EXPONENTIAL GROWTH MODELS When a real-life quantity increases by a fixed percent each year (or other time period), the amount y of the quantity after t years can be modeled by the equation

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

where a is the initial amount and r is the percent increase expressed as a decimal. Note that the quantity $1 + r$ is the growth factor.

TAKS

EXAMPLE 4 Solve a Multi-Step Problem

COMPUTERS In 1996, there were 2573 computer viruses and other computer security incidents. During the next 7 years, the number of incidents increased by about 92% each year.

- Write an exponential growth model giving the number n of incidents t years after 1996. About how many incidents were there in 2003?
- Graph the model.
- Use the graph to estimate the year when there were about 125,000 computer security incidents.

Solution

STEP 1 The initial amount is $a = 2573$ and the percent increase is $r = 0.92$. So, the exponential growth model is:

$n = a(1 + r)^t$ **Write exponential growth model.**

$= 2573(1 + 0.92)^t$ **Substitute 2573 for a and 0.92 for r.**

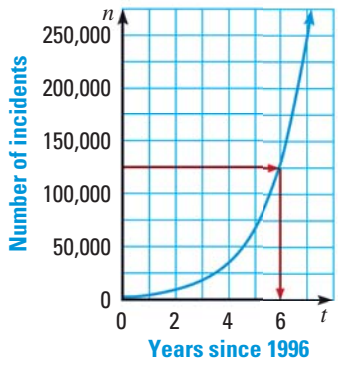
$= 2573(1.92)^t$ **Simplify.**

AVOID ERRORS Notice that the percent increase and the growth factor are two different values. An increase of 92% corresponds to a growth factor of 1.92.

Using this model, you can estimate the number of incidents in 2003 ($t = 7$) to be $n = 2573(1.92)^7 \approx 247{,}485$.

STEP 2 The graph passes through the points (0, 2573) and (1, 4940.16). Plot a few other points. Then draw a smooth curve through the points.

STEP 3 Using the graph, you can estimate that the number of incidents was about 125,000 during 2002 ($t \approx 6$).



Animated Algebra at classzone.com

GUIDED PRACTICE for Example 4

4. **WHAT IF?** In Example 4, estimate the year in which there were about 250,000 computer security incidents.
5. In the exponential growth model $y = 527(1.39)^x$, identify the initial amount, the growth factor, and the percent increase.