

## 8.8 Exponential Decay

The half-life of a radioactive substance is the length of time it takes for one half of the substance to decay into another substance. To treat some forms of cancer, doctors use radioactive iodine. The half-life of iodine-131 is 8 days. A patient receives a 12-mCi treatment. How much iodine is left in the patient 32 days later?

days	iodine
0	12
8	6
16	3
24	1.5
32	0.75

$$y = ab^x$$
$$y = 12 \left(\frac{1}{2}\right)^{x \div 8}$$

common ratio  
 $\frac{1}{2}$

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In 1990, the population of Washington D.C. was about 604,000 people. Since then the population has decreased by about 1.8% each year.

Write an exponential decay function to model the D.C. population and find its projected population in 2010.

$$a = y\text{-intercept} = 604,000$$

$$b = \text{decay} = \frac{100\% - 1.8\%}{100\%} = .982$$

$$x = \text{time} = 20$$

$$y = \text{population} = 604000(.982)^{20}$$
$$y = 420,017$$

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The function

$$y = a \cdot b^x$$

models exponential decay for  $a > 0$  and  $0 < b < 1$ .

When a number is decreased by 5%, the result is 95% of the original number. So when you find the decay factor, think of 100% minus the percent its decreasing.

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