Which Account Wins?

Students race a linear account against an exponential one (Kevin and Joseph), find the crossing from a table and a graph, compare two banks given in different forms, and conclude that exponential growth eventually exceeds linear growth.

TIME	45 minutes (one student with a parent or tutor, or a small group)
WHO	Math 1 (algebra readiness), about age 12. Follows Unit 8, Lesson 3.
MATERIALS	Student worksheet (PDF), the Deep Dive 5 interactive page for this lesson (race table and graphs need a screen), pencil, calculator with a power key
PRIOR KNOWLEDGE	Simple and compound interest (Lessons 1 to 3). Linear or exponential from a table (Unit 7, Lesson 5). Reading an intersection (Unit 6, Lesson 1).
STANDARDS	NC.M1.F-LE.3, NC.M1.F-IF.9, NC.M1.F-LE.1.
KEEP OUT	Solving for the crossing time with algebra or logarithms.

Learning goals

1. Decide from a description whether an account is linear or exponential, and write its equation.
2. Build a table for two accounts and find the first time the exponential one is ahead.
3. Read the crossing from a graph and explain what it means.
4. Compare two accounts given in different forms and explain why the answer depends on the time.

Vocabulary: say both, every time

The rule for the whole lesson: whenever the adult or the student says a math word, they follow it with the plain-English version. Proper term first, plain English second, until the student does it without being asked.

TERM	LOOKS LIKE	PLAIN ENGLISH
Eventually exceeds	passes and stays ahead	The exponential wins in the end.
Intersection	the crossing	Equal balances.
Constant difference	adds	Linear.
Constant ratio	multiplies	Exponential.

> THE ONE SENTENCE TO SAY OUT LOUD
>
> Lines add, exponentials multiply. Multiplying always passes adding, sooner or later, so ask how long the money stays.

Lesson timeline (45 minutes)

0:00 to 0:05	Warm-up: vote. $5 every month or 3% every month, on $100? Take a vote and write it down.
0:05 to 0:20	The race. Write both equations and name the families. Fill in months 12 and 24: Kevin is ahead, which surprises students. Run the race table to month 33 and beyond. Read the crossing on the graph and tie it to Unit 6. State the big idea.
0:20 to 0:30	Two banks. City Bank as a sentence, National Bank as a formula. Put both in a table. Year 10 and year 15. Conclude: it depends on how long.
0:30 to 0:40	Sort and practice. The money-story sort, then the practice problems or Worksheet Parts A and B. Same buttons: Hint, Show next step, Reveal answer, Hide help.
0:40 to 0:45	Exit ticket. Worksheet Part E. Success looks like Kevin at 24 months, Joseph at 48, and an answer that depends on the time.

Misconceptions to listen for

- **The bigger rate always wins.** Not over a long time, if the other one compounds.
- **Kevin is ahead at two years, so Kevin wins.** Look further.
- **The line will catch up again.** Once passed, it stays behind.
- **You need algebra to find the crossing.** A table or a graph is the tool here.
- **3% a month is small.** It is a percent of a growing balance.

Support and stretch

Support

Fill the Kevin and Joseph table together for months 0, 12, and 24 before using the race builder. Have the student point to the crossing on the graph and say both balances there.

Stretch

Ask what monthly dollar amount Kevin would need to still be ahead at month 48 (more than about $6.53). Ask whether any fixed amount keeps Kevin ahead forever, and why not.

Where this goes next

Lesson 5: when money shrinks. The same form with a factor below 1 for depreciation, interest that works against you on a loan, and using the models to answer what-if and how-long questions.

> THE HABIT TO BUILD
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> Name the family, write both, build the table, find the first row where the exponential leads.