

Case math: six useful checks

Worked answer key

01 / Percentage change

Sales rose by how much?

A shop sold 80 units last week and 92 this week. What is the percentage increase in units sold?

Assumptions: Compare equally long periods; every unit is counted once.

15%.

The increase is 12 units. Divide by the starting value: $12 \div 80 = 0.15 = 15\%$.

Watch for: 12 is an absolute unit change. Percentage change uses the original 80 as its denominator.

02 / Profit and margin

More revenue. Less profit?

A retailer has \$10 million in annual revenue and \$8 million in annual costs. Next year, revenue grows 10% and costs grow 15%. Calculate next year's profit and profit margin. Did profit grow?

Assumptions: Profit means revenue minus the stated costs; use the same cost scope in both years.

\$1.8 million profit; about 16.36% margin.

Revenue becomes \$11 million and costs become \$9.2 million. Profit is $\$11\text{m} - \$9.2\text{m} = \$1.8\text{m}$. Margin is $\$1.8\text{m} \div \11m .

Profit falls 10% from \$2m. Margin falls from 20% to about 16.36%: about 3.64 percentage points.

Watch for: Do not subtract the growth rates to calculate profit growth. Costs and revenue start at different values.

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03 / Weighted average

The mix changed.

A store sells two products at \$60 and \$100. At first, 40% of units are the \$60 product and 60% are the \$100 product. The mix then changes to 60% and 40%. Find the average selling price before and after. What happens to revenue if total unit sales stay at 1,000?

Assumptions: Prices do not change. Shares refer to unit volume, not revenue.

\$84 before; \$76 after.

First: $0.40 \times \$60 + 0.60 \times \$100 = \$84$. Then: $0.60 \times \$60 + 0.40 \times \$100 = \$76$.

At 1,000 units, revenue falls from \$84,000 to \$76,000: \$8,000, or about 9.52%.

Watch for: The unweighted midpoint of \$80 ignores the mix. A shift toward the lower-priced product reduces revenue even with unchanged volume.

04 / Break-even

How many units cover costs?

A service charges \$12 per unit, has an \$8 variable cost per unit, and incurs \$360,000 in annual fixed costs. How many units must it sell each year to break even?

Assumptions: Price and unit cost stay constant; all stated fixed costs belong to the same year. Ignore taxes and capacity constraints.

90,000 units per year.

Each unit contributes $\$12 - \$8 = \$4$ toward fixed costs. $\$360,000 \div \$4 = 90,000$ units.

Watch for: Dividing fixed costs by the \$12 selling price ignores the variable cost. Check the answer: $90,000 \times \$4$ exactly covers \$360,000.

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05 / Compound growth

Three years at 10%.

Annual revenue is \$100 million today. It grows 10% each year for three years. What is revenue after year three, and what is the total percentage increase?

Assumptions: Each year's growth applies to the previous year's revenue.

\$133.1 million; a 33.1% total increase.

Year one is \$110m, year two is \$121m, and year three is \$133.1m. Equivalently: $\$100\text{m} \times 1.1^3$.

Watch for: Adding three annual rates gives 30%, which omits compounding. The annual growth rate is still 10%.

06 / Capacity

Can the team meet demand?

Four analysts each process 60 tickets per working day. The team works five days a week and receives 1,500 tickets a week. What is weekly capacity, the shortfall, and the minimum total number of analysts needed at the same productivity?

Assumptions: All analysts work all five days; tickets require comparable effort. Ignore leave, rework and scheduling variability.

1,200 tickets of capacity; 300 tickets short; five analysts in total.

$4 \times 60 \times 5 = 1,200$. Demand exceeds capacity by $1,500 - 1,200 = 300$. Each analyst processes 300 tickets a week, so $1,500 \div 300 = 5$.

Watch for: Five is the total required headcount, not five additional hires. Real staffing decisions also need variability and quality assumptions.