Which Account Wins?

Simple interest adds (a line). Compound interest multiplies (an exponential). The exponential eventually passes the line and stays ahead. Find the crossing with a table or a graph.

1 THE VOCABULARY
Words we use

Eventually exceeds passes and stays ahead.
Intersection where the two graphs cross: equal balances.
Constant difference same dollars each step: linear.
Constant ratio same factor each step: exponential.
Same form put both accounts in a table, graph, or equation to compare.

- Watch out for these.
- Picking the account with the bigger rate without checking the time.
- Deciding from the first few rows. Look further.
- Trying to solve the crossing with algebra. Use the table or the graph.
- Thinking the line can catch up again. It cannot.

2 THE METHOD
Compare two accounts

1. NAME THE FAMILIES dollars each step: linear. Percent each step: exponential.
2. WRITE BOTH line: P + (dollars)t. Exponential: $P(\text{factor})^t$.
3. BUILD A TABLE same times for both.
4. FIND THE CROSSING the first row where the exponential is ahead, or the intersection on the graph.
5. ANSWER WITH THE TIME before the crossing, the line; after it, the exponential.

> WHY MULTIPLYING PASSES ADDING
> The line adds the same amount forever. The exponential adds a percent of a growing balance, so its step grows without limit, passes the line's step, and the gap only widens.

3 THE RACE
Kevin 100 + 5m; Joseph $100(1.03)^m$

month 12: \$160.00 and \$142.58	Kevin ahead
month 24: \$220.00 and \$203.28	Kevin still ahead
month 32: \$260.00 and \$257.51	closing in
month 33: \$265.00 and \$265.23	Joseph takes the lead
month 48: \$340.00 and \$413.23	Joseph pulls away

> TWO BANKS
> City Bank 10,000 + 300y; National Bank 2.6% compounded monthly. Year 10: \$13,000.00 and \$12,965.65. Year 15: \$14,500.00 and \$14,763.58. National Bank leads from year 11.

> SAY IT OUT LOUD
> Lines add, exponentials multiply, and multiplying always passes adding, sooner or later.