Exponential Regression

Roughly constant ratios and a bending plot: fit an exponential, y = a · b^x, with technology. a is the starting value; b is the growth or decay factor. Support the choice; do not try to prove it.

1 THE VOCABULARY
Words we use

Exponential regression finding the best-fitting exponential curve.
Roughly constant close to the same, not exact.
a the starting value, at x = 0.
b above 1 growth factor: 1.63 grows about 63%.
b below 1 decay factor: 0.49 keeps about 49%.

- Watch out for these.
- Fitting a line because r is big. Check the ratios and the residuals.
- Reading b = 1.63 as 163% growth. It is 63% growth.
- Expecting the ratios to be exactly equal.
- Expecting a to equal the first data value. Regression fits all the points.

2 THE METHOD
Fit an exponential

1. CHECK differences roughly equal: a line. Ratios roughly equal and a bend: an exponential.
2. FIT the tool or a calculator gives a and b.
3. READ a about that many at the start.
4. READ b 1 plus or minus the rate: grows or loses that percent each step.
5. USE IT predict; for when-will-it-reach, use a table or a horizontal line.

WHY REAL DATA WOBBLES
Real things are random: coin flips, gnats, weather. The data lands near the true pattern, not on it, so the fitted numbers are near the story's numbers.

3 THE GNATS
12, 20, 35, 60, 80

differences 8, 15, 25, 20	not equal: not a line
ratios 1.67, 1.75, 1.71, 1.33	roughly the same: try an exponential
$y = 12.48 \cdot 1.63^x$	from the tool
about 12 at the start; grows about 63% an hour	a and b in the story
200 gnats at about 5.7 hours	table or horizontal line

THE PENNIES
300, 164, 100, 46, 20, 8. Story: $300 \cdot (12)^x$. Tool: about $348 \cdot 0.49^x$. Close, not exact.

SAY IT OUT LOUD
Adds or multiplies, even when it is messy. Roughly constant ratios: fit an exponential, and read a and b in the story.