

Decimals: Equivalence, Rounding and Estimating

Decimals expand our number system. One type of decimal problem that you have already worked with is money. The amount of \$4.23 is also the decimal, 4 and 23 hundredths. We'll take a look at equivalent decimals and decimal squares to begin to explore the world of decimals.

Looking at a number line helps to round a decimal number. We'll look at a number line that includes decimals and see how to round decimals.

Estimating will give an approximate amount for the actual amount needed in the problem. We'll look at estimating a money problem to see how estimating with decimals can be useful.

Decimal Squares

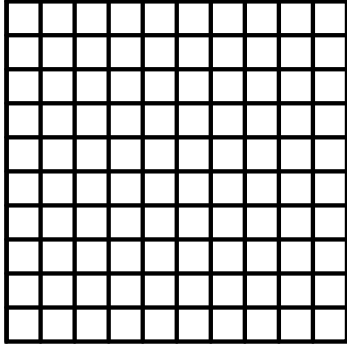
Equivalent Decimals Using Decimal Squares

Rounding Decimals

Estimating with Decimals

Decimal Squares

1 Whole or $\frac{100}{100ths}$



1

$\frac{1}{10th}$

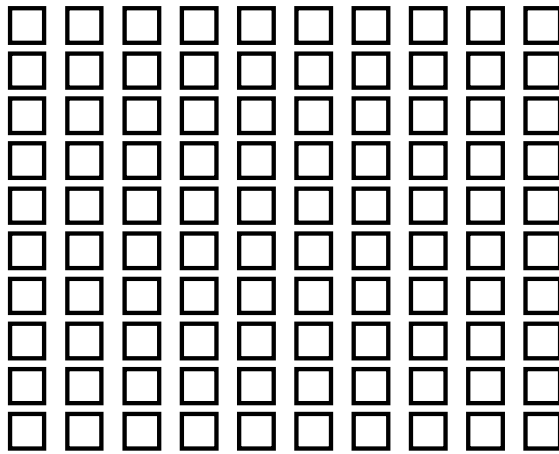
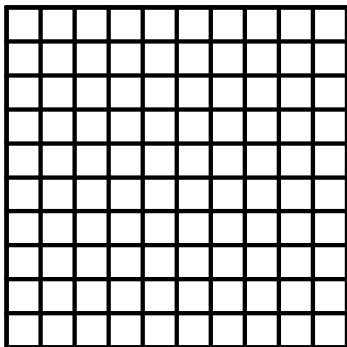
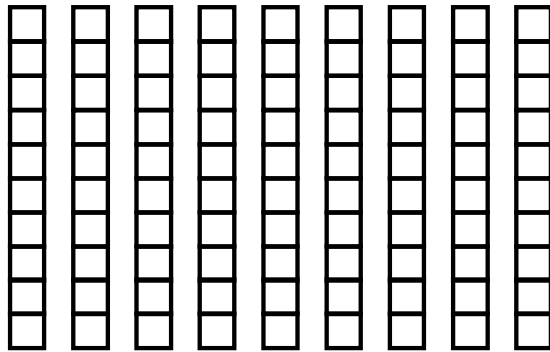
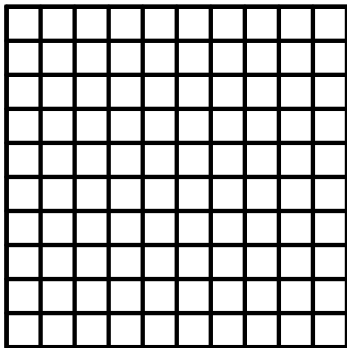


0.1

$\frac{1}{100th}$

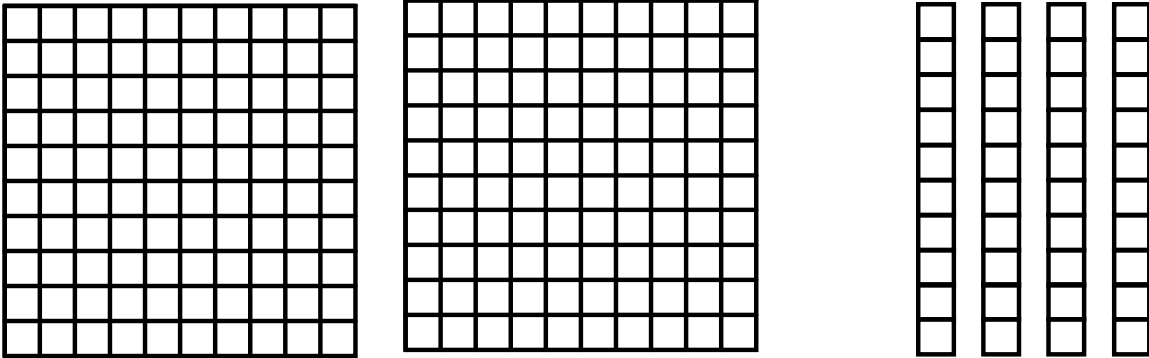


0.01

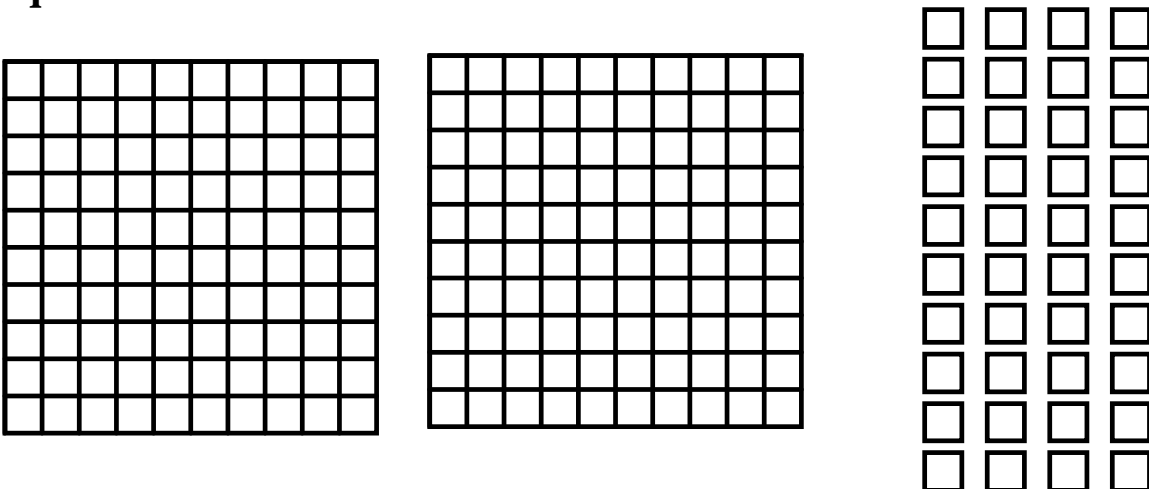


Equivalent Decimals Using Decimal Squares

Here is a model of 2.4 (2 and 4 tenths) using decimal squares.



Here is a model of 2.40 (2 and 40 hundredths) using decimal squares.



Through the models you can see that 2.4 and 2.40 represent the same amount.

$$2.4 = 2.40$$

1 tenth strip has 10 hundredth squares in it; thus there would be 40 hundredth squares in 4 tenth strips.

Rule: To make **equivalent decimals**, you may **add on zeros** as needed. *The zeros do not change the value of the decimal, just its appearance.*

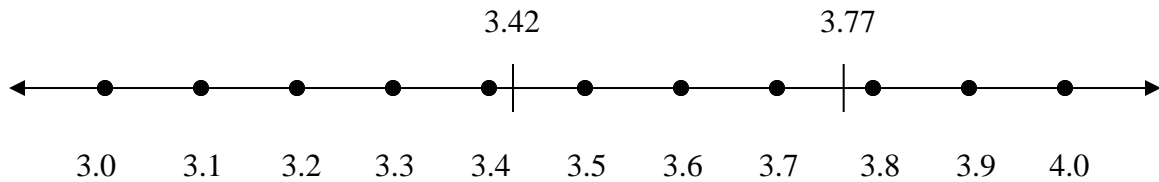
$$2.4 = 2.40 = 2.400$$

2 and 4 tenths equals 2 and 40 hundredths equals 2 and 400 thousandths

or

$$2\frac{4}{10} = 2\frac{40}{100} = 2\frac{400}{1000}$$

Rounding Decimals



Looking at a number line helps to round a decimal number. You can round 3.42 to 3.4 since it is located closer to 3.4 on the number line. You can round 3.77 to 3.8 since it is closer to 3.8 than 3.7 on the number line.

Follow these steps to round decimal numbers.

Round 3.42 to the nearest tenth.

1. Locate the place you are rounding. $3.\mathbf{4}2$
2. Look at the number to the right. $3.4\mathbf{2}$
3. If that number is 5 or more, round up to the next digit, *then drop the other digits to the right.*

If the number is less than 5, then leave the place as is, *and drop the other digits.*

Since 2 is less than 5 , the 4 **stays the same** and the rounded number is **3.4**

Round 3.77 to the nearest tenth.

1. Locate the place you are rounding. $3.\mathbf{7}7$
2. Look at the number to the right. $3.7\mathbf{7}$
3. Round. **3.8**

Round 24.625 to the nearest hundredth.

1. Locate the place you are rounding. $24.6\mathbf{2}5$
2. Look at the number to the right $24.62\mathbf{5}$
3. Round. **24.63**

Estimating with Decimals

Jonathan's mother is planning a trip to the grocery market. She has \$20 to spend. She wants to estimate the cost of her bill so that she will stay within her budget. She jots down the items with an approximate price: cereal (\$3.95), bread (\$0.89), milk (\$2.39), chips (\$2.50), lunchmeat (\$3.79), apples (\$1.99), potatoes (\$2.69), cottage cheese (\$2.19) and butter (\$2.49). She decides to round to the nearest \$0.50 to get a more accurate estimate. Does she have enough money?

0 ---- 0.50 ---- 1.00 ---- 1.50 ---- 2.00 ---- 2.50 ---- 3.00 ---- 3.50 ---- 4.00

3.95 rounds to 4.00

0.89 rounds to 1.00 (halfway between 0.50 and 1.00 is 0.75, so 0.89 is closer to 1.00)

2.39 rounds to 2.50 (halfway between 2.00 and 2.50 is 2.25, so 2.39 is closer to 2.50)

2.50 rounds to 2.50

3.79 rounds to 4.00 (halfway between 3.50 and 4.00 is 3.75, so 3.79 is closer to 4.00)

1.99 rounds to 2.00

2.69 rounds to 2.50 (halfway between 2.50 and 3.00 is 2.75, so 2.69 is closer to 2.50).

2.19 rounds to 2.00 (halfway between 2.00 and 2.50 is 2.25, so 2.19 is closer to 2.00).

2.49 rounds to 2.50

Estimating

$$4 + 1 + 2.50 + 2.50 + 4 + 2 + 2.50 + 2 + 2.50$$

Grouping and rearranging the numbers

$$4 + 1 + (2.50 + 2.50) + 4 + 2 + (2.50 + 2.50) + 2$$

Simplify

$$4 + 1 + 5 + 4 + 2 + 5 + 2 = \$23.$$

She is a little over and must decide which items she will purchase at another time.