion (USD)

Chewing gums (sweets)

(a) as a means to kill change (at shops)

(b) General consumption by individuals.

as a means to kill change in a shop

Work (labourforce)

- Agriculture (50%)
- Industry (20%)
- Services (30%)

Note Retails business is a type of services industry

Also, estimated labourforce of India = 500 million

∴ 150 million people in services

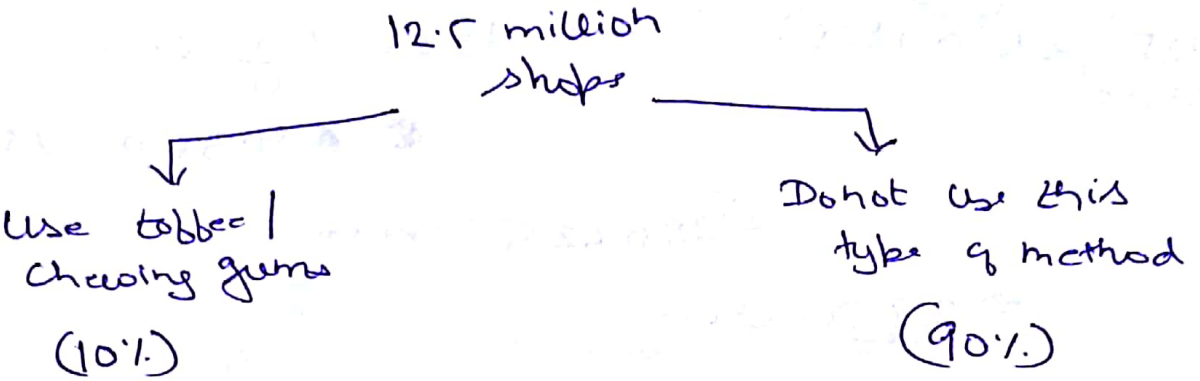
Services

- Retail (10%) 50 million people
- All others like service class, hospitals, Engineers, musicians, artists, etc (90%) 450 million

Let at an average 4 people are employed in a retail shop

∴ 12.5 million retails shop.

Now not every shop uses toffees / chewing gums to kill charge. Only a limited number of shops like panwaalas, small grocery shops, small dairy shops, etc will have them. Or big general stores have them (in organised sectors)



Let at an average they sell 20 chewing gums like this.

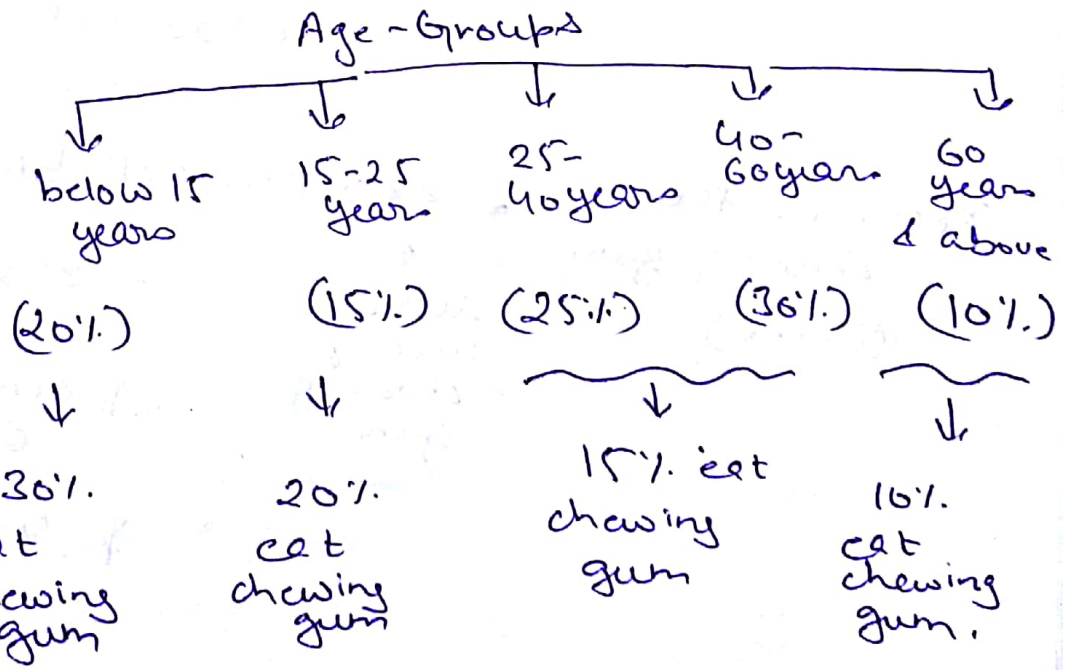
$\therefore$ 1.25 million × 20 × 365 days

1.25 million × 7300

$= \frac{5}{4} \times 7.3$ billion $= \frac{36.5}{4}$ billion $= 9.125$ billion chewing gums.

(a)

Now people Genuinely buying chewing gums



$125 \text{ crore} \times (0.2 \times 0.3 + 0.15 \times 0.2 + 0.25 \times 0.15 + 0.3 \times 0.15 \times 0.1 \times 0.1)$

$= 125 \text{ crore} \times (0.06 + 0.03 + 0.0375 + 0.045 + 0.01)$

$= 125 \text{ crore} \times (0.1825) = 18.25 \times \frac{5}{4} \text{ crore}$

$= 4.5625 \times 5 \text{ crore}$

$= 23.0625 \text{ crore}$

$\Rightarrow 23.30 \text{ crore}$

Let the average consumption be 10 chewing-gums per week.

$= 23.30 \times 10 \times 52 \text{ crore}$

$= 121.1 \text{ billion}$ (b)

∴ Total number of chewing-gums sold $= 121.1 \text{ billion} + 9.125 \text{ billion}$

$= 130.225 \text{ billion}$

Revenue from chewing gum (Sweet) $= 2\$ \times 130.225 \text{ billion}$

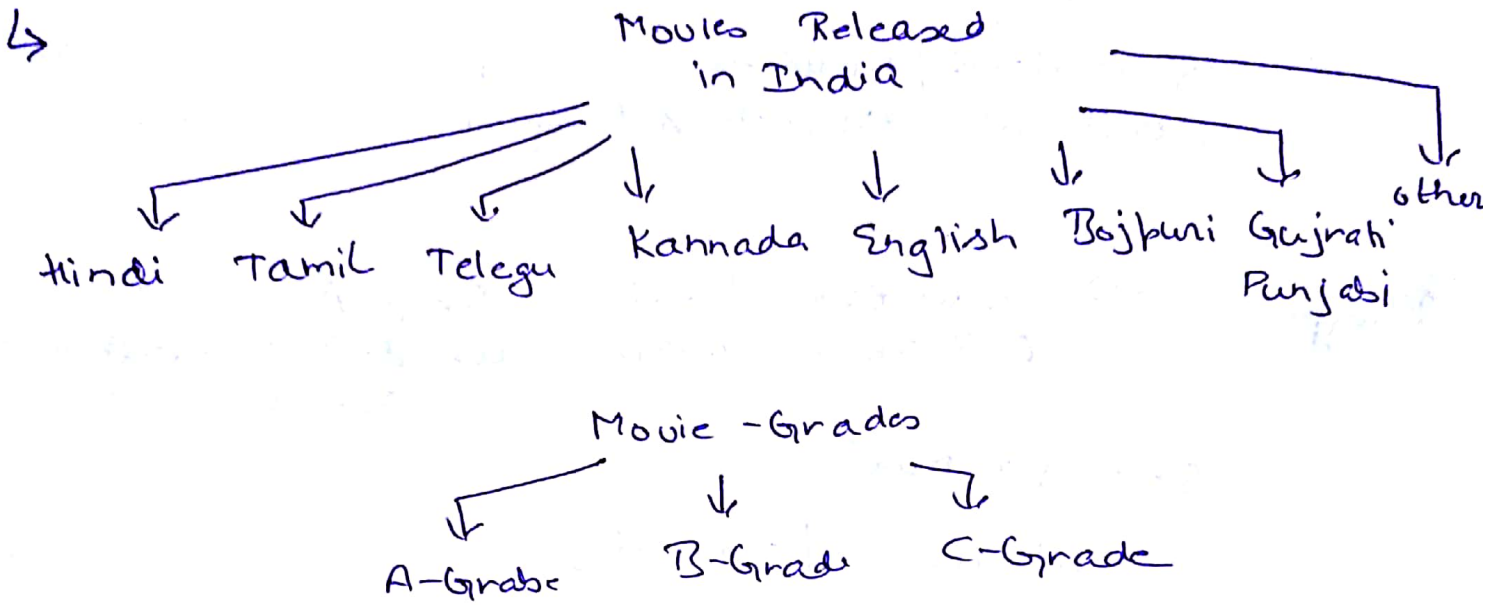
↑ average cost of a chewing gum

$= ₹ 260.45 \text{ billion}$

$= \$ \frac{260.45}{60} \text{ billion}$

$= \$ 4.34 \text{ billion}$

(xxix) Estimate the number of movies Released in India annually.



Hindi Movie →

1.5 movies / week - Grade A
2.5 movies / week - Grade B
2.0 movies / week - Grade C

7 movies / week)

∴ 7 × 52 weeks = 364 movies annually.

Tamil movie =

1 movie / week Grade A
2.5 movie / week Grade B
3.0 movie / week Grade C

(6.5 movies / week)

∴ 6.5 × 52 = 338 movies annually.

Telegu movies

1 movie / week - Grade A
2.0 movie / week - Grade B
3.0 movie / week Grade C

= 52 × 6 = 312 movies annually

Gujrati & Punjabi movies → 0.6 movies/week - Grade A
0.2 movie/week - Grade B and Grade-C as well

∴ 52 movies/annually each for Gujrati & Punjabi

Bhojpuri → 0.6 movies/week - Grade A
0.3 movies/week - Grade B & Grade C as well

∴ 52 × 1.2 movies
= 64 movies/annually.

other languages = 1.5 movie/week → Grade A
3.0 movie/week → Grade B
3.0 movie/week → Grade C

∴ 7.5 × 52 = 390 movies annually.

English/Foreign movies = 0.6 movies/week
= 52 × 0.6 = 32 movie

Total = 364 + 338 + 312 + 52 + 52 + 64 + 390 + 32

= 1604 movies.

XL) Estimate the average number of hours A.C. are run in Delhi over a year.

↳ March April May June July
31 30 31 30 31 — summer months

∴ 153 days.

During summers, A.C. are run over the night (during the sleep-time) at an average of 3 hours

And say 2 hours for the afternoon time (12PM - 4PM).

And an hour extra for the evening / morning time

∴ 6 hours / day

⇒ 6 × 153 hours / summer = 918 hours / sum.

This is for a household for middle-income. The actual hours may vary. Also the amount for which A.C. are run in commercial space will be different.

August September October
30 31 30 — Rainy / autumn

∴ 91 days

During this time say an average income household operates an AC for 1 hour each during afternoon and night.

~~Also~~ ~~to~~ ∴ 2 x 91 hours / autum

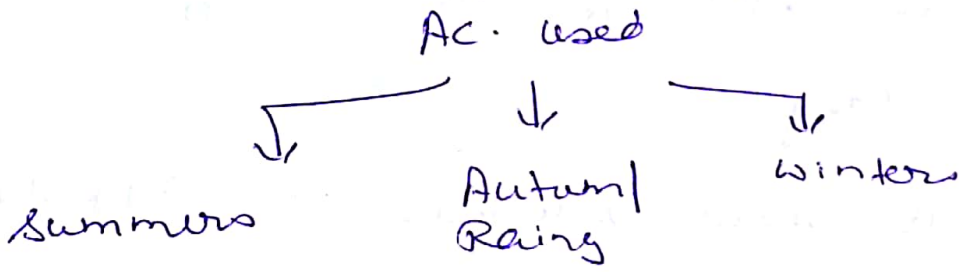
⇒ 182 hours / autum

November	December	January	February
30	31	31	28

∴ 120 days winters

The AC. is hardly used during these times in domestic purposes.

∴ 0 hours / winter

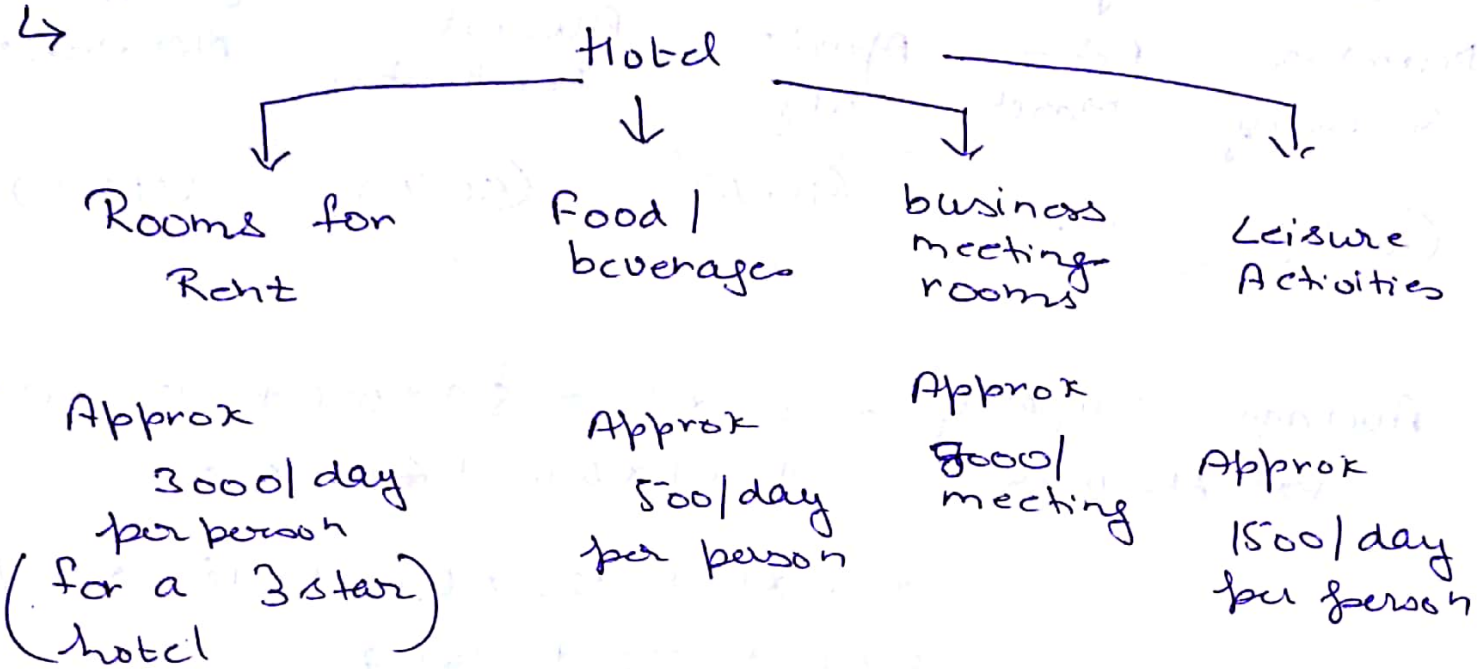


∴ Total usage = 918 + ~~822~~ 182 + 0

= 1100 hours / year

(XLI) Estimate the revenue of a hotel / lodge in Goa in a year

↳



Now let the hotel be having 40 rooms for tourists and say 10 meeting rooms for the business purposes.

At an average lets assume that each room for tourists houses 2 persons.

∴ Revenue from a Tourist Room = 3000 + 2×500 + 1500 ×2

= 3000 + 1000 + 3000

= 7000 / day

Revenue from a business meeting Room = 8000 / meeting

and let there be two meeting per day in a room

⇒ 16000 / day

occupancy for Tourist Rooms

- December - January (100%)
- Feb - March (60%)
- April - July (90%)
- August - September (60%)
- October - November (90%)

Average occupancy for the year = $62 \times 1 + 59 \times 0.6 + 122 \times 0.9 + 61 \times 0.6 + 61 \times 0.9$

$= 62 \times 1 + 120 \times 0.6 + 183 \times 0.9$

$= 62 + 72 + 164.7$

$= 298.7$ days

(or 300 days approx)

Revenues from the tourists = # of rooms x revenue from one room x # of days occupied

$= ₹40 \times 7000 \times 300$

$= ₹12000 \times 7000$ / annually

$= ₹\ 84000\ 000$ / annually

or ₹ 84 million

occupancy for ~~Tourist~~ Business Rooms

- Non-Festive Period (10 months) 80%.
- Festive Period (2 months) 60%.

Average occupancy $= \frac{0.8 \times 10 + 0.6 \times 2}{12}$

$= \frac{9.2}{12} \sim 75\%$ occupancy

Revenue from Business-meeting rooms = # of rooms × average revenue from a day × # of days occupied.

$= £10 \times 4000 \times \frac{3}{4} \times 365$

$= £40000 \times 1095$

$= £43800000$

$\Rightarrow £43.8$ million

∴ Total Revenue $= £84$ million + $£43.8$ million

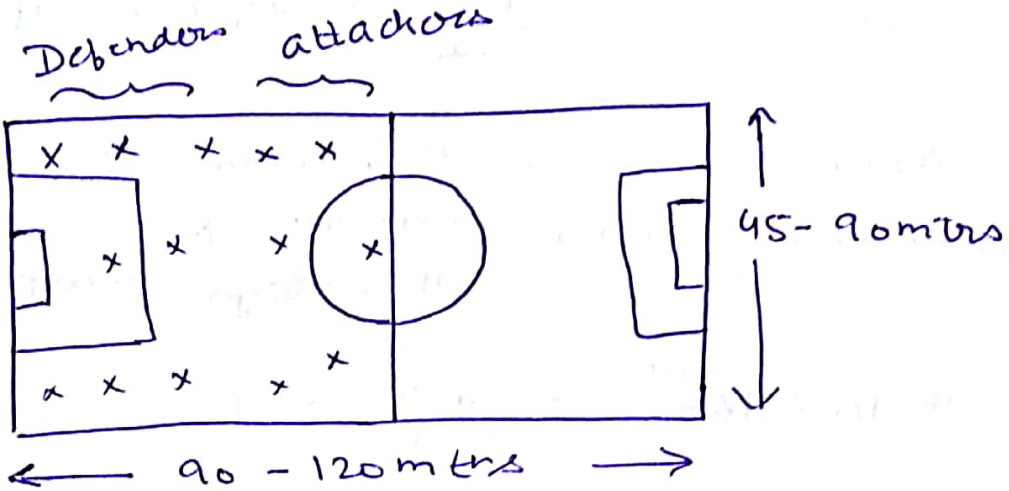
$= £127.8$ million

(approx $\$ 2$ million / annually)

Note- The occupancy depends upon what the hotel offers to its customers in comparision to the competition. How good is its services and customer retention policies (especially for business customers).

(XLII) Estimate the average distance run by a football player in an average match

↳



A football match is of two halves, each of 45 minutes. and the stoppage time is added to each half.

So let the total playing time be 90minutes and the stoppage time compensate for any delays.

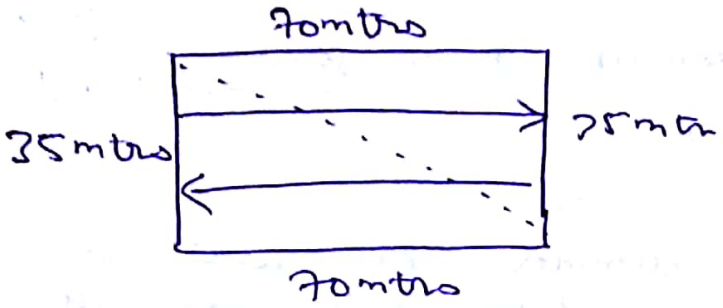
Generally the attacker / defender disperses a distance of two-thirds of the total length.

∴ average length of the field = $\frac{120+90}{2}$ = 105m

dispersed by a player ∴ $\frac{2}{3} \times 105$ or 70m.

Average width of the field = 65 mtrs

Generally a player travels half = 35mtrs approx the width



At an average let the player move along this ~~dotted~~ ~~line~~ = ~~line~~ * area and and in round trip travels a distance of

$70 + 70 + 20 + 20 = 180$ mtrs.

Let a player do this every 2 minutes. (Average time taken by a team to attempt to strike a goal.)

∴ 45 attempts are made at an average.

Also let the person remain on field for 2/3rd of the time. and is substituted for the remaining time.

$\Rightarrow 180m \times 45 \times \frac{2}{3}$ m = 180 × 30 mtrs

= 5.4 km

(XLIII) Estimate the Power consumed in your house in a day.

↳ Power consumed on a summer day will be different from that on a winter day. We will show summer day as from there winter day calculations can be visualised easily.

- Power Rating of AC — 1 unit / hour
  # of ACs = 2.

  1 AC operates for 3 hours (during daytime) and 2 ACs operates for 3 hours (during night time).

  ∴ 9 hours / day = 9 units / day.

- Power Rating of a Refrigerator = 0.2 units / hour
  # of hours working in a day = 22 hours
  ∴ 4.4 units / day

- Power Rating of water pump = 2 units / hour
  usage = 1 hour / day.

  ∴ 2 units.

- Power Rating of microwave oven = 0.5 units / hour
  usage = ~~2d~~ 1 hour
  = 0.5 units / day.

- water heater usage = 2 hours at 1 unit / hour rating
  = 2 units / day

- # of fans in the home = 3 bedrooms + 3 washroom + 1 kitchen + 2 drawing room

= 9 fans (~~cie~~ ceiling fans)

3 washroom + 1 kitchen (exhaust fan)

= 4 fans.

Power Rating of fans = 0.1 units/hour

usage = 2 hours/day for exhaust fan + 22 hours/day for ciding fan

$= (2 \times 4 + 9 \times 22) \times 0.1$ units/day

$= 19.8 + 0.8$ units

$=$ ~~20~~ 20.6 units/day

- # of Lamps/Tubelight = 5 × 3 bedrooms + 3 × 3 washrooms + 8 × 1 drawing room + 4 × 1 kitchen

$= 15 + 9 + 8 + 4 = 36$ lamps/tubelight

average power ratings = 0.025 units/day

average usage = ~~10 hrs~~ 10 hours/day for each lamp/tubelight

$= 0.025 \times 36 \times 10$

$= \frac{25}{1000} \times 36 \times 10 = 9$ units/day

- power rating of a TV = 0.3 units / hour
  average usage = 3 hours / day

  # of TV = 2

  ∴ $2 \times 0.3 \times 3$ = 1.8 unit / day.

- Power consumption of a Laptop / P.C = 0.4 units / day

  average usage = 2.5 hours

  ∴ 1 unit / day.

- Average power consumption of electronic gadgets like a mobile phone, electric iorns, other kitchen ~~etc~~ equipments like grinders, juicers, etc = 2 units / day.

∴ Total consumption = 1 + 9 + 4.4 + 2 + 0.5 + 2 + 20.6 + 9 + 1.8 + 1 + 2 unit / day

= 57.3 units / day.

Monthly bill during summers = 57.3 × 30

= 1719 units / month.

Average cost of electricity = ₹ 6 / unit

= 1719 × 6

= ~~₹ 10200~~ ₹ 10,314 / month

approx ₹ 10k / month.

Note that during winters, we do not have fans/ ACs running for longer duration which will save a lot of energy.
We will have water heater running for longer durations though.

Also to estimate the power consumed by Delhi Annually we will need to consider the amount of families (if only domestic power consumption is considered). Further we will have to divide the consumptions in summer, winter & autumn seasons.

Also this is power consumed in Kw/hour which is a commercial unit for electricity.

Delhi Domestic Power consumption

	Below Poverty Line	Low Income	Middle Income	High Income
	(15%)	(35%)	(40%)	(10%)
Power consumption	0.3x than middle income	0.7x than middle income	1x	1.7x than middle income

Take this weighted average and then multiply by number of households and power consumed by a middle income family annually.

(XLIV) Estimate the number of Youtube videos streamed in Delhi on a day.

↳ Population of Delhi = 1.5 crores.

Delhi

- Below Poverty Line (15%) (20 lac)
- Above Poverty Line (85%) (1.3 crores)

↑ These people have mobile access.

Mobile Access

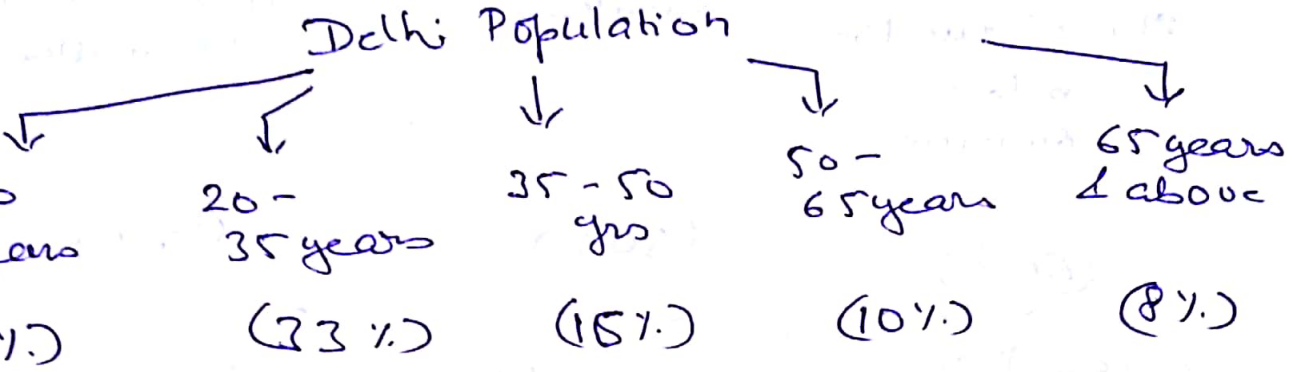
- 2G handset (feature phone) (20%) 26 lac
- 3G/4G handset (smartphone) (80%) 1.04 crore

Internet Access methods

- ↳ Mobile Phone (80%)
- ↳ Broadband (20%)
- ↳ cyber cafe (≈1%)

This means that out of total of 1.5 crores people 1.04 crores or approx 2/3 have internet access.

Also the amount of time spent will be different on a working day than a weekend.



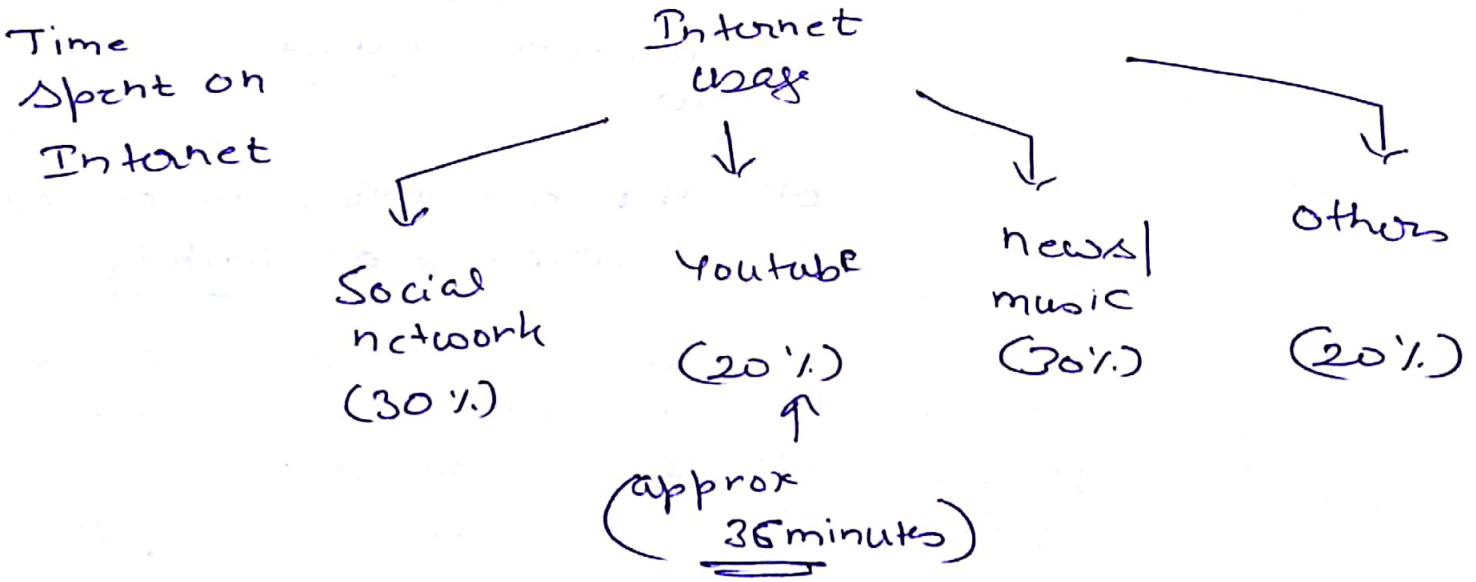
- Average time spent on internet: 4 hrs/day, 3 hrs/day, 2 hrs/day, 1.5 hrs/day, 1 hr/day

$$\therefore \quad 4 \times \frac{1}{3} + 3 \times \frac{1}{3} + 2 \times \frac{1}{6} + 1.5 \times \frac{1}{10} + 1 \times \frac{1}{12}$$

$$= \frac{4}{3} + 1 + \frac{1}{3} + 0.15 + 0.08$$

$$= 2.67 + 0.15 + 0.08 \text{ hours/day}$$

$$= 2.90 \text{ hours/day}$$



Youtube Videos.

Short duration below 6 minutes	Medium Duration 6 - 20 minutes	Long Duration 20 minutes +
(60%)	(30%)	(10%)
songs, trailers etc	short films, shows, movie clips, etc reviews	TV series, educational videos, shows, etc

Average Duration of a youtube video = 5 minutes × 0.6 + 10 minutes × 0.3 + 15 minutes × 0.1

= (3 + 3 + 1.5) or 7.5 minutes.

∴ Number of Youtube videos streamed = 1 crore × $\frac{36}{7.5}$

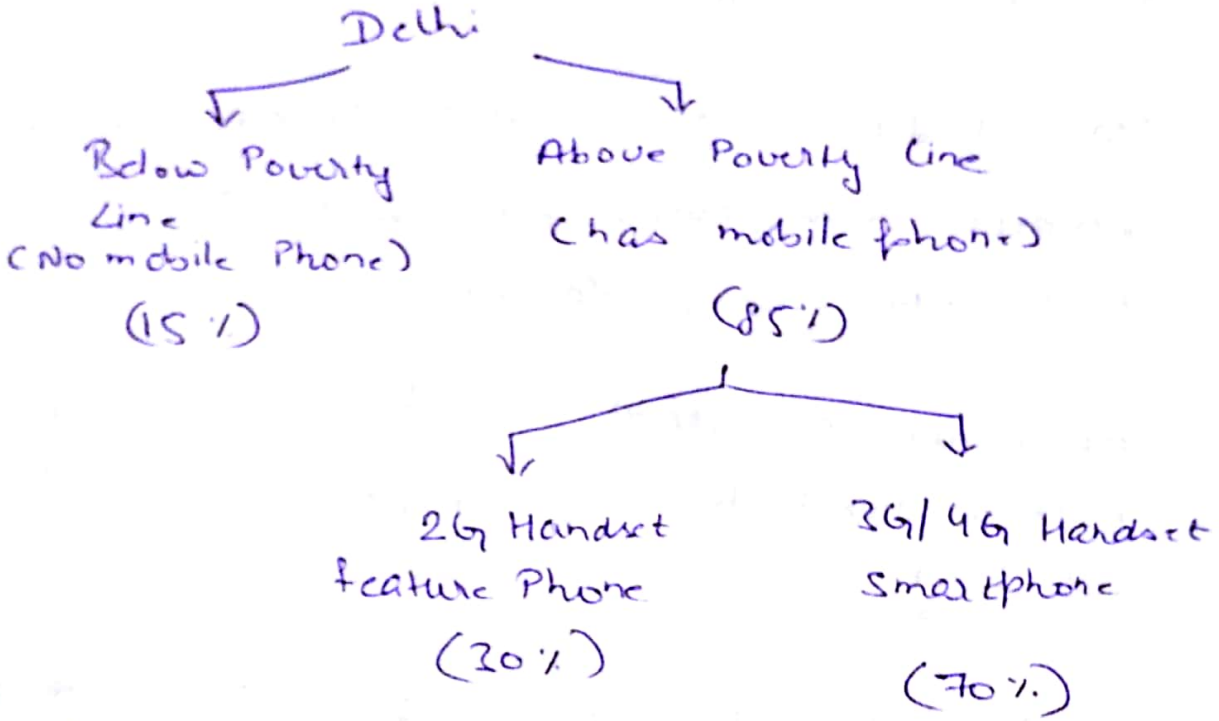
= 1 crore × $\frac{36}{3} \times \frac{4}{10}$

= $\frac{48}{10}$ crore videos.

or 4.8 crore times. videos are streamed on Youtube.

(XLV) Estimate the amount of data consumed by Delhi on a single day

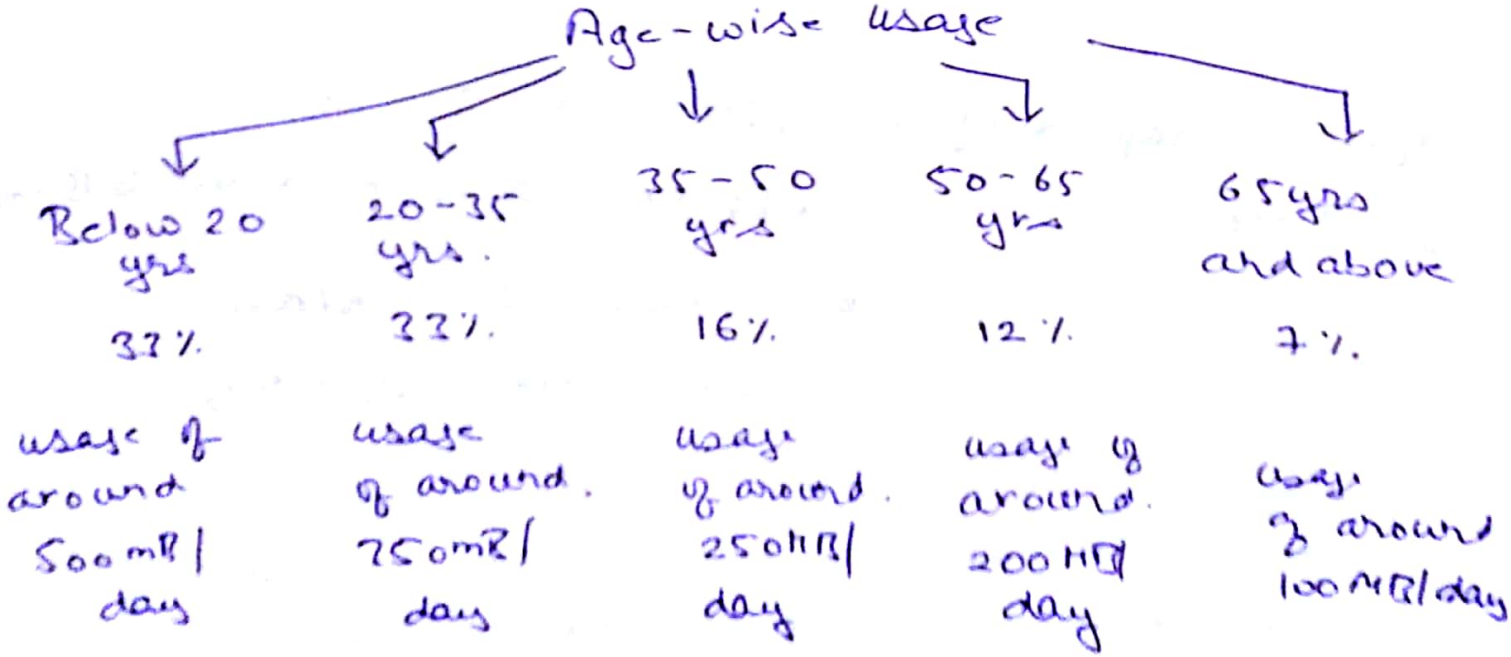
↳ Population of Delhi = 1.5 crores.



∴ People with internet access = $0.85 \times 0.7 \times 1.5$ crore

$= 0.595 \times 1.5$ crore

$\sim 0.6 \times 1.5$ crore or 0.9 crore



Note young population will use more data owing to the fact that they will be using social media (facebook, whatsapp, twitter, shapchat, etc) and digital media (such as Netflix, movies, youtube, etc) at a larger extent.

Many people will use data because of whatsapp, emails, data / cloud sync, ~~etc~~ online collaboration, maps, ~~etc~~. uber, ola, etc

Also now as data has become cheap and is within reach to larger population, data consumption is high.

weighted average data usage = $0.37 \times (500 + 350) + 0.16 \times 250 + 0.12 \times 200 + 0.07 \times 100$

$= 283 + 40 + 24 + 7$

$= 354$ MB / day

Total average daily usage = 354 MB $\times$ 90 lac

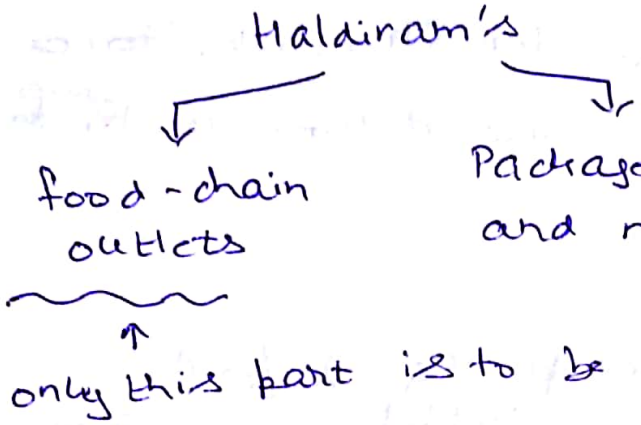
= approx 0.35×90 lac GB / day

= 305 lac GB / day

= 3.05 crore GB / day

XLVI) Estimate the revenue of Haldiram food chain in India in a single day.

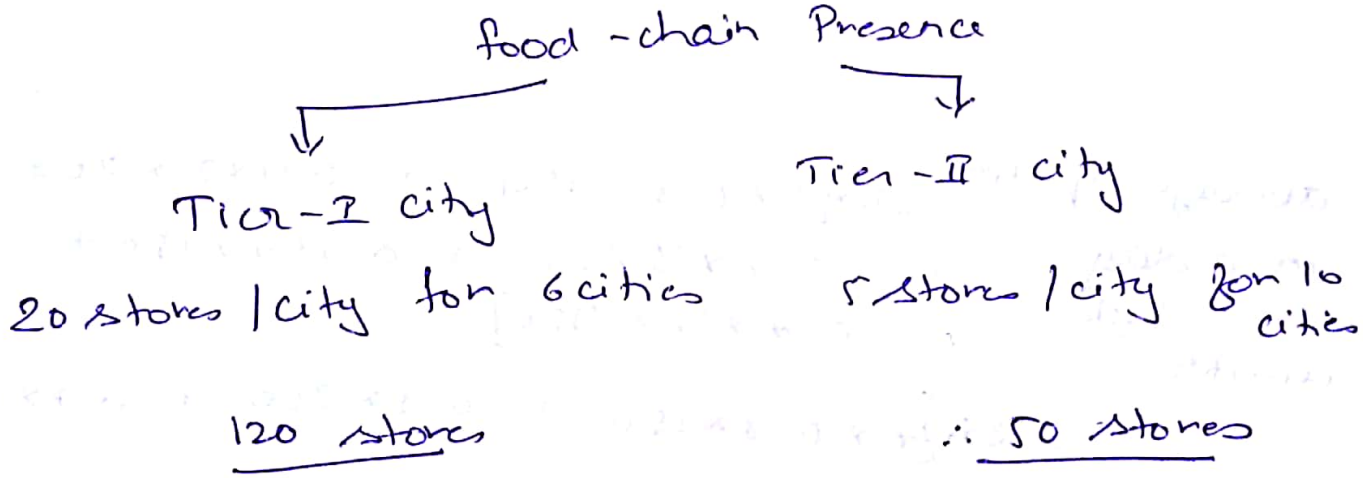
↳



Also, note that Haldiram's food-chain is present only in select cities across India.

Lets assume that Haldiram's is present in 6 Tier-I cities with an average 20 stores in each cities.

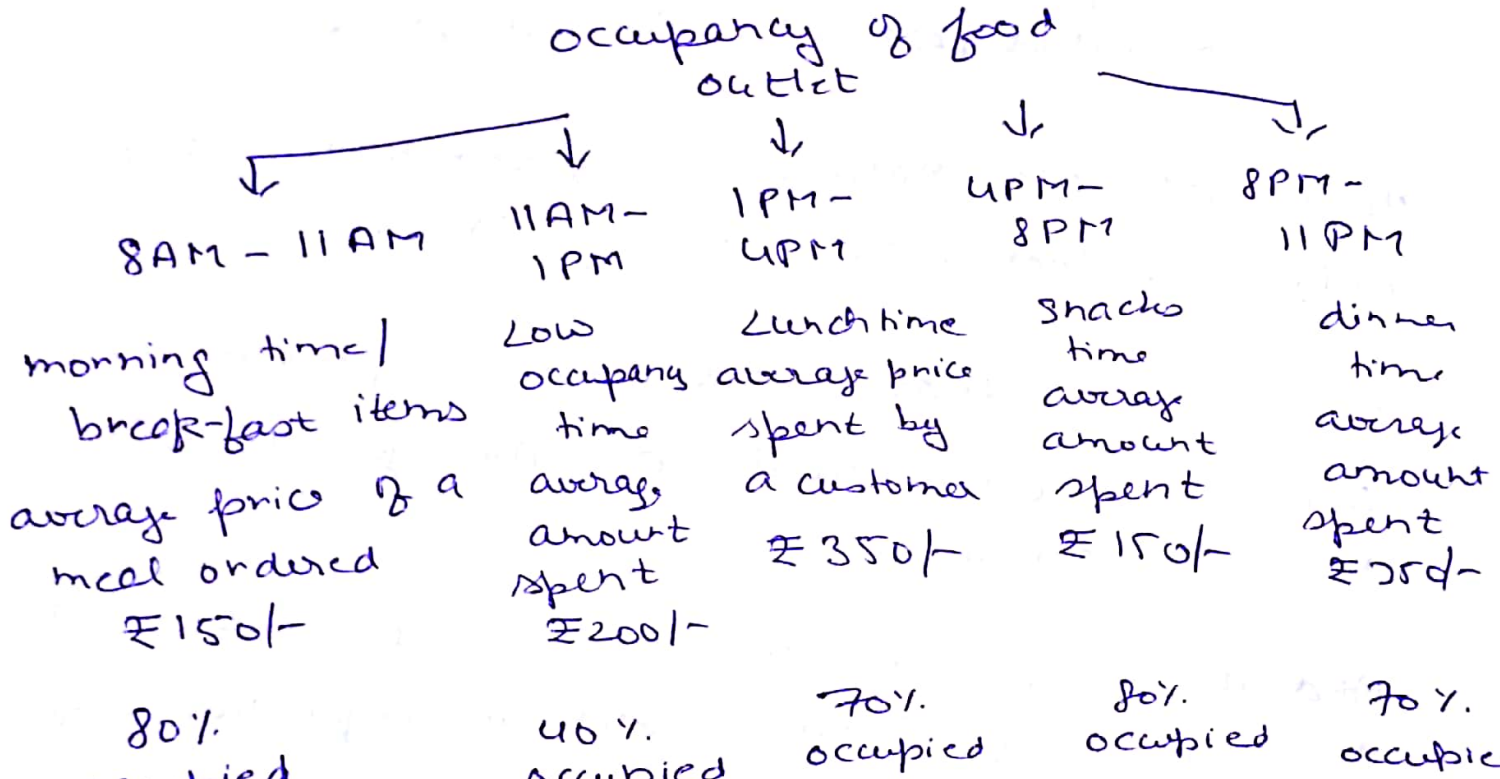
And it is present in 10 tier-II cities, with an average of 5 stores each in respective cities



Also, note that the revenue generated on a day will depend upon whether its a casual day, holiday, festival, etc. Here we are considering that its a casual day.

Let there be a four food servicing centres at a food outlet

Also at an average let 5 minutes be taken to order a food, and deliver it to the customer.



average spent in a day on a single counter

$$= 12 \times [3 \times 0.8 \times 150/- + 0.4 \times 2 \times 200 + 0.7 \times 3 \times 350 + 0.8 \times 4 \times 150 + 0.7 \times 3 \times 350]$$

$$= 12 \times [7 \times 0.8 \times 150 + 0.8 \times 200 + 0.7 \times 6 \times 350/-$$

$$= 12\,(840 + 160 + 1960)$$

$$= 12 \times 2960$$

$$= ₹35,520/-$$

Since we have assumed that there are 4 servicing counters

∴ average revenue for a day of one outlet = ₹4 × 35,520/-

= 142080/-

or ₹142K

Now the average revenue from all the outlets across India is

170 × ₹0.142 million

= ₹ 24.14 million

Annual Revenue = ₹ 24.14 × 365 million

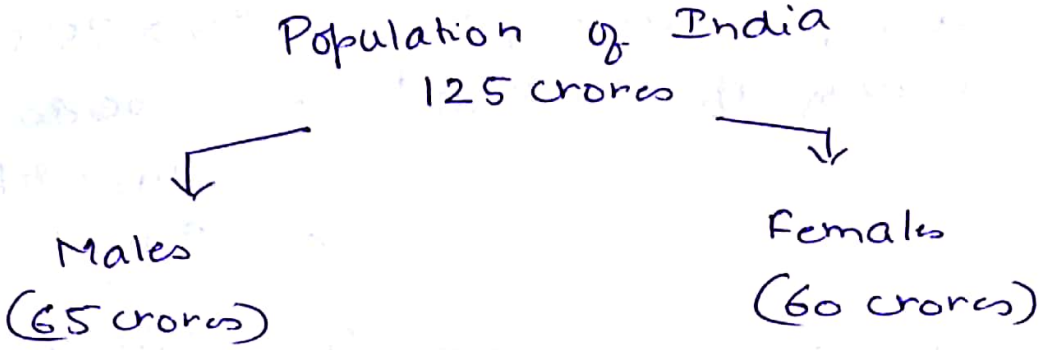
= ₹ 8.811 billion annually.

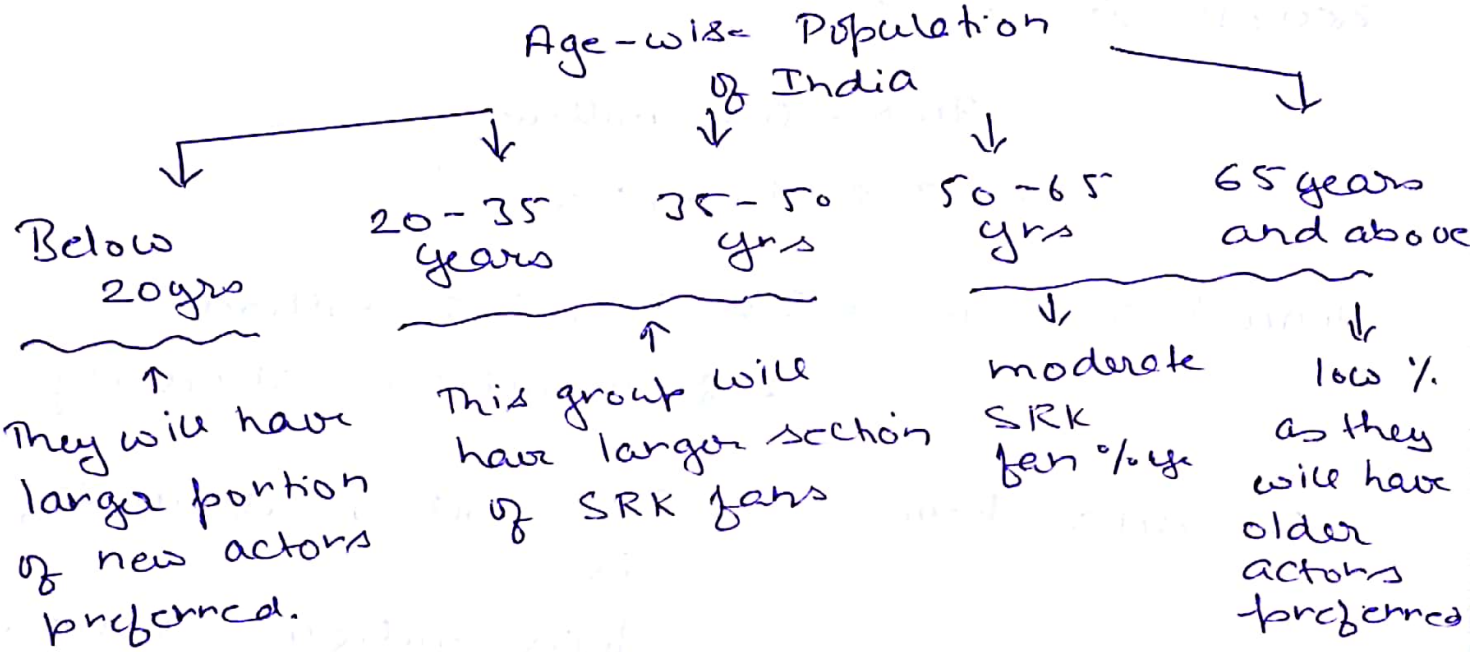
In dollar terms = $ $\frac{8811}{65}$ million annually

= $135 million annually.

(XLVII) Estimate the number of SRK fans in India.

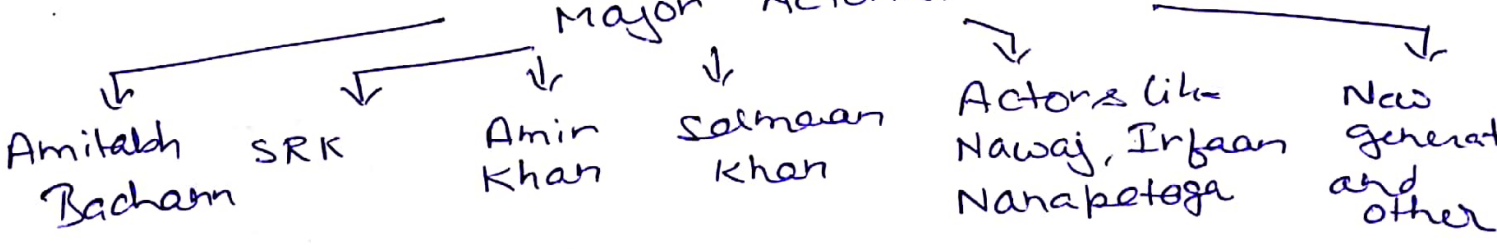
↳





Also there will larger female fans numbers as compared to male fans.

Also there will section who donot have any actor/actress as their favourite



Also, we are assuming that foreign actors are not considered.

Males (65 crores)

Below 20 yrs	20-35 years	35-50 years	50-65 years	65 years and above
(33%)	(37%)	(16%)	(10%)	(7%)
10% SRK fans	16% SRK fan	16% SRK fan	12% SRK fan	7% SRK fan

Total number of SRK fans (males) = 3.3% + 5.56% + 2.75% + 1.2% + 0.49%

(a) = 13.33% of total

= 13.33% of 65 crores

= 8.66 crore

Females (60 crores)

Below 20 years	20-35 years	35-50 years	50-65 years	65 years and above
(33%)	(33%)	(16%)	(10%)	(7%)
12% SRK fans	20% SRK fans	20% SRK fans	15% SRK fans	10% SRK fans

Total number of SRK fans (female) = (3.96% + 6.6% + 6.6% + 1.5% + 0.7%) of 60 crores

(b) = 19.36% of 60 crore = 11.61 crore

Total number of SRK fan = 8.66 crore + 11.61 crore

= 20.27 crore

(XLVIII) Estimate the amount of money drawn from an ATM machine in Delhi in one day.

↳ Let the average time to withdraw money from an ATM machine be 90 seconds.

∴ in one hour we can $\frac{60}{1.5}$ = 40 withdrawls.

Amount of Money withdrawl from ATM

average of ₹500/-	average of ₹2000/-	average ₹5000/-	Average ₹10000/-
↑ 55%	30%	10%	5%

Max withdrawls numbers

As generally people withdraw money from ATM when they are out of cash ~~or~~ or when they have to purchase something from a place where card payment is not accepted. In Delhi generally we have swipe machine at outlets and hence the former cause is more likely.

Average withdrawl amount per person = $0.55 \times 500 + 0.3 \times 2000 + 0.1 \times 5000 + 0.05 \times 10,000$

$= 275 + 600 + 500 + 500$

$=$ ₹1875/- per withdrawl.

occupancy of the ATM

6AM–9AM	9AM–12PM	12PM–4PM	4PM–7PM	7PM–10PM	10PM–6AM
40%	80%	60%	70%	60%	10%

average occupancy $= [0.4 \times 3 + 0.5 \times 3 + 0.7 \times 0.3 + 0.6 \times 3 + 8 \times 0.1] \frac{1}{24}$

$= (6.6 + 0.8) \frac{1}{24}$

$= \frac{7.4}{24}$ approx 30% occupancy

Total withdrawal = ₹1875 × 24 hours × 40 withdrawals/hours × 30% occupancy

$= ₹\ 1875 \times 24 \times 40 \times \frac{3}{10}$

$= ₹\ 5,40,000/-$

Note that occupancy of the ATM depends upon its location. Occupancy will be higher for an ATM located in a metro station or hospital.

Occupancy will higher at peak market time (morning and afternoon time) if an ATM is located in a commercial space/shopping market.

For an ATM located in residential area, occupancy will be different. Similarly occupancy is also affected by other factors such as presence of other ATMs and/or bank branches.

(XLIX) Estimate the market size of formal ties in India on an annual basis.

↳ Population – 125 crores. or 1.25 billion

↓

people in working age = 52.5 crores or 525 million

525 million

↓

Agriculture and Fishery
50%
(262.5 million)

Industry and Allied Sector
20%
(105 million)

Services.
30%
(157.5 million)

Note that services include retail as well which has large portion in unorganised sector.

organised sector
~~67~~ (33%)
52.5 million

unorganised sector
(67%)
105 million

Dressing code formal
(36.75 million) (70%)
many large scale ops, hotel chains, doctors, and other service firms.

~~Informal~~ (Dressing code Distribution)

No Dressing code
(15.75 million) (30%)
many start-ups, companies like google

Many people in un-organised sectors may also wear tie. Like many restaurants, small retail outlets, etc

105 million

Unorganised sector

Tie Required (15%) 15.75 million

Tie Not Required (85%) 89.25 million

Total number of people who use tie as formal = 36.75 + 15.75 million
= 52.5 million

At an average let the aging of the formal tie be as follow

52.5 million

No tie is purchased (20%)

Purchase 2 tie an year (20%)

Purchase 1 tie a year (50%)

Purchase 3 ties a year (10%)

average tie purchased per person = 0.2×0 + 0.2×2 + 0.5×1 + 0.1×3
= 1.3 tie / person

# of formal tie sold = 1.3 × 52.5 million
= 68.25 million.

Now note that the question is to be estimate the market size, this can be revenue generated or can be number of ties sold.

Revenue generated by formal tie = 68.25 million × cost of one tie

Industry 68.25 × ₹100 million

= ₹6825 million or ₹6.825 billion

In dollar terms,

$$\$ \frac{6825}{65} \text{ million}$$

or $105 million annually.

Also note that formal ties are not just used by office going people. They are also used in formal events like parties, anniversary, marriages, etc

They are also used in school / college events like MUN debates or other presentation based competitions.

(The above two regions are not explored)

(L) Estimate the annual size of socks in India.

↳ Population of India = 125 crore

125 crores
- ↓ Below Poverty Line (20%)
- ↓ Low Income (40%)
- ↓ Middle Income (30%)
- ↓ High Income (10%)

∴ Population who can afford socks = 80% of 125 crores
= 100 crore

Age-wise usage

→ Below 20 years (33%)
Generally school & college going age
3 Socks for school & 3 for personal use

→ Between 20 years to 65 years (60%)
- males (50%)
  - ↓ Employed (90%)
  - ↓ Unemployed (10%)
- females (50%)
  - ↓ Employed (90%)
  - ↓ Unemployed (60%)

↳ 3 for office use annually
3 for personal use annually

→ Above 65 years (7%)
3 socks annually.

socks are consumed by (below 20 years)

$6 \times \frac{1}{3} \times 100$ crore = 200 crores

socks consumed by (blw 20 - 65 years)

$$\left[6 \times (0.3 \times 0.9 + 0.3 \times 0.4) + 3 \times (0.3 \times 0.1 + 0.3 \times 0.6)\right] \times 100 \text{ crore}$$

$$= \{6(0.39) + 3(0.21)\} \times 100 \text{ crore}$$

$$= (2.34 + 0.63) \times 100 \text{ crores}$$

$$= 2.97 \times 100 \text{ crore}$$

$$= 297 \text{ crores.}$$

socks consumed by (above 65 years)

$$\frac{7}{100} \times 100 \text{ crore} \times 3 \text{ crore}$$

$$= 21 \text{ crores}$$

Total socks sold = (200 + 297 + 21) crore

= 518 crores

Average cost of a socks = ₹50/pair

Revenue (annual) = ₹50 × 518 crores

= ₹25900 crores

or ₹259 billion

in dollar terms = $\$\frac{259}{65}$ billion = $4 billion approx.

(LI) Estimate the daily amount of water consumed by an Indian

↳ Water-usage

- drinking
- bathing and pooping
- washing clothes, utensils, cars, scooters, bike
- cleaning of house (dusting & mobbing)
- watering plants
- hand wash, face wash, etc.
- cooking food.

Drinking (assuming summers) - 7 glasses of 200ml each
- 1.4 Litre (h)

bathing (assuming summer)
1 bucket of water = 20L (bathing)
pooping = 3L (a)

washing clothes
We ~~use~~ wash our clothes once in three days and we are a family of five.

Estimated water consumption
= 15 buckets of water
= 15 x 20 L for 5 persons in 3 days
= $\frac{15 \times 20}{5 \times 3}$ L per person / day
= 20L (b)

washing utensils - They are washed twice daily
estimated water consumption = 150L

∴ per person per day consumption = $\frac{150}{5 \times 2}$ L = 15L (c)

Assuming that 1 bucket each is ~~used~~ to clean two scooters and 1 bucket for a car.

∴ 2 buckets of water for a family of 5

$= \frac{2 \times 20}{5} = 8$ L/day (d)

cleaning of house = 1 bucket of water

$= \frac{20}{5}$ L = 8L/day (e)

Handwash – 3 time before having meal + 3 time after having meal + 5 times extra for various reasons

= 12 time handwash each consuming ~~150ml~~ 200ml per wash

⇒ 2.4L/day (f)

Cooking food – 1.5L per meal for 5 person meal (includes water used for cooking vegetable & making flour)

⇒ $1.5 \times \frac{3}{5}$ L or 0.9L (g)

Total water consumption = $1.4 + 3 + 40 + \frac{40}{5} + 15 + \frac{8}{16} + 8 + 2.4 + 0.9$

= ~~123L/day~~ 123.7L/day

Monthly consumption per person = ~~43.5 × 30~~ 123.7 × 30

= ~~1299L/month~~.

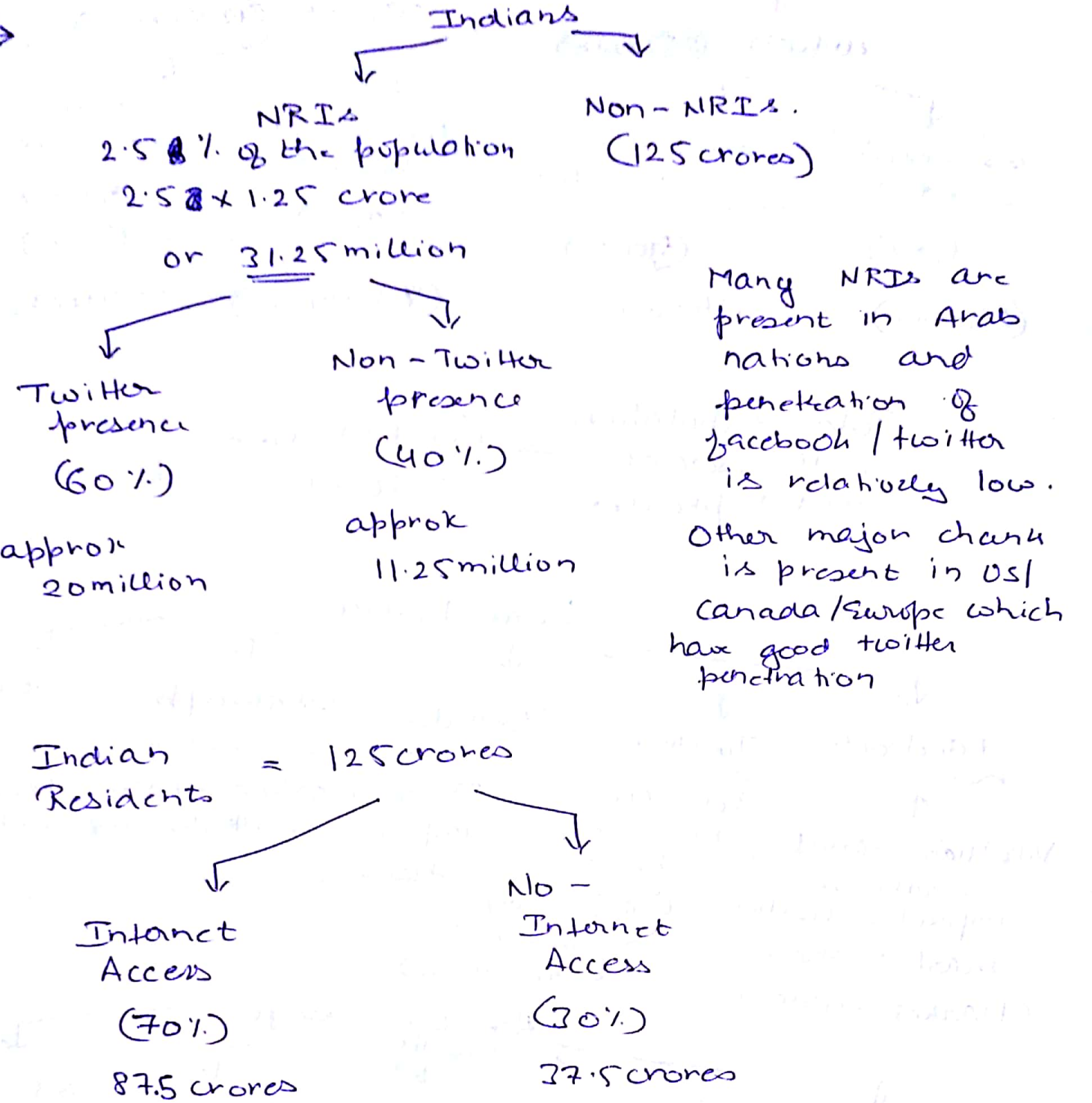
3711 L/d monthly

Monthly consumption (family of five) = 3711 × 5 L/month

= 18555 L/month.

(Q11) Estimate the number of Indians on Twitter

↳



Social Media Integration

Urban (75 crore)

- Use social media (80%) (28 crore)
- Don't use social media (20%) (7 crore)

Rural (42.5 crore)

- Use social media (20%) (8.5 crore)
- Don't use social media (80%) (34 crore)

Total population with social media presence → (28 + 8) crore = 36 crore

Social Media

- Facebook — Very High market share, it impacts twitter market share (Market Leader)
- Twitter — Very Low market share (II position in terms of market share)
- Youtube, whatsapp, others — There market share does not impact twitter's market share

Age-wise usage Twitter

- Below 20 years (33%) — 7.5% use twitter
- b/w 20 to 35 years (33%) — 10% use twitter
- 35-50 years (16%) — 5% use twitter
- 50-65 years (10%) — 2.5% use twitter
- 65 years & above (7%)

$$\text{average penetration} = (5\% + 6.33\% + 1.66\% + 0.85\%)\frac{1}{2}$$

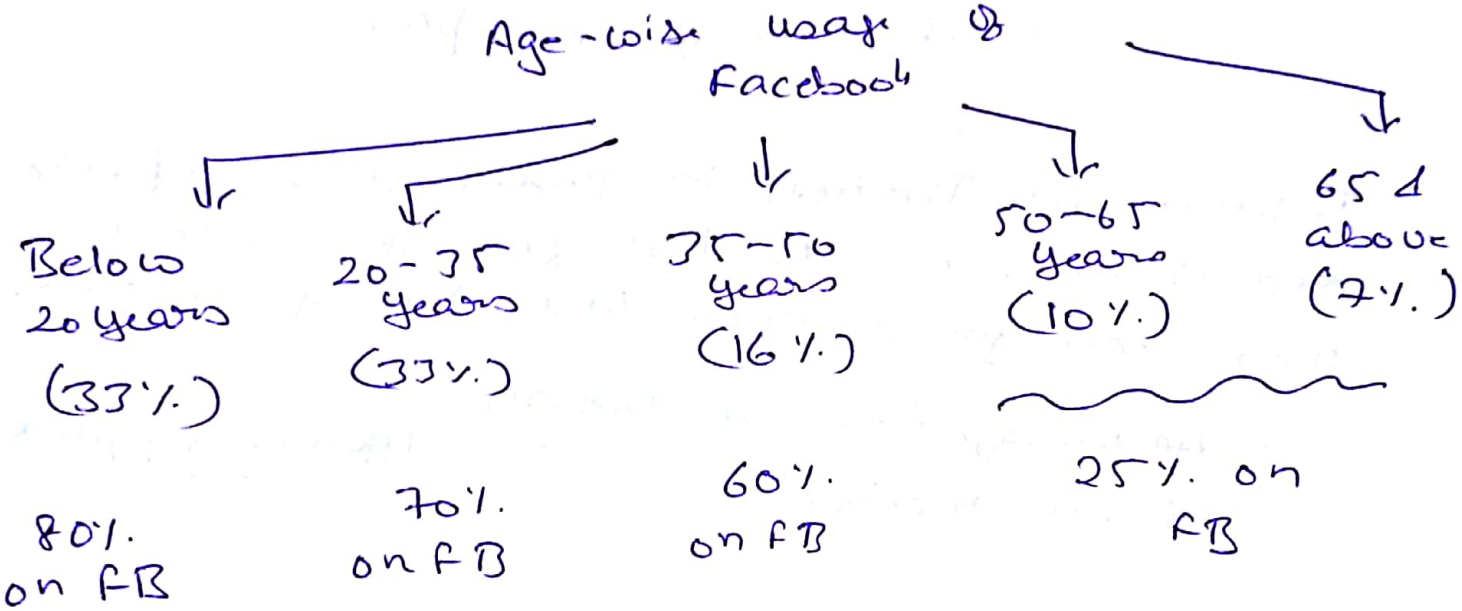
$$= 13.85\% \times \frac{1}{2}$$

$\frac{1}{2} \times 13.85$ of 36 crores

$= 2.497$ crore

or 24.97 crore

Similarly, if we had to estimate the number of Facebook users then the penetration would have been much higher.



Average % age of on FB $= 0.8 \times 33\% + 0.7 \times 33\% + 0.6 \times 16\% + \frac{25}{100}(17\%)$

$= 64.25\%$

$\therefore$ Number of FB users $= 64.25\%$ of 36 crore

$= 23.13$ crore

or approx 231 million FB users.

Another follow up question can be to estimate the number of photographs of Indian on FB.

Approx number of users = 230 million

Facebook was launched in the year 2004 (February)
Now its ~~at~~ almost the end of year 2017.
∴ 18 years of life span

Internet penetration in India has improved drastically since the last five years. So many users have joined in the last five years only.

∴ ~~Ag~~ Average time an Indian is on facebook = 4 years approx

Types of Facebook users

- who add their photos at a fast pace (20%.)
- who donot add their photos ; expect on special occasions (60%.)
- Donot upload any photos (rarely use facebook or only browse it.) (20%.)

Let there be at an average 10 instances (special occasion) on which photos are tagged.
Let there be at an average 8 photos per tag. ∴ 80 photos an year ~~of~~ for special occasions.

Let those add photos at a very fast pace add 5 photos a week.

$\Rightarrow 5 \times 52$ or 260 photos/year

$\therefore$ Average number of photos added $= 0.2 \times 260 + 0.6 \times 80$

$= 52 + 48$

$= 100$ photos/year

Total photos added in 4 years $= 4 \times 100$

$= 400$ photos

Total number of photos on FB of Indians $= 400 \times 270$ million

$= 400 \times 0.23$ billion

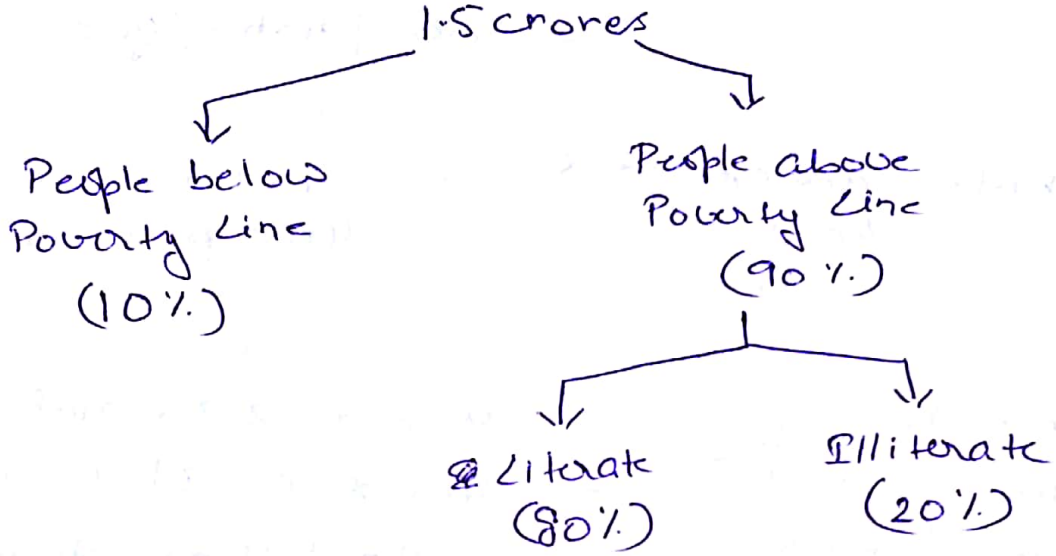
$= 92$ billion photographs.

Note here photographs of Indian is considered. These dont include photos containing memes or other stuffs.

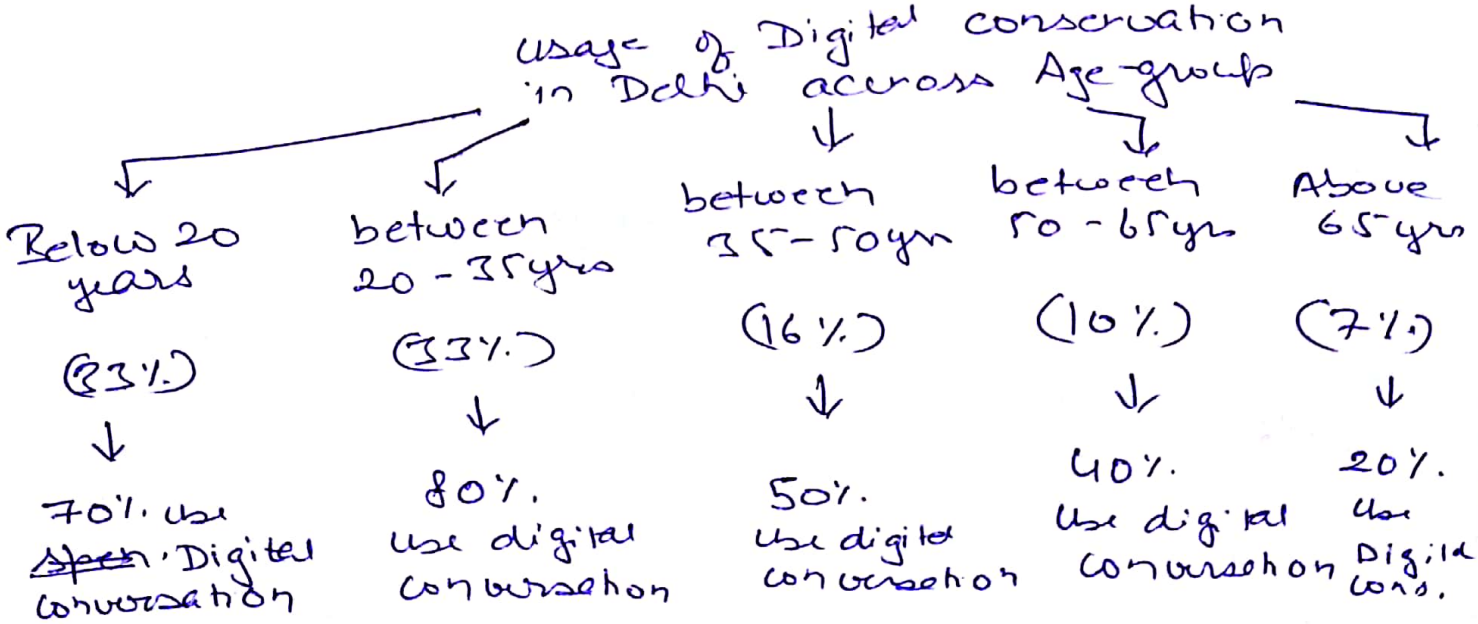
(LTI) Estimate the smileys used in daily electronic conversation in Delhi

↳ Population of Delhi = 1.5 crore

People having smartphone/ Internet access.



⇒ 72% of total Delhi population knows & has the access for smiley usage = 72% of 1.5 crore = 1.08 crore



Also, smileys are generally used when we are doing personal chats and not professional.

Also, some people donot like using smileys at all.

And the time spent on digital conversation daily is also different accross age-group.

Time spent on Digital conversations

Below 20 yrs	blw 20-35 yrs	blw 35-50 yrs	blw 50-65 yrs	Above 65 yr
(23.1%)	(26.4%)	(8%)	(4%)	1.4%
80% use smileys	70% use smileys	50% use smileys	30% use smileys	10% use smileys
18.5%	18.7%	4%	1.2%	0.14%
approx 20%		4%	1%	0.1%
21.61 lac people each	4.32 lac people		1.18 lac	0.18 lac
Average time spent on personal chat	1.5 hours/day 90 minutes a day	0.75 hr/day 45 min a day	0.5 hr/day 30 min a day	0.33 hr/day 20 min/day.

At an average say we use ~~5 emoji~~ 2 smileys a minute.

$\Rightarrow (21.6 \text{ lac} \times 90 \times 2) \times 2 + (4.32 \text{ lac} \times 45 \times 2) + (1.18 \text{ lac} \times 30 \times 2) + (0.18 \text{ lac} \times 20 \times 2)$

$= 194.4 \text{ crore} + 9.72 \text{ crore} + 1.77 \text{ crore} + 0.18 \text{ crore}$

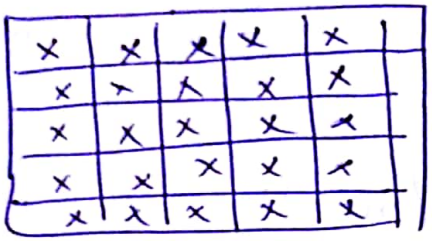
$= 206.07 \text{ crore}$ or 2 billion smileys/day

Note- here we have taken a standard average of 5 emoji or smileys a minute per person. but this average will vary across age-groups and can also vary across gender.

(LIV) Estimate the number of mangoes in an average sized mango orchard.

↳ Let the average size of an orchard be 100m × 100m or 10000 m^2 or 10K m^2

Let the mangoes be arranged as follows



Average size of square be 2m × 2m or 4 m^2

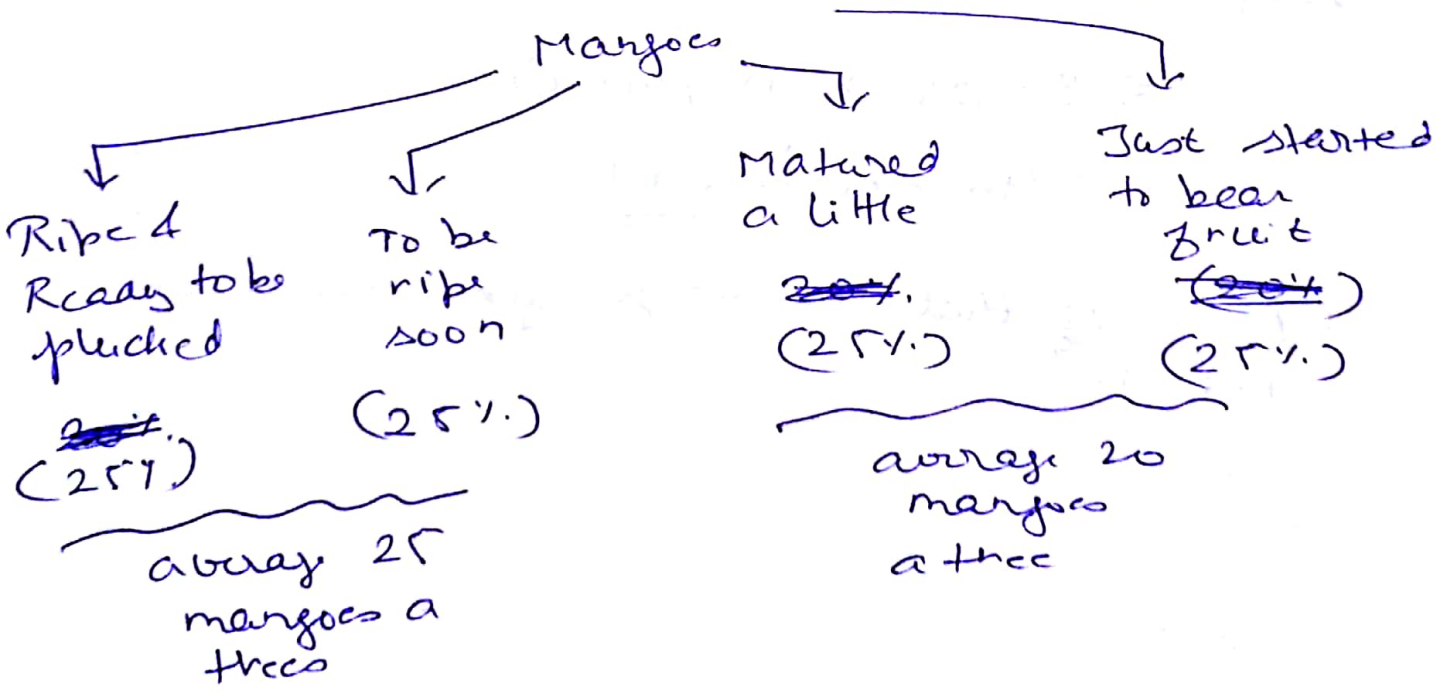
∴ Number of mango trees = $\frac{10,000}{4}$

= 2500 trees.

Also let an average ~~60%~~ 80% of them have mangoes and 20% have mangoes plucked.

(Note by mangoes we mean here both which ripe and ~~those~~ raw)

∴ 80% of 2500 or 2000 trees have mangoes.



Total number of mangoes = $500 \times 25 \times 2 + 500 \times 20 \times 2$

$= 25,000 + 20,000$

$= 45,000$ mangoes.

Revenue generated by this orchard = Let a batch of 500 trees produce x lbs mangoes in one month

$\therefore 500 \times 25$

or $\frac{50000}{4}$ mangoes/month

$= 12500$ mangoes/month

At an average say 4 mangoes make a kg.

$\Rightarrow \frac{12500}{4}$ kg $= 3125$ kg.

Average cost of mangoes (in wholesale market) say is ₹ 15/kg

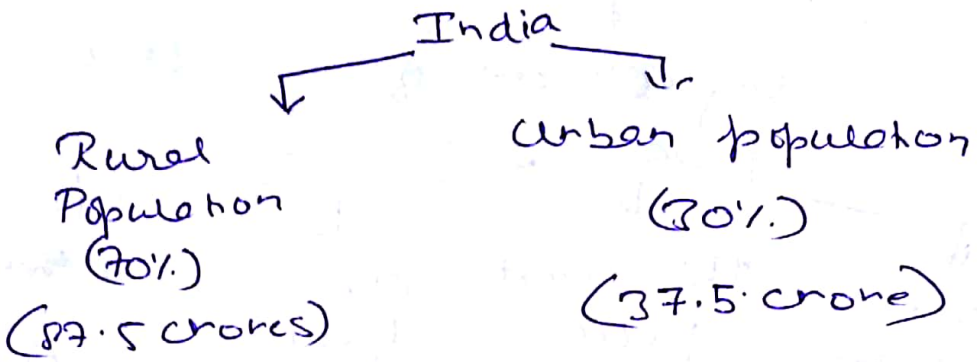
$\Rightarrow$ ₹ 3125×15 /month

$=$ ₹ $46,875$ /month.

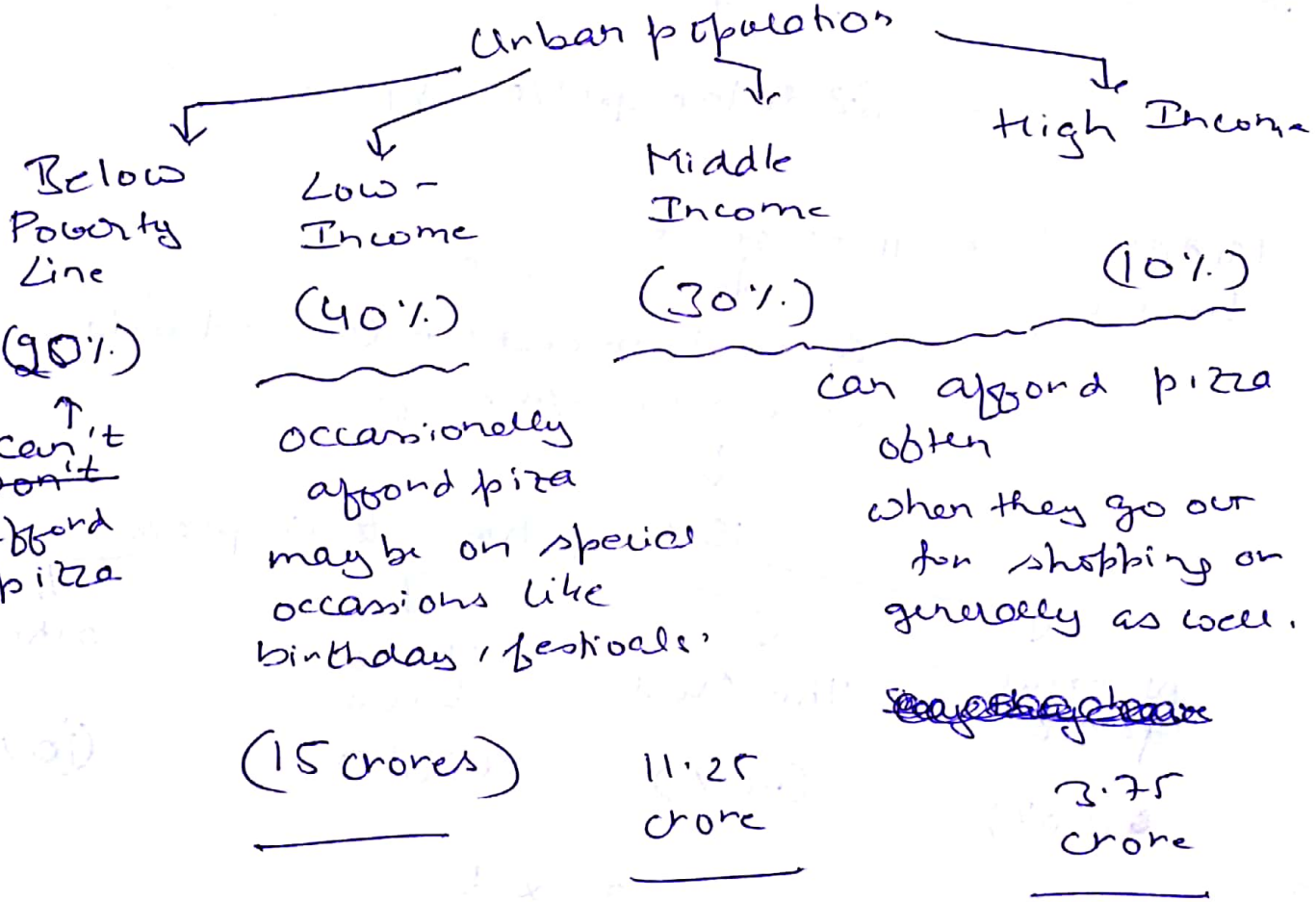
(Assuming that no mango goes waste or rots).

(IV) Estimate the number of cheese burst pizza sold in India. in a day

↳ population of India = 125 crore



Urban population has accen to food outlet chains such as pizza hut, dominos, chicago pizza, etc ...



High Income Group = 3.75 crore people

↓

Go out to eat / order outside once a week

↓

Say 20% ~~out~~ of time it's a pizza

↓

Normal crust pizza ~~40%~~ 25%

Thin crust pizza (30%)

Cheese burst pizza (30%)

Others (15%)

$\Rightarrow$ 3.75 crores $\times \frac{1}{7} \times \frac{1}{5} \times \frac{3}{10}$ cheese burst pizza

3.2 lac pizza approx.

Middle Income = 11.25 crore

↓

Go out to eat / order outside once in ten days

↓

15% of time its a pizza

↓

Normal pizza (50%)

Thin Crust (20%)

Cheese burst (20%)

others (10%)

$11.25 \text{ crore} \times \frac{1}{10} \times \frac{3}{20} \times \frac{1}{5}$

$\frac{33.75}{1000}$ crore = 3.37 lac pizza approx.

Low Income Group = 15 crore population

↓

Go out to eat / order online once in 20 days

↓

5% of them have pizza

- Normal Pizza (85%)
- Thin Crust (5%)
- Cheese Burst (5%)
- others (5%)

$\Rightarrow 15 \text{ crore} \times \frac{1}{20} \times \frac{1}{20} \times \frac{1}{20}$

$= \frac{15}{8} \times 10^{-3}$ crores $\quad \frac{1500}{8000}$ lac

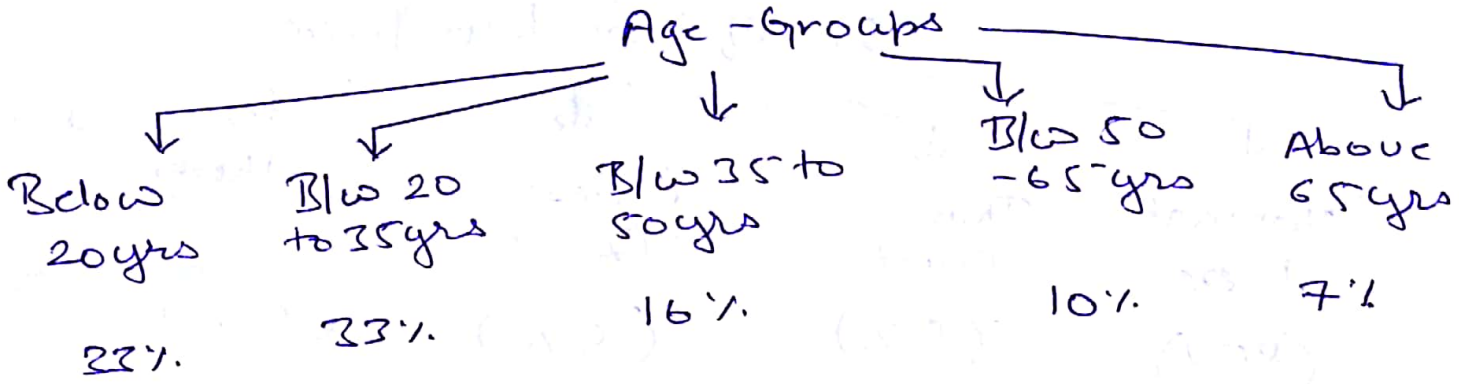
0.1875 lac pizza approx

Totes pizza (cheese burst) = 3.2 lac + 3.37 lac + 0.18 lac

= 6.75 lac cheeze burst pizza / day.

(LVI) Estimate the average number of Indians awake post mid-night in India.

↳ Population of India = 125 crore



Now note that number of Indians awake post-mid night will be different on a casual day when compared to days like new year's eve, christmas, Diwali night, Eid, etc.

Also if there is a sports event happening in other corner of the world, the number of people awake on that day will be different

If there are examinations or entrance exams are approaching then also the number of people awake will be different.

If there is a major political/social unrest in an area then also number of people awake post mid-night will be different.

Also, if its a holiday, the following days, the number of people awake post mid night will be different.

The general cause of people awake post mid-night is

- insomnia
- depression / stress
- work load

} ⇒ Higher dominance in urban lifestyle

- Generally the lifestyle (catching up with friends & family for those who work out of their town.)
- wishing birthdays / celebrating birthdays or other anniversaries

Indian Population

Urban (30%)
37.5 crores

Rural (70%)
87.5 crore

~~30% of the total reported cases~~ or.

Age-Groups

Below 20 yrs	B/w 20 to 35 yrs	b/w 35 to 50 yrs	b/w 50 to 65 yrs	Above 65 yrs
33%	33%	16%	10%	7%
↓	↓	↓	↓	↓
5%	7%	10%	7%	5%

$$\Rightarrow 125 \text{ crore} \times \left(\frac{1}{3}\times\frac{1}{5} + \frac{1}{3}\times\frac{7}{100} + \frac{1}{6}\times\frac{1}{10} + \frac{1}{10}\times\frac{7}{100} + \frac{7}{100}\times\frac{1}{20}\right)$$

$$= 1.65\% + 2.31\% + 1.6\% + 0.7\% + 0.35\%$$

$$= 6.61\% \text{ of } 125 \text{ crores.}$$

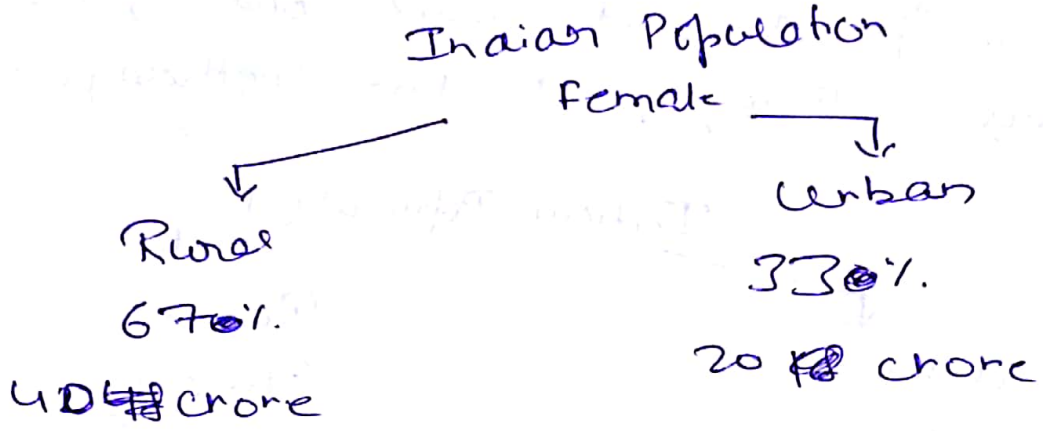
$$= 8.26 \text{ crores approx.}$$

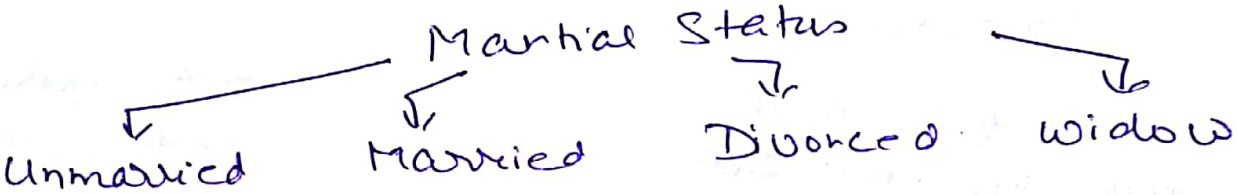
(LVII) Estimate the average number of Indian women who are married in India

↳ Indian Population = 125 crore

Male population = 65 crore

Female population = 60 crore





Rural population → General age of marriage is lower than urban people. Generally don't take divorce due to accessability problem & lack of general awareness & social & family pressure

Urban Population → General age of marriage higher than rural population. can take divorce due to better social awareness and stronger family support.

Rural Population → Female

Below 16 yrs	b/w 16 to 25 years	25 to 40 yrs	40 to 60 years	above 60 yrs
(30%)	(10%)	(20%)	(20%)	(10%)
2% married	80% married	98% married	95% married	60% married
0.24 crore	6.4 crore	7.84 crore	7.6 crore	2.4 crore

Total Rural = 24.48 crore

Urban Population

Below 16 yrs	b/w 16-25 yrs	25 to 40 yrs	40 to 60 yrs	Above 60 yrs
(30%)	(20%)	(20%)	(20%)	(10%)
0% married	60% married (2.4 crore)	90% married (3.2 crore)	95% married (3.8 crore)	70% married (1.4 crore)

Total Urban = 10.8 crore

Total married women (Female) in India = 24.48 crore + 10.8 crore

= 35.28 crores.

(LVIII) Estimate the average number of caps worn in Delhi

↳ caps worn will be different in summers and ~~different~~ winters.

(Lets assume that its winters)

and male sikhs do not wear caps. They have a turban. And male muslims have a cap of there own.

Population of Delhi = 1.5 crores

- Sikhs: 7.5 lac (5%)
- Muslims: 22.5 lac (15%)
- Others Religions: 1.2 crore (80%)

And lets assume that 50% are male & 50% female.

⇒ 22.5 lac muslims

↳ 11.25 lac male muslims — (a)

1.2 crores

- below 20 yrs: 33% → 5% wear a cap
- blw 20 to 35 years: 33% → 2% wear a cap.
- blw 35 to 50 years: 16% → 2.5% wear a cap.
- blw 50 to 65 years: 10% → 5% wear a cap
- Above 65 years: 7% → 40% of them wear a cap

1.6% + 0.66% + 0.4% + 0.5% + 2.8%

= 5.96% of 1.2 crore

= approx 6% of 1.2 crore

= 7.2 lac caps — (b)

(159)

Also we have caps used in professions such as security gaurds, nurses, traffic police, police, etc however we only consider the caps worn for personal use.

Total caps = 11.25 lac + 7.2 lac

= 18.45 lac

(And this is in winters)

- Easiest way to calculate # of police personels is by constituency method.
- Easiest way to calculate/estimate # of nurse is by number of hospitals
- Easiest way to estimate # of traffic police personals is by # of traffic lights

(We also have reserve police force & central reserve forces.)

Hats / caps are also used by clowns and in plays. (plays can be street plays, school or college plays, etc)

(IX) Estimate the number of books read by an average Indian in his lifetime.

↳ Probability that an average Indian studies till 10th Standard = 80%.

From class-I to class-VIII, we had five subjects and one subject had one prescribed book

∴ 5 books/yr

Also say 20% of these students followed a reference book in say 2 subjects

⇒ 0.4 books/yr

Also, say 30% read ~~other~~ novels/comics and were able to read 2 books at an average in an year

⇒ 0.6 books/yr

∴ Total number of books = 6 books/yr for 8 yrs

⇒ 48 books.

For classes IX-X, we have at an average 8 books prescribed by the course and say 60% follow reference books and say 4 reference books in total @ in an year and 50% probability to read another

⇒ 2 × (8 + 0.6 × 4 + 0.5 × 1)

= 2 × 10.9 books

or approx 22 books is

Books studied till tenth standard = 80% of (40+22)
= 80% of 70
= 56 books

↳ Probability that a person completes XII = 70%.

for class XI - XII, we have at an avrg. 10 books prescribed by the course. Say 60%. also refer to 4 reference books at an average. Say 50% read a novel a year over that.

∴ 2 x (10 + 0.6 x 4 + 0.5)
= 2 x (10 + 2.9)
2 x 12.9 or 36 books approx

Books read from XI - XII = 70% of 36
= 25 books approx

↳ Probability that a person completes Graduation = 40%.

Average course duration = 4 yrs or 8 sem.
Let each sem has 5 subjects with 2 books each
= 80 course books
Also let 30% read a novel a year
= 80 + 4 x 0.3 or 81 books approx

Number of books read during graduation = 30% of 81 = 24 books approx.

Note considering Post Graduation & Phd.

Also say 5% of the people are fond of reading books and that they read a book a year. Generally, this can occur when the person is young (b/w 25 yrs to 50 yrs of age).

$\therefore 25 \times 0.05$ books at an average by an Indian b/w 25 to 50 yrs

$= 1.25$ books

(1 book approx)

After the age of 50 to 65, the person generally gets more free time. Say 3% of the people are fond of reading books and they read 2 books a year

$= 15 \times 0.03 \times 2$

$= 15 \times 0.06$ $= 0.9$ book

(1 book approx)

Total books read at an average by an Indian = [illegible] + 56 [illegible] + 25 + [illegible] + 24 + 1 + 1

= 107 books.

(IX) Estimate the amount of water required to submerge NSIT.

↳ (Assuming No water spill & leakage)

we have 6 blocks (academic), 1 library and an admin block.

↳ 6 academic blocks,

Each have three floors + Ground floor each containing 40 classrooms.

Size of Each classroom = 7m high × 15m wide × 15m length.

= 1575 m^3

or approx 1600 m^3

Total Volume = 1600 m^3 × 4 × 40 × 6

= 256 km^3 × 6 or 1536,000 m^3

Also we have pathway outside the classroom which are about 5m wide.

Volume of path-ways = 4×40×6 × (5 × 7 × 15)

504,000 m^3

Total volume of academic block = 1,536,000 + 504,000

= 2040 000 m^3

approx 2 million m^3

Assuming that 90% of ~~the~~ the volume is occupied by fans, lights, benches, chairs, tables, etc in a classroom and pathway is completely empty, then

Total Volume = 80% of 1.536 million + 0.5 mill
of water req. = 1.732 million m^3

↳ ~~Academ~~ Admin Block

4 floor, each having 50 rooms

using same measurements as before

Room volume = $4 \times 50 \times 7 \times 15 \times 15$ m^3

$315,000 m^3$

~~Again~~ assuming ~~Test~~ 60% ~~of~~ free space.
(less space because admin rooms have a good number of ~~cab~~ cabins and cupboards.)

= $0.6 \times 315,000$ = $189000 m^3$

= ~~189000 m³~~

approx 0.2 million m^3

↳ Library

Library has 4 floors with one floor capable of housing 40 racks of books along its length and 30 racks across its breadth.

Assuming height of floor is ~~6~~ 7m

Breadth/~~Length~~ of ~~one~~ one rack = ~~0.3~~ 3m

Total volume = $4 \times 40 \times 30 \times 7 \times$ ~~1.5~~ 3m m^3

$100800 m^3$

or 0.1 million m^3 approx

Free space in Library = 60% of $0.1 m^3$

= 0.06 million m^3

Now each academic block has 6 staircase admin has 2 set of stair-case and libraray has 2 set of stair-case

Average width of the staircase = 2m

Average length of staircase = 10m

Average height of the staircase = 7m

Free space = 70%.

Total volume required to submerge staircase = (6+2+2) x 4 floors x (2 + 7 x 10) x 0.7 m^3

= 40 x 14 x 10 x 0.7 m^3

approx 2,000 m^3

Total volume of water required = 1.732 million + 0.2 million + 0.1 million + 2000 m^3

$\Rightarrow$ 2.734 million m^3

(Note - hostels have not been included. NSIT has 4 boys hostel & 2 girls hostel.)