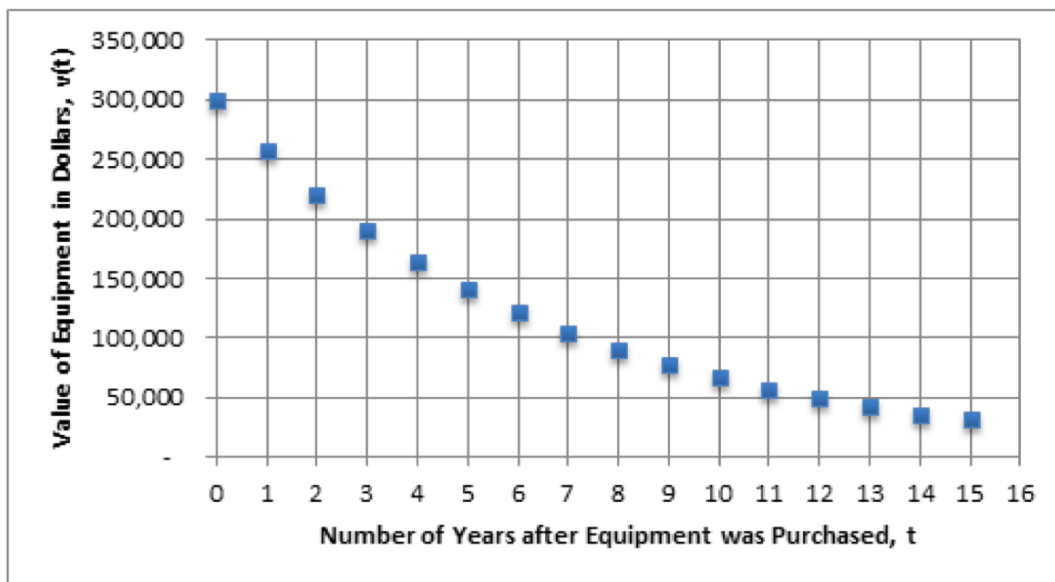


NAME: \_\_\_\_\_ PERIOD: \_\_\_\_\_ DATE: \_\_\_\_\_

# Homework Problem Set

1. A construction company purchased some equipment costing \$300,000. The value of the equipment depreciates (decreases) at a rate of 14% per year.



- A. Write a formula that models the value of the equipment each year.

$$v(t) = 300,000(0.86)^t$$

- B. What is the value of the equipment after 9 years?

$$\$ 77,198$$

- C. Graph the points  $(t, v(t))$  for integer values of  $0 \leq t \leq 15$ .

See graph

- D. Estimate when the equipment will have a value of \$50,000

About 12 years

2. The number of newly reported cases of HIV (in thousands) in the United States from 2000 to 2010 can be modeled by the following formula:

$$f(t) = 41(0.9842)^t, \text{ where } t \text{ is the number of years after 2000}$$

A. Identify the growth factor.

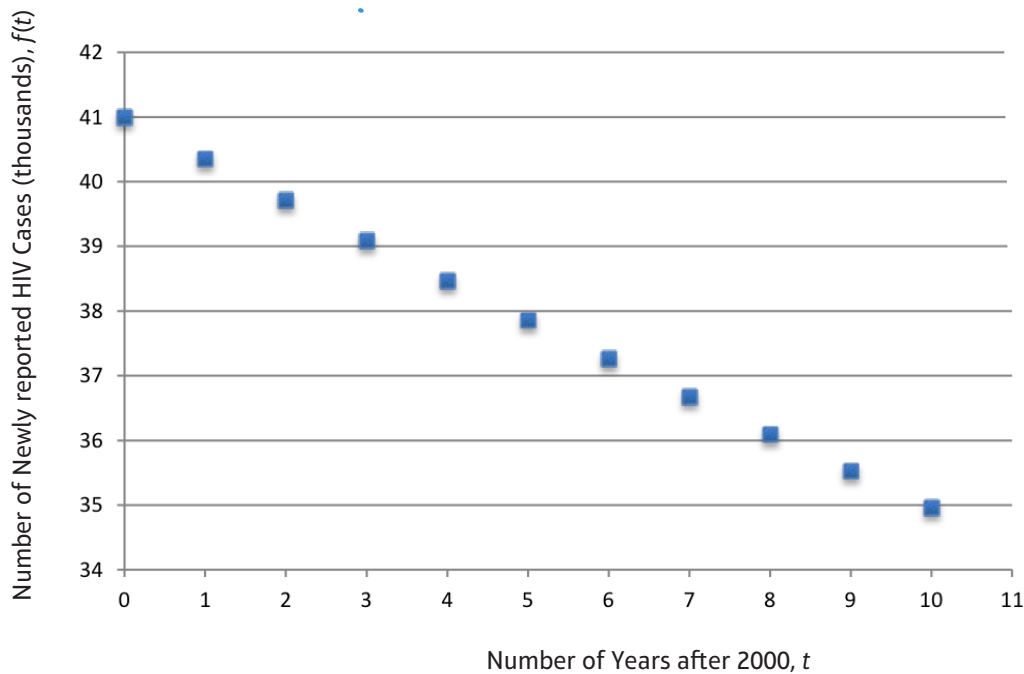
0.9842

B. Calculate the estimated number of new HIV cases reported in 2004.

$$f(4) = 41(0.9842)^4$$

$$= 38.4695 \xrightarrow{\text{in thousands}} 38,470 \text{ new cases}$$

C. Graph the points  $(t, f(t))$  for integer values of  $0 \leq t \leq 10$ .



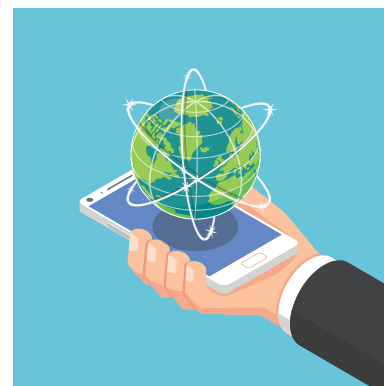
D. During what year did the number of newly reported HIV cases drop below 36,000?

2009



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3. In 2013, a research company found that smartphone shipments (units sold) were up 32.7% worldwide from 2012, with an expectation for the trend to continue. If 959 million units were sold in 2013, how many smartphones can be expected to sell in 2018 at the same growth rate? (Include the explicit formula for the sequence that models this growth.)



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- A. Identify the growth factor.

$$100\% + 32.7\% = 1.327$$

- B. Calculate the estimated number of smartphones expected to be sold in 2018 at the same growth rate.

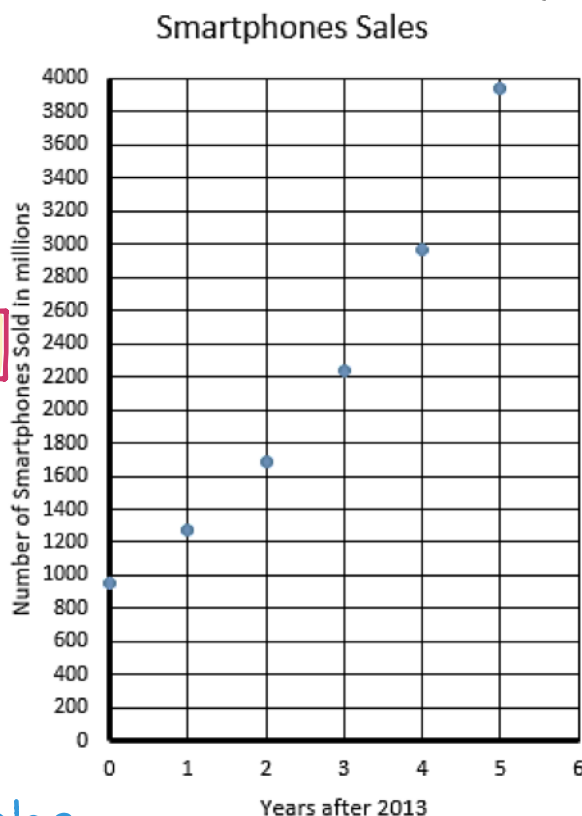
$$f(t) = 959(1.327)^t$$

*in millions*

$$f(5) = 959(1.327)^5 = 3946$$

Approx. **3.95 billion units in 2018**

- C. Graph the points  $(t, f(t))$  for integer values of  $0 \leq t \leq 5$ .



- D. Can this trend continue? Explain your thinking.

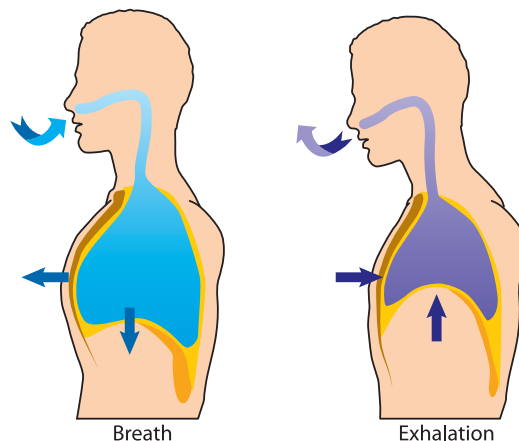
No, there are a finite number of people on Earth, so this trend cannot continue.

4. When you breathe normally, about 12% of the air in your lungs is replaced with each breath. Write an explicit formula for the sequence that models the amount of the original air left in your lungs, given that the initial volume of air is 500 ml. Use your model to determine how much of the original 500 ml remains after 50 breaths.

$100\% - 12\% = 88\%$  air remains  
 $a(n) = 500(0.88)^n$   
 $n = \#$  of breaths

$a(50) = 0.83 \text{ mL}$

The movements of the chest during breathing.



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5. Ryan bought a new computer for \$2,100. The value of the computer decreases by 50% each year.

- A. Identify the decay factor.

$100\% - 50\% = 0.50$

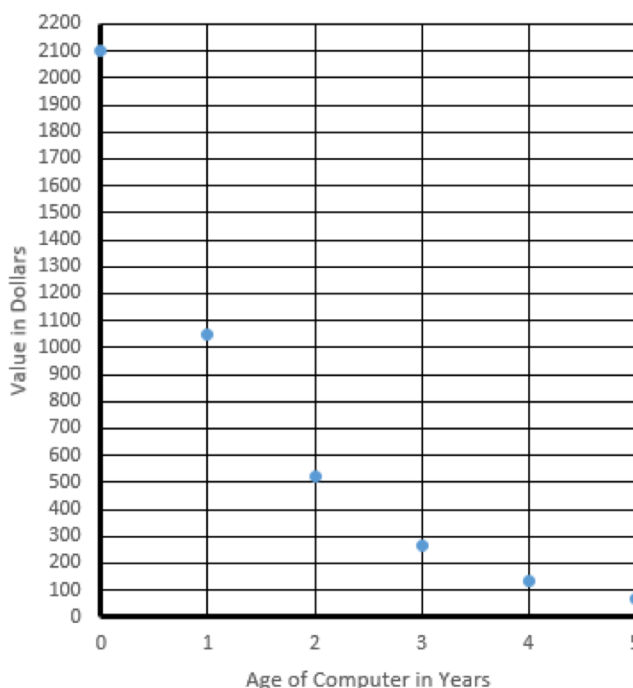
$0.50$

- B. Calculate the value of Ryan's computer after 5 years.

$f(t) = 2100 \cdot (0.50)^t$

$f(5) = \$65.63$

Value of Ryan's Computer



- C. Graph the points  $(t, f(t))$  for integer values of  $0 \leq t \leq 5$ .

- D. When will the value drop below \$300?

After 3 years, the value will be \$262.50.