Decimals

Section 1: Introduction

The name and the place value for the first seven columns in our number system is as follows:

Millions Column	Hundred Thousands Column	Ten Thousands Column	Thousands Column	Hundreds Column	Tens Column	Ones Column
1,000,000	**100,000**	**10,000**	**1,000**	**100**	**10**	**1**

As we move from right to left, we multiply by 10 each time. The value of each column is 10 times the value of the column on its right, with the rightmost column being 1. To understand the idea behind decimal numbers, we notice that moving in the opposite direction, from left to right, we divide by 10 each time.

If we are at the ones column and go to the right the next column would have to be

$$1 \div 10 = \frac{1}{10}$$ Ten**th**s

The next one after that will be

$$\frac{1}{10} \div 10 = \frac{1}{10} \cdot \frac{1}{10} = \frac{1}{100}$$ Hundred**th**s

After that, we have

$$\frac{1}{100} \div 10 = \frac{1}{100} \cdot \frac{1}{10} = \frac{1}{1000}$$ Thousand**th**s

We could continue this process of dividing by 10 to move one column to the right as long as we wanted to. A **decimal point** is used to show where the ones column is. The decimal point is placed between the ones column and the tenths column.

Thousands	Hundreds	Tens	Ones		Tenths	Hundredths	Thousandths	Ten Thousandths
1,000	100	10	1	.	$\frac{1}{10}$	$\frac{1}{100}$	$\frac{1}{1000}$	$\frac{1}{10000}$

↑
Decimal Point

We use the place value of decimals to write them in expanded form.

Example 1 : Write 321.765 in expanded form.

Solution: $321.765 = (3 \times 100) + (2 \times 10) + (1 \times 1) + (7 \times \frac{1}{10}) + (6 \times \frac{1}{100}) + (5 \times \frac{1}{1000})$

or $321.765 = (3 \times 100) + (2 \times 10) + (1 \times 1) + \frac{7}{10} + \frac{6}{100} + \frac{5}{1000}$ ♦

Example 2 : Write each number in words.

a) 0.3 b) 0.03 c) 0.003

Solution: a) 0.3 is "three tenths."

b) 0.03 is "three hundredths."

c) 0.003 is "three thousandths." ♦

When a decimal contains digits to the left of the decimal point, the word "and" is used to indicate where the decimal point is when writing the number in words.

Example 3 : Write the following in words.

a) 4.2 b) 4.02 c) 4.002

Solution: a) 4.2 is "four and two tenths."

b) 4.02 is "four and two hundredths."

c) 4.002 is "four and two thousandths." ♦

Example 4 : Write 5.23 in words.

Solution: The number 5.23 is read "five and twenty-three hundredths."

5	. 2	3
↑	↑	↑
5	2	3
ones	tenths	hundredths

The decimal part is read as "twenty-three hundredths" because

2 tenths + 3 hundredths $= \frac{2}{10} + \frac{3}{100} = \frac{20}{100} + \frac{3}{100} = \frac{23}{100}$ ♦

Activity 1

A. Write out the name of each of the numbers in words.

1. 1.73 ____________

2. 0.005 ____________

B. Write each number in decimal notation.

1. Eight and ninety-three thousandths ____________________

2. Sixteen and one hundred nine ten-thousandths ______________

Example 5 : Write each number as a fraction or a mixed number. Do not simplify.

a) 0.003 b) 15.6547

Solution: a) Since 0.003 is 3 thousandths, we write

$$0.003 = \frac{3}{1000}$$

b) $15.6547 = 15\frac{6547}{10000}$ ♦

Activity 2

Write each number as a fraction or a mixed number.

1. 9.019 _________

2. 78.143 _________

3. 0.45 _________

Example 6 : Write the following decimal numbers in order from smallest to largest.

6.02, 6.24, 6.0024, 6.204, 6.04

Solution:

1. Line up the decimal points.

   6.02
   6.24
   6.0024
   6.204
   6.04

2. Fill in with zeros so that all decimals have the same number of places.

   6.0200
   6.2400
   6.0024
   6.2040
   6.0400

3. Since all the ones column contain a 6, we ignore that column and treat the decimal portions as if they were whole numbers. Then compare those numbers, putting them in order from smallest to largest: 24, 200, 400, 2040, and 2400.

4. Write the decimals in order:

   6.0024, 6.02, 6.04, 6.204, 6.24 ♦

Activity 3

Write the following decimal numbers in order from smallest to largest.

a) 0.05 0.04 0.045 0.004 0.0405

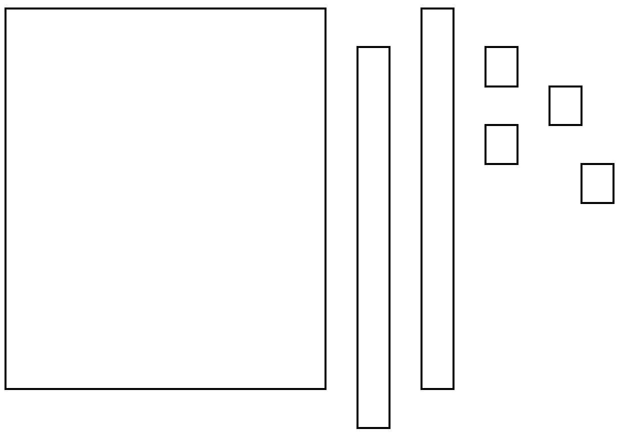
b) 0.017 0.17 0.0071 0.07 0.01

Section 2: Models for Decimals

In this section we will look at a couple of models for decimals: squares and strips, and the hundreds square.

Squares and Strips. Large squares are used to represent the **ones**. The large square can be separated into ten equal strips which are used to represent **tenths**, and a strip can be cut into ten small squares to represent **hundredths**.

Example 7 : What number does the following represent?



Solution: The large square represents the ones, the strip represents the tenths, and the small squares represent the hundredths. Hence the diagram above represents $1 + \frac{2}{10} + \frac{4}{100}$ which can be written as a decimal as 1.24. ♦

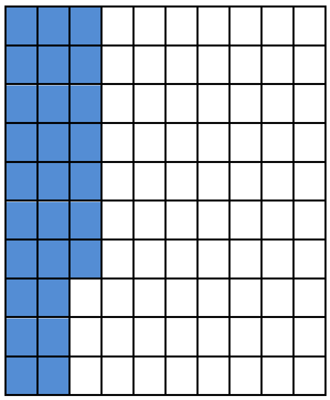
Activity 4

Represent 2.18 using the *squares and strips* model.

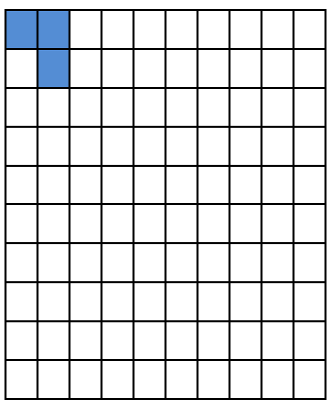
Hundreds Square. The hundreds square represents **1**. It is subdivided into ten rows of ten equal squares. Any row or column can be shaded to represent one **tenth**. Any of the small squares can be shaded to represent one **hundredth**.

Example 8 : What number do the following figures represent?

a)



b)



Solution:

a) Each column represents one tenth and there are two columns shaded, the two columns represent "two tenths". Each single square that is shaded represents one hundredth, so the seven shaded squares represent "seven hundredths". This would be written as $\frac{2}{10} + \frac{7}{100}$ or as a decimal , **0.27**.

b) There are no columns or rows shaded so we have 0 tenths, $\frac{0}{10}$.

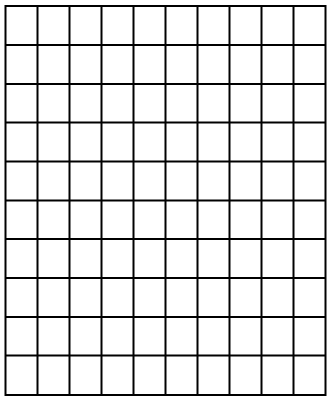
The 3 shaded squares represent three hundredths, $\frac{3}{100}$. Hence the shaded portion of the square written as a decimal is **0.03**. ♦

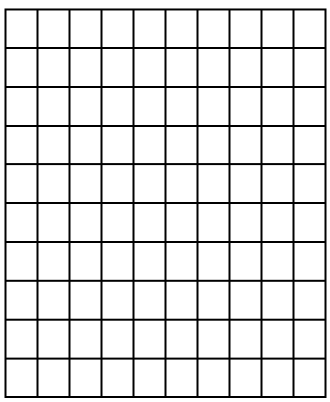
Activity 5

Shade the squares below to represent

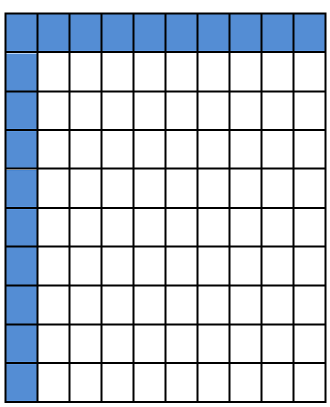
a) 0.35

b) 0.09





The shaded portion of the following square represents what decimal?



The models for decimals are meant to give us a way to visualize decimals and the operations with decimals. Keep this in mind as the operations with decimals are covered in the next few sections.

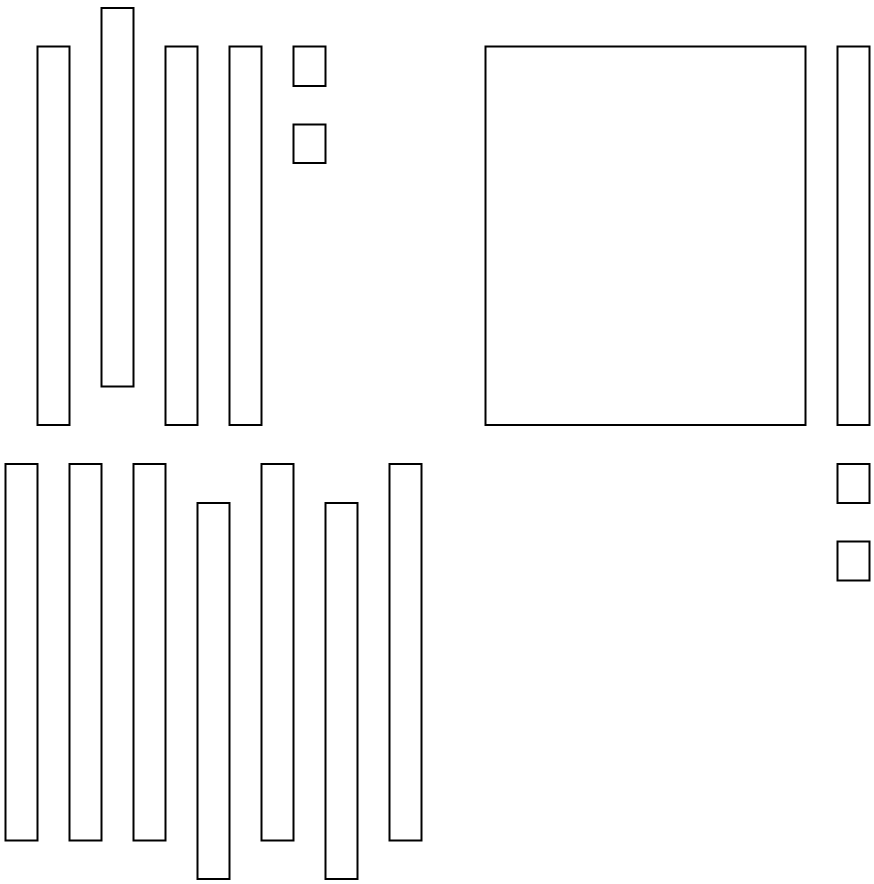
Section 3:   Adding and Subtracting Decimals

Let's first do an addition problem using the squares and strips that were introduced in the previous section.

Example 9 :   Do the following addition using the squares and strips model for decimals.

0.42 + 0.7

Solution:



So, 0.42 + .7 = 1.12   ♦

In the example above, the square and strip model helps you see that there are two important ideas in decimal addition. First, you can only add like units (tenths to tenths, hundredths to hundredths, and so on). Secondly, when there are too many of some unit, a trade must be made. (10 strips for 1 large square, which represents the whole number 1)

The algorithm for **adding** decimals is a three step process:

1. Line up decimal points. (Add zeros if necessary.)
2. Add, ignoring decimal points.
3. Insert a decimal point in the sum directly below those in the addends.

Example 10 : Add 2.345 + 45.5

Solution: 2.345 + 45.5

$$\begin{array}{r} 2.345 \\ +\ 45.5\mathbf{00} \\ \hline 47.845 \end{array}$$

♦

You can see from this example, that adding decimals is almost as easy as adding whole numbers. Let's try to understand **why** the algorithm works. The small numbers above the equal sign correspond to the steps in the algorithm.

$$2.345 + 45.5 = \frac{2345}{1000} + \frac{455}{10}$$

$$\stackrel{1}{=} \frac{2345}{1000} + \frac{455\mathbf{00}}{10\mathbf{00}}$$ raising a fraction to higher terms

$$\left(\frac{a}{b} = \frac{a \cdot 100}{b \cdot 100}\right)$$

$$= \frac{2345 + 45500}{1000}$$ adding fractions with a common denominator

$$\stackrel{2}{=} \frac{47845}{1000}$$ adding whole numbers

$$\stackrel{3}{=} 47.845$$ dividing by 1000

Example 11 : Add by first changing to fractions: 25.43 + 2.897

Solution: $25.43 + 2.897 = 25\frac{43}{100} + 2\frac{897}{1000}$

$$= \frac{2543}{100} + \frac{2897}{1000} = \frac{25430}{1000} + \frac{2897}{1000}$$

$$= \frac{25430 + 2897}{1000}$$

$$= \frac{28327}{1000}$$

$$= 28.327$$ ♦

Now let's add the numbers in the last example without changing them to fractions.

Example 12 : Add 25.43 + 2.897

Solution:

$$\begin{array}{r} 25.43\mathbf{0} \\ +\ \ 2.897 \\ \hline 28.327 \end{array}$$

♦

Note: The decimal point in the answer is directly below the decimal points in the problem.

Example 13 **:** Add 5 + 1.0034 + 18.75 + 6.4

Solution:

$$\begin{array}{r} 5.0000 \\ 1.0034 \\ 18.7500 \\ +\ 6.4000 \\ \hline 31.1534 \end{array}$$

Remember, adding the zeros is really equivalent to finding a common denominator for the two original numbers.

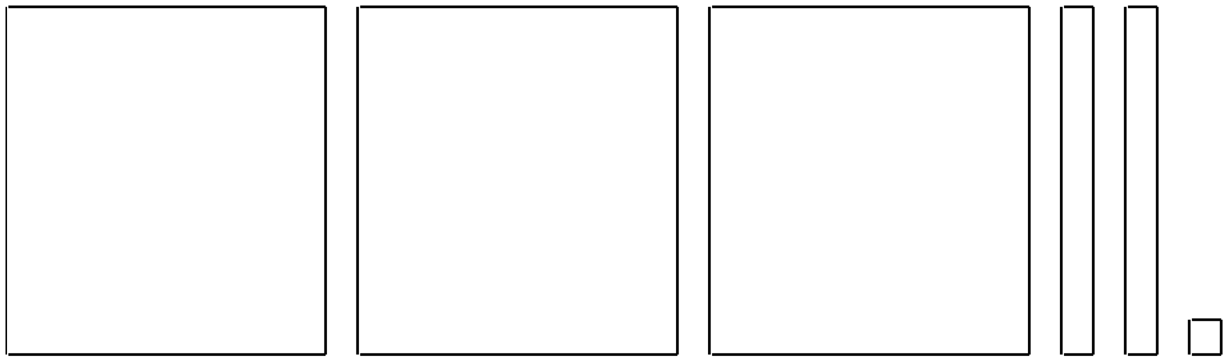
♦

The square and strips model help you see that decimal subtraction is almost identical to whole-number subtraction. We always subtract like units and if there is not enough of some unit a trade has to be made. This model is illustrated in Example 14 on the next page.

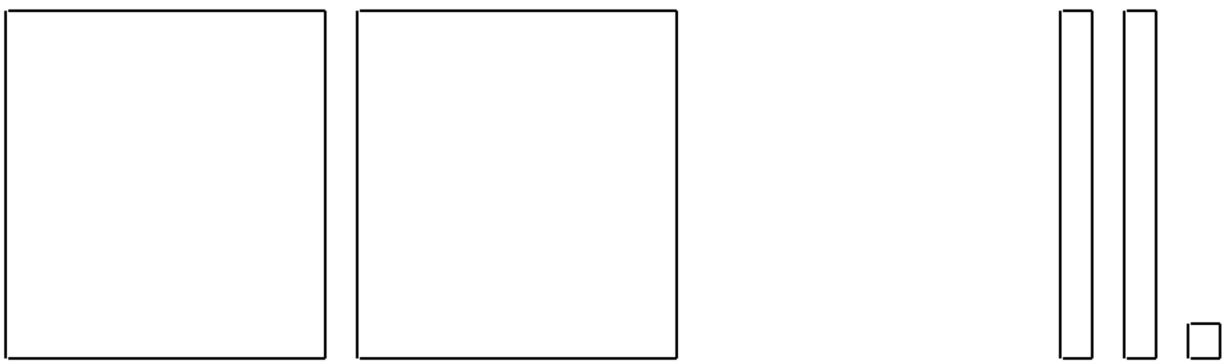
Example 14 **:** Use squares and strips to perform the following subtraction.

3.21 - 1.3

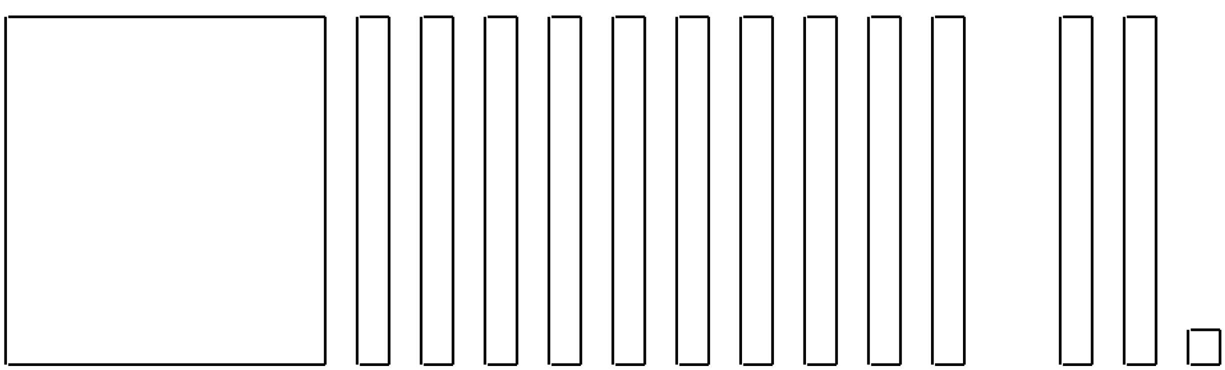
Solution: First, put on the squares and strips for 3.21.



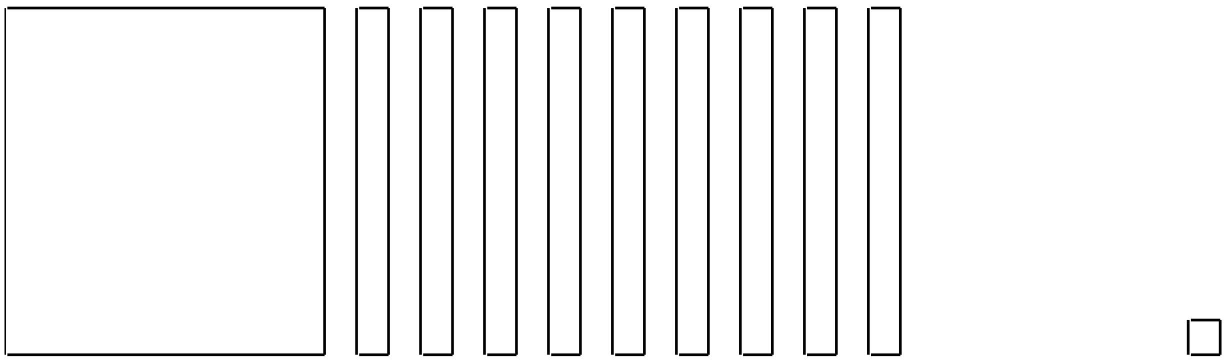
Second, take away 1.3. It's easy to take away 1 square:



However, there are not enough strips to take 3 away, so we need to trade 1 large square for 10 strips.



Now we can take 3 strips away.



Third, write the answer : **1.91**

By looking at the concrete example above, you can see how the subtraction algorithm works.

```
  3. 2  1
- 1 .3 0
  1 . 9  1
```

The algorithm for **subtracting** decimals is essentially the same as the addition algorithm:

1. Line up decimal points. (Add zeros if necessary.)
2. Subtract, ignoring decimal points.
3. Insert a decimal point in the difference directly below those in the minuend and subtrahend.

The explanation of **why** this algorithm works is essentially the same as the explanation for addition.

Example 15 : Subtract: 27.876 - 11.654

Solution: As before we will first line numbers up vertically, with the decimal points lined up, and then subtract as usual. Remember to place the decimal point in the answer directly below the decimal point in the problem.

```
   27.876
-  11.654
   16.222
```

Example 16 : Simplify: $45.6 - 4.3 + 6.8 - 5$

Solution: Working from left to right:

1.	2.	3.
$\begin{array}{r} 45.6 \\ -\ 4.3 \\ \hline 41.3 \end{array}$	$\begin{array}{r} 41.3 \\ +\ 6.8 \\ \hline 48.1 \end{array}$	$\begin{array}{r} 48.1 \\ -\ 5.0 \\ \hline 43.1 \end{array}$

Therefore, $45.6 - 4.3 + 6.8 - 5 =$ **43.1**

Activity 6

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1. Add: $0.14 + 7.6$

2. Add: $9.73 + 0.46 + 17.5 + 6.002$

3. Subtract: $17.4 - 2.78$

4. Subtract: $15.089 - 6.04$

5. Simplify: $132.8 - 15.09 + 3.7 - 4.2$

Example 17 : Add 4.75 + (-7.23)

Solution: Recall that to add two numbers with different signs, we have to subtract the smaller absolute value from the larger. The sign of the answer is the same as the sign of the number with the larger absolute value.

$|4.75| = 4.75$ and $|-7.23| = 7.23$

Now subtract the smaller absolute value from the larger absolute value.

$$\begin{array}{r} 7.23 \\ -\ 4.75 \\ \hline \end{array} \qquad \begin{array}{r} \overset{6}{\cancel{7}}.\overset{11}{\cancel{2}}{}^{1}3 \\ -\ 4.\ 7\ \ 5 \\ \hline 2.\ 4\ \ 8 \end{array}$$

Since 7.23 is larger than 4.75, we keep the sign of 7.23.

Therefore, 4.75 + (-7.23) = -2.48

Example 18 : Subtract -5 - 2.34

Solution: -5 - 2.34 = -5 + (-2.34) Since subtraction can be thought of as addition of the opposite.

To add two numbers of the same sign, we add their absolute values and keep the sign of the original two numbers.

-5 - 2.34 = -7.34

$$\begin{array}{r} 5.00 \\ +\ 2.34 \\ \hline 7.34 \end{array}$$

Add the absolute values of the two numbers.

The answer has the same sign as the original two numbers.

Activity 7

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1. Add -3.73 + 6.67

2. Subtract -9.67 - 14

Section 4: Multiplying Decimals

Like the algorithm for adding and subtracting decimals, the multiplication algorithm also involves three steps.

1. Multiply, ignoring decimal points.
2. Add up the number of decimal places in the factors.
3. Insert a decimal point in the product so that

$$\begin{bmatrix}\text{Number of}\\ \text{decimal places}\\ \text{in product}\end{bmatrix} = \begin{bmatrix}\text{Number of}\\ \text{decimal places}\\ \text{in first factor}\end{bmatrix} + \begin{bmatrix}\text{Number of}\\ \text{decimal places}\\ \text{in second factor}\end{bmatrix}$$

Example 19 : Multiply 1.751 x 2.34

Solution:

```
   1.751      3 decimal places
 x  2.34      2 decimal places
   7004
  5253
 3502
 4.09734
```

The decimal point is placed
so there are 3 + 2 = 5 decimal places.

Let's take a closer look at the multiplication algorithm to try and understand why it works. The multiplication algorithm relies on properties of fractions. As before, the small numbers above the equal sign refer to the steps in the algorithm.

$$1.751 \text{ x } 2.34 = \frac{1751}{1000} \text{ x } \frac{234}{100}$$

$$= \frac{1751 \text{ x } 234}{1000 \text{ x } 100} \qquad \text{rule for multiplying fractions}$$

$$\overset{1:2}{=} \frac{409734}{100000} \qquad \text{multiplying whole numbers}$$

$$\overset{3}{=} 4.09734 \qquad \text{dividing by 100000}$$

The multiplication algorithm is a shortcut so we do not have to first change the decimal to a fraction.

Example 20 : How many digits will be to the right of the decimal point in the following product?

4.005 x 0.65

Solution: There are three digits to the right of the decimal point in 4.005, and two digits to the right of the decimal point in 0.65. Therefore, there will be 3 + 2 = 5 digits to the right of the decimal point in the product.

Example 21 : Simplify: $(0.15)^2$

Solution: Recall that the exponent of 2 tells us to multiply the base, 0.15, by itself.

```
  0.15
x 0.15
    75
   15
 .0325
```

Since we had 4 decimal places in our factors, we needed to add a zero in front of the 3 to have 4 decimal places in our answer.

Example 22 : Multiply 4.65 x 2.67

Solution:

```
   4.65
 x 2.67
   3255
  27900
  93000
12.4155
```

Activity 8

Find each of the following products.

1. 0.8 x 0.04

2. 2.604 x 14.03

3. 1.4 x 0.17

4. $(0.23)^2$

A common error that happens when multiplying decimals is to place the decimal point in the wrong place. You should always estimate to make sure the decimal was placed in the proper place. For example, suppose you were multiplying 45.6 by 2.3 and came up with the following:

$$\begin{array}{r} 45.6 \\ \underline{\times\ 2.3} \\ 10488 \end{array}$$

If you estimate the answer, it is then easy to place the decimal. In this example we have about 45 times 2, so the decimal point would only make sense between the 4 and 8 giving an answer of 104.88.

Activity 9

Use estimation to place the decimal point in the product.

a) 4.36 x .4 = 1744 b) 52 x .19 = 988 c) 52 x 1.9 = 988

Section 5: Dividing Decimals

Division of decimals closely follows division of whole numbers. Suppose you had to find 123.45 ÷ 2.5. The traditional division algorithm for decimals is as follows:

1. Set up the calculation in the usual whole number format.

$$2.5 \overline{\smash{)}123.45}$$

Recall the terms used in division: $\text{divisor} \overset{\text{quotient}}{\overline{\smash{)}\text{dividend}}}$

2. Move the decimal point in the divisor just enough places to the right so that the new divisor is a whole number, and move the decimal point in the dividend the same number of places to the right:

$$25 \overline{\smash{)}1234.5}$$

3. Divide as usual, and insert the decimal point in the quotient directly above the decimal point in the (new) dividend:

```
      49.38
25 | 1234.50     <--  Notice a zero was added to the dividend to continue the division.
     100
      234
      225
        95
        75
        200
        200
          0      <--  If a remainder of zero was not found, more zeros could
                      be added to the dividend until a remainder of zero was found or
                      instructions were given to round to a specific place value.
```

Let's try to see why this algorithm works. In fraction form, the problem above is equivalent to $\frac{123.45}{2.5}$. If we want to write the divisor as a whole number, we can multiply the numerator and the denominator of this fraction by 10:

$$\frac{123.45 \text{ x } \mathbf{10}}{2.5 \text{ x } \mathbf{10}} = \frac{1234.5}{25}$$

Since this fraction is equivalent to the original fraction, our original division problem is equivalent to

$25 \overline{\smash{)}1234.5}$. **This justifies step 2 in the division algorithm.**

To see why step 3 works, we note that the answer has to check. In other words,

quotient x divisor = dividend.

By what we know about multiplication of decimals, this equation implies that

$$\begin{bmatrix}\text{Number of decimal} \\ \text{places in quotient}\end{bmatrix} + \begin{bmatrix}\text{Number of decimal} \\ \text{places in divisor}\end{bmatrix} = \begin{bmatrix}\text{Number of decimal} \\ \text{places in dividend}\end{bmatrix}$$

That is,

$$\begin{bmatrix}\text{Number of decimal}\\ \text{places in quotient}\end{bmatrix} = \begin{bmatrix}\text{Number of decimal}\\ \text{places in dividend}\end{bmatrix} - \begin{bmatrix}\text{Number of decimal}\\ \text{places in divisor}\end{bmatrix}$$

In other words, to find the number of decimal places in the quotient, one must decrease the number of decimal places in the dividend by the number in the divisor. This is what is accomplished by sliding decimal points over and up.

Example 23 : Divide 1 by 62.5

Solution:

Step 1 $62.5\,\overline{)\,1}$

Set up the calculation in the usual whole number format.

Step 2 $625\,\overline{)\,10.}$

Move the decimal point in the divisor just enough places to the right so that the new divisor is a whole number, and move the decimal point in the dividend the same number of places to the right.

Step 3

```
        .0 1 6
625 | 1 0.0 0 0
       6 2 5
       3 7 5 0
       3 7 5 0
             0
```

Divide as usual, and insert the decimal point in the quotient directly above the decimal point in the (new) dividend.

Activity 10

Divide the following:

1. 17.759 ÷ 3.01

2. 1.53 ÷ 7.5

Section 6: Changing Fractions to Decimals

A fraction can be thought of as a numerator divided by a denominator. For example, the fraction $\frac{3}{5}$ can be thought of as 3 divided into 5 equal parts, or simply as 3 divided by 5. So to change a fraction to a decimal you just have to carry out the division.

Example 24 : Change $\frac{3}{5}$ to a decimal.

Solution: Dividing 3 by 5 we get

$$\begin{array}{r} .6 \\ 5\overline{)\,3.0} \\ \underline{3\,0} \\ 0 \end{array}$$

Therefore, $\frac{3}{5} = .6$

Example 25 : Change $\frac{7}{8}$ to a decimal.

Solution: We have to divide 7 by 8. It is always a good idea to have an estimate of the answer before we begin. Since $\frac{7}{8}$ is greater than $\frac{1}{2}$ and less than 1, the answer has to be between .5 and 1.

$$\begin{array}{r} .875 \\ 8\overline{)\,7.000} \\ \underline{6\,4} \\ 60 \\ \underline{56} \\ 40 \\ \underline{40} \\ 0 \end{array}$$

Therefore, $\frac{7}{8} =$ **.875**

Many times when changing a fraction to a decimal, the decimal does not terminate like the last two examples. For example, $\frac{1}{3} = .333333...$, where the three dots mean that the decimal never terminates.

Another way to write this is $\frac{1}{3} = .\overline{3}$ where the line goes above the part that repeats.

Example 26 : $\frac{1}{7} = .\overline{142857}$

This means that the .142857 repeats indefinitely, in other words $\frac{1}{7} = .142857142857142857142857...$.

Class Activity 11

Change the following fractions to decimals.

a) $\frac{7}{20}$

b) $\frac{1}{40}$

c) $\frac{5}{6}$

d) $\frac{3}{11}$

Example 27 : Add: $0.12+\frac{3}{8}$

Solution: In order to add these numbers we must make them both fractions or both decimals.

FRACTIONS:

$$0.12=\frac{12}{100}$$

$$\frac{12}{100}+\frac{3}{8}=\frac{24}{200}+\frac{75}{200}=\mathbf{\frac{99}{200}}$$

DECIMALS: First change $\frac{3}{8}$ to a decimal.

$$\begin{array}{r} .375 \\ 8\overline{)3.000} \\ \underline{24} \\ 60 \\ \underline{56} \\ 40 \\ \underline{40} \\ 0 \end{array}$$

$0.12+\frac{3}{8}$ = 0.12 + 0.375 = **0.495**

Activity 12

Show that $\frac{99}{200}=0.495$

Section 7: Rounding Decimals

The rule for rounding decimal numbers is similar to the rule for rounding whole numbers.

1. If the digit in the column to the right of the one you are rounding to is 5 or more, add 1 to the digit in the column we are rounding to; otherwise, we leave it alone.

2. Replace all digits to the right of the column we are rounding to with zeros if they are to the left of the decimal point; otherwise, we delete them.

Example 28 : Round 467.999 to the nearest ten.

Solution: The number next to the tens column is 7, which is 5 or more, so we add 1 to 6. We change all digits to the right to 0, and drop all digits to the right of the decimal point.

467.999 is rounded to **470**

Example 29 : Round 1.006349 to the nearest ten thousandth.

Solution: Since the number to the right of the ten thousandths column is 4, which is less than 5, the 3 is left alone. All digits to the right of 3 are deleted.

1.006349 is rounded to **1.0063**

Class Activity 13

1. Complete the following table.

	Rounded to the Nearest		
Number	**Whole number**	**Tenth**	**Hundredth**
4.099	______	______	______
4.936	______	______	______
0.074999	______	______	______
0.545	______	______	______

2. Round 9.05496 to the nearest ten thousandth. ___________

3. Round 10,479.057 to the nearest thousand. ___________

Example 30 : Divide and round the answer to the nearest hundredth.

$$23.002 \div 3.01$$

Solution: Since we are asked to round to the hundredth place, we must carry out our division to the thousandth place (3 decimal places). We will use the thousandths place digit to round the hundredths place digit.

$$\begin{array}{r} 7.641 \\ 3.01\overline{)23.002000} \\ \underline{2107} \\ 1932 \\ \underline{1806} \\ 1260 \\ \underline{1204} \\ 560 \\ \underline{301} \\ 259 \end{array}$$

Since the number to the right of the 4 in the quotient is less than 5, the 4 is left alone. Therefore,

$23.002 \div 3.01$ is rounded to **7.64**

Activity 14

Divide and round the answer to the nearest hundredth.

$$105.208 \div 7.9$$

Exercises for Decimals

Do all the exercises on separate paper, showing all work neatly.

1. Write the name of each number in words.

   a) 0.103 b) 5.02 c) 24.6

2. Write each number as a fraction or a mixed number. Do not simplify your answers.

   a) 2.96 b) 65.101 c) 0.00062

3. Give the place value of the 1 in each of the following numbers.

   a) 314.67 b) 65.12 c) 0.0021 d) 8.54321

4. Write each of the following as a decimal.

   a) Six and two tenths b) two hundred and 8 hundredths

   c) Five thousand and five thousandths

   d) Twelve thousand and four hundred thirty-five thousandths

5. Write the following numbers in order from smallest to largest.

   a) .03 .02 .025 .0099 0.209

   b) 5.7 5.07 5.27 5.027 5.207

6. Change each decimal to a fraction, and then simplify.

   a) 0.35 b) 0.125 c) 0.0605

   d) 0.0500 e) 0.1742

7. Without a calculator, find the following:

   a. 4.56 + 2.09 b. 0.04 + 0.83 + 0.72

c. $5.0004 + 2.97 + 0.008$

d. $0.81 + (-5) + 4.95$

e. $65.0197 + 6.78 + 0.0009$

f. $987.658 + 341.396$

g. $76.56 - 49.82$

h. $5.94 - 4.84$

i. $-5 - .943$

j. $15.837 + 19.02 + 7 + .49$

k. $30.7 + 8.042 - 6.3 + 2.19$

l. $1.43 + \frac{3}{4}$

m. $\frac{2}{5} + 0.63 - \frac{1}{8}$

n. $(0.35)^2$

o. $(1.4)^2$

q. $411.4 \div 44$

r. 2.3×4.52

s. $21.978 \div 3.3$

t. $2.40 \div 0.75$

u. 4.005×0.97

8. a. Round 2,456.8706 to the nearest thousandth.
   b. Round 0.6235 to the nearest hundredth.
   c. Round 15.8479 to the nearest thousandth.
   d. Round 109.543 to the nearest ones.

9. Write each fraction as a decimal.

a. $\frac{4}{5}$ b. $\frac{13}{60}$ c. $\frac{9}{80}$ d. $\frac{3}{7}$

Activity 1:

A. 1. one and seventy-three hundredths

2. five thousandths

B. 1. 8.093

2. 16.0109

****

Activity 2:

1. $9\frac{19}{1000}$ 2. $78\frac{143}{1000}$ 3. $\frac{45}{100} = \frac{9}{20}$

****

Activity 3:

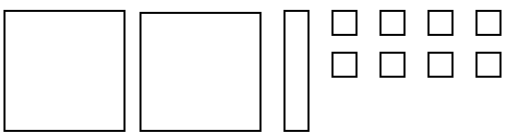
1. 0.004 < 0.04 < 0.0405 < 0.045 < 0.05

2. 0.0071 < 0.01 < 0.017 < 0.07 < 0.17

****

Activity 4:

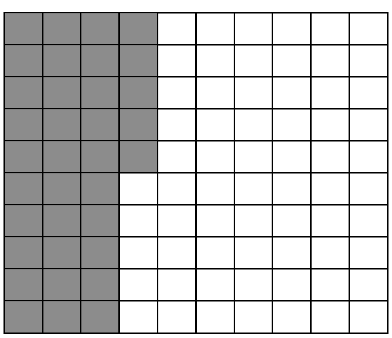
Represent 2.18 using the *squares and strips* model.



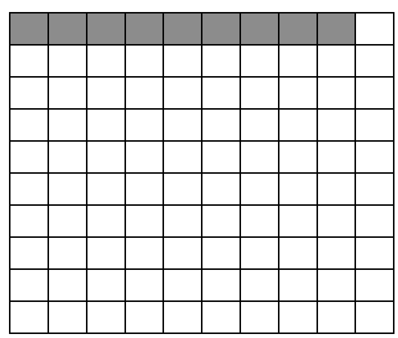
****

Activity 5:

a)



b)



The shaded portion of the following square represents what decimal? 0.19

****

Activity 6:

1. 7.74 2. 33.692 3. 14.62 4. 9.049 5. 117.21

Activity 7:

1. 2.94 2. - 23.67

****

Activity 8:

Find each of the following products.

1. 0.8 x 0.04

```
  0.8
x 0.04
 0.032
```

2. 2.604 x 14.03

```
   2.6004
  x 14.03
     7812
  1041600
  2604000
 36.53412
```

3. 1.4 x 0.17

```
   1.4
  x.17
    98
    14
 0.238
```

4. $(0.23)^2$

```
  0.23
 x 0.23
    69
   460
0.0529
```

****

Activity 9:

a) 4.36 x 0.4 = 1.744 *4x0.4 = 1.6*

b) 52 x 0.19 = 9.88 *50 x0 .2 = 10*

c) 52 x 1.9 = 98.8 *50 x 2 = 100*

****

Activity 10:

1.

```
        5.9
301)1775 .9
    1505
     2709
     2709
        0
```

2.

```
       0.204
   75)15.300
      15 0
        300
        300
          0
```

Therefore, 17.759 ÷ 3.01 = 5.9

Therefore, 1.53 ÷ 7.5 = 0.204

Activity 11:

a) $\frac{7}{20} = 0.35$

$$\begin{array}{r} 0.35 \\ 20\overline{)7.00} \\ \underline{60} \\ 100 \\ \underline{100} \\ 0 \end{array}$$

b) $\frac{1}{40} = 0.025$

$$\begin{array}{r} 0.025 \\ 40\overline{)1.000} \\ \underline{80} \\ 200 \\ \underline{200} \\ 0 \end{array}$$

c) $\frac{5}{6} = 0.8\overline{3}$

$$\begin{array}{r} 0.83 \\ 6\overline{)5.00} \\ \underline{48} \\ 20 \\ \underline{18} \\ 2 \end{array}$$

d) $\frac{3}{11} = 0.\overline{27}$

$$\begin{array}{r} 0.2727 \\ 11\overline{)3.0000} \\ \underline{22} \\ 80 \\ \underline{77} \\ 30 \\ \underline{22} \\ 80 \\ \underline{77} \\ 3 \end{array}$$

Activity 12:

Show that $\frac{99}{200} = 0.495$

$$
\begin{array}{r}
0.495 \\
200\overline{)99.000} \\
\underline{800} \\
1900 \\
\underline{1800} \\
1000 \\
\underline{1000} \\
0
\end{array}
$$

****

Activity 13:

1.

Rounded to the nearest

Number	Whole number	Tenth	Hundredth
4.099	4	4.1	4.10
4.936	5	4.9	4.94
0.074999	0	0.1	0.07
0.545	1	0.5	0.55

2. Round 9.05496 to the nearest ten-thousandth 9.0550

3. Round 10,479.057 to the nearest thousand 10,000

****

Activity 14:

Divide: 105.208 ÷7.9 round the answer to the nearest hundredth.

$$
\begin{array}{r}
13.317 \\
79\overline{)1052.080} \\
\underline{79} \\
262 \\
\underline{237} \\
250 \\
\underline{237} \\
138 \\
\underline{79} \\
590 \\
\underline{553} \\
37
\end{array}
$$

Since the number to the right of 1 is 5 or more, the 1 becomes a 2. Therefore, 105.208 ÷ 7.9 = 13.32