Compounding More Often

Students learn the compounding periods, find the rate per period (r over n) and the number of periods (n times t), read A = P(1 + r/n)^(nt) as whole quantities, compute balances in the right order, and conclude that compounding more often earns only a little more.

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 2.
MATERIALS	Student worksheet (PDF), the Deep Dive 5 interactive page for this lesson, pencil, calculator with a power key (required for this lesson)
PRIOR KNOWLEDGE	A = P(1 + r)^t and the growth factor (Lesson 2). Order of operations. Stacked fractions as division.
STANDARDS	NC.M1.A-SSE.1b, NC.M1.F-IF.8b, NC.M1.F-LE.5.
KEEP OUT	Solving for the exponent or the rate. Continuous compounding and the number e.

Learning goals

1. Name n for annual, quarterly, monthly, and daily compounding.
2. Find the rate per period and the number of periods.
3. Read the parentheses as the growth factor for one period and the exponent as the number of periods.
4. Compute a balance in order (divide, add 1, power, times P) to the cent, and explain why more frequent compounding earns only a little more.

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
Compounding period	how often	n times a year.
Rate per period	r over n	A piece of the yearly rate.
Number of periods	n times t	The exponent.
Growth factor for one period	1 + r over n	One quantity.

> THE ONE SENTENCE TO SAY OUT LOUD
>
> Divide the rate, add 1, raise to the number of periods, times P. More often earns a little more, but only a little.

Lesson timeline (45 minutes)

0:00 to 0:05	Warm-up: Lesson 2's formula. $1,000 at 6% compounded annually for 1 year: $1,060.00. Ask: what if the bank paid a piece of the interest every month instead?
0:05 to 0:17	Mini-lesson: periods. The four values of n. Split the rate: r over n, stacked. Count the periods: n times t. Build the formula from Lesson 2's and read it in chunks. Show that n = 1 gives Lesson 2 back.
0:17 to 0:28	One example all the way. $1,000 at 6%, monthly, in four ordered steps with the calculator keys. Then the table for annual, quarterly, monthly, daily. Draw the conclusion: a little more, only a little. Try other numbers in the comparer.
0:28 to 0:40	Practice. The practice problems or Worksheet Parts B to D. Same buttons: Hint, Show next step, Reveal answer, Hide help. Insist on the order and on rounding at the end.
0:40 to 0:45	Exit ticket. Worksheet Part F. Success looks like 0.004 and 36 periods; $840.76.

Misconceptions to listen for

- **Use the full yearly rate each period.** Divide by n first.
- **The exponent is t.** It is n times t.
- **Round the factor.** Keep all the digits until the end.
- **Daily earns far more.** Only cents more than monthly.
- **Add 1 before dividing.** Divide r by n, then add 1.

Support and stretch

Support

Give a four-box template: rate per period, add 1, power, times P. Let the comparer confirm each answer. Start with quarterly, where the numbers are friendlier.

Stretch

Ask for the balance of $1,000 at 6% after 10 years, annually and monthly ($1,790.85 and $1,819.40), and whether the gap grows with time. Ask what compounding every hour would add.

Where this goes next

Lesson 4: which account wins? A simple interest account races a compound interest account, and the answer depends on how long you wait.

> THE HABIT TO BUILD
>
> Divide the rate by n, add 1, raise to n times t, multiply by P. Read the chunks.