Case Interview Math Cheat Sheet

Assume no calculator in a live case unless you are offered one. Set up the formula with units, round, calculate out loud, then say what it means.

1. Profitability

Profit = Revenue − Cost
Revenue = Volume x Price
Cost = Fixed + Variable
Profit margin = Profit / Revenue
Gross margin = (Revenue − COGS) / Revenue
Market share = Company revenue / Market revenue

Example: revenue $120M, cost $96M: profit $24M, margin 20%.

2. Pricing and break-even

Contribution margin (CM) = Price − Variable cost per unit
CM % = CM per unit / Price
Break-even units = Fixed cost / CM per unit
Break-even revenue = Fixed cost / CM %
Volume a price rise can lose = rise / (CM % + rise)

Example: price $50, variable cost $30: CM $20 (40%). Fixed cost $1M: break-even 50,000 units. A 10% price rise can lose 10 / (40 + 10) = 20% of volume.

3. Growth

% change = (New − Old) / Old
CAGR = (End / Start)^(1/years) − 1
Rule of 72: years to double = 72 / growth %
Price and volume: revenue factor = (1 + p) x (1 + v)

Example: $50B to $100B in 9 years: 72 / 9 = about 8% a year. Price +10%, volume -10%: 1.1 x 0.9 = 0.99, revenue -1%.

4. Investment

Payback = Investment / Annual cash flow
ROI = (Gain − Cost) / Cost
NPV = Sum of CF / (1 + r)^t, minus investment
Perpetuity = Cash flow / r
Growing perpetuity = Cash flow / (r − g)
LTV / CAC: healthy subscription businesses aim for 3x or more

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Example: $4M a year forever at 10%: worth $40M. Costs $30M: NPV +$10M.

5. Mental math shortcuts

- **Write zeros as units.** 70M x $14 = $980M. Track K, M, B, not strings of zeros.
- **Build percentages from 10% and 1%.** 15% = 10% + 5%. 8% = 10% - 2%.
- **Swap the percentage.** 8% of 50 = 50% of 8 = 4.
- **A share of a share multiplies.** 40% x 25% = 10% of the base.
- **Round, then correct.** 49 x 21 = 50 x 21 - 21 = 1,029.
- **Two changes compound.** +10% then +10% is +21%, not +20%.
- **Divide by a fraction you know.** 12.5% is one eighth; 6.25% is one sixteenth.
- **Say the order of magnitude first.** "Roughly a billion" before the exact figure.
- **Aim for under 10 seconds** per operation, out loud.

6. Fractions to know cold

Fraction	%	Fraction	%
1/2	50%	1/7	14.3%
1/3	33.3%	1/8	12.5%
1/4	25%	1/9	11.1%
1/5	20%	1/12	8.3%
1/6	16.7%	1/16	6.25%

Before you say the number

1. **Units:** per year or per month? Dollars or units?
2. **Bounds:** an average sits between its parts; output cannot exceed capacity.
3. **Magnitude:** divide by population or customers. Is the per-head figure believable?
4. **So what:** "Profit rises $2.6M, so the price rise pays off."

7. The traps that cost the most points

- **Dropped zeros.** Thousands become millions mid-chain. Keep units on every line.
- **Wrong base.** Growth is measured on the old number, margin on revenue.
- **Adding changes that multiply.** Price +10% and volume -10% is -1%, not 0%.
- **Mixed periods.** A monthly price against an annual volume.
- **False precision.** "About $6B" beats "$5.91B" when inputs are assumptions.
- **No implication.** A number without "so the client should..." scores half.

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Market Sizing Cheat Sheet

The interviewer scores your structure and assumptions more than the final number. Say every assumption and why it is reasonable.

1. The method in five steps

1. **Clarify:** geography, revenue or units, which year, which customers.
2. **Choose a path:** top-down from people, or bottom-up from supply.
3. **Build the tree** out loud before any arithmetic.
4. **Calculate** with rounded numbers and units.
5. **Sanity-check** and say what the size means for the decision.

Timing: 3 to 6 minutes in total. About 1 minute to clarify and announce the approach, 2 to 3 to build and calculate, under 1 to check and conclude.

2. Two formulas

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Top-down = Population x % in segment x % who buy
    x Purchases per year x Price
Bottom-up = Units of supply (stores, machines,
    drivers) x Output per unit x Price
```

Example: 10M people x 20% buy x 4 times a year x $25 = $200M a year.

Bottom-up example: 40,000 shops x 300 cups a day x 360 days x $5 = $21.6B.

3. Numbers to memorize (rounded, 2024)

Place	Population	GDP	Urban share
United States	340M	$29T	80%
United Kingdom	69M	$3.7T	83%
Germany	84M	$4.7T	82%
France	69M	$3.2T	79%
India	1.45B	$3.8T	35%
China	1.41B	$18.7T	66%
World	8.1B	$112T	58%

Source: World Bank Open Data, 2024 values (population, GDP in current US dollars, urban population share), checked November 2026.

4. US anchors

US households	about 132M (2.6 people each)
US median household income	about $80K (2023)
US births per year	about 3.6M

Sources: US Census Bureau, families and living arrangements 2024 and income report P60-282; CDC births data.

5. Time and units

Days a year	365 (about 360 for easy math)
Weeks a year	52 (about 50)
Working days a year	about 250
Working hours a year	about 2,000
Hours a year	8,760

6. Penetration rules of thumb

Early or niche product	5 to 15%
Mature, mass-appeal product	30 to 50%
Near-universal product	80 to 95%

Rules of thumb for interviews, not data. State which band you chose and why.

7. Sanity checks

- **Per person:** $45B / 340M people is about $132 a year. Believable?
- **Share of the economy:** compare with GDP or household income.
- **Second path:** run top-down and bottom-up; they should land within 2 to 3x.

8. Worked example: US disposable diapers, top-down

```
3.6M births a year x 2.5 years in diapers = 9M children
9M x 6 diapers a day = 54M a day; x 365 = about 19.7B a year
19.7B x $0.30 per diaper = about $5.9B, so about $6B a year
```

Check: about $650 a year per child in diapers, roughly $55 a month. Believable for a family, so the estimate passes. Years in diapers, diapers a day and price are assumptions: say them out loud.

Practice next

Timed, graded reps by skill (free account): Percentages · Break-even · Growth · Market sizing `roadtooffer.com/quick-math`

Case math workbook (free account): 35 timed problems across percentages, break-even, growth, profitability, investment and market sizing, with a worked answer key and an error log. roadtooffer.com/resources/case-math-workbook

Graded drills: roadtooffer.com/blog/case-interview-math-practice. **Full method:** roadtooffer.com/blog/market-sizing-step-by-step

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