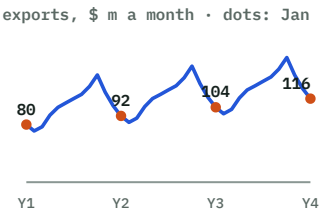
What does the trend say?

A few months of falling numbers prove little: they can be the **season** (it comes every year), **noise** (luck) or a chart that starts in a convenient year. Zoom out, compare like with like, smooth, and ask where it starts. Question 8 of the ten to ask a number.

1 Seasonality

zoom out

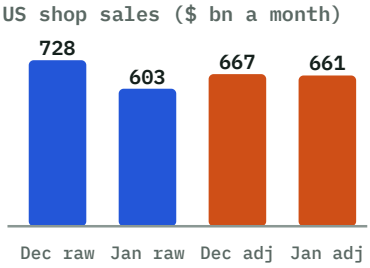
- **Coralia Gazette** (the toy island's newspaper): "Exports (what Coralia sells abroad) have fallen **three months in a row**!" · Oct → Jan: **173 → 149 → 130 → 116** ($ millions a month) · all true
- Zoom out to **3 years** → the same October peak (harvest ships) and winter dip **every year** · each year higher than the last
- **Seasonality** = a pattern that repeats at about the same time every year · holidays, harvests, weather, school terms
- **Trend** = a lasting move one way, up or down · two months (Dec → Jan) cannot show one → more history



2 Compare like with like

year on year · adjusted

- **Year on year** = a month against the **same month a year earlier** → the season cancels · Jan `116 − 104 = +12` → exports **up** $12 million
- **Seasonally adjusted** = statisticians remove the usual seasonal pattern · the unemployment rate in the news (Macro Lesson 3) is published adjusted
- US shop sales (Census Bureau, government statistics office) · Dec 2023 ≈ $728 bn → Jan 2024 ≈ $603 bn · raw **−17%** · adjusted ≈ $667 → $661 bn ≈ **−1%** → almost all of the 17% = the season
- Practice: hotel guests Jul → Oct 124 → 119 → 104 → 94 · Oct `94 − 86 = +8` thousand



3 Noise

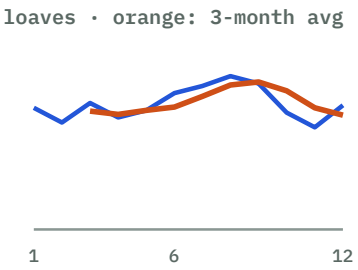
luck makes streaks

- **Noise** = random ups and downs that carry no message
- Palmera bakery ≈ 100 loaves a month, only luck moves it · "up **four months in a row**!" 92 → 126 → then back down
- Luck alone makes streaks · coin flips of Finance Lesson 7 · four months is too short to call a trend → wait for more
- Five-day stock price, lottery numbers → noise · ice cream, air travel by month → season · phones 2000-2020, life expectancy → trend

4 Moving average

smooth, but late

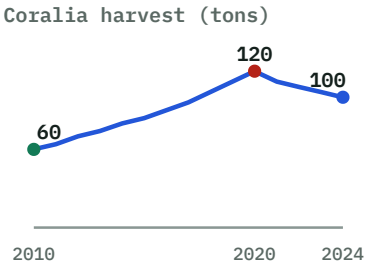
- **Moving average** = mean of the last few periods, recalculated each period → ups and downs cancel · 3 months: `(a + b + c) ÷ 3`
- `(10 + 14 + 9) ÷ 3 = 11` · `(14 + 9 + 13) ÷ 3 = 12` · catch 12, 18, 9, 15, 21 → **13, 14, 15** → up ≈ 1 a month · March "crash" = noise
- **Longer** window → **flatter**, but reacts **later** · real fall 30 → 18 in April → average 26, 22, then 18 in June



5 The start year

since when?

- "Harvest **falling since 2020**!" · 2020 = record 120 t → 2024 100 t = **−17%** · since 2010 (60 t) → **+67%**
- **Start-year trick** = choosing a first year that makes a series look like it rises or falls · starts at a peak → only the way down
- US corn (tons per hectare; 1 ha = 100 m × 100 m) · 2004 ≈ **10.1** · drought (long dry spell) 2012 ≈ **7.7** · 2024 ≈ **11.3** → 2004-12 −23% · 2012-24 +46% · neither false
- Headlines: "down 30% since 2019" (the record) · "doubled since 2021" (the worst year) → ask **why that year**



6 So what?

question 8 of 10

- **Ten questions to ask a number** · 1 · Where does the axis start, and what is its scale? · 2 · Average of what: the mean or the median? · 3 · Percent of what? Percent or percentage points? · 4 · Real or nominal: did prices change too? · 5 · What else changed? Could something else explain both? · 6 · Compared with whom? Where is the control group? · 7 · Who was asked, and who was not? · **8 · Where does the series start, and is it seasonal?**
- Read a series in order: a fall over a few months → **zoom out** (same dip every year?) → take away the **season** (year on year) and the **noise** (moving average) → check the **start** → only then say "trend"
- Gazette rewritten → "Exports fell for three months, as they do every year after the October peak. Compared with the same month a year earlier, they are up $12 million." · next → Lesson 9, how much is a trillion?

Watch out: before you credit a cause, take out the season · sunscreen +50% March → June with a new ad, but +50% last year with no ad → June vs last June 63 vs 60 = **+5%** → at most that is left for the ad · a short streak is not a trend