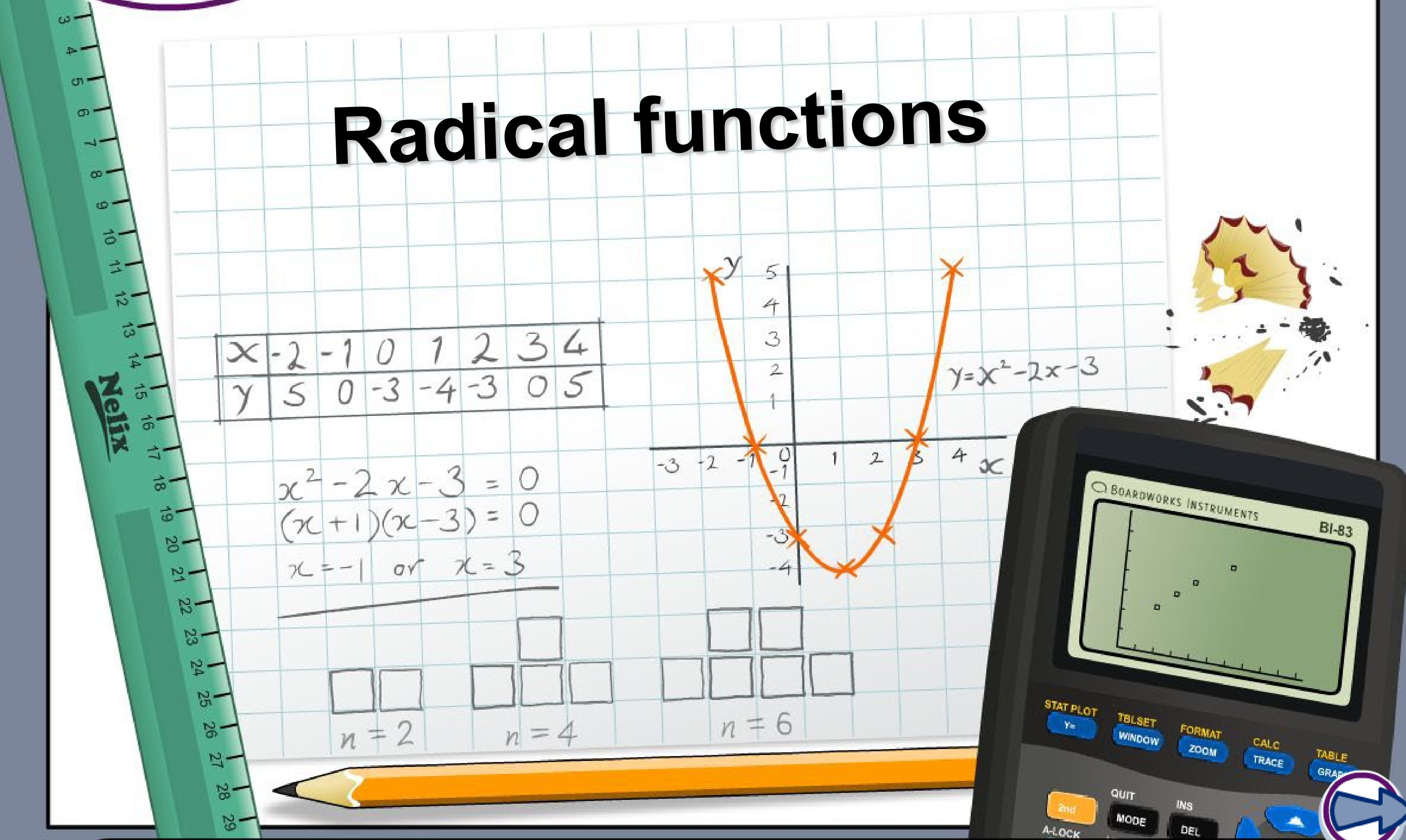
Radical functions



Information

Common core icons

This icon indicates a slide where the Standards for Mathematical Practice are being developed. Details of these are given in the Notes field.

MODELING

Slides containing examples of mathematical modeling are marked with this stamp.

This icon indicates an opportunity for discussion or group work.

The **Standards for Mathematical Practice** outlined in the Common Core State Standards for Mathematics describe varieties of expertise that mathematics educators at all levels should seek to develop in their students.

They are:

1) Make sense of problems and persevere in solving them.

2) Reason abstractly and quantitatively.

3) Construct viable arguments and critique the reasoning of others.

4) Model with mathematics.

5) Use appropriate tools strategically.

6) Attend to precision.

7) Look for and make use of structure.

8) Look for and express regularity in repeated reasoning.

This icon indicates that the slide contains activities created in Flash. These activities are not editable.

This icon indicates teacher's notes in the Notes field.

Radicals

A radical is the **root** of a number.

root index → $$\sqrt[n]{a}$$ ← radical sign

← radicand

When the radical sign is written without a root index it is a square root. The unwritten index is a **2**.

A number b is the **square root** of a number a if $b^2 = a$.

For example, 6 is the square root of 36 because $6^2 = 36$.

A number b is said to be the **cube root** of a number a if $b^3 = a$.

For example, 2 is the cube root of 8 because $2^3 = 8$.

Inverse operations

How do you “undo” addition?

subtraction $2 + 3 = 5$ $5 - 3 = 2$

Addition and subtraction are **inverse operations**. Adding a number and then subtracting the same number gives the number you started with.

How do you “undo” multiplication?

division $7 \times 4 = 28$ $28 \div 4 = 7$

Multiplication and division are also inverse operations.

How do you “undo” squaring a number?

take the square root $5^2 = 25$ $\sqrt{25} = 5$

Squaring and taking the square root

x
0
1
2
3
4
5
6

The inverse of **squaring** a number is **taking the square root.**

Use this activity to compare the tables and graphs for these two functions.

Press "**start**" to begin.

start

Plot
nction:

$= x^2$

$= \sqrt{x}$

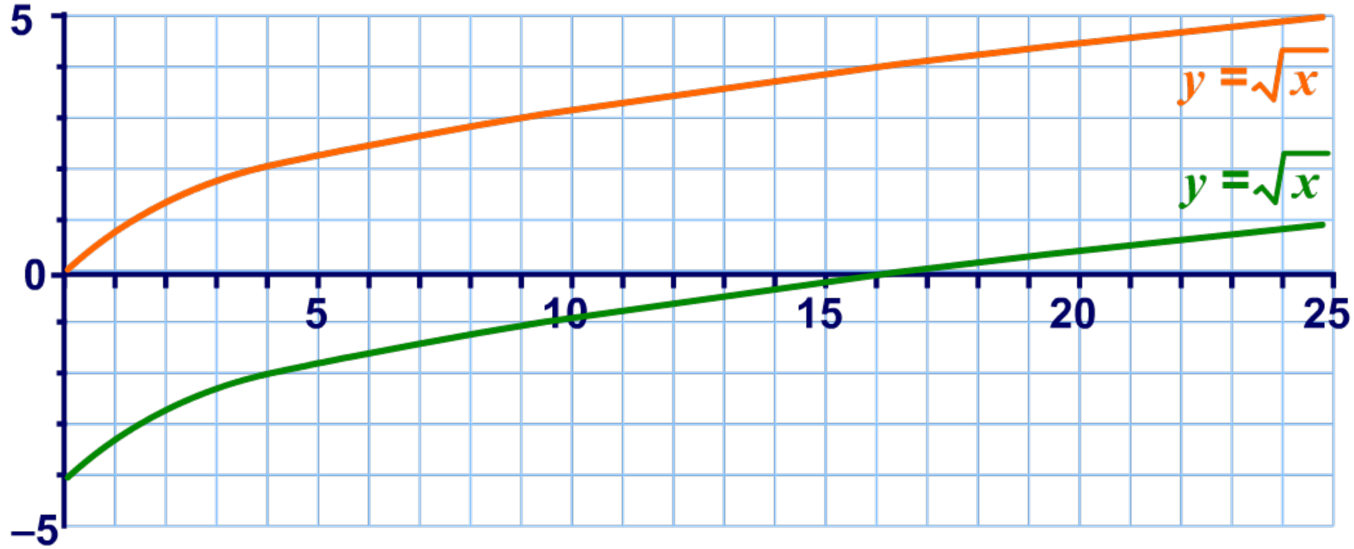
$y = x$

0 5 10 15 20 25

What do you think the graph of $f(x) = \sqrt{x} - 4$ will look like?

Complete the table of values for $y = \sqrt{x} - 4$ and sketch its graph. Use the graph of $y = \sqrt{x}$ to help you.

x	y
0	–4
1	–3
4	–2
9	–1
16	0
25	1



$y = \sqrt{x} - 4$ has the same shape as $y = \sqrt{x}$, but has been translated vertically.

Domain and range

Find the domain and range of these radical functions.

Question 1) $y = \sqrt{x - 1}$ S

Question 2) $y = \sqrt{2x} + 3$ S

Question 3) $y = \sqrt{x + 5}$ S

Determine the domain and range of the function algebraically and then use your graphing calculator to confirm your results.

Press the S buttons to show the solutions.

A pendulum swings back and forth on a large clock. It takes 1.5 seconds to perform a complete oscillation.

The time period of oscillation is modeled by the formula $T = 2.006\sqrt{L}$ where L is the length of the pendulum in meters and T is measured in seconds.

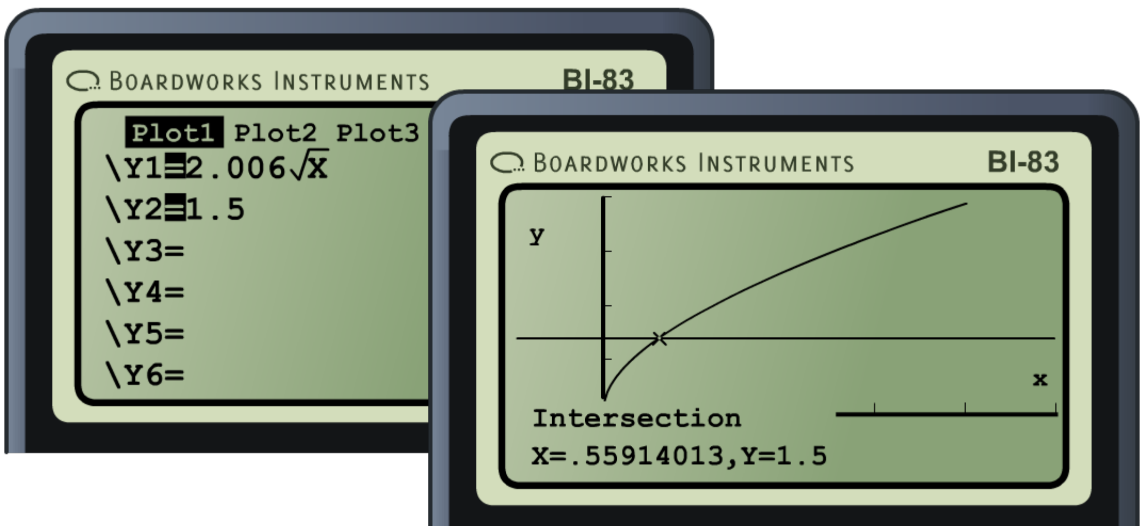
How long is the pendulum?

How can you solve this using a graphing calculator?

A graphical solution

We are looking for the length, L, that corresponds to the time, T, of 1.5 seconds. In terms of the graph, we are given y and are looking for x.

Look at the intersection of the graphs $y = 2.006\sqrt{x}$ and $y = 1.5$



The pendulum is **0.56 meters** long.

Cubing and taking the cube root

x
–3
–2
–1
0
1
2
3

The inverse of **cubing** a number is **taking the cube root**.

Use this activity to compare the tables and graphs for these two functions.

Press "**start**" to begin.

start

Plot
nction:

$y = x^3$

$= \sqrt[3]{x}$

$y = x$

sw

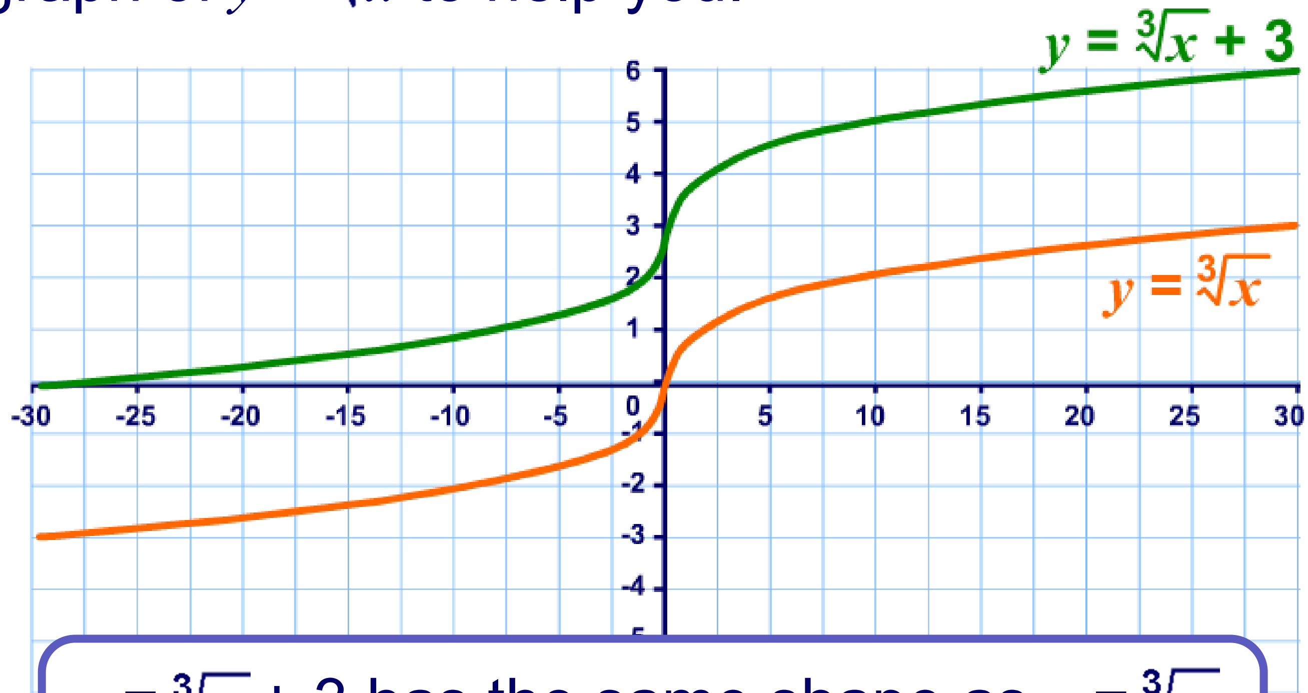
-25

Graphing other cube root functions

What do you think the graph of $f(x) = \sqrt[3]{x} + 3$ will look like?

Complete the table of values for $y = \sqrt[3]{x} + 3$ and sketch its graph. Use the graph of $y = \sqrt[3]{x}$ to help you.

x	y
-27	0
-8	1
-1	2
0	3
1	4
8	5
27	6



$y = \sqrt[3]{x} + 3$ has the same shape as $y = \sqrt[3]{x}$, but has been translated vertically.

In groups, discuss the following functions.
What shape are they? Where do they cross the axes?
What are their domains and ranges?
Sketch them on graph paper.

$y = \sqrt{x} - 5$

$y = \sqrt[3]{3x} - 2$

$y = \sqrt{x + 4}$

$y = \sqrt[3]{x - 4}$

Press the functions to reveal their graphs.