Compound Interest, Interest on Interest

Compound interest pays interest on interest. Each year multiplies by the growth factor 1 + r. A = P(1 + r)^t, the exponential y = a · b^x with a = P and b = 1 + r.

1 THE VOCABULARY
Words we use

Compound interest interest on the principal and on the interest already earned.
Compounded annually interest added once a year.
Growth factor 1 + r, what you multiply by each year.
Growth rate r, the percent: how far the factor is from 1.
Initial value P, the balance when t = 0.

- Watch out for these.
- Using 0.05 as the factor. The factor is 1.05: keep all of it, plus 5%.
- Multiplying P by 1.05 before the power. Power first.
- Reading 1.055 as 55%. It is 1 + 0.055: 5.5%.
- Calling it a line. The interest earned grows each year.

2 THE METHOD
Use the formula

1. RATE AS A DECIMAL 5% is 0.05.
2. GROWTH FACTOR 1 + r: 1.05.
3. POWER FIRST $(1.05)^t$. Keys: 1.05, power key, t, equals.
4. TIMES P multiply by the principal; round to the cent.
5. READ IT BACKWARD front number is P; the factor is 1 plus the rate.

> WHY YOU MULTIPLY BY 1 + R
> B + rB = B(1 + r), the distributive property. The 1 keeps all of the money; the r adds the interest.

3 SAME $1,000 AT 5%
Year by year, then the shortcut

year 1: 1000 × 1.05 = $1,050.00	interest $50.00
year 2: 1050 × 1.05 = $1,102.50	interest $52.50
year 3: 1102.50 × 1.05 = $1,157.63	interest $55.13: growing
$A = 1000(1.05)^3 = 1000 \times 1.157625$	power first
= $1,157.63	same as the table

> READ AN EXPRESSION
> $10{,}000(1.055)^n$: first deposit $10,000; 1.055 = 1 + 0.055, a 5.5% yearly rate. Never 0: positive times positive.

> SAY IT OUT LOUD
> Simple interest adds, compound interest multiplies. The growth factor is 1 plus the rate.