**Key Takeaways from the Video:**

1. **Why Are Guesstimates Asked?**
   * Helps interviewers understand a candidate’s **numerical reasoning and analytical skills**.
   * Tests **logical structuring**—whether a candidate is **structured, fluent, random, or intuition-based**.
   * Assesses **basic data awareness** and the ability to make reasonable assumptions.
2. **Types of Guesstimate Questions:**
   * **Market Sizing** (e.g., "Estimate the number of ATMs in New York.")
   * **Product Usage** (e.g., "How many cups of coffee are consumed daily in India?")
   * **Operational Estimates** (e.g., "Estimate the number of flights landing in a city per day.")
3. **Best Approach to Answer Guesstimates:**
   * **Break the problem into logical steps** instead of guessing directly.
   * **State all assumptions clearly** and use approximate data points.
   * **Use a structured framework** (e.g., Population-based, Geographic-based, or Demand-Supply modeling).
   * **Cross-verify results** using multiple approaches when possible.
4. **Common Mistakes to Avoid:**
   * Making **wild guesses** without breaking the problem down.
   * Forgetting to **state assumptions**, which makes answers appear unrealistic.
   * Ignoring **units of measurement**, leading to calculation errors.
   * Failing to **explain the thought process**, which is as important as the final number.
5. **Final Round Insights:**
   * **Senior managers** also ask guesstimate questions, often combined with **behavioral and case-study questions**.
   * These rounds evaluate whether the candidate’s **approach aligns with data-driven decision-making**.

**Conclusion:**

Guesstimates are used as a **proxy to test analytical thinking, data sense, and structured problem-solving**. Mastering these helps candidates **stand out in analytics interviews**.

**How to Solve Guesstimates**

**1️⃣ Step-by-Step Framework**

1. **Clarify the Question**
   * Ask the interviewer for any missing details.
   * Define what you are estimating and any constraints.
2. **Break It Down Logically**
   * Choose a **demand-side** or **supply-side** approach.
   * Identify **key components** (population, households, businesses, etc.).
3. **Make Reasonable Assumptions**
   * Use publicly known facts or simple approximations.
   * Clearly state your assumptions before proceeding.
4. **Use a Structured Calculation Approach**
   * Divide the problem into **logical chunks**.
   * Multiply step-by-step to reach an estimate.
5. **Cross-Check Your Answer**
   * Sense-check your result (Does it seem reasonable?).
   * Use multiple perspectives to validate (e.g., compare with known data).

**🔹 Example 1: Estimate the Number of Washing Machines in India**

**Solution (Using Demand-Side Approach)**

1. **Step 1: Start with the Population**
   * Assume **India’s population = 120 crore**
   * Households typically own washing machines, not individuals.
   * Assume **1 household = 4 people**
   * ⇒ **Total households = 120 crore / 4 = 30 crore**
2. **Step 2: Segment Households Based on Location**
   * **Villages** (65%) → 20 crore
   * **Tier 2/3 cities** (15%) → 4.5 crore
   * **Tier 1 cities** (20%) → 6 crore
3. **Step 3: Segment by Income Groups**
   * **Poor (No washing machines)**
   * **Middle class (Some have washing machines)**
   * **Rich (All have washing machines)**
4. **Step 4: Assign Ownership Assumptions**
   * **Poor households (No washing machine) = 0%**
   * **Middle class households:**
     + **50% own washing machines in Tier 1 cities**
     + **40% own washing machines in Tier 2/3 cities**
     + **0% in villages**
   * **Rich households (100% ownership across all regions)**
5. **Step 5: Final Calculation**
   * Tier 1: (50% of middle class + 100% rich) → **3 crore washing machines**
   * Tier 2/3: (40% of middle class + 100% rich) → **1.35 crore washing machines**
   * Villages: (100% of rich) → **0.4 crore washing machines**
   * **Total: ~4.7 crore washing machines in India**

✅ **Key Learning:** Always structure your approach and state assumptions before calculating.

**🔹 Example 2: Estimate the Number of Cars in New York City**

**Approach:** Demand-Side

1. **Population of NYC** = 8.5 million
2. **Average household size** = 2.5 people
3. **Total households** = 8.5M / 2.5 = 3.4M
4. **Car ownership assumptions**:
   * **Rich families (own 2+ cars):** 20%
   * **Middle-class families (own 1 car):** 50%
   * **Poor families (no car):** 30%
5. **Final estimate:**
   * 20% × 3.4M × 2 cars = 1.36M
   * 50% × 3.4M × 1 car = 1.7M
   * Total **≈ 3M cars in NYC**

✅ **Key Learning:** **Break it into manageable segments**, then multiply step-by-step.

**🧠 How to Solve Puzzles in Interviews**

Puzzles test your **critical thinking, creativity, and structured problem-solving**.

**1️⃣ General Tips for Solving Puzzles**

* **Think aloud** so the interviewer understands your reasoning.
* **Ask clarifying questions** before jumping into solving.
* **Look for patterns** in numbers, sequences, or logical relationships.
* **Break it down** into **small, manageable steps**.

**🔹 Puzzle 1: Light Bulb and Switch Problem**

**Problem Statement:**  
You are in a room with **three switches**. Outside the room, there are **three light bulbs**.

* Each switch controls **one** of the light bulbs.
* You can **only go out once** to check which switch controls which bulb.
* How do you determine which switch controls which bulb?

**Solution:**

1. Turn **ON Switch 1** for **5 minutes**.
2. Turn **OFF Switch 1**, then turn **ON Switch 2**.
3. Go outside and check the bulbs:
   * **The lit bulb** → Connected to **Switch 2**.
   * **The warm bulb** → Connected to **Switch 1**.
   * **The cold bulb** → Connected to **Switch 3**.

✅ **Key Learning:** Use **indirect clues** (heat) when direct observation isn’t possible.

**🔹 Puzzle 2: Glass Rearrangement Problem**

**Problem Statement:**  
There are **six glasses** in a row.

* The **first three are full of juice**, and the **last three are empty**.
* You can **only move one glass**.
* Rearrange them so **full and empty glasses alternate**.

**Solution:**

1. **Take the second full glass**.
2. **Pour its juice into the fifth empty glass**.
3. **Place the empty glass back**.

✅ **Final Order:** Full - Empty - Full - Empty - Full - Empty

**Key Learning:** Sometimes **moving liquid instead of glasses** is the trick.

**🔹 Puzzle 3: Family Members Puzzle**

**Problem Statement:**

* A couple has **six sons**.
* Each son has **one sister**.
* How many people are in the nuclear family?

**Solution:**

* Parents = **2**
* Sons = **6**
* **One** sister (same for all sons) = **1**
* **Total = 9 people**

✅ **Key Learning:** Understand **wording traps** before answering.

**📌 Common Mistakes in Guesstimates & Puzzles**

❌ **Making wild guesses** without structured assumptions.  
❌ **Not asking clarifying questions** before solving.  
❌ **Ignoring logical constraints** (e.g., impossible population growth).  
❌ **Not checking units of measurement** (e.g., using square meters instead of square kilometers).

**🚀 Final Takeaways**

* Guesstimates **test your logical thinking and numerical reasoning**.
* Break the problem into **smaller steps** and explain your **thought process**.
* Puzzles evaluate **creativity, pattern recognition, and lateral thinking**.
* Always **ask for clarification** and **sense-check** your final answer.

**Why Are Guesstimate Questions Asked?**

* Assess **problem-solving skills and logical reasoning**.
* Evaluate **how candidates think under uncertainty**.
* Measure **numerical estimation skills** without requiring precise data.
* Observe **structured thinking and clear communication**.

**Example Guesstimate Questions:**

* *How many cars are on the road at a given time?*
* *How many ping-pong balls can fit in a school bus?*

**📌 Step-by-Step Approach to Solving Guesstimate Questions**

**1️⃣ Understand the Question**

* Identify the **key objective** (e.g., total number, market size, usage frequency).
* Clarify **any missing details** by asking the interviewer for specifics.
* Break down the problem into **logical subparts**.

**Example:** *How many cars pass through a busy intersection during rush hour?*  
**Clarification Needed:**

* Define "rush hour" (morning/evening, duration).
* Include only cars or all vehicles?

**2️⃣ Break the Problem into Small Components**

* Use a **divide-and-conquer** approach.
* Identify **relevant variables** affecting the estimate.
* Categorize the problem into **logical groups**.

**Example:** *Estimate the number of coffee cups sold in New York daily.*  
**Breakdown Approach:**

* Segment population into **commuters, tourists, and residents**.
* Estimate the **number of coffee shops per segment**.
* Calculate the **average number of cups sold per shop**.

**3️⃣ Establish Key Assumptions**

* Use **common knowledge** or **publicly available data**.
* Make **realistic assumptions** based on industry norms.
* Communicate your **assumptions clearly** to the interviewer.

**Example:** *How many people use Facebook daily?*  
**Assumption:** Facebook has ~2.9 billion users, and **~1 billion users log in daily**.

**4️⃣ Identify Key Variables**

* Determine the **most important factors** affecting the estimate.
* Categorize variables into **primary drivers**.

**Example:** *How many pianos are tuned annually in New York?*  
**Key Variables:**

* Total **population of NYC**
* % of **households that own a piano**
* **Average tuning frequency** per piano

**5️⃣ Use Approximation & Logical Reasoning**

* Apply **rounding techniques** for easy calculations.
* Use **ratios and benchmarks** from known data.
* Cross-check estimates to **ensure realism**.

**Example:** *How many cars are in the U.S. at any given time?*

* U.S. population: **330M**
* Cars per household: **1.5**
* Households: **~120M**
* **Total cars ≈ 180M**

**🚀 Common Guesstimate Questions & Sample Solutions**

**🔹 Example 1: How Many Tennis Balls Fit in a School Bus?**

**Solution Approach:**

1. **Assume Dimensions:**
   * Tennis ball: **6 cm diameter (~250 cm³ volume)**
   * School bus: **10m × 2.5m × 3m = 75,000,000 cm³ volume**
2. **Account for Space Inefficiency:**
   * Packing efficiency ~70%
   * **Final estimate: ~200,000 tennis balls**

✅ **Key Learning:** Approximations and logical chunking simplify calculations.

**🔹 Example 2: How Many Golf Balls Can Fit in an Airplane?**

**Solution Approach:**

1. **Assume Dimensions:**
   * Golf ball: **5 cm diameter (~65 cm³ volume)**
   * Passenger airplane volume: **~1,200 m³ (~1,200,000,000 cm³)**
2. **Packing Efficiency (~60%)**
   * **Final estimate: ~12 million golf balls**

✅ **Key Learning:** Consider **packing efficiency and available volume**.

**🔹 Example 3: Estimate the Number of ATMs in India**

**Solution Approach:**

1. **India’s population:** ~140 crore
2. **Assume 1 ATM per 2,000 people**
3. **Final estimate:** ~700,000 ATMs

✅ **Key Learning:** Use a **per-capita approach for large-scale estimates**.

**❌ Mistakes to Avoid**

* **Making wild guesses** without logical reasoning.
* **Skipping assumptions** or failing to justify them.
* **Rushing calculations** instead of breaking them down.
* **Ignoring clarifications** that could refine the estimate.

**📌 Final Takeaways**

✔ **Ask clarifying questions** before solving.  
✔ **Break problems into smaller parts** for easier estimation.  
✔ **Use real-world data points** when available.  
✔ **Communicate assumptions clearly** throughout the process.  
✔ **Sense-check your results** to ensure a reasonable range.

**1. Estimate the Number of Queries Google Handles Per Second**

**Approach:**

1. **Global Population:** Approximately 7.8 billion people.
2. **Internet Penetration:** Around 60% have internet access, equating to about 4.68 billion users.
3. **Google's Market Share:** Assume Google holds 90% of the search engine market, resulting in approximately 4.21 billion users.
4. **Average Searches per User:** Estimate that an average user conducts 3 searches per day.
5. **Total Daily Searches:** 4.21 billion users × 3 searches/user = 12.63 billion searches per day.
6. **Searches per Second:** 12.63 billion searches/day ÷ 86,400 seconds/day ≈ 146,000 searches per second.

**Key Considerations:**

* **Regional Variations:** Internet access and search habits vary by region.
* **Device Usage:** The proliferation of smartphones increases search frequency.
* **Temporal Factors:** Search activity may peak during certain hours.

**2. Estimate the Annual Revenue of YouTube from Advertisements**

**Approach:**

1. **Global Internet Users:** Approximately 4.68 billion.
2. **YouTube Penetration:** Assume 70% use YouTube, equating to about 3.28 billion users.
3. **Average Daily Watch Time per User:** Estimate 1 hour per user.
4. **Total Daily Watch Time:** 3.28 billion users × 1 hour = 3.28 billion hours.
5. **Advertisements per Hour:** Assume 3 ads per hour.
6. **Total Daily Ad Impressions:** 3.28 billion hours × 3 ads/hour = 9.84 billion ads.
7. **Ad Revenue per Impression:** Assume $0.01 per ad impression.
8. **Daily Ad Revenue:** 9.84 billion ads × $0.01/ad = $98.4 million.
9. **Annual Ad Revenue:** $98.4 million/day × 365 days = approximately $35.9 billion.

**Key Considerations:**

* **Monetization Rates:** Not all views are monetized; some users use ad blockers.
* **Regional Ad Rates:** Ad rates vary by region and audience demographics.
* **Seasonality:** Ad revenue can fluctuate based on seasons and events.

**3. Estimate the Number of Windows in New York City**

**Approach:**

1. **Population of NYC:** Approximately 8.5 million people.
2. **Average Household Size:** Assume 2.5 people per household, resulting in 3.4 million households.
3. **Residential Windows:** Assume each household has an average of 10 windows, totaling 34 million windows.
4. **Commercial Buildings:** Estimate 1 million commercial buildings, each with an average of 50 windows, totaling 50 million windows.
5. **Total Windows:** 34 million (residential) + 50 million (commercial) = 84 million windows.

**Key Considerations:**

* **Building Variability:** Window counts vary between skyscrapers and smaller buildings.
* **Non-Building Windows:** Vehicles, buses, and trains also contribute to the total number of windows.

**4. Estimate the Market Size for Diapers in the United States**

**Approach:**

1. **U.S. Population:** Approximately 330 million people.
2. **Birth Rate:** Assume 12 births per 1,000 people annually, resulting in 3.96 million births per year.
3. **Children in Diaper-Wearing Age:** Assume children wear diapers for the first 2.5 years, leading to approximately 9.9 million children in diapers at any time.
4. **Diaper Usage per Child:** Estimate 5 diapers per day, totaling 1,825 diapers per year.
5. **Total Annual Diaper Consumption:** 9.9 million children × 1,825 diapers = approximately 18 billion diapers.
6. **Cost per Diaper:** Assume $0.20 per diaper.
7. **Annual Market Size:** 18 billion diapers × $0.20/diaper = $3.6 billion.

**Key Considerations:**

* **Birth Rate Variations:** Birth rates can fluctuate annually.
* **Diaper Alternatives:** Some parents may use cloth diapers or practice alternative methods.
* **Economic Factors:** Economic conditions can influence birth rates and diaper affordability.

**5. Estimate the Number of Piano Tuners in Chicago**

**Approach:**

1. **Population of Chicago:** Approximately 2.7 million people.
2. **Households:** Assume an average household size of 2.5 people, resulting in 1.08 million households.
3. **Piano Ownership:** Estimate that 1 in 20 households owns a piano, totaling 54,000 pianos.
4. **Tuning Frequency:** Assume each piano is tuned once per year.

**Key Takeaways on Solving Guesstimate Questions**

1. **Understanding the Question Scope**
   * Always **ask clarifying questions** to define the problem scope before jumping into calculations.
   * Example: If estimating flights from Bangalore airport, clarify whether to include cargo flights or just passenger flights.
2. **Choosing the Right Approach**
   * Guesstimates can be solved using **two primary approaches**:
     + **Supply-side approach**: Focuses on infrastructure and operational capacity.
     + **Demand-side approach**: Estimates based on user needs and consumption patterns.
   * In most cases, the **supply-side approach** is easier and more structured.
3. **Breaking the Problem into Smaller Parts**
   * Divide the problem into logical components.
   * Example: Estimating the number of **flights from Bangalore airport** involved:
     + Dividing the day into **peak, non-peak, and non-operational hours**.
     + Estimating **number of operational gates** and **average boarding time per flight**.
     + Calculating the number of flights per segment and summing them up.
4. **Validating Assumptions**
   * State and justify assumptions clearly (e.g., "The average boarding time is 45 minutes because international flights take longer").
   * Adjust assumptions based on interviewer feedback (e.g., increasing the number of gates due to airport size).
5. **Interviewer Engagement**
   * **Think out loud** so the interviewer can guide you.
   * If stuck, ask if your approach is correct before proceeding further.
6. **Final Calculation & Sanity Check**
   * Ensure the final estimate **makes logical sense** based on real-world expectations.
   * Consider additional factors like **layover flights** in an airport or **multi-car ownership in urban areas**.

**Example Guesstimate Questions Solved in the Video**

1. **Estimating Daily Flights from Bangalore Airport**
   * Breakdown: Peak hours, non-peak hours, operational gates, flight turnover time.
   * Adjustments: Increased boarding gates and flight turnaround time for accuracy.
   * Final estimate: **~286 flights per day** (including layovers).
2. **Estimating Total Number of Cars in Mumbai**
   * Breakdown: Population segmentation (urban, rural, below poverty line), average family size, car ownership trends.
   * Adjustments: Considered **higher-income households owning multiple cars**.
   * Final estimate: **~40 lakh personal cars in Mumbai**.

**3 Golden Rules for Guesstimates in Interviews**

✔ **Ask clarifying questions** to refine the problem statement.  
✔ **Choose the right approach** (supply-side or demand-side) based on the scenario.  
✔ **Break down the problem into logical steps**, ensuring a structured and reasoned approach.

**Key Takeaways on Solving Guesstimate Questions**

1. **Understanding the Question Scope**
   * Always **ask clarifying questions** before jumping into calculations.
   * Example: If estimating flights from Bangalore airport, clarify:
     + Should cargo flights be included or just passenger flights?
     + Are both **domestic and international** flights considered?
2. **Choosing the Right Approach**
   * Guesstimates can be solved using **two primary approaches**:
     + **Supply-side approach**: Focuses on infrastructure and operational capacity.
     + **Demand-side approach**: Estimates based on user needs and consumption patterns.
   * In most cases, the **supply-side approach** is **more structured** and preferred.
3. **Breaking the Problem into Smaller Parts**
   * Divide the problem into logical components.
   * Example: Estimating the number of **flights from Bangalore airport** involved:
     + Splitting the day into **peak hours, non-peak hours, and non-operational hours**.
     + Estimating **number of operational gates** and **average boarding time per flight**.
     + Calculating flights per segment and summing them up.
4. **Validating Assumptions**
   * State and justify assumptions clearly.
   * Example:
     + “The average boarding time is **45 minutes** because international flights take longer.”
     + “There are **10 boarding gates** in Bangalore Airport instead of 5, considering it is an international hub.”
5. **Engaging the Interviewer**
   * **Think out loud** so the interviewer can guide you.
   * If stuck, ask if your approach is correct before proceeding further.
6. **Final Calculation & Sanity Check**
   * Ensure the final estimate **makes logical sense** based on real-world expectations.
   * Consider **additional factors** like **layover flights** in an airport or **multi-car ownership in urban areas**.

**Example Guesstimate Questions Solved in the Video**

**Example 1: Estimating Daily Flights from Bangalore Airport**

**Problem Statement:** *Estimate the total number of flights taking off from Bangalore Airport in a day.*

**Step-by-Step Breakdown:**

1. **Divide the Day into Different Segments**
   * **Peak Hours (12 hours total)**: Flights operate at full capacity.
   * **Non-Peak Hours (8 hours total)**: Flights operate at reduced capacity (~60% operational gates).
   * **Non-Operational Hours (4 hours total)**: Minimal or no flights.
2. **Estimate Flights per Time Segment**
   * Bangalore Airport has **10 operational boarding gates** (adjusted assumption).
   * Each flight takes **~45 minutes** for boarding, takeoff, and clearance.
   * **Peak Hours Calculation**
     + Total time available: **12 hours = 720 minutes**
     + Flights per gate: **720 minutes ÷ 45 minutes = 16 flights per gate**
     + Total flights (100% operational gates): **16 × 10 gates = 160 flights**
   * **Non-Peak Hours Calculation**
     + Total time: **8 hours = 480 minutes**
     + Flights per gate: **480 ÷ 45 = ~10 flights per gate**
     + Total flights (60% operational gates): **10 × 6 gates = 60 flights**
3. **Final Estimate Including Layover Flights**
   * Regular flights: **160 (peak) + 60 (non-peak) = 220 flights**
   * Additional **30% for layover flights** → **220 × 1.3 = ~286 flights per day**

**Final Answer:** **~286 flights take off from Bangalore Airport daily.**

**Example 2: Estimating the Number of Cars in Mumbai**

**Problem Statement:** *Estimate the total number of personal cars in Mumbai.*

**Step-by-Step Breakdown:**

1. **Estimate Mumbai’s Population**
   * Assume **Mumbai’s population = 2 crore (20 million)**.
   * Average **family size = 4 members**.
   * Number of families = **2 crore ÷ 4 = 50 lakh families**.
2. **Classify the Population Based on Economic Segments**
   * **Urban (High Income):** **60% (30 lakh families)**
   * **Rural (Lower Income):** **30% (15 lakh families)**
   * **Below Poverty Line (BPL):** **10% (5 lakh families)**
3. **Estimate Car Ownership Rates by Segment**
   * **Urban Families (60%) → Higher disposable income → Most own at least 1 car**
     + **30 lakh families × 100% = 30 lakh cars**
   * **Rural Families (30%) → Fewer car owners → 50% own a car**
     + **15 lakh families × 50% = 7.5 lakh cars**
   * **BPL Families (10%) → Very low car ownership**
     + Assume **1% own a car** → **5 lakh families × 1% = 5,000 cars**
4. **Consider High-Income Families with Multiple Cars**
   * Assume **10% of urban families own an extra car**.
   * **10% of 30 lakh families = 3 lakh extra cars**.
5. **Final Calculation**
   * **Urban Cars:** **30L + 3L = 33L**
   * **Rural Cars:** **7.5L**
   * **BPL Cars:** **5,000**
   * **Total Cars in Mumbai = ~40 lakh personal cars.**

**Final Answer:** **~40 lakh personal cars in Mumbai.**

**3 Golden Rules for Guesstimates in Interviews**

✔ **Ask clarifying questions** to refine the problem statement.  
✔ **Choose the right approach** (*supply-side vs. demand-side*).  
✔ **Break the problem into logical steps**, ensuring a structured approach.

**Key Takeaways on Solving Guesstimates**

1. **Ask Clarifying Questions**
   * What types of windows are we counting?
     + Residential buildings
     + Institutional buildings (shops, hospitals, schools)
     + Automobiles (personal vehicles, public transport)
   * Do we need a projection for the future, or only the current number?
   * What **geographical scope** are we considering? (Here, Jaipur city)
   * Should we consider **all window types** (wooden, glass, etc.) or just a specific type?
2. **Break Down the Problem into Components**
   * **Total Windows = Residential Windows + Institutional Windows + Vehicle Windows + Public Transport Windows**
   * Start with **Jaipur’s population** to estimate:
     + **Number of households** → **Residential windows**
     + **Institutional buildings** (e.g., schools, offices)
     + **Personal vehicles** (cars) → **Vehicle windows**
     + **Public transport (buses, trucks)**
3. **Set Up a High-Level Formula**
   * **Total Windows = Windows in Homes + Windows in Offices + Windows in Vehicles + Windows in Public Transport**
   * Assign logical estimates for each component.

**Example Breakdown: Estimating Windows in Jaipur**

**Step 1: Estimate Population & Households**

* Jaipur population ≈ **4 million (40 lakh)**
* Assume **4 people per household** → **Total households = 1 million (10 lakh)**
* Assume **70% of households** live in **buildings with windows** → **7 lakh homes with windows**

**Step 2: Estimate Institutional Buildings**

* Assume **for every 100 homes, there are 20 institutions (shops, schools, hospitals, etc.)**
* **Institutional buildings = 20% of 7 lakh homes = 1.4 lakh buildings**

**Step 3: Estimate Vehicle Ownership**

* Assume **20% of households own a personal vehicle**
* **Total personal vehicles = 20% of 1 million = 2 lakh cars**
* **Public transport (buses, trucks, etc.) = 10% of personal vehicles**
* **Total public transport vehicles = 20,000**

**Final Calculation: Estimating the Number of Windows**

1. **Windows in Residential Buildings**
   * Assume **2 rooms per house**, each with **1 window**
   * **Total = 7 lakh × 2 = 14 lakh windows**
2. **Windows in Institutional Buildings**
   * Assume **each building has 10 rooms, each with 1 window**
   * **Total = 1.4 lakh × 10 = 14 lakh windows**
3. **Windows in Personal Vehicles**
   * Assume **each car has 4 windows**
   * **Total = 2 lakh × 4 = 8 lakh windows**
4. **Windows in Public Transport**
   * Assume **each public transport vehicle (bus, truck) has 20 windows**
   * **Total = 20,000 × 20 = 4 lakh windows**

**Final Answer: Total Windows in Jaipur**

✔ **Residential Windows:** **14 lakh**  
✔ **Institutional Windows:** **14 lakh**  
✔ **Personal Vehicle Windows:** **8 lakh**  
✔ **Public Transport Windows:** **4 lakh**

🔹 **Total Windows in Jaipur ≈ 40 lakh**

**Interview Takeaways: How to Approach Any Guesstimate**

✔ **Clarify the scope** – Ask if you need to include all types of windows, locations, and future projections.  
✔ **Use logical breakdowns** – Break down by population, households, institutions, and vehicles.  
✔ **Make reasonable assumptions** – Use practical estimates like 4 windows per car, 1 window per room, etc.  
✔ **Engage the interviewer** – Think out loud and validate your approach step by step.

**What Are Guesstimate and Market Sizing Questions?**

* **Guesstimate Questions:** Require estimating a number based on minimal data, using logical reasoning, mental math, and problem-solving skills.
* **Market Sizing Questions:** Involve estimating the market size of a specific product using limited data, requiring logic, business knowledge, and analytical skills.

**Step-by-Step Approach to Solving Guesstimate Questions**

**1. Clarify the Problem**

* Always start by asking clarifying questions to align with the interviewer.
* Clarifications prevent misunderstandings and demonstrate an organized approach.
* Example: Estimating **smartphone market size in Germany**—questions to clarify:
  + **What is considered a smartphone?** (e.g., touchscreen-only devices)
  + **What is the unit of measurement?** (e.g., smartphones sold to end users)
  + **What is the timeframe?** (e.g., annual sales)
  + **What point in time are we considering?** (e.g., present year)

**2. Break Down the Problem**

* Decompose the question into smaller, more manageable components.
* Use a **problem tree** to visualize the breakdown.
* Example: Estimating annual smartphone sales in Germany:
  + **Total population of Germany**
  + **Percentage of mobile phone owners**
  + **Percentage of smartphone users among mobile owners**
  + **Average lifespan of a smartphone**

**3. Estimate Each Component**

* Use logical approximations and general knowledge.
* Example estimates:
  + Germany's population ≈ **80 million**
  + Mobile phone owners ≈ **80% of population** → **64 million**
  + Smartphone owners ≈ **95% of mobile phone owners** → **60 million**
  + Average lifespan of a smartphone ≈ **2.5 years** → **Each user buys ~0.4 phones per year**

**4. Perform Mental Math and Consolidate**

* Multiply the estimates step by step:
  + **Total annual smartphone sales** = **60 million × 0.4** = **24 million**
* The real-world figure (from 2020) was **22.9 million**, which is close.
* **Accuracy is less important than a structured approach**—focus on the logic.

**Key Takeaways**

✔ **Clarify all terms** before starting calculations.  
✔ **Break down the problem** into manageable steps.  
✔ **Use logical approximations** based on general knowledge.  
✔ **Practice mental math** to maintain a smooth flow.  
✔ **Focus on structure, not perfect accuracy.**

**What Are Guesstimates?**

* A **guesstimate** is a mix of **guesswork and logical calculation**.
* Candidates are asked to **estimate a quantitative value** based on minimal data.
* The estimate is often **related to the job, industry, or a random real-world scenario** (e.g., "How many ACs are installed in your city?").
* The interviewer may **not even know the actual answer**, as they are evaluating **your approach rather than correctness**.

**Why Are Guesstimates Asked in a Data Science Interview?**

* **Tests problem-solving skills under pressure.**
* **Evaluates structured thinking and logical breakdown.**
* **Checks numerical aptitude and mental math ability.**
* **Assesses ability to validate and estimate magnitudes quickly.**
* **Provides insight into handling real-world data science problems.**

**Approach to Solving Guesstimate Questions**

**1. Clarify the Question**

* Ask for additional details to remove ambiguity.
* Example: *"How many ACs are in a city?"*
  + Are we considering **household ACs, vehicle ACs, or industrial ACs**?
  + Are we looking at **installed units or total sales per year**?

**2. Devise a Logical Breakdown**

* There is **no single correct approach**—pick one that **minimizes assumptions**.
* Example strategies:
  + **Start with population size.**
  + **Use economic factors** (income level, urban/rural distribution).
  + **Consider relevant usage factors** (weather, necessity, affordability).

**3. Choose an Approach and Estimate**

* Pick an approach that makes calculations **easier and realistic**.
* Break the problem into **manageable segments**.
* Example for estimating **number of ACs in Bangalore**:
  + **Population of Bangalore** (1 crore).
  + **Distribution of tenants vs. landlords** (80% tenants, 20% landlords).
  + **Estimate number of rooms per household.**
  + **Assume percentage of rooms with ACs.**
  + **Sum up the estimates** to reach a final number.

**4. Perform Mental Math and Arrive at the Answer**

* Example: Final estimate for **total ACs in Bangalore** = **30 lakh units**.
* The **actual number might be different**, but the **approach should be structured and logical**.

**Example Guesstimate: How Many Red Cars Are in India?**

1. **Estimate total population** → **130 crore.**
2. **Divide by average family size (4)** → **30 crore families.**
3. **Classify into economic groups**:
   * **30% lower-class** (no cars).
   * **60% middle-class** (50% no cars, 30% one car, 20% two cars).
   * **10% upper-class** (average 2 cars).
4. **Estimate total number of cars in India**:
   * **18.6 crore personal cars** + **1.4 crore commercial cars** = **20 crore cars**.
5. **Estimate color distribution**:
   * **White & black = 50%** of total cars.
   * **Remaining 50% split among 5 other colors** → **each ~20%**.
   * **Red cars ≈ 20% of 10 crore** = **2 crore red cars** in India.

**Key Tips for Guesstimate Success**

✔ **Analyze all possible use cases** (e.g., ACs in homes, offices, vehicles).  
✔ **Memorize population figures** for cities, states, and countries.  
✔ **Use logical segmentation diagrams** for clarity.  
✔ **Avoid rounding all numbers in the same direction** (prevents large errors).  
✔ **Practice different estimation methods** to improve mental agility.

**1. Google: How Many Pizzas Are Sold in New York City Per Day?**

**Approach:**

1. **Clarify Scope:**
   * Are we considering **only restaurants, delivery, homemade pizzas**?
   * Is it **all types of pizzas** (slices, personal pizzas, family-size pizzas)?
2. **Break Down the Population:**
   * NYC population ≈ **8 million**.
   * Tourists visiting NYC per day ≈ **1 million**.
3. **Estimate Eating Habits:**
   * Assume **50% of NYC residents** eat pizza daily.
   * Assume **10% of tourists** eat pizza daily.
4. **Estimate Pizza Consumption per Person:**
   * Assume each NYC pizza eater eats **2 slices**.
   * A **whole pizza has 8 slices**.
   * Total slices needed **= (4 million residents × 2 slices) + (100,000 tourists × 2 slices)**.
   * **Total pizzas = ~1 million per day.**

✅ **Final Estimate:** ~1 million pizzas are sold daily in NYC.

**2. Meta (Facebook): How Many Profile Pictures Are Uploaded on Instagram Every Day?**

**Approach:**

1. **Clarify Scope:**
   * Are we considering only **profile picture updates** or **all photo uploads**?
   * Are we considering **global Instagram users** or a **specific country**?
2. **Break Down Instagram Users:**
   * Instagram has **~2 billion users globally**.
   * Assume **50% are active monthly (~1 billion active users).**
   * Assume **10% are active daily (~100 million daily active users).**
3. **Estimate Profile Picture Updates:**
   * People don’t change profile pictures daily, so assume **5% update weekly**.
   * **Daily updates** = **(5% of 1 billion) ÷ 7** = **7 million daily profile picture uploads**.

✅ **Final Estimate:** ~7 million profile picture uploads on Instagram per day.

**3. Amazon: How Many Packages Are Delivered in India Per Day?**

**Approach:**

1. **Clarify Scope:**
   * Only Amazon deliveries or all e-commerce deliveries?
   * Are we including **rural and urban areas**?
2. **Break Down India's Online Shoppers:**
   * India’s population ≈ **1.4 billion**.
   * Assume **30% are internet users** (~420 million).
   * Assume **half of them shop online regularly** (~210 million).
   * **Daily active online shoppers** = **5% of 210 million** = **10.5 million users.**
3. **Estimate Order Frequency:**
   * Assume each **active shopper places 2 orders per week**.
   * **Daily orders = (10.5 million × 2) ÷ 7** = **3 million packages per day**.

✅ **Final Estimate:** Amazon alone could deliver **~3 million packages daily** in India.

**4. Microsoft: How Many Emails Are Sent Every Day Globally?**

**Approach:**

1. **Clarify Scope:**
   * Are we considering **personal + work emails** or **only business emails**?
   * Do **spam emails count**?
2. **Break Down Internet Users:**
   * World population ≈ **8 billion**.
   * Internet users ≈ **5 billion**.
   * Email users ≈ **4 billion** (assume 80% have email accounts).
3. **Estimate Email Frequency:**
   * Assume **50% of email users are active daily** → **2 billion active users**.
   * Assume each **user sends 10 emails/day** (including personal & work).
   * **Spam emails:** Assume **10 billion** spam emails are sent daily.

✅ **Final Estimate:** **~30 billion emails are sent per day globally**.

**5. Uber: How Many Uber Rides Are Taken in San Francisco Per Day?**

**Approach:**

1. **Clarify Scope:**
   * Are we considering **only Uber or all ride-sharing services**?
   * Do we need **weekend vs. weekday estimates**?
2. **Break Down the Population:**
   * SF population ≈ **900,000**.
   * Tourists visiting daily ≈ **100,000**.
3. **Estimate Ride Usage:**
   * Assume **10% of residents use Uber daily** = **90,000 users**.
   * Assume **30% of tourists take at least one ride daily** = **30,000 users**.
   * **Daily Uber rides per person** = **1.5**.

✅ **Final Estimate:** **~180,000 Uber rides per day in San Francisco**.

**6. Tesla: How Many Electric Cars Will Be Sold in the US in 2025?**

**Approach:**

1. **Clarify Scope:**
   * Only Tesla or all electric vehicles (EVs)?
   * Are we considering **passenger cars or commercial EVs too**?
2. **Break Down the Market:**
   * Total US car sales per year ≈ **17 million**.
   * Current EV market share ≈ **10% (1.7 million EVs per year)**.
   * Growth rate of EV sales ≈ **30% annually**.
3. **Estimate Future Sales:**
   * If **EV growth continues at 30% per year**:
   * By 2025, **EV sales = 1.7M × (1.3)^3 ≈ 3.7 million EVs.**

✅ **Final Estimate:** ~**3.7 million EVs will be sold in the US in 2025**.

**Guesstimate Tips for Interviews**

✔ **Clarify all assumptions** before jumping into calculations.  
✔ **Break problems into manageable chunks** (population, behavior, frequency).  
✔ **Use reasonable estimates** (e.g., assume 50% of people use an app).  
✔ **Perform quick mental math** for efficiency.  
✔ **Keep a structured, logical approach**—interviewers care more about **your thinking process than accuracy**.

**Industry-Specific Guesstimate Questions and Approaches**

Here are **real-world guesstimate questions** tailored for different industries, including **Healthcare, FinTech, E-commerce, EdTech, and Social Media.**

**1. Healthcare: How Many Surgeries Are Performed in the US Per Year?**

**Approach:**

1. **Clarify Scope:**
   * Are we considering **all types of surgeries (major + minor)** or **only major ones**?
   * Are we including **emergency and elective procedures**?
2. **Break Down the Population:**
   * US population ≈ **330 million**.
   * Assume **60% have access to regular healthcare (~200 million people).**
   * Assume **each person undergoes surgery once every 10 years on average**.
3. **Estimate Surgery Count:**
   * **Annual surgeries** = **(200 million / 10) = 20 million** major surgeries per year.
   * **Minor procedures (cosmetic, dental, LASIK, etc.)** could be ~**2x major surgeries** → **40 million minor procedures**.

✅ **Final Estimate:** ~**60 million surgeries performed annually in the US.**

**2. FinTech: How Many Credit Card Transactions Happen in India Daily?**

**Approach:**

1. **Clarify Scope:**
   * Are we considering **only credit cards or debit cards as well**?
   * Are **online and offline transactions both included**?
2. **Break Down Credit Card Users:**
   * India’s population ≈ **1.4 billion**.
   * Assume **30% are eligible for credit cards (~400 million people)**.
   * Assume **only 20% actively use credit cards (~80 million users).**
3. **Estimate Transaction Frequency:**
   * Assume each active user **makes 2 credit card transactions per day**.

✅ **Final Estimate:** ~**160 million credit card transactions per day in India.**

**3. E-Commerce: How Many Packages Are Shipped by Amazon US Every Day?**

**Approach:**

1. **Clarify Scope:**
   * Are we including **only Amazon or all e-commerce platforms**?
   * Are we considering **business and personal shipments**?
2. **Break Down Amazon's User Base:**
   * US population ≈ **330 million**.
   * **Amazon Prime users ≈ 100 million**.
   * Assume **50% of Prime users order at least once a week** → **50 million active users per week**.
3. **Estimate Daily Orders:**
   * **Daily shipments** = **(50 million / 7) ≈ 7 million orders per day**.

✅ **Final Estimate:** ~**7 million packages shipped per day by Amazon US.**

**4. EdTech: How Many Online Courses Are Completed on Coursera Every Year?**

**Approach:**

1. **Clarify Scope:**
   * Are we considering **free and paid courses**?
   * Are we looking at **certification completions or total enrolled courses**?
2. **Break Down User Base:**
   * **Coursera has ~100 million users globally.**
   * Assume **50% actively enroll in at least one course per year** → **50 million active learners.**
3. **Estimate Course Completion Rate:**
   * Assume **30% complete their course** → **15 million course completions per year**.
   * Assume each **active learner completes ~2 courses per year**.

✅ **Final Estimate:** ~**30 million course completions on Coursera annually.**

**5. Social Media: How Many Tweets Are Sent Per Day on Twitter?**

**Approach:**

1. **Clarify Scope:**
   * Are we considering **only original tweets or retweets as well**?
   * Are we including **bot-generated tweets**?
2. **Break Down Twitter’s Active Users:**
   * Twitter has ~**400 million monthly active users (MAUs)**.
   * Assume **30% use Twitter daily (~120 million daily active users).**
3. **Estimate Tweet Frequency:**
   * Assume each active user tweets **5 times per day** (including retweets).

✅ **Final Estimate:** ~**600 million tweets sent per day.**

**6. Ride-Sharing (Uber, Lyft): How Many Cabs Are Booked Daily in London?**

**Approach:**

1. **Clarify Scope:**
   * Are we including **all cabs (Uber, Bolt, traditional taxis)**?
   * Are we considering **weekday vs. weekend differences**?
2. **Break Down Population & Users:**
   * London population ≈ **9 million**.
   * Assume **30% use ride-sharing at least once per week** → **3 million active users**.
   * **Daily active users** = **(3 million / 7) ≈ 400,000 users per day**.
3. **Estimate Ride Frequency:**
   * Assume **each user takes ~1.5 rides per day**.

✅ **Final Estimate:** ~**600,000 cab bookings per day in London.**

**7. Fast Food: How Many Burgers Does McDonald's Sell in the US Daily?**

**Approach:**

1. **Clarify Scope:**
   * Only **McDonald's or all fast food chains**?
   * Are we considering **breakfast items like McMuffins**?
2. **Break Down Restaurant Network:**
   * **McDonald's has ~14,000 stores in the US**.
   * Assume **each store sells ~1,000 burgers per day**.

✅ **Final Estimate:** ~**14 million burgers sold per day in the US.**

**8. Internet & Cloud Computing: How Much Data Is Uploaded to Google Drive Per Day?**

**Approach:**

1. **Clarify Scope:**
   * Are we considering **only Google Drive or all cloud services**?
   * Do we include **business and personal users**?
2. **Break Down Google Drive Users:**
   * Google Drive has ~**1 billion users globally**.
   * Assume **30% actively upload files daily (~300 million users).**
3. **Estimate Data Uploads:**
   * Assume each user uploads **50 MB of data per day**.

✅ **Final Estimate:** ~**15 petabytes of data uploaded daily.**

**9. Airline Industry: How Many Flights Take Off Globally Per Day?**

**Approach:**

1. **Clarify Scope:**
   * Are we considering **only commercial flights** or **private & cargo flights too**?
   * Are **connecting flights counted separately**?
2. **Break Down Air Travel Market:**
   * **Total commercial airlines worldwide ≈ 5,000.**
   * **Daily departures per airline ≈ 500.**

✅ **Final Estimate:** ~**25,000 commercial flights per day globally.**

**10. Real Estate: How Many Houses Are Sold in the US Each Year?**

**Approach:**

1. **Clarify Scope:**
   * Are we considering **only new homes or resale properties too**?
   * Are we including **apartment units and townhouses**?
2. **Break Down Homeowners & Transactions:**
   * **US has ~140 million housing units**.
   * Assume **5% of homes are sold each year**.

✅ **Final Estimate:** ~**7 million home sales annually in the US.**

**🔑 Guesstimate Pro Tips**

✔ **Always clarify the question scope** before solving.  
✔ **Start with a population estimate** and narrow down using relevant filters.  
✔ **Use real-world knowledge** (economic status, behavior, industry trends).  
✔ **Break the problem into smaller, logical chunks** to simplify calculations.  
✔ **Estimates don’t have to be exact—focus on structured thinking!**

**Why Are Guesstimates Asked in Data Science Interviews?**

* **Tests ability to deal with uncertainty and stress** – Interviewers want to see how you think under pressure.
* **Assesses structured problem-solving** – Do you break the problem down logically?
* **Evaluates mathematical proficiency** – How comfortable are you with numbers and mental calculations?
* **Simulates real-world decision-making** – Data scientists often estimate trends and metrics in business scenarios.

**🔹 Approach to Solving Guesstimates**

**1️⃣ Understand the Question**

* **Clarify ambiguities** (e.g., "How many ACs are in your city?" – Does it include homes, offices, cars?).
* **Extract key details** before making assumptions.

**2️⃣ Develop a Logical Approach**

* **Break the problem into smaller components** (e.g., using population, households, income levels, etc.).
* **Minimize assumptions** to maintain accuracy.

**3️⃣ Choose the Best Approach**

* **Think a few steps ahead** and decide which method leads to a reasonable answer.
* **Cross-check calculations** to ensure they make sense.

**4️⃣ Provide a Structured Conclusion**

* **Clearly explain how you arrived at your final estimate.**
* **Round numbers logically** to simplify calculations without introducing bias.

**🔹 Sample Guesstimate Questions and Solutions**

**1️⃣ Estimate the Number of Air Conditioners (ACs) in Bangalore**

**Approach:**

1. **Population of Bangalore:** ~10 million
2. **Tenant vs. Landlord Distribution:**
   * **80% tenants (8M people)**
   * **20% landlords (2M people)**
3. **Room Distribution:**
   * **Tenants:** 50% in single sharing (4M rooms), 50% in double sharing (2M rooms) → **Total: 6M rooms**
   * **Landlords:** **1.5M rooms**
4. **AC Ownership Rates:**
   * **30% of tenant rooms have ACs** → **1.8M ACs**
   * **50% of landlord rooms have ACs** → **750K ACs**
   * **Additional ACs in common areas:** ~450K ACs
5. **Final Estimate:** **~3 million ACs in Bangalore**.

✅ **Key Learning:** **Segment the population**, estimate home types, and use **logical AC ownership rates**.

**2️⃣ Estimate the Number of Red Cars in India**

**Approach:**

1. **Population of India:** ~1.3 billion
2. **Number of Households:** ~325M
3. **Economic Segmentation:**
   * **30% lower class (no cars)**
   * **60% middle class (50% own 1 car, 30% own 2 cars)**
   * **10% upper class (100% own 2 cars)**
4. **Total Cars in India:** ~200M
5. **Car Color Distribution:**
   * **7 major colors** (White & Black = 50%, others = 50%)
   * **Red cars = ~20% of total cars** → **~40M red cars in India**.

✅ **Key Learning:** **Break down by income groups and market share of different car colors**.

**3️⃣ Estimate the Number of Weddings per Day in London**

**Approach:**

1. **Population of London:** ~9M
2. **Marriage Rate in UK:** ~4 per 1,000 people per year
3. **Total Weddings in London per Year:** (9M ÷ 1,000) × 4 = **36,000 weddings annually**
4. **Daily Weddings:** 36,000 ÷ 365 ≈ **100 weddings per day in London**.

✅ **Key Learning:** Use **official marriage rates and population estimates**.

**🔹 Pro Tips for Solving Guesstimates**

✔ **Identify all possible use cases** – e.g., ACs exist in homes, offices, hotels, and vehicles.  
✔ **Know common population figures** for cities, states, and countries.  
✔ **Use diagrams or mental models** to organize calculations.  
✔ **Avoid rounding all numbers in the same direction** – it can lead to over/underestimation.