

SWBAT use the Exponential Growth and Decay Model to solve word problems.

Exponential Growth Model

$$y = a(1+r)^t$$

Starting
 $a = \text{Amount}$ $r = \text{rate}$ $t = \text{time}$

(r is usually given as a % so turn into a decimal)

For each problem, identify a , r and t then use the model to solve.

Examples: Apply the exponential growth model to solve the problem.

14. You deposit \$500 in an account that pays 6.5% annual interest compounded yearly. What is the account balance after 8 years?

$$a = 500$$

$$r = 6.5\% = .065$$

$$t = 8$$

$$y = a(1+r)^t$$

$$y = 500(1 + .065)^8$$

$$y = \$827.50$$

16. A population of 20 rabbits is released into a wild-life region. The population increases by 200% each year. What is the population after 5 years?

$$a = 20$$

$$r = 200\% = 2$$

$$t = 5$$

$$y = a(1+r)^t$$

$$y = 20(1+2)^5$$

$$y = 4,860 \text{ rabbits}$$

Exponential Decay Model

$$y = a(1 - r)^t$$

Starting
 $a = \text{Amount}$ $r = \text{rate}$ $t = \text{time}$

(r is usually given as a % so turn into a decimal)

For each problem, identify a , r and t then use the model to solve.

Examples: Apply the exponential growth model to solve the problem.

17. You bought a used car for \$18,000. The value of the car depreciates (loses value) at the rate of 12% per year. What is the value of the car after 8 years?

$$a = 18,000$$

$$r = 12\% = .12$$

$$t = 8$$

$$y = a(1 - r)^t$$

$$y = 18,000(1 - .12)^8$$

$$y = \$6,473.42$$

19. A local tennis club has a declining membership. The club started with 500 members, but enrollment is decreasing at a rate of 5% per year. What will the enrollment be in 10 years?

$$a = 500$$

$$r = 5\% = .05$$

$$t = 10$$

$$y = a(1 - r)^t$$

$$y = 500(1 - .05)^{10}$$

$$y = 299 \text{ members}$$

Read each problem carefully, label as growth or decay, and then use the correct exponential model to solve the problem. Be sure to include the units in your answer.

*20. You bought a Nintendo Wii for \$250. The value of the Wii decreases at a rate of 12% each year.

21. You start a 4 week running program. The first week you ran 2 miles. Each of the following weeks, you increase your distance by 10%.

$$\begin{aligned}
 a &= 2 \\
 r &= 10\% \quad .1 \\
 t &= 4 \\
 y &= a(1+r)^t \\
 y &= 2(1+.10)^4 \\
 y &= 2.93 \text{ miles}
 \end{aligned}$$

22. You Deposit \$125 in a savings account that earns 5% annual interest compounded yearly. Find the balance in the account after the given amount of time.

$$\begin{array}{ll}
 a = 125 & \text{a.) 2 years} \\
 r = .05 & y = a(1+r)^t \\
 t = 2 & y = 125(1+.05)^2 \\
 & y = 137.813 \\
 & y = \$137.81 \\
 & \text{b.) 5 years} \\
 & y = a(1+r)^t \\
 & y = 125(1+.05)^5 \\
 & y = 159.535 \\
 & y = \$159.54
 \end{array}$$

23. You put \$250 in a savings account that earns 4% annual interest compounded yearly. You do not make any deposits or withdrawals. How much will your investment be worth in 5 years?

$$\begin{aligned}
 a &= 250 \\
 r &= .04 \\
 t &= 5 \\
 y &= a(1+r)^t \\
 y &= 250(1+.04)^5 \\
 y &= \$304.16
 \end{aligned}$$

24. You purchase a cell phone for \$125. The value of the cell phone decreases by about 20% annually. Write a function that models the value of the phone over time. Then Find the value of the cell phone after 3 years.

$$\begin{aligned}
 a &= 125 \\
 r &= .20 \\
 t &= 3 \\
 y &= a(1-r)^t \\
 y &= 125(1-.2)^3 \\
 y &= \$64.00
 \end{aligned}$$