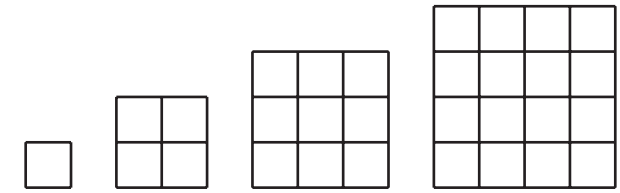
Unit 4 Family Support Materials

Introduction to Quadratic Functions

In this unit, students learn about quadratic functions. Earlier, they learned about linear functions that grow by repeatedly adding or subtracting the same amount and exponential functions that grow by repeatedly multiplying by the same amount.

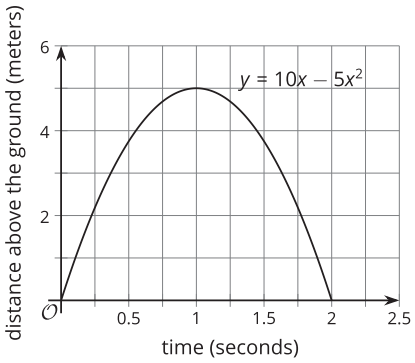
Quadratic functions also change in a predictable way. Here, the number of small squares in each step is increasing by 3, then 5, then 7, and so on. How many squares are in Step 10? How many in Step n?



Here is a table that shows the pattern.

step number	1	2	3	4	10	n
number of small squares	1	4	9	4×4 or 16	10×10 or 100	$n \times n$ or n^2

In this unit, students will also learn about some real-world situations that can be modeled by quadratic functions. For example, when you toss a ball up in the air, its distance above the ground as time passes can be modeled by a quadratic function. Study the graph. The ball starts on the ground because the height is 0 when time is 0. The ball lands back on the ground after 2 seconds. After 1 second, the ball is 5 meters in the air.



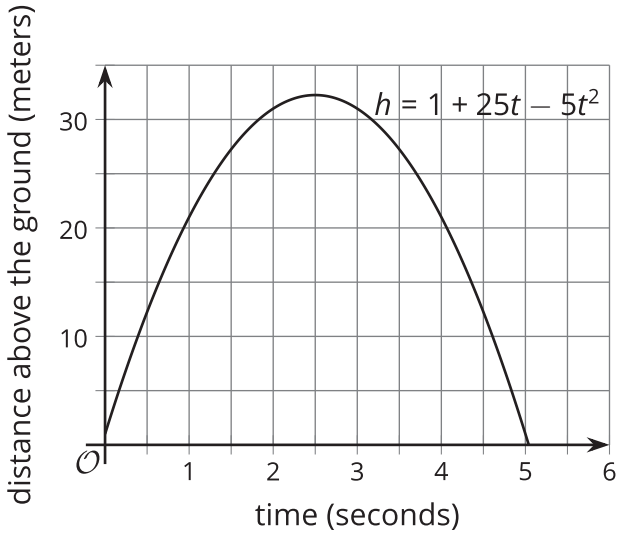
Both of the following expressions give the ball's distance above the ground: $5x(2 - x)$ and $10x - 5x^2$, where x represents the number of seconds since it was thrown. Quadratic expressions are most recognizable when you can see the "squared term," such as $-5x^2$ in the expression $10x - 5x^2$.

Your student will learn even more about quadratics in the next unit.

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Here is a task to try with your student:

The equation $h = 1 + 25t - 5t^2$ models the height in meters of a model rocket t seconds after it is launched in the air. Here is a graph representing the equation.



1. What was the height of the rocket above the ground at the time it was launched?
2. How high did it go up in the air?
3. When did the rocket land back on the ground?

Solution:

1. 1 meter
2. about 32 meters
3. a little more than 5 seconds after launch