

# Exponential Growth and Decay

Algebra 1 • Section 11.2

Name: \_\_\_\_\_

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## Quick Review and Helpful Hints

Exponential models multiply by a constant factor over equal input intervals. Compare the initial value, multiplier, and long-term behavior before deciding what the model means.

▷ **Example:** Evaluate  $100(1.05)^2$ .

**Work:** Square the growth factor:  $1.05^2 = 1.1025$ . Then multiply:  $100(1.1025) = 110.25$ .

★ **Answer:** 110.25

## Practice Problems

Solve each problem. Show enough work that another student could follow your thinking.

- |                                                             |       |                                                      |       |
|-------------------------------------------------------------|-------|------------------------------------------------------|-------|
| 1. Write a growth model for 200 increasing by 5% each year. | _____ | 6. Find the decay factor for 35% decay.              | _____ |
| 2. Write a decay model for 800 decreasing by 12% each year. | _____ | 7. Does $y = 4(1.2)^x$ show growth or decay?         | _____ |
| 3. Evaluate $500(1.1)^2$ .                                  | _____ | 8. Does $y = 9(0.75)^x$ show growth or decay?        | _____ |
| 4. Evaluate $1000(0.9)^3$ .                                 | _____ | 9. Find the initial value of $A = 350(1.04)^t$ .     | _____ |
| 5. Find the growth factor for 7% growth.                    | _____ | 10. What is the percent change in $y = 60(1.18)^x$ ? | _____ |

## Word Problems

11. A car worth \$20,000 loses 15% yearly. Write the model. \_\_\_\_\_
12. A population of 1,500 grows by 3% each year. Estimate after 2 years. \_\_\_\_\_



## Answer Keys

- |                  |                     |
|------------------|---------------------|
| 1. $200(1.05)^t$ | 7. Growth           |
| 2. $800(0.88)^t$ | 8. Decay            |
| 3. 605           | 9. 350              |
| 4. 729           | 10. 18% growth      |
| 5. 1.07          | 11. $20000(0.85)^t$ |
| 6. 0.65          | 12. 1,591.35        |

### Step-by-Step Explanations

- Going up 5% means you keep the whole amount plus a little more, so multiply by 1.05 every year.
- Losing 12% leaves 88% behind, so the yearly multiplier is 0.88.
- Two years of growth means multiplying by 1.1 twice:  $1.1^2 = 1.21$ , and  $500 \times 1.21 = 605$ .
- Apply the 0.9 factor three times —  $0.9^3 = 0.729$  — so 1000 shrinks to 729.
- The factor is your starting whole, 1, plus the 0.07 you gain — so 1.07.
- If 35% disappears, 65% stays — and that surviving share, 0.65, is your factor.
- A base bigger than 1 makes each step larger than the last, so this one is growing.
- When the base sits between 0 and 1, every multiply shrinks the value — that's decay.
- At  $t = 0$  the factor  $1.04^0$  equals 1, so the coefficient 350 is exactly where things start.
- Read 1.18 as  $1 + 0.18$  — that extra 0.18 is an 18% jump each step.
- Drop 15% and 85% of the value carries over, so each year multiplies by 0.85.
- Two years of 3% growth means  $1500 \times 1.03^2$ ; since  $1.03^2 = 1.0609$ , you land at 1591.35.



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