

Student Workbook

Exponential Functions

Name: _____

Date: _____

Period: _____

Learning Target: I can identify, evaluate, and apply exponential growth and decay models, including compound interest.

Vocabulary

Term	Meaning
Exponential Function	$f(x) = ab^n$, where a is the initial value and b is the growth/decay factor.
Growth Factor	$b > 1$: the function increases; $b = 1 + r$, where r is the percent growth rate (decimal).
Decay Factor	$0 < b < 1$: the function decreases; $b = 1 - r$, where r is the percent decay rate (decimal).
Compound Interest	$A = P(1 + r/n)^{nt}$ — interest compounded n times per year.

Key Concept: Growth vs. Decay

THE FACTOR b TELLS THE STORY $b > 1 \rightarrow$ growth ($b = 1 + r$) $0 < b < 1 \rightarrow$ decay ($b = 1 - r$)

EXAMPLE 1 — Growth

$f(x) = 300(1.08)^x$ ($a=300$, $b=1.08$, 8% growth)

EXAMPLE 2 — Decay

$f(x) = 1500(0.85)^x$ ($a=1500$, $b=0.85$, 15% decay)

COMMON MISTAKE

The growth **FACTOR** (b) is **NOT** the same as the growth **RATE** (r)! If a population grows 5% per year, the growth factor is $b = 1.05$, not 0.05.

Key Concept: Compound Interest

EXAMPLE 3

\$1000 is invested at 6% annual interest, compounded quarterly, for 5 years. Find the amount.

$$A = 1000(1 + 0.06/4)^{4(5n)} = 1000(1.015)^{20} = \underline{\hspace{2cm}}$$

Guided Practice — Part A: Identify a, b, Growth/Decay, Rate

A1 $f(x) = 300(1.08)^n$

A2 $f(x) = 1500(0.85)^n$

Guided Practice — Part B: Evaluate

B1 $f(x) = 200(1.12)^n$. Find $f(4)$.

B2 $f(x) = 1000(0.75)^n$. Find $f(3)$.

Guided Practice — Part C: Write & Use a Model

C1 A bacteria culture starts with 50 cells and doubles every hour. Write the model and find the population after 5 hours.

C2 A car worth \$25,000 depreciates 15% per year. Write the model and find its value after 4 years.

Guided Practice — Part D: Compound Interest

D1 \$2000 invested at 4% annual interest, compounded annually, for 6 years.

D2 \$5000 invested at 5% annual interest, compounded monthly, for 3 years.

BEFORE YOU MOVE ON

Check with a partner: did you convert the percent rate to decimal form, and add/subtract it from 1 correctly to get b ?