Compound Interest, Interest on Interest

Compound interest: each year multiplies by the growth factor 1 + r. A = P(1 + r)^t. Power first, then times P. Money to the cent.

Name _____ Date _____

Words we use say the math word, then the plain English

WORD	PLAIN ENGLISH	WHAT YOU DO
Compound interest	Interest paid on the principal and on the interest already earned.	Interest on interest: the balance multiplies each year.
Compounded annually	Interest is added once a year.	One multiplication by 1 + r per year.
Growth factor	1 + r, the number you multiply by each year.	5% gives 1.05. It is the b of $y = a \cdot b^x$.
Growth rate	r, the percent. How far the factor is from 1.	A factor of 1.055 is a rate of 5.5%.
Initial value (principal)	P, the amount at the start, when t = 0.	It is the a of $y = a \cdot b^x$.
Constant ratio	The same number multiplied each step: the exponential pattern.	Divide one year's balance by the year before: 1.05.

Part A Interest on interest

$1,000 at 5% compounded annually. Each year's interest is 5% of the balance so far.

YEAR	INTEREST EARNED THIS YEAR	BALANCE
0		$1,000.00
1		
2		
3		
4		

1. Is the interest earned the same every year? What does that say about the rate of change, and the family?

Part B Rates and factors

RATE	4%	7%	2.5%	10%		
Growth factor					1.08	1.055

Part C Read the expression

EXPRESSION	PRINCIPAL P	GROWTH FACTOR	GROWTH RATE
$2500(1.04)^t$			
$10{,}000(1.055)^n$			
$750(1.1)^t$			

Part D Write it and use it

1. $800 at 3% compounded annually. Write the balance after t years.

2. $1,500 at 6% compounded annually for 5 years. Find the balance to the cent. Show the power first.

3. $1,000 at 5% for 10 years: simple interest balance, compound interest balance, and the difference.

Part E In your own words

1. Why is adding 5% the same as multiplying by 1.05? Use the distributive property.

2. How is $A = P(1 + r)^t$ the same as $y = a \cdot b^x$?

3. Can the balance in $10{,}000(1.055)^n$ ever be 0? Why?

Part F Exit ticket

1. $3000(1.07)^t$: P, growth factor, growth rate.

2. $500 at 4% compounded annually for 3 years, to the cent.

Answer key

Part A. $50.00, $1,050.00; $52.50, $1,102.50; $55.13, $1,157.63; $57.88, $1,215.51. 1. No, it grows: the rate of change increases, so it is not a line. Constant ratio 1.05: exponential.

Part B. 1.04, 1.07, 1.025, 1.10; 8%, 5.5%.

Part C. $2,500, 1.04, 4%. $10,000, 1.055, 5.5%. $750, 1.1, 10%.

Part D. 1. $A = 800(1.03)^t$. 2. 1500 × 1.3382256 = $2,007.34. 3. Simple $1,500.00; compound $1,628.89; difference $128.89.

Part E. 1. B + 0.05B = B(1 + 0.05) = 1.05B. 2. a is P (the start) and b is 1 + r (the growth factor). 3. No: positive times positive is never 0.

Part F. 1. $3,000; 1.07; 7%. 2. 500 × 1.124864 = $562.43.