Base Ten Decimal Frame™

Guide & Activities

Created by Steven Lanza
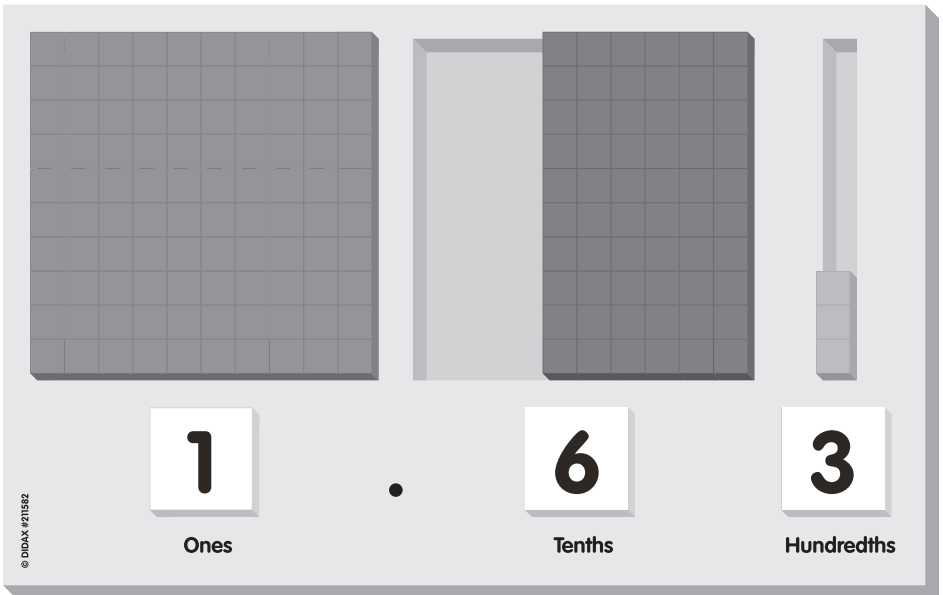
1 . **6** **3**
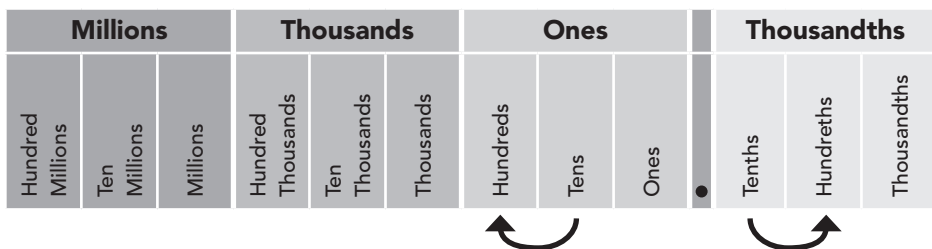
Ones   Tenths   Hundredths

Base Ten Decimal Frame™ Guide

This tool is designed to be used with standard 1-centimeter base ten blocks to enable students to represent decimal values to hundredths. The combination of the physical constraints of the frame and the numbered tiles for indicating place value provide an opportunity for children to make effective use of mathematical models and to look for and make use of structure, as recommended by the Common Core State Standards.

Most educational standards suggest introducing decimals (decimal fractions) in grade 4.

It may be useful to provide the following illustration to students to explain that whole numbers and decimal place value positions follow a similar pattern as you move away from the decimal point.

Millions			Thousands			Ones				Thousandths		
Hundred Millions	Ten Millions	Millions	Hundred Thousands	Ten Thousands	Thousands	Hundreds	Tens	Ones	.	Tenths	Hundreths	Thousandths

Before using the Base Ten Decimal Frame, demonstrate to students how base ten blocks (which they may have used to represent whole numbers in the past) can be used to represent decimals.
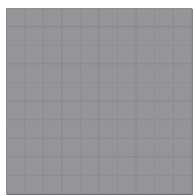
"This is called a flat and is worth one whole or 1."

"This is called a rod and is worth one tenth or .1. It is called one tenth, because it is one out of ten that make up one whole."

"This is called a unit and is worth one hundredth or .01. It is called one hundredth because it is one out of one hundred that make up a whole"

Some students may be confused by changing the familiar value of each base ten model.

To illustrate why we need to shift the value of each model, you can ask the students to visualize what it would look like to represent tenths and hundredths using the whole number values for base ten blocks. For example the unit cube would have to be divided into 10 equal parts to represent tenths and 100 equal parts to represent hundredths.

Explain that since we do not have a model to represent these smaller fractions and because they are too small to work with, we need to assign new values to the blocks to illustrate decimals.

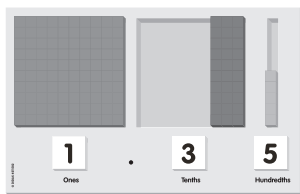| Whole Number Model |
| --- |
| Unit cube = 1 (one) |
| Ten rod = 10 (ten) |
| Hundred flat = 100 (one hundred) |

| Decimal Model |
| --- |
| Unit cube = .01 (one hundredth) |
| Ten rod = .1 (one tenth) |
| Hundred flat = 1 (one) |

To get the students familiar with the use of the Base Ten Decimal Frame, ask them if they can show you a number. For example 1.35.

Repeat this with other numbers until it is clear that students understand this concept.

To illustrate that the decimals truly represent a fraction of the whole, you can have the students place the rods of ten and unit cubes on top of the hundred flat.
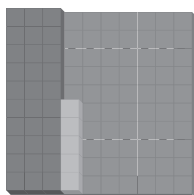
In this example, they should be able to see that the combination of the rods and cubes totals 35 and represents 35 out of 100 (.35).
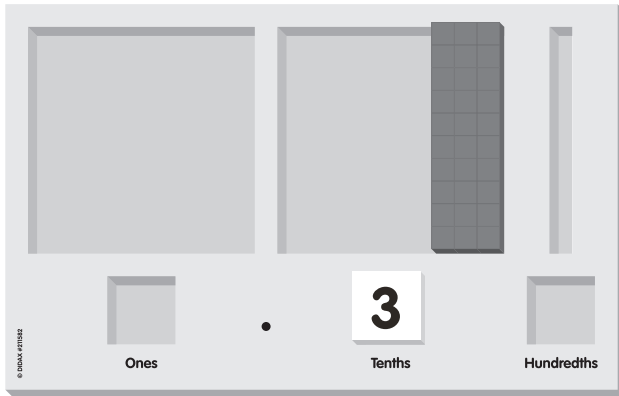
Expressing Fractions as Decimals

(4.NF.C.6) Use decimal notation for fractions with denominators 10 or 100.

Ask students to represent 3/10 with the frame and base ten blocks.

Have them use the number tiles to label the place values.

Reinforce the concept that the 3 rods of ten represent 3 out of 10 total rods in 1 whole, or 30 units out of 100.

Ask students to represent 32/100 with the frame and base ten blocks.

Have them use the number tiles to label the place values.

Reinforce the concept that the 3 rods of ten and 2 unit cubes represent 32 out of 100 in 1 whole.
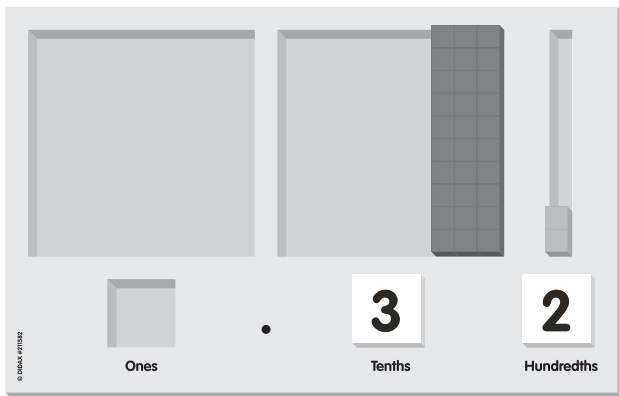
Comparing Decimals

(4.NF.C.7) Compare two decimals to hundredths by reasoning about their size. Recognize that comparisons are valid only when the two decimals refer to the same whole. Record the results of comparisons with the symbols >, =, or <, and justify the conclusions, e.g., by using a visual model.
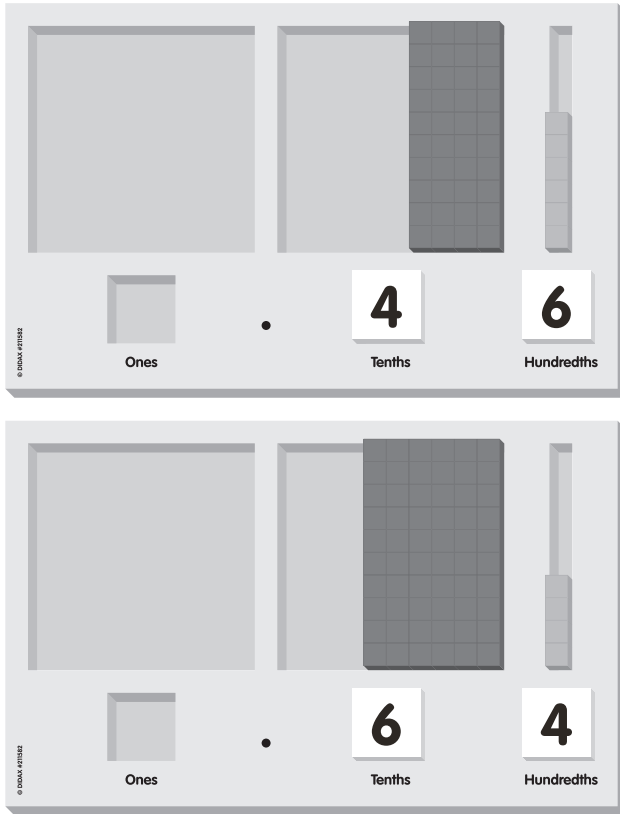

Ask the students to compare .46 to .64 using the frame and base ten blocks and determine which is bigger. Ask them to record their findings using the ">"sign.

Ask them to randomly grab a number of blocks and put them in the frame, and then record if the number is between .46 and .64, is smaller than .46, or is larger than .64.

Exchanging Values

(5.NBT.A.1) Recognize that in a multi-digit number, a digit in one place represents
10 times as much as it represents in the place to its right and
1/10 of what it represents in the place to its left.
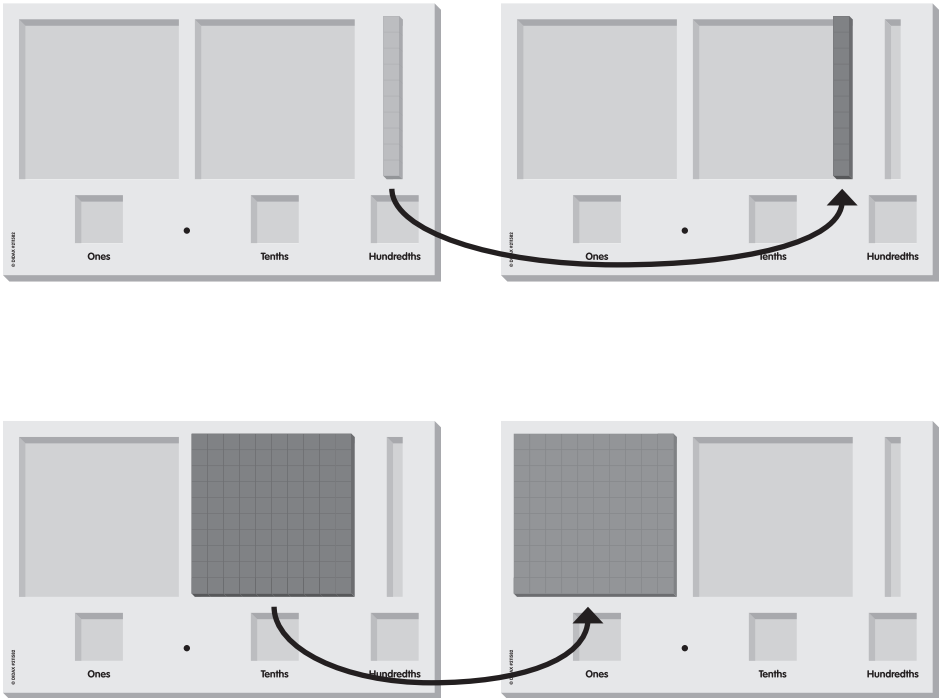
Demonstrate to the students that the value in the hundredths column is 1/10 of the value in the tenths column and that the value in the tenths column is 1/10 the value in the ones column. Ask the students how they can use the frame and base ten blocks to prove this. You may need to show them how to count up and then exchange for the next place value.

Adding Two-Digit Numbers (.76 + .39)

(5.NBT.B.7) Add, subtract, multiply, and divide decimals to hundredths, using concrete models or drawings and strategies based on place value, properties of operations, and/or the relationship between addition and subtraction; relate the strategy to a written method and explain the reasoning used.

Say: "Show me how to represent .76 using the frame and base ten blocks."
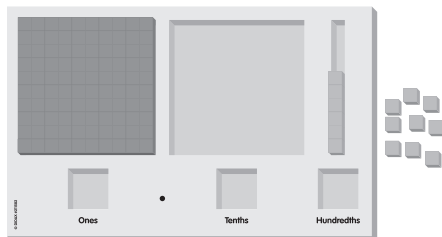
There should be 7 rods of ten in the tenths column and 6 cubes in the hundredths column.

Say: "Label the number by placing the correct numeral tile below each column."
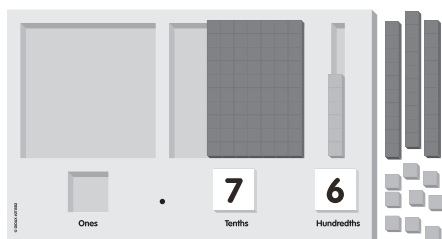
Say: "Count out 39 cubes to represent .39."

Say: "Add .39 and .76 using the base ten blocks."

The students should add the 3 loose rods of ten to the 7 rods in the frame for a total of 10 rods. They can now "trade" the 10 rods for a hundred flat and add it to the ones column.

The students should add 4 of the 9 loose cubes to the 6 cubes in the frame, filling the hundredths column. They can now "trade" the 10 cubes for a rod of ten and add it to the tenths column.
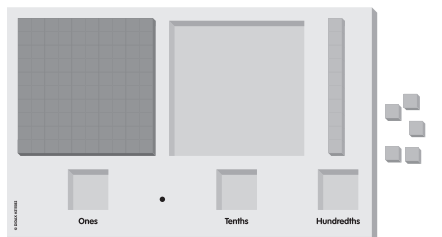
The students should add the remaining 5 cubes to the hundredths column.

Say: "Change the number tiles to indicate how many blocks you now have."
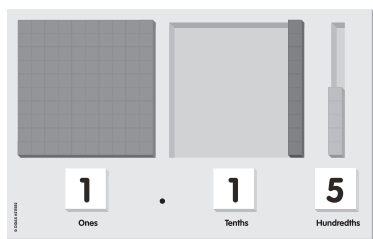
Subtracting Two-Digit Numbers (.63 – .27)

(5.NBT.B.7) Add, subtract, multiply, and divide decimals to hundredths, using concrete models or drawings and strategies based on place value, properties of operations, and/or the relationship between addition and subtraction; relate the strategy to a written method and explain the reasoning used.

Say: "Show me how to represent .63 using the frame and base ten blocks."

There should be 6 rods of ten in the tenths column and 3 cubes in the hundredths column.
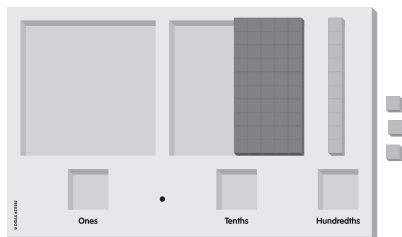
Say: "Label the number by placing the correct numeral tile below each column."
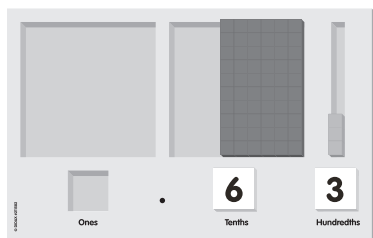
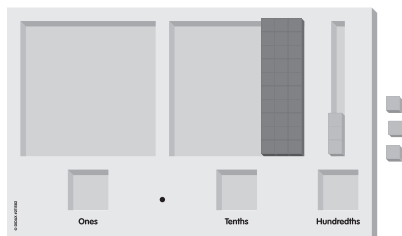Say: "Take away .27 from the .63."

Since they cannot subtract 7 from 3 the students will need to exchange a rod of ten for 10 cubes.

Say: "You can trade a rod of ten for 10 cubes."

They should fill the hundredths column with 10 cubes and have 3 leftover. They can now take away .27 from .63.

The students should take away 2 rods of ten from the tenths column and 7 cubes from the hundredths column. They can then add the 3 loose cubes back into the hundredths column, giving them 6.

Say: "Change the number tiles to indicate how many blocks you now have."