

10-6 Growth and Decay (Pages 561–565)

General Equation for Exponential Growth	$A = C(1 + r)^t$ in which the initial amount C increases by the same percent r over a given period of time t .
General Equation for Exponential Decay	$A = C(1 - r)^t$ in which the initial amount C decreases by the same percent r over a given period of time t .
Compound Interest Equation	$A = P\left(1 + \frac{r}{n}\right)^{nt}$ where A = amount of the investment over a period of time, P = principal (initial amount of investment), r = annual rate of interest expressed as a decimal, n = number of times the interest is compounded each year, and t = number of years (may be expressed as a fraction) the money is invested.

Example

If a city with a population of 125,000 is decreasing at a rate of 1.15% per year, what will its population be after 10 years?

$A = C(1 - r)^t$ *General equation for exponential decay.*
 $A = 125,000(1 - 0.0115)^{10}$ $C = 125,000, r = 0.0115, \text{ and } t = 10.$
 $A \approx 111,347$ *In ten years the population will be about 111,347.*

Practice

Determine whether each exponential equation represents growth or decay.

1. $y = 20(0.85)^x$ 2. $y = 20(1.025)^x$ 3. $y = 20(0.682)^x$

4. **Finance** Determine the final amount for each investment.
- a. \$500 invested at 7.5% per year compounded monthly for 2 years
 - b. \$500 invested at 7.5% per year compounded yearly for 2 years
 - c. \$500 invested at 6.25% per year compounded daily for 3 years
 - d. \$500 invested at 6.25% per year compounded monthly for 3 years
 - e. \$500 split into two investments: \$400 invested at 8% per year compounded quarterly for 2 years and \$100 invested at 10.75% per year compounded yearly for 1 year

5. **Standardized Test Practice** Due to decline in industry in a particular city, the enrollment at the local high school is also declining. Since 1995, the school lost students at an annual rate of 1.95%. Given that the enrollment in 1995 was 1020 students, which equation can be used to find out what the enrollment will be in the year 2015 if the school continues to lose students at the same rate?
- A** $A = 1020(1 - 0.195)^{20}$ **B** $A = 1020(1 - 0.195)^{15}$
C $A = 1020(1 - 0.0195)^{20}$ **D** $A = 1020(1 - 0.0195)^{15}$

Answers: 1. decay 2. growth 3. decay 4a. \$580.65 4b. \$577.81 4c. \$603.11 4d. \$602.82 4e. \$579.41 5. C