Unit 1

Working with Decimals

Topic A: Part of the Whole Thing

This is the beginning of an adventure with numbers that represent **part of the whole thing**. These numbers can be shown in a few different ways:

Fraction name	Example
Decimal fraction	0.50
Common fraction	$\frac{50}{100}$ or $\frac{1}{2}$
Percent fraction	50%

When we talk about fractions in any of the three ways listed above, we are talking about numbers in relation to the whole thing. The whole thing is a word we use to describe one thing.

An example would be one jug of juice.

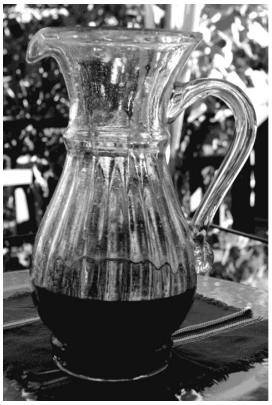
That is one whole thing.

Once someone starts taking some juice, less than the whole thing remains.

Someone had half the juice.

The remaining amount can be

written as 0.5 or $\frac{1}{2}$ or 50%.



Almost all the juice has been taken.

Now there is only 0.25 of the juice

left (or $\frac{1}{4}$ or 25%).

Now there are two full jugs of juice.

This shows *two* whole things.

A fraction does not tell us much unless we know what the fraction is part of—we need to know the whole thing! If someone says to you,

"Sure, let's go, I still have $\frac{1}{2}$!" you instantly need to know, "One-half of what?"

This could be $\frac{1}{2}$ of a tank of gas, it could be $\frac{1}{2}$ of a paycheque, it could be $\frac{1}{2}$ of a vacation, it could be $\frac{1}{2}$ of an hour, or $\frac{1}{2}$ of...

> Fractions have meaning only when we understand the whole thing.

Decimal Fractions

Decimal fractions are one way to consider **parts of the whole thing**—and the whole thing is one. You use decimal fractions every time you think about money! The dollars are written as whole numbers; the cents are written as a decimal fraction of a dollar.

A decimal fraction has a decimal point (**.**) that separates the whole number from the fraction. We use our **knowledge of place value** to understand how many parts the whole thing is divided into. Our number system is called a ***decimal system*** because it is based on the number **ten** ("deci" is the Latin word for ten). So in decimal fractions the whole thing is divided into **tenths**; the tenths are divided by ten to make **hundredths**; the hundredths are divided by ten to make **thousandths** and so on.

Decimal fractions are often used in our daily lives, especially in money and measurement.

$12.24

3.5 kilometres to drive to the store

2.6 metres of material

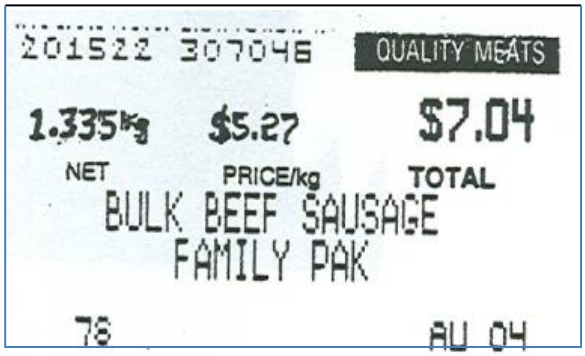
1.8 kilograms of roast beef

You will be working with decimal fractions in the first two units of this book.

Adult – regular strength

CAPLETS **24 pkg.**

$ 2.29



Common Fractions

Common Fractions are a second way we will work with **parts of the whole thing**. They are written with two numbers, one above the other, with a line in between. The line may be straight — or on an angle /

$$\frac{3}{4} \quad \text{or} \quad 3/4$$

The **denominator** is the bottom number. The denominator tells **how many equal parts there are in the whole thing.**

Numerator → $\frac{3}{4}$ ← Denominator

The **numerator** is the top number in a common fraction. The numerator tells **how many of the equal parts are actually being described or talked about.**

This pizza has been **cut into eight pieces**, all the same size (equal).

The denominator to use while talking about **this** pizza is **8**. The numerator will be the exact number of pieces of the pizza that are being described.

This is **1 pizza**, and that is the **whole thing**. If someone ate all 8 pieces or 8/8 (eight-eighths) that person ate **1** pizza. Eating three of the pieces would be 3/8 of the pizza.

Fundamental Mathematics book 5 explains more about common fractions.

Fractions as a Percent

A third and useful way to think about **parts of the whole thing** is as a percent.

Percent fractions are written with a number and a percent sign.

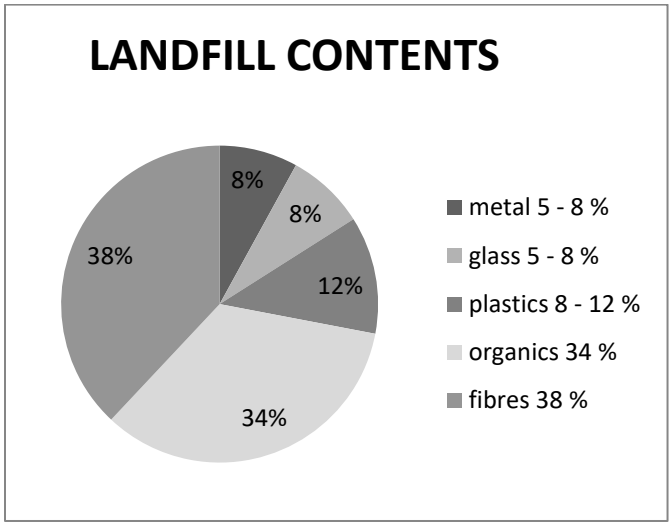
50%

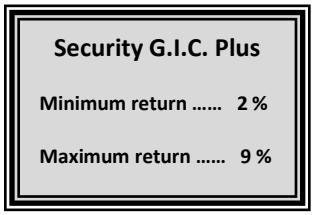
99%

In percent fractions the denominator is **always** understood to be **100**. That makes the arithmetic much easier and helps us to understand the **size** or **proportion** of the fraction. For example, if you got $\frac{13}{17}$ on a test this week, and $\frac{14}{20}$ on one last week, it is hard to get a sense of how you are doing. But if you know you got 70% last week and 76% this week, it is easier to see your improvement.

In percent fractions, the **whole thing is 100%**. 100% equals 1.

Statistics and general information are often reported in percent fractions. You will learn to work with fractions as a percent in Fundamental Mathematics book 6. We hope you enjoy the challenge.





Comox Valley Regional District - 2010

LESS THAN 10% OF OUR LANDFILL IS REAL GARBAGE!

Real Life Examples

The idea of fractions may be very comfortable to most of us because our minds are used to dealing with **parts** in our everyday life. Look at the pictures and use a **fraction** to answer the questions.

one quarter = 0.25 = $\frac{1}{4}$

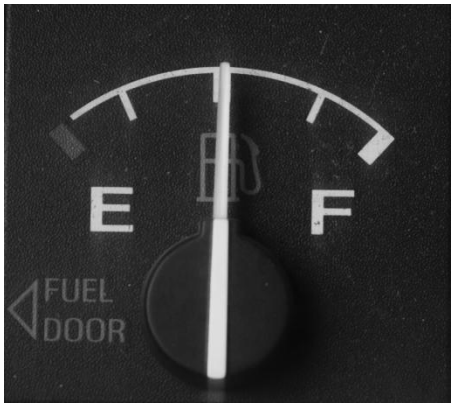
one half = 0.5 = $\frac{1}{2}$

three quarters = 0.75 = $\frac{3}{4}$

one third = 0.333. . . = $\frac{1}{3}$

two thirds = 0.666. . . = $\frac{2}{3}$

How much gas is left? (See page 5 for possible answers.)



a) _____ of a tank

b) _____ of a tank

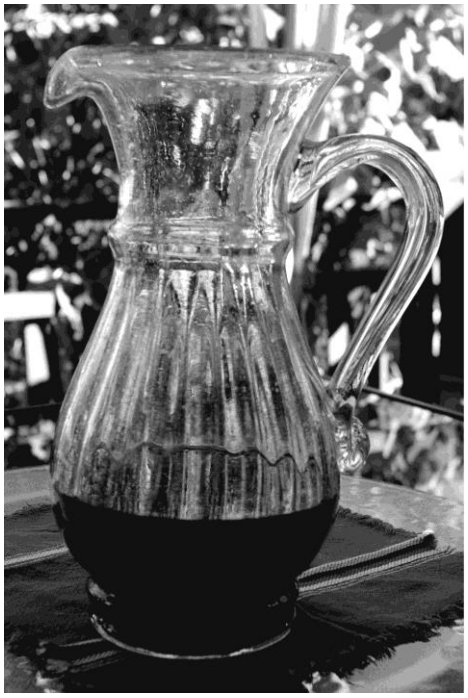
This full cup of coffee is the **whole thing**. It is **1** cup of coffee.

Do you want more coffee?

c) No thanks, I still have _____ of a cup.

d) Sure, I only have _____ of a cup left.

e) Yes please, I'm down to _____ of a cup.



Do we need more juice?

f) Yes, there is just _____ of the juice left.

Here is a familiar sight—a full basket of clothes to be ironed!

This full basket is the **whole thing**.

It is **1** basket of ironing.

Things are looking up!

g) _____ of the ironing has been done. There is only about _____ of the ironing left to do.

Answers to Photo Questions: Answers may differ because the fraction is approximate. Ask your instructor to check any different answers.

a) $\frac{1}{2}$ **or** $\frac{2}{4}$ **or** 0.5 b) $\frac{1}{4}$ **or** 0.25 c) $\frac{3}{4}$ **or** 0.75

d) $\frac{1}{2}$ **or** 0.5 e) $\frac{1}{4}$ **or** 0.25 f) $\frac{1}{3}$ **or** 0.333

g) $\frac{3}{4}$ done $\frac{1}{4}$ left to do **or** 0.75 done, with 0.25 left to do

What is a Decimal Fraction?

As you know, fractions describe **part** of **the whole thing**—a fraction is smaller than **1**. And as you also know, **1** (the whole thing) can be many things. For example, it can be:

one dollar
one city
one school
one paycheque
one year
one second
one loaf of bread
one population
one ferry ride...

So a decimal might represent part of a year, part of the population of Canada, part of a second or part of anything you want.

Decimal fractions are different from common fractions in several ways:

- **A decimal point,** separates whole numbers from the fraction. A decimal fraction starts with a decimal point.

0.1 (is $\frac{1}{10}$) **0.34** (is $\frac{34}{100}$) **0.5** (is $\frac{5}{10}$)

In a decimal fraction, the **denominator** is **not written**. Remember that the denominator in a common fraction is the bottom number and tells how many equal parts there are in the whole thing.

$\frac{1}{8}$ ⇐ denominator $\frac{3}{4}$ ⇐ denominator

But in a decimal fraction the denominator is **understood**. We tell the size of the denominator by looking at how many numerals are placed **after** the decimal point.

Decimal fraction denominators are always **ten or ten multiplied by tens**. ***Decimal*** means "based on the number ten".

0.4	has a denominator of 10
0.44	has a denominator of 100
0.444	has a denominator of 1 000
0.4444	has a denominator of 10 000
0.44444	has a denominator of 100 000
0.444444	has a denominator of 1 000 000

A whole number and a decimal can be written together. This is called a **mixed decimal**.

4.35 100.47 $12.39

Every whole number has a decimal point after it, even though we usually do not bother to write the decimal point unless a decimal follows the whole number. We can also put zeros to the right of the decimal point of any whole number without changing its value. Get used to thinking of a decimal point after every whole number!

3	=	3**.**	=	3**.0000000**
275	=	275**.**	=	275**.0**
100	=	100**.**	=	100**.0000000000**
$8	=	$8**.**	=	$8**.00**

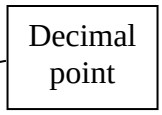
Decimal or Decimal Fraction?

⇨ In math, we use the word **decimal** to mean **decimal fraction.** In the rest of this book, you will see the word **decimal,** and it will mean **decimal fraction.**

Topic B: Reading & Writing Decimals

Remember the Place Value Chart of whole numbers?

Thousands			Ones			
Hundred thousands	Ten thousands	One thousands	hundreds	tens	ones	●
			3	**5**	**2**	



352 is the first number on the chart:

- The three is in the hundreds spot
- The five is in the tens spot
- The 2 is in the ones spot

Place the following numbers on the place value chart:

- 4 984
- 836 466
- 70 834

Check with your instructor to see if you have placed the numbers in the chart correctly.

Have you ever wondered what goes to the right of the decimal in a place value chart?

That is where the decimals go!
Here is a place value chart for decimals:

Hundreds	tens	ones	•	tenths	hundredths	thousandths	Ten thousandths	Hundred thousandths
		3	•	4	5	3		
		0	•	9	6			

See the words in to the right of the decimal point? They look different than the usual whole number words you are used to. These are all the names for the decimal places. You will see them in the next lesson.

The first number is 3.453

It is said as three and four hundred fifty-three thousandths or three point four five three

- 3 is in the ones spot
- 4 is in the ten*ths* spot
- 5 is in the hundred*ths* spot
- 3 is in the thousand*ths* spot

The second number is 0.96

It is said as zero and ninety six hundredths or as zero point nine six.

- 0 is in the ones spot
- 9 is in the tenths spot
- 6 is in the hundredths spot

Common fractions with a denominator of 10 are written as a decimal with **one place to the right of the decimal point**. This is the **tenths place**.

We often shorten the way we say "places to the right of the decimal point" to **"decimal places"**. So we can say that **tenths** have **one decimal place**.

$\frac{6}{10}$ = 0.6 = six tenths

$\frac{3}{10}$ = 0.3 = three tenths

(An easy way to remember is that there is one zero in the denominator and so there is one decimal place taken up).

Exercise One

Write each common fraction as a decimal and in words.

a) $\frac{4}{10}$ = 0.4 = four tenths

b) $\frac{1}{10}$ = 0.1 = one tenth

c) $\frac{2}{10}$ = ____ = _____

d) $\frac{9}{10}$ = ____ = _____

e) $\frac{7}{10}$ = ____ = _____

f) $\frac{5}{10}$ = ____ = _____

g) $\frac{8}{10}$ = ____ = _____

h) $\frac{6}{10}$ = ____ = _____

i) $\frac{3}{10}$ = ____ = _____

j) Now enter each common fraction in the place value chart on the next page. The first one is done for you. Please show this to your instructor once you are finished to make sure you are on the right track.

hundreds	tens	ones	●	tenths	hundredths	thousandths	Ten thousandths	Hundred thousandths
		0	•	4				

Answers to Exercise One

a) 0.4, four tenths b) 0.1, one tenth c) 0.2, two tenths d) 0.9, nine tenths

e) 0.7, seven tenths f) 0.5, five tenths g) 0.8, eight tenths h) 0.6, six tenths

i) 0.3, three tenths

Decimals with one digit to the right of the decimal point have an **unwritten denominator of ten.** These decimals show the whole thing is thought about in 10 equal parts. Each part is called a **tenth**.

When we write decimals, a zero is usually placed to the left of the decimal point to show there is no whole number. This zero keeps the decimal point from being "lost" or not noticed.

.2 should be written as 0.2

Exercise Two

Write each decimal as a common fraction and in words.

a) 0.3 = $\frac{3}{10}$ = *three tenths*

b) 0.4 = $\frac{4}{10}$ = *four tenths*

c) 0.8 = ____ = _____

d) 0.7 = ____ = _____

e) 0.1 = ____ = _____

f) 0.6 = ____ = _____

g) 0.2 = ____ = _____

h) 0.9 = ____ = _____

Answers to Exercise Two

a) $\frac{3}{10}$, three tenths b) $\frac{4}{10}$, four tenths c) $\frac{8}{10}$, eight tenths d) $\frac{7}{10}$, seven tenths

e) $\frac{1}{10}$, one tenth f) $\frac{6}{10}$, six tenths g) $\frac{2}{10}$, two tenths h) $\frac{9}{10}$, nine tenths

Decimals with two digits to the right of the decimal point have an **unwritten denominator of one hundred**. These decimals show that the whole is thought about in 100 equal parts. Each part is called a **hundredth**.

Exercise Three

Write each decimal as a common fraction and in words.

a) 0.34 $\frac{34}{100}$ *thirty-four hundredths*

b) 0.71 $\frac{71}{100}$ *seventy-one hundredths*

c) 0.06 _____ _____

d) 0.56 _____ _____

e) 0.33 _____ _____

f) 0.40 _____ _____

g) 0.75 _____ _____

h) 0.09 _____ _____

i) 0.16 _____ _____

j) 0.08 _____ _____

k) Now place the above decimal numbers in the place value chart on the next page. The first two are done for you. Then ask your instructor to correct it.

Hundreds	tens	ones	●	tenths	hundredths	thousandths	Ten thousandths	Hundred thousandths
		0	•	3	4			
		0	•	7	1			

Answers to Exercise Three

a) $\frac{34}{100}$, thirty-four hundredths b) $\frac{71}{100}$, seventy-one hundredths c) $\frac{6}{100}$, six hundredths

d) $\frac{56}{100}$, fifty-six hundredths e) $\frac{33}{100}$, thirty-three hundredths f) $\frac{40}{100}$, forty hundredths

g) $\frac{75}{100}$, seventy-five hundredths h) $\frac{9}{100}$, nine hundredths i) $\frac{16}{100}$, sixteen hundredths

j) $\frac{8}{10}$, eight hundredths

Common fractions with a **denominator of one hundred** are written as decimals with **two decimal places**.

$\frac{23}{100} = 0.23$

$\frac{99}{100} = 0.99$

$\frac{4}{100} = 0.04$

The **0** must be used after the decimal point in 0.**0**4 to hold the tenths place so the denominator will be understood as hundredths.

This is called **prefixing zeros**. (see that there are two zeros in the denominator, so there must be two decimal places taken up.)

Exercise Four

Write these common fractions as decimals.

a) $\frac{34}{100}$ *0.34*

b) $\frac{70}{100}$ *0.70*

c) $\frac{85}{100}$ _____

d) $\frac{11}{100}$ _____

e) $\frac{21}{100}$ _____

f) $\frac{5}{100}$ _____

g) $\frac{6}{100}$ _____

h) $\frac{45}{100}$ _____

i) $\frac{50}{100}$ _____

j) $\frac{1}{100}$ _____

Answers to Exercise Four

a) 0.34 b) 0.70 c) 0.85 d) 0.11 e) 0.21 f) 0.05 g) 0.06 h) 0.45 i) 0.50 j) 0.01

Decimals with three digits to the right of the decimal point (**three decimal places**) have an unwritten denominator of one thousand. Each part is one **thousandth**. Look carefully at how thousandths are written. Watch for the zero that may be needed to hold the tenth decimal place or the hundredth decimal place.

0.472 = four hundred seventy-two thousandths = $\frac{472}{1000}$

0.085 = eighty-five thousandths = $\frac{85}{1000}$

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

(see that there are three zeros in the denominator, so there must be three decimal places taken up.)

Exercise Five

Write each decimal as a common fraction and in words. When there is no whole number to the left of the decimal point, do not use "and". Practise saying them aloud.

a) 0.006 $\frac{6}{1000}$ *six thousandths*

b) 0.142 $\frac{142}{1000}$ *one hundred forty-two thousandths*

c) 0.238 _____ _____

d) 0.562 _____ _____

e) 0.600 _____ _____

f) 0.203 _____ _____

g) 0.025 _____ _____

h) 0.042 _____ _____

i) 0.070 _____ _____

Answers to Exercise Five

a) $\frac{6}{1000}$, six thousandths

b) $\frac{142}{1000}$, one hundred forty-two thousandths

c) $\frac{238}{1000}$, two hundred thirty-eight thousandths

d) $\frac{562}{1000}$, five hundred sixty-two thousandths

e) $\frac{600}{1000}$, six hundred thousandths

f) $\frac{203}{1000}$, two hundred three thousandths

g) $\frac{25}{1000}$, twenty-five thousandths

h) $\frac{42}{1000}$, forty-two thousandths

i) $\frac{70}{1000}$, seventy thousandths

Exercise Six

Write each common fraction as a decimal. Write the decimals in the place value chart, then show it to your instructor.

a) $\frac{736}{1000}$ *0.736*

b) $\frac{84}{1000}$ *0.084*

c) $\frac{210}{1000}$ _____

d) $\frac{6}{1000}$ _____

e) $\frac{106}{1000}$ _____

f) $\frac{116}{1000}$ _____

g) $\frac{3}{1000}$ _____

h) $\frac{400}{1000}$ _____

i) $\frac{20}{1000}$ _____

j) $\frac{27}{1000}$ _____

k) $\frac{592}{1000}$ _____

l) $\frac{962}{1000}$ _____

hundreds	tens	ones	●	tenths	hundredths	thousandths	Ten thousandths	Hundred thousandths
		0	•	7	3	6		
		0	•	0	8	4		

Answers to Exercise Six

a) 0.736 b) 0.084 c) 0.210 d) 0.006 e) 0.106 f) 0.116

g) 0.003 h) 0.400 i) 0.020 j) 0.027 k) 0.592 l) 0.962

Decimals with **four decimal places** have an unwritten denominator of **ten-thousand**. The whole thing is being thought of as having ten thousand parts. Each part is one **ten-thousandth**.

$0.1458 = \frac{1458}{10000}$ = one thousand four hundred fifty-eight **ten-thousandths**

$0.0581 = \frac{581}{10000}$ = five hundred eighty-one **ten-thousandths**

(See that there are four zeros in the denominator, so there must be four decimal places taken up.)

Exercise Seven

Write each decimal as a common fraction and in words. Practise saying these aloud to someone else; they can be real tongue-twisters!

a) 0.2489 $\frac{2489}{10000}$ *two thousand four hundred eighty-nine ten-thousandths*

b) 0.1111 $\frac{1111}{10000}$ *one thousand one hundred eleven ten-thousandths*

c) 0.0236 _____ _____

d) 0.4015 _____ _____

e) 0.2306 _____ _____

f) 0.0003 _____ _____

g) 0.4501 _____ _____

h) 0.0024 _____ _____

i) 0.9001 _____ _____

j) 0.0298 _____ _____

Answers to Exercise Seven

a) $\frac{2489}{10000}$, two thousand four hundred eighty-nine ten-thousandths

b) $\frac{1111}{10000}$, one thousand one hundred eleven ten-thousandths

c) $\frac{236}{10000}$, two hundred thirty-six ten-thousandths

d) $\frac{4015}{10000}$, four thousand fifteen ten-thousandths

e) $\frac{2306}{10000}$, two thousand three hundred six ten-thousandths

f) $\frac{3}{10000}$, three ten-thousandths

g) $\frac{4501}{10000}$, four thousand five hundred one ten-thousandths

h) $\frac{24}{10000}$, twenty-four ten-thousandths

i) $\frac{9001}{10000}$, nine thousand one ten-thousandths

j) $\frac{298}{10000}$, two hundred ninety-eight ten-thousandths

Exercise Eight

Write these common fractions as decimals, and then place the numbers from a) to f) in the place value chart. Please have you your instructor check your place value chart once you have completed it.

a) $\frac{1489}{10000}$ *0.1489*

b) $\frac{2}{10000}$ *0.0002*

c) $\frac{386}{10000}$ _____

d) $\frac{9137}{10000}$ _____

e) $\frac{4}{10000}$ _____

f) $\frac{916}{10000}$ _____

g) $\frac{290}{10000}$ _____

h) $\frac{111}{10000}$ _____

i) $\frac{5003}{10000}$ _____

j) $\frac{75}{10000}$ _____

hundreds	tens	ones	●	tenths	hundredths	thousandths	Ten thousandths	Hundred thousandths
		0	•	1	4	8	9	
		0	•					

Answers to Exercise Eight

a) 0.1489 b) 0.0002 c) 0.0386 d) 0.9137 e) 0.0004 f) 0.0916

g) 0.0290 h) 0.0111 i) 0.5003 j) 0.0075

⇨ **Mixed decimals** are a whole number and a decimal written together.

4.3 = $4\frac{3}{10}$ = four **and** three tenths

27.27 = $27\frac{27}{100}$ = twenty-seven **and** twenty-seven hundredths

8.104 = $8\frac{104}{1000}$ = eight **and** one hundred four thousandths

Digits to the left of the decimal point are whole numbers.

Digits to the right of the decimal point are fractions.

The decimal point is read "**and**".

Look at the above mixed decimals in the place value chart:

hundreds	tens	ones	●	tenths	hundredths	thousandths	Ten thousandths	Hundred thousandths
		4	•	3				
	2	7	•	2	7			
		8	•	1	0	4		

Writing Decimals

1. Read the number. Does the word "**and**" show that this is a mixed decimal? If it does, the **whole number** is **before** the word "**and**".

2. If it is a mixed decimal, write the whole number with the decimal point after it. If there is no whole number, write a **0** with the decimal point after it.

3. Decide how many decimal places you need. Look and listen for the "**ths**" ending.

    - Ten**ths** need one decimal place.
    - Hundred**ths** need two decimal places.
    - Thousand**ths** need three decimal places.
    - Ten-thousand**ths** need four decimal places.

4. It may help if you draw a little line for each decimal place that you need. The word with "**ths**" is the understood denominator.

    - tenths
    - hundredths
    - thousandths
    - ten-thousandths

5. Write the decimal so the last digit is on the last little line and fill any remaining lines with zeros. For example:

• seven hundredths	._ 7	0.0 7
• eight thousandths	._ _ 8	0.0 0 8
• twenty-six thousandths	._ 2 6	0.0 2 6
• four hundred six thousandths	.4 0 6	0.4 0 6

CHECK what you have written. Does it say what you want?

Exercise Nine

Write each as a common fraction and as a decimal.

a) sixty-eight thousandths	$\frac{68}{1000}$	*0.068*
b) five tenths	$\frac{5}{10}$	*0.5*
c) fifty-six thousandths	_____	_____
d) ninety-nine hundredths	_____	_____
e) four hundred twenty-seven ten-thousandths	_____	_____
f) four thousandths	_____	_____
g) six hundredths	_____	_____
h) one thousand three hundred two ten-thousandths	_____	_____
i) four hundred thirty-three thousandths	_____	_____
j) thirty-seven hundredths	_____	_____
k) five thousandths	_____	_____
l) six hundred five thousandths	_____	_____
m) nine tenths	_____	_____
n) nine thousand nine hundred fifty ten-thousandths	_____	_____

Answers to Exercise Nine

a) $\frac{68}{1000}$, 0.068 b) $\frac{5}{10}$, 0.5 c) $\frac{56}{1000}$, 0.056 d) $\frac{99}{100}$, 0.99 e) $\frac{427}{10000}$, 0.0427

f) $\frac{4}{1000}$, 0.004 g) $\frac{6}{100}$, 0.06 h) $\frac{1302}{10000}$, 0.1302 i) $\frac{433}{1000}$, 0.433 j) $\frac{37}{100}$, 0.37

k) $\frac{5}{1000}$, 0.005 l) $\frac{605}{1000}$, 0.605 m) $\frac{9}{10}$, 0.9 n) $\frac{9950}{10000}$, 0.9950

Exercise Ten

Write each number as a decimal (or mixed decimal).

a) eighteen and six tenths *18.6*

b) six and forty-two hundredths *6.42*

c) seventy-one ten-thousandths _____

d) one hundred and sixty-seven hundredths _____

e) five hundred twenty-seven and twelve hundredths _____

f) one and five tenths _____

g) two hundred six and four thousand three hundred twenty-one ten thousandths _____

h) nineteen and seven hundredths _____

i) two hundred sixty-five thousandths _____

j) thirty-six and nine thousandths _____

k) one hundred twenty and ninety-nine thousandths _____

l) four thousand two hundred one and forty-seven hundredths _____

Answers to Exercise Ten

a) 18.6	b) 6.42	c) 0.0071	d) 100.67	e) 527.12	f) 1.5
g) 206.4321	h) 19.07	i) 0.265	j) 36.009	k) 120.099	l) 4201.47

Often, people read decimals and mixed decimals in the following way:

4.25 as "four point two five" instead of "four and twenty-five hundredths"
0.009 as "point zero zero nine" instead of nine thousandths

It is important to read and understand decimals using their place values before you start taking shortcuts in the way you read them.

Dollars and Cents

As you have noticed, the cents part of our money is written as a decimal with two decimal places. $1.00 = 1 dollar

What do we call $\frac{1}{100}$ of a dollar? _____ Right! One cent.

$2.33 = two dollars **and** thirty-three **cents**

$427.05 = four hundred twenty-seven dollars **and** five **cents**

$0.62 = sixty two **cents**

$0.03 = three **cents**

Exercise Eleven

Write the amount of money in words.

a) $212.63 *two hundred twelve dollars and sixty-three cents*

b) $47.01 _____

c) $9.28 _____

d) $82.50 _____

e) $100.05 _____

Write with numerals, using $.

f) twenty-seven dollars and six cents *$27.06*

g) one hundred sixty-two dollars _____

h) thirteen dollars and sixty cents _____

i) one thousand dollars and seventy-seven cents _____

j) sixty-nine cents _____

k) seven cents _____

l) five hundred dollars and ninety cents _____

Answers to Exercise Eleven

a) two hundred twelve dollars and sixty-three cents

b) forty-seven dollars and one cent

c) nine dollars and twenty-eight cents

d) eighty-two dollars and fifty cents

e) one hundred dollars and five cents

f) $27.06 g) $162.00 h) $13.60 i) $1000.77 j) $0.69 k) $0.07 l) $500.90

Let's leave math for a minute and look at some **Latin**!

Latin is the language formerly used in the Roman Empire. The Latin language provides the base (the root) for many English words. Other European languages also have a Latin base for many words.

CENTUM is a **Latin** word which means

a) a **hundred** or a hundred fold (hundred times)

b) a **hundredth** part of

Look at these words:

centipede - wormlike creatures with a hundred legs

century - a hundred years

centennial - a hundredth anniversary

centigrade - having a hundred degrees

cent - one hundredth of a dollar

centimeter - one hundredth of a meter

You might enjoy looking in the dictionary at the many words starting with "cent".

So when we talk about $12.25 as twelve dollars and twenty-five **cents** we are using the Latin word for "one hundredths". We could also write our money like this, which we do on cheques:

$14.75 = $14 $\frac{75}{100}$ (looks funny!)

$12.25 = $12 $\frac{25}{100}$

$403.10 = $403 $\frac{10}{100}$

We have another way of writing money. We often write money that is **less than one dollar** using a **cent sign** which is a **c** for cent with a line through it ¢. We can also use the ¢ method for amounts more than a dollar, but this is not very common unless you want to count all the pennies, nickels, and dimes in your piggy bank!

$0.05 = 5¢ $0.33 = 33¢

$0.10 = 10¢ $0.25 = 25¢

$0.99 = 99¢ $1.08 = 108¢

Exercise Twelve

Rewrite these using the other common way of writing money. Remember to use the ¢ or $ as needed.

a) $0.75 = *75¢* b) 83¢ = *$0.83*

c) $0.01 = _____ d) 47¢ = _____

e) $0.04 = _____ f) 3¢ = _____

g) $0.40 = _____ h) 101¢ = _____

i) $0.29 = _____ j) 50¢ = _____

k) $0.80 = _____ l) 99¢ = _____

m) $1.00 = _____ n) 175¢ = _____

o) $1.10 = _____ p) 18¢ = _____

q) $1.25 = _____ r) 200¢ = _____

s) $2.20 = _____ t) 167¢ = _____

Answers to Exercise Twelve

a) 75¢	b) $0.83	c) 1¢	d) $0.47	e) 4¢	f) $0.03	g) 40¢
h) $1.01	i) 29¢	j) $0.50	k) 80¢	l) $0.99	m) 100¢	n) $1.75
o) 110¢	p) $0.18	q) 125¢	r) $2.00	s) 220¢	t) $1.67	

Important Information!

Do we need to use a decimal point with the cent sign?

No.

A decimal point would indicate a **fraction or part of one cent**.

If a sign said "ice cream cones **.**50¢", you would only pay fifty hundredths of a cent (= one half of a cent) for an ice cream cone. That would be two cones for 1¢ —good deal!

Pay attention to the way amounts of money are written.

We will work with this in other units.

Exercise Thirteen

Correct the following ways of writing money.

a) .50¢ = 50¢

b) .99¢ = _____

c) .20¢ = _____

d) ¢0.40 = _____

Answers to Exercise Thirteen

b) 99¢ c) 20¢ d) 40¢

Exercise Fourteen

A Review: Complete the chart so that each question has the amount written as a decimal, a common fraction, and in words. The first two are done.

	Decimal	Fraction	In words
a)	.048	$\frac{48}{1000}$	
b)	0.7	$\frac{7}{10}$	seven tenths
c)			four hundredths
d)	0.006		
e)		$16\frac{2}{1000}$	
f)			twelve and fifteen hundredths
g)	463.03		
h)		$213\frac{25}{1000}$	
i)			seventy-five and twenty-eight thousandths
j)	1833.018		
k)		$12\frac{418}{10000}$	
l)			nine tenths

Answers to Exercise Fourteen

	Decimal	Fraction	In words
a)	.048	$\frac{48}{1000}$	forty-eight thousandths
b)	0.7	$\frac{7}{10}$	seven tenths
c)	0.04	$\frac{4}{100}$	four hundredths
d)	0.006	$\frac{6}{1000}$	six thousandths
e)	16.002	$16\frac{2}{1000}$	sixteen and two thousandths
f)	12.15	$12\frac{15}{100}$	twelve and fifteen hundredths
g)	463.03	$463\frac{3}{100}$	four hundred sixty-three and three hundredths
h)	213.025	$213\frac{25}{1000}$	two hundred thirteen and twenty-five thousandths
i)	75.028	$75\frac{28}{1000}$	seventy-five and twenty-eight thousandths
j)	1833.018	$1833\frac{18}{1000}$	one thousand eight hundred thirty-three and eighteen thousandths
k)	12.0418	$12\frac{418}{10000}$	twelve and four hundred eighteen ten-thousandths
l)	0.9	$\frac{9}{10}$	nine tenths

Topic B: Self-Test

Mark /43 Aim 36/40

A. Write as decimals. 10 marks

a) $\frac{3}{10}$ _____ b) $\frac{24}{100}$ _____

b) $\frac{36}{1000}$ _____ d) $\frac{206}{10\,000}$ _____

e) $3\frac{123}{1000}$ _____ f) $\frac{2}{100}$ _____

g) $6\frac{3}{10}$ _____ h) $4\frac{11}{1000}$ _____

i) $6\frac{250}{1000}$ _____ j) $93\frac{47}{10\,000}$ _____

B. Change these decimals to common fractions. 10 marks

a) 0.5 _____ b) 0.04 _____

c) 0.37 _____ d) 0.010 _____

e) 3.0918 _____ f) 3.025 _____

g) 0.164 _____ h) 2.1498 _____

i) 0.110 _____ j) 6.08 _____

C. Write as common fractions and as decimals. 20 marks

a) one hundredth _____ _____

b) forty-seven hundredths _____ _____

c) two hundred seventy-one thousandths _____ _____

d) forty-one thousandths _____ _____

e) one hundred twenty ten-thousandths _____ _____

f) four and four tenths _____ _____

g) two hundred sixty and fourteen ten-thousandths _____ _____

h) seven and two hundred eleven thousandths _____ _____

i) forty and six hundredths _____ _____

j) five dollars and sixty-three cents _____ _____

D. Write the amount of money with numerals, using a $ sign. 3 marks

a) Five dollars and sixty cents $5.60

b) Seventy two cents $0.72

c) Fifty six cents _____

d) Six cents _____

e) One hundred twenty four cents _____

Answers to Topic B Self-Test

Part A

a) 0.3 b) 0.24 c) 0.036 d) 0.0206 e) 3.123 f) 0.02

g) 6.3 h) 4.011 i) 6.250 j) 93.0047

Part B

a) $\frac{5}{10}$ b) $\frac{4}{100}$ c) $\frac{37}{100}$ d) $\frac{10}{1000}$ e) $3\frac{918}{10000}$ f) $3\frac{25}{1000}$

g) $\frac{164}{1000}$ h) $2\frac{1498}{10000}$ i) $\frac{110}{1000}$ j) $6\frac{8}{100}$

Part C

a) $\frac{1}{100}$, 0.01 b) $\frac{47}{100}$, 0.47 c) $\frac{271}{1000}$, 0.271 d) $\frac{41}{1000}$, 0.041

e) $\frac{120}{10000}$, 0.0120 f) $4\frac{4}{10}$, 4.4 g) $260\frac{14}{10000}$, 260.0014 h) $7\frac{211}{1000}$, 7.211

i) $40\frac{6}{10}$, 40.06 j) $5\frac{63}{100}$, \$5.63

Part D

c) \$0.56 d) \$0.06 e) \$1.24

Topic C: Comparing Decimals

More about Zeros...

Here is a quick review:

- A whole number can have a decimal point and as many zeros as you care to write after it without changing its value.

  47 = 47.0 = 47.000 = 47.0000000000000000

- Zeros are used to hold a place when we write whole numbers.

  in 1**00**, the 0's hold the tens place and the ones place

  in 1 2**0**6, the 0 holds the tens place

- In decimals, any zero to the right of the decimal point and to the left of another digit is important because the zero is holding a place and giving the decimal the correct value.

  in 4.3**0**6, the 0 holds the hundredths place

  in 17.**000**2, the 0's hold the tenth, hundredth and thousandth places.

- A zero is usually placed to the left of the decimal point if there is no whole number.

  0.5 **0**.937

Which zeros are not needed?

- Zeros at the **beginning**, or far left, of **whole numbers** are **not needed**.

  00004 = 4 **00**100 = 100

- Zeros at the **end**, or far right, of **decimal** are **not needed**.

  3.21**0** = 3.21 34.062**000** = 34.062

Zeros **on the outside edges of mixed decimals** do **not change the value of the number** and are not necessary.

0028.971**0** = 28.971

00100.003**000** = 100.003

890.407 = **00**890.407**0000000**

Exercise One

Cross out the zeros that are not needed.

a) 70.0390

b) 0 0.2906

c) 06.30

d) 087.50

e) 60.0205

f) 4 020.0020

g) 400.080

h) 340.600

i) 03.5830

j) 9.0

k) 0.002030

l) 50.300

m) 04.803

n) 4 000.060

o) 002.002

Answers to Exercise One

a) 709.0390 b) 00.2906 c) 06.30 d) 087.50 e) 60.0205

f) 4 020.0020 g) 400.080 h) 340.600 i) 03.5830 j) 9. 0

k) 0.002030 l) 50.300 m) 04.803 n) 4 000.060 o) 002.002

Zeros at the **end** of a **decimal do not change the value**.

6. = 6.0 = 6.00

And zeros at the **beginning** of a **whole number do not change the value**.

8 = 08 = 00008

But zeros **between** a decimal point and a digit **do** change the value.

Example:

405 is very different than 45

and: 0.05 = five hundredths

0.5 = five tenths

These are also very different.

Apples and Oranges!

You have probably heard the old saying: "You cannot compare apples to oranges!" And it's true, it **is** tough to compare things that do not have much in common.

So before we compare decimals, we give the decimals something in common—the **same number of decimal places** which gives them a **common** understood **denominator**.

Before comparing decimals, **put zeros at the end** or cross out any unnecessary zeros so the decimals have a common (same) number of decimal places. If you write the decimals that you are comparing right underneath each other your eye will often tell you which is the larger amount or if the amounts are equal.

Example: Compare 0.43 and 0.4 Which is larger?

1. 0.43 has two decimal places; it is forty-three hundredths.
2. 0.4 has one decimal place; it is four tenths.
3. Add a zero to 0.4 to make it 0.4**0**; now we read it as forty hundredths. (which is the same as 4 tenths)

   Now, which is larger? $0.40 \left(\frac{40}{100}\right)$ $0.43 \left(\frac{43}{100}\right)$

5. You can easily see that 0.43 is the larger amount.

Review of Greater Than > and Less Than <

An easy way to remember these signs is to think that the big (wide) end of the sign is closer to the bigger (greater) number, and the small end of the sign is closer to the smaller number.

0.43 is larger than 0.40 $0.43 > 0.40$
0.52 is smaller than 0.60 $0.52 < 0.60$

Exercise Two

Which is greater? Draw a box around the bigger decimal fraction in each pair and write a greater than > or a less than < sign to make a true statement.

a)	**0.6**	**<**	**0.65**		
b)	**14**	**>**	**1.4**		
c)	0.17		0.02		
d)	0.009		0.09		
e)	0.148		0.2		
f)	0.999		1		
g)	0.23		0.215		
h)	0.51		0.159		
i)	0.8		0.008		
j)	0.11		0.101		
k)	0.03		0.0352		
l)	0.07		0.063		
m)	630.3		630.03		
n)	0.80		0.6989		

Answers to Exercise Two

a) < b) > c) > d) < e) < f) < g) > h) > i) >

j) > k) < l) > m) > n) >

Comparing decimals

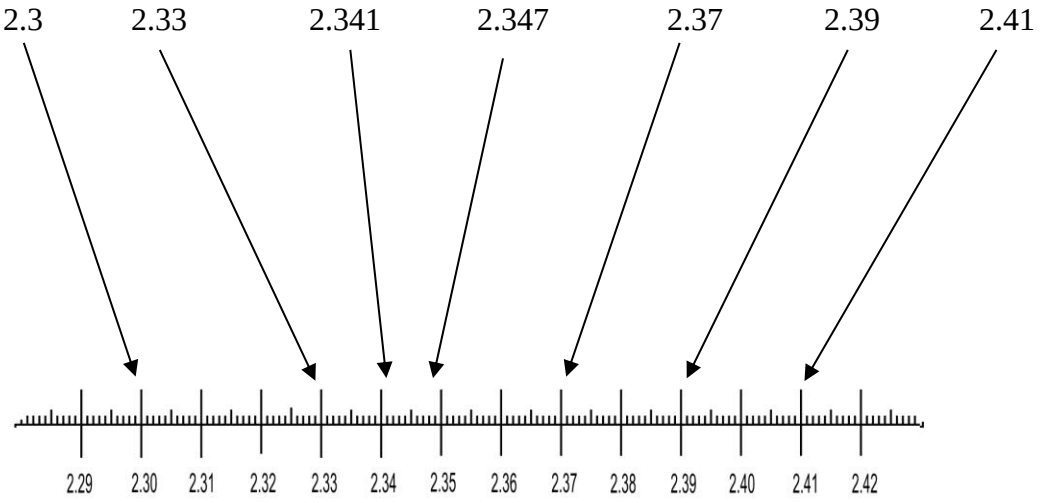
You can compare decimals using a number line. A number line organizes what you are thinking about on paper – or on a ruler. You can plot your decimals on the number line and then be able to see which number is larger. Take a look:

First try to put the following numbers in order without looking at the number line below:

2.347 2.3 2.37 2.33 2.39 2.341 2.41

Then, look at the number line and see if you ordered your numbers correctly. The number line has a jagged edge which means it does not start at zero. It starts in the middle of a ruler.

Using a number line can help you see your work and think about it at the same time.



Try plotting the following decimals on the number line below:

4.59 4.32 4.7 5.23 4.47 4.3 4.17

And now, plot these numbers on an empty number line.

(You need to fill in the numbers yourself. Plot 7.3 on the first large vertical line on the left)

7.35 7.3 8.2 7.53 7.98 8.34 7.9 7.5

This is one way to organize and order decimals, please use it if the system is helpful for you.

Answers:

4.17	4.3	4.32	4.47	4.59	4.7	5.23	7.3
7.35	7.5	7.53	7.9	7.98	8.2	8.34	

Exercise Three

Draw a box around the smallest decimal fraction in each group.

a) 0.3, 0.03 , 0.23

b) 0.04 , 0.14, 0.41

c) 0.016, 0.2, 0.216

d) 0.62, 0.6103, 0.5

e) 2.202, 2.21, 2.200

f) 9.678, 8.866, 9.9

g) 0.041, 0.04, 0.4

h) 100.1, 100.13, 100.01

i) 2.71, 2.072, 2.007l

j) 0.38, 0.4, 0.401

Answers to Exercise Three

a) 0.03 b) 0.04 c) 0.016 d) 0.5 e) 2.200 f) 8.866

g) 0.04 h) 100.01 i) 2.0071 j) 0.38

Exercise Four

State if each pair of decimal fractions is equal = or not equal ≠ by putting the correct sign between them.

a) 0.8 = 0.80

b) 0.25 ≠ 0.205

c) 5.503 5.330

d) 9.3200 9.32

e) 0.02 0.20

f) 3.309 3.90

g) 0.75 0.750

h) 23.3 2.33

i) 0.040 0.40

j) 0.8010 0.801

k) 0.027 0.270

l) 50.91 50.091

Answers to Exercise Four

a) = b) ≠ c) ≠ d) = e) ≠ f) ≠ g) =

h) ≠ i) ≠ j) = k) ≠ l) ≠

Topic C: Self-Test

Mark /20 Aim 17/20

A. Cross out the unnecessary zeros. **4 marks**

a) 0401.02 b) 1 000.001

c) 68.3020 d) 050.200

B. Draw a box around the larger amount in each pair. **8 marks**

a) 0.8 or 0.08 b) 0.004 or 0.04

c) 0.125 or 0.21 d) 2.100 or 2.12

e) 0.006 or 0.6 f) 33.006 or 33.06

g) 0.88 or 0.879 h) 4.01 or 5.01

C. Put the correct sign between the decimals. Choose = or > or < **8 marks**

a) 2.3 23 b) 0.2 0.003

c) 4.7 4.700 d) 0.25 0.250

e) 0.2081 0.2108 f) 18.34 19.43

g) 042.9002 042.9 h) 0.4092 0.411

Answers to Topic C Self-Test

Part A

a) 0401.02 b) 1 000.001 c) 68.3020 d) 050.200

Part B

a) 0.8 b) 0.04 c) 0.21 d) 2.12 e) 0.6

f) 33.06 g) 0.88 h) 5.01

Part C

a) < b) > c) = d) = e) < f) < g) > h) <

Estimating and Rounding Decimals

If a pair of jeans cost $49.98, what amount would you say if someone asks what you paid for them? You would probably say, "They cost around $50."

We often round cents to dollars as we go about our lives. You may already have an idea of how to do this. For example, answer these questions.

About how much do your groceries cost each month?
About how much does it cost to fill a small car's gas tank?

Look at your answers. The amount for groceries may be quite large. When you estimated your answer, how did you round the amount?

For example, if your real monthly grocery bill was $481.73 you might have said $482 or perhaps $480. Perhaps you even have estimated to the nearest hundred dollars and said, "About $500 a month for groceries." All those estimates would be correct.

Of course, the estimates you wrote down will be different because the amount you spend on groceries is different.

The amount for a tank of gas is less than a month's groceries. How did you estimate? For example, a small car may take $33.75 of gas.

If you estimated to the nearest dollar, you would say, "About $34."
If you estimated to the nearest ten dollars, you would say, "About $30."
If you rounded to the nearest dollar you would say “34 dollars”.

We round a number in different ways depending on several things:

- the **size** of the number we are rounding
- what we are going to do with the number after we have rounded it off
- our own convenience

Topic D: Rounding Whole Numbers

1) Carefully review the **place value for whole numbers**

Thousands			Ones			
Hundred thousands	Ten thousands	One thousands	hundreds	tens	ones	●
			3	**5**	**2**	

2) Write down the method you use to round whole numbers.

_____

_____

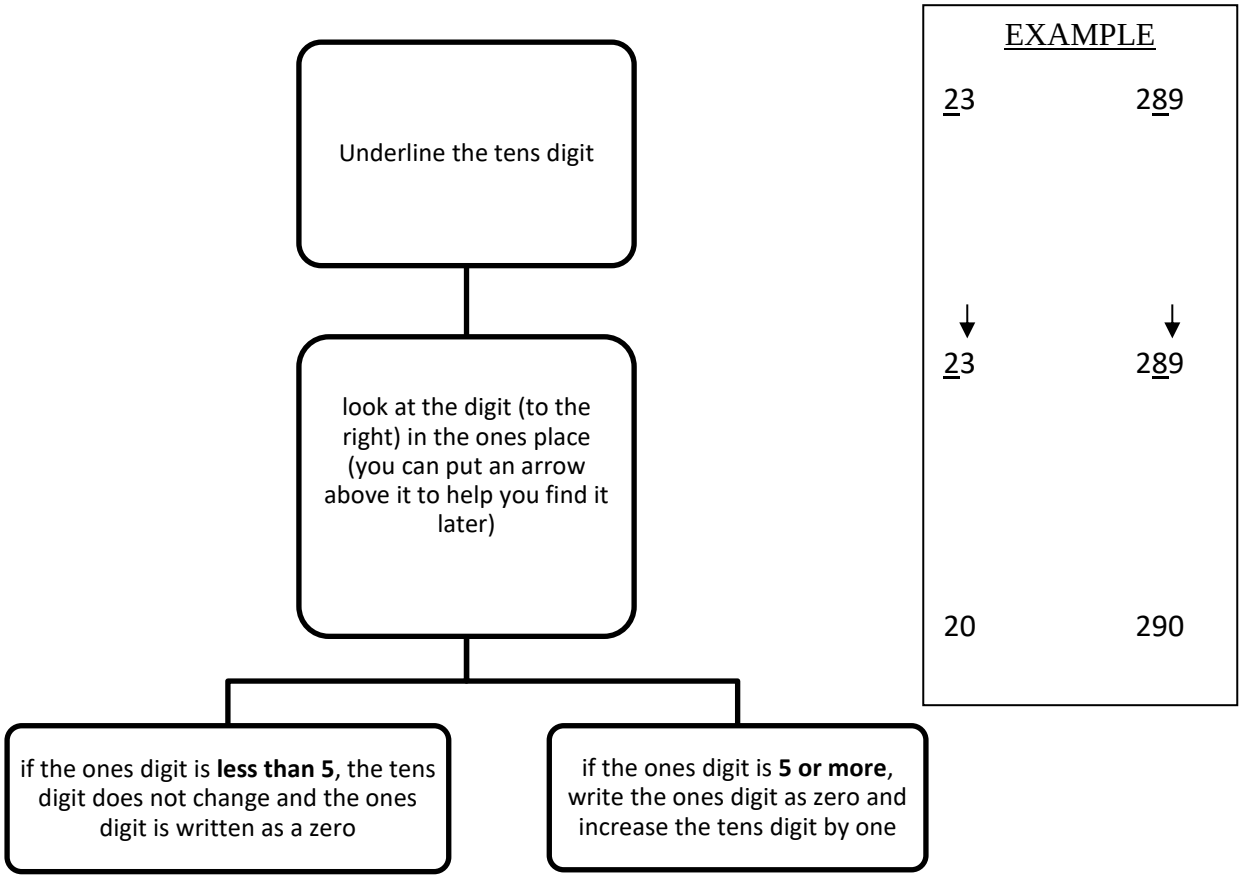
_____

4) Find another student who is working on the same topic, and compare notes. Tell your partner what your method is and let him/her tell you his/her method.

5) If you have trouble explaining to yourself or your partner how to round whole numbers, ask your instructor for assistance and work through Exercises One, Two, and Three.

Rounding numbers gives an approximate amount; it is not an accurate figure. Use a different form of the equal sign which means **approximately equal**. This sign is ≈

Review: Rounding to the Nearest Ten



Example:

2 3 Rounding 23 to the nearest ten is 20 because the ones digit is less than 5.

2 8 7 Rounding 287 to the nearest ten is 290 because the ones digit is 5 or more.

Exercise One

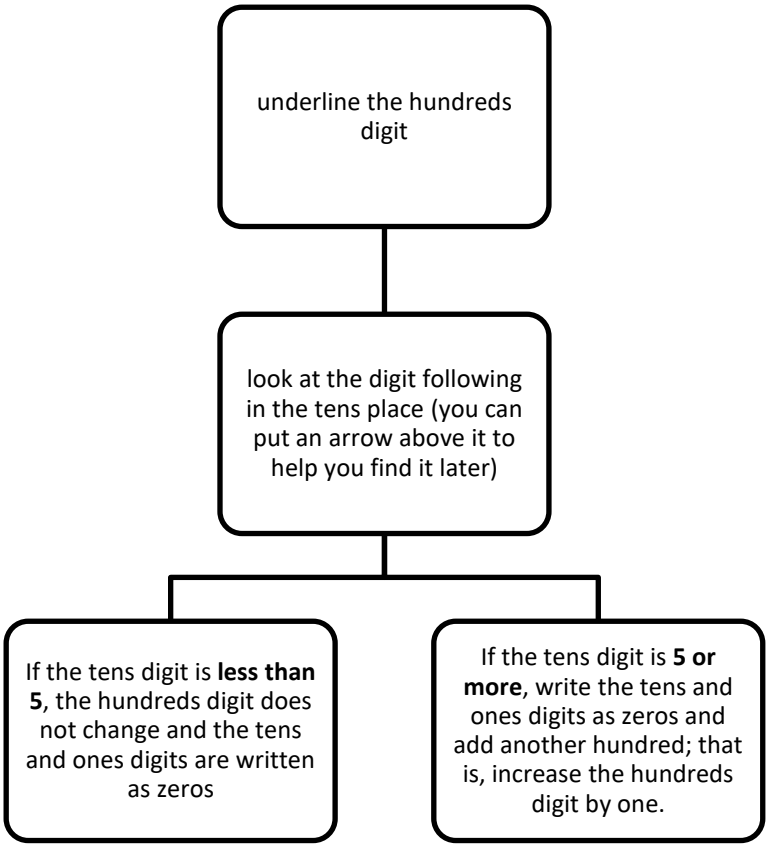
Round each of the following to the nearest ten.

a) 46 *≈50*	111 ____	7 ____	116 ____
b) 71 *≈70*	89 ____	96 ____	4 ____
c) 385 *≈390*	108 ____	73 ____	17 ____
d) 14 ____	25 ____	399 ____	123 ____
e) 361 ____	8 ____	49 ____	148 ____
f) 77 ____	l65 ____	128 ____	35 ____

Answers to Exercise One

a) ≈50 ≈110 ≈10 ≈120
b) ≈70 ≈90 ≈100 ≈0
c) ≈390 ≈110 ≈70 ≈20
d) ≈10 ≈30 ≈400 ≈120
e) ≈360 ≈10 ≈50 ≈150
f) ≈80 ≈170 ≈130 ≈40

Review: Rounding to the Nearest Hundred



EXAMPLE

728	793
↓	↓
728	793
700	800

Example:

↓

7 2 8 to the nearest hundred is 700 because the tens digit is less than 5.

↓

5 7 6 to the nearest hundred is 600 because the tens digit is 5 or more.

Exercise Two

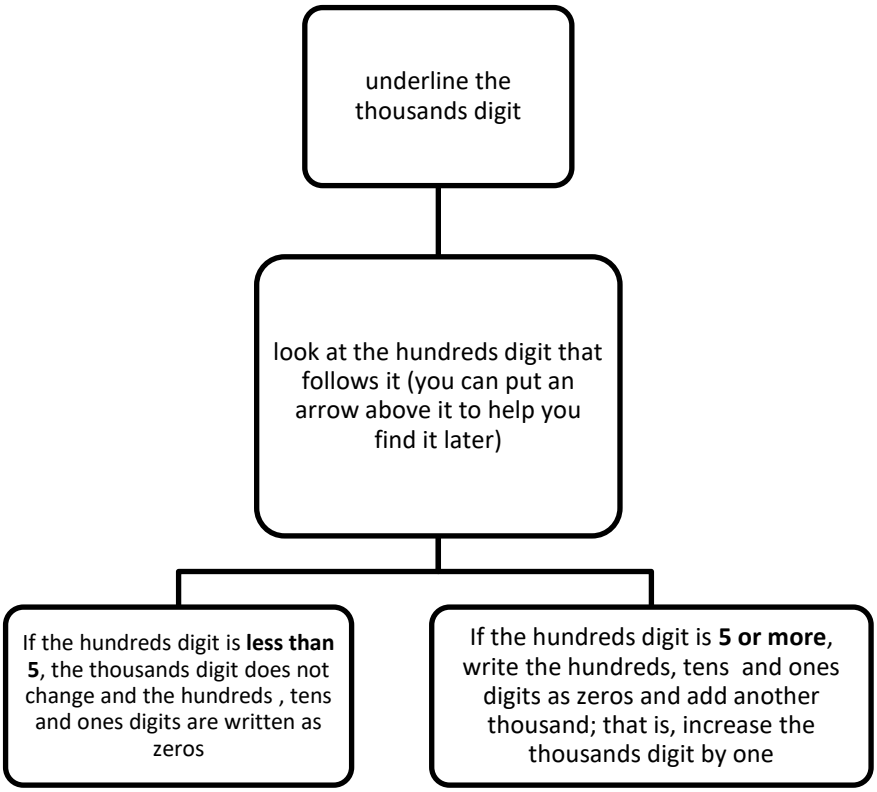
Round these numerals to the nearest hundred.

a) **3**30 *≈300*	908 _____	2 795 _____	1 260 _____
b) **7**42 *≈700*	127 _____	302 _____	945 _____
c) **8**65 *≈900*	275 _____	590 _____	1 240 _____
d) 214 _____	4 450 _____	98 _____	996 _____
e) 348 _____	720 _____	497 _____	1 075 _____
f) 480 _____	95 _____	1 742 _____	80 _____
g) 250 _____	333 _____	1 899 _____	1 355 _____

Answers to Exercise Two

a) ≈300 ≈900 ≈2 800 ≈1 300
b) ≈700 ≈100 ≈300 ≈900
c) ≈900 ≈300 ≈600 ≈1 200
d) ≈200 ≈4 500 ≈100 ≈1 000
e) ≈300 ≈700 ≈500 ≈1 100
f) ≈500 ≈100 ≈1 700 ≈100
g) ≈300 ≈300 ≈1 900 ≈1 400

Review: Rounding to the Nearest Thousand



EXAMPLE

3496 3996

3496 3996

3000 4000

Example:

4 4 9 6 rounds to 4 000 because the hundreds digit is less than 5.

1 3 5 0 1 rounds to 14 000 because the hundreds digit is 5 or more.

Exercise Three

Round these numerals to the nearest thousand.

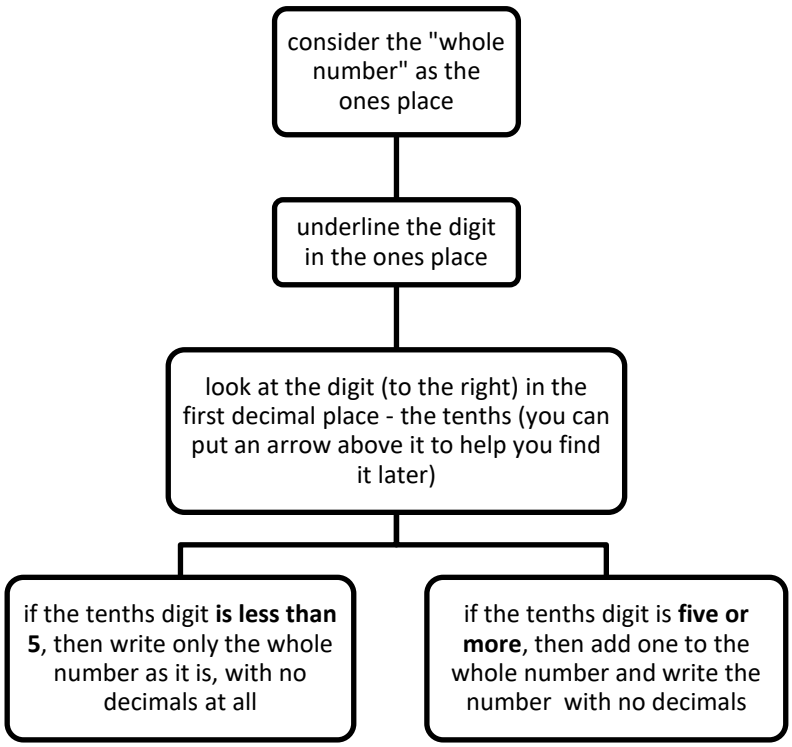
a) 1 760	≈ 2 000	6 250	_____	850	_____
b) 320	≈ 0	5 544	_____	1 234	_____
c) 4 925	≈ 5 000	6 199	_____	9 883	_____
d) 1 045	_____	7 856	_____	500	_____
e) 1 780	_____	495	_____	9 300	_____
f) 2 450	_____	8 075	_____	31 900	_____
g) 700	_____	2 449	_____	5 555	_____
h) 8 914	_____	85 455	_____	6 475	_____
i) 927	_____	2 050	_____	11 250	_____
j) 1 723	_____	5 500	_____	25 902	_____

Answers to Exercise Three

a)	≈ 2 000	≈ 6 000	≈ 1 000	f)	≈ 2 000	≈ 8 000	≈ 32 000
b)	≈ 0	≈ 6 000	≈ 1 000	g)	≈ 1 000	≈ 2 000	≈ 6 000
c)	≈ 5 000	≈ 6 000	≈ 10 000	h)	≈ 9 000	≈ 85 000	≈ 6 000
d)	≈ 1 000	≈ 8 000	≈ 1 000	i)	≈ 1 000	≈ 2 000	≈ 11 000
e)	≈ 2 000	≈ 0	≈ 9 000	j)	≈ 2 000	≈ 6 000	≈ 26 000

Rounding Decimals to Whole Numbers

Decimals are **part of the whole thing**. As we discussed at the beginning of this topic, sometimes the **whole thing** might be all we need. So we **round** the decimal to a whole number. The **whole number** is **written with no numbers after the decimal dot**. Rounding to whole numbers means rounding off to the **ones** place. When rounding to the whole number:



EXAMPLE

37.392	37.792
↓	↓
37.392	37.792
37	38

Example A: Round to a whole number.

$$42.123 \longrightarrow 42.123 \approx 42$$

Example B: Round 960.802 to the nearest whole number.

$$960.802 \longrightarrow 960.802 \approx 961$$

Example C: Round 39.5 to the nearest whole number (ones).

$$39.5 \longrightarrow 39.52 \approx 40$$

Zeros again - You know that zeros at the **end** of a decimal do **not change** the value of the amount and can be added as you like.

But, when a decimal has been rounded, **drop any zeros after the place where you have rounded**. The reason? The 0 in a decimal place implies an accurate amount for that place when in fact you have estimated the amount.

39.52 ≈ 40.0 is **not** correct, just write 39.52 ≈ 40
960.802 ≈ 961.000 is **not** correct, just write 960.802 ≈ 961

Exercise Four

Round each of the following to the nearest whole number.

a)	11.3	≈ 11		2.679		403.8	
b)	7.6	≈ 8		65.91		22.2	
c)	3.76	≈ 4		9.2		1.7	
d)	2.4			9.9		1.4	
e)	0.6			2.63		5.09	
f)	19.8			2.1		0.7	
g)	74.2			3.61		12.3	
h)	6.4			48.5		9.492	
i)	34.5			17.82		2.45	

j) 1.792 _____ 2.01 _____ 5.55 _____

k) 1.17 _____ 17.2 _____ 3.72 _____

l) 4.16 _____ 25.08 _____ 8.703 _____

m) 10.3 _____ 9.9 _____ 8.15 _____

Answers to Exercise Four

a) ≈11 ≈3 ≈404

b) ≈8 ≈66 ≈22

c) ≈4 ≈9 ≈2

d) ≈2 ≈10 ≈1

e) ≈1 ≈3 ≈5

f) ≈20 ≈2 ≈1

g) ≈74 ≈4 ≈12

h) ≈6 ≈49 ≈9

i) ≈35 ≈18 ≈2

j) ≈2 ≈2 ≈6

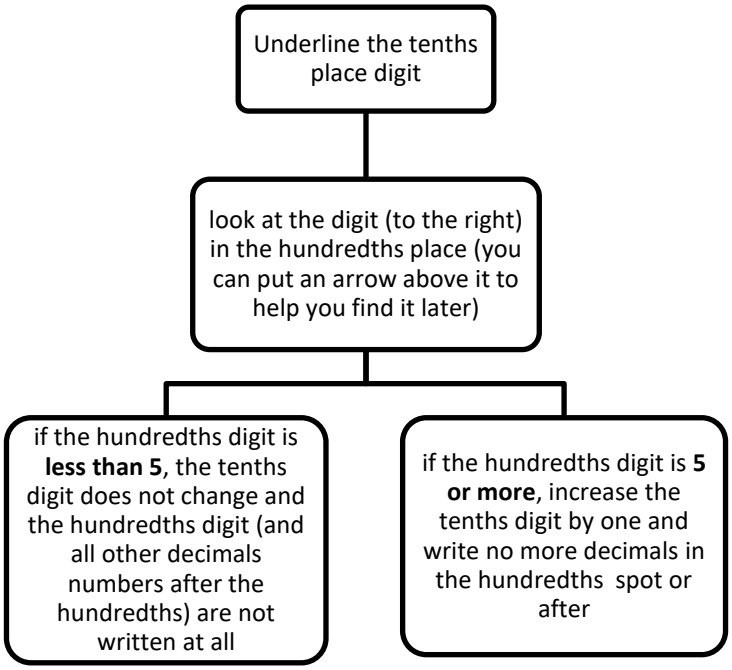
k) ≈1 ≈17 ≈4

l) ≈4 ≈25 ≈9

m) ≈10 ≈10 ≈8

If these exercises on rounding are becoming tiresome, please do not despair—there **is** a purpose. When you do operations (+ - × ÷) with decimals, you will often end up with answers in the ten-thousandths place when you really only need the accuracy of a tenth or a hundredth place decimal. If you do decimal operations on a calculator you may end up with 6 decimal places (millionths)—not too practical if you are working with money and only want two decimal places! You will know how to round the answer to the decimal place you need for that question or situation.

Rounding Decimals to the Nearest Tenth



EXAMPLE

13.4̲32 → 13.4̲32 → 13.4

13.4̲76 → 13.4̲76 → 13.5

Example A: Round to the nearest tenth.

0.263 → 0.2̲ 6 3 ≈ 0.3

Example B: Round to the nearest tenth.

234.0399 → 234.0̲ 3 99 ≈ 234.0

Keep the 0 because you have accurately rounded off to that zero.
It is called a ***significant figure***.

Exercise Five

Round each of the following to the nearest tenth.

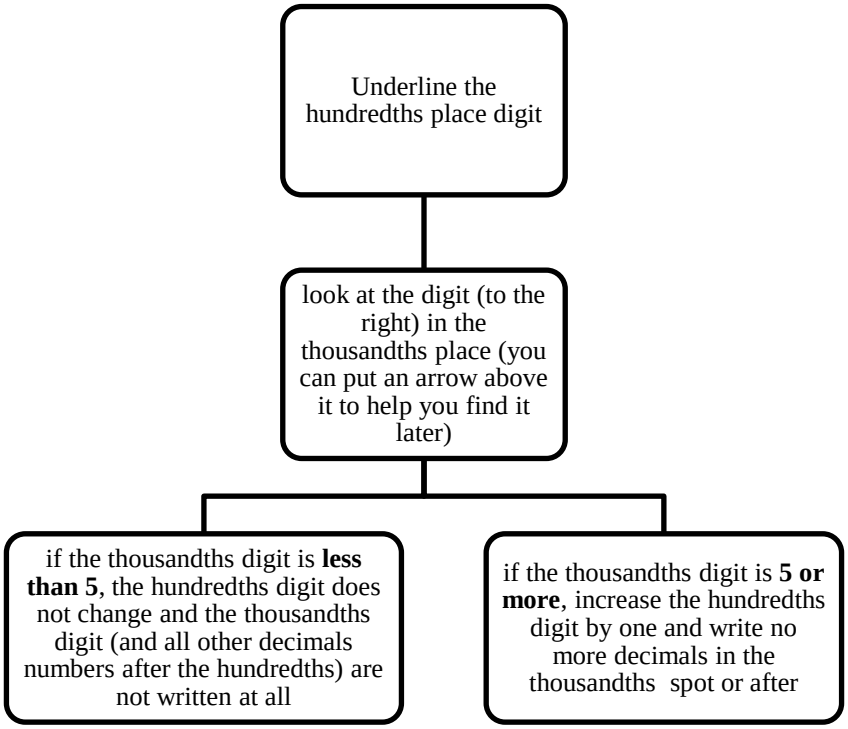
a)	4.23	≈ 4.2		5.18	.	8.54	
b)	16.09	≈ 16.1		3.52		4.14	
c)	6.24	≈ 6.2		1.76		1.74	
d)	7.19			2.15		1.44	
e)	3.172			9.99		5.09	
f)	4.111			6.046		0.71	
g)	3.63			9.45		12.36	
h)	202.305			2.66		9.492	
i)	7.388			5.249		2.45	
j)	7.452			10.78		5.55	
k)	3.96			43.94		3.72	
l)	0.726			4.072		8.703	
m)	0.051			3.274		8.15	
n)	6.148			0.082		4.378	
o)	7.642			3.501		5.647	

Answers to Exercise Five

a)	≈ 4.2	≈ 5.2	≈ 8.5	i)	≈ 7.4	≈ 5.2	≈ 2.5
b)	≈ 16.1	≈ 3.5	≈ 4.1	j)	≈ 7.5	≈ 10.8	≈ 5.6
c)	≈ 6.2	≈ 1.8	≈ 1.7	k)	≈ 4.0	≈ 43.9	≈ 3.7
d)	≈ 7.2	≈ 2.2	≈ 1.4	l)	≈ 0.7	≈ 4.1	≈ 8.7
e)	≈ 3.2	≈ 10.0	≈ 5.1	m)	≈ 0.1	≈ 3.3	≈ 8.2
f)	≈ 4.1	≈ 6.0	≈ 0.7	n)	≈ 6.1	≈ 0.1	≈ 4.4
g)	≈ 3.6	≈ 9.5	≈ 12.4	o)	≈ 7.6	≈ 3.5	≈ 5.6
h)	≈ 202.3	≈ 2.7	≈ 9.5				

Rounding Decimals to the Nearest Hundredth

Rounding decimals to the nearest hundredth is similar to rounding to the nearest tenth.



EXAMPLE

35.4524 35.4567

35.4524 35.4567

35.45 35.46

Example A: Round to the nearest hundredth.

47.9873 → 47.9873 ≈ 47.99

Example B: Round to the nearest hundredth. Watch this one!

23.99609 → 23.99609 ≈ 24.00

Keep these zeros because you have accurately rounded off to them.

These zeros are significant.

Exercise Six

Round to the nearest hundredth.

a) 128.409 ≈ 128.41 b) 0.909 _____

c) 98.024 _____ d) 3.001 _____

e) 10.6659 _____ f) 4.798 _____

g) 76.3333 _____ h) 0.229 _____

i) 100.999 _____ j) 0.756 _____

k) 0.098 _____ l) 4.796 _____

Answers to Exercise Six

a) ≈128.41 b) ≈0.91 c) ≈98.02 d) ≈3.00 e) ≈10.67 f) ≈4.80

g) ≈76.33 h) ≈0. 23 i) ≈101.00 j) ≈0.76 h) ≈0.10 l) ≈4.80

More Dollars and Cents

A cent is what fraction of a dollar? _____

Yes, a cent is $\frac{1}{100}$ th of a dollar.

You may be asked to round amounts of money to the nearest cent. What you are actually doing is rounding to the nearest hundredth of a dollar.

$3.28 6 ≈ $3.29 $14.92 3 ≈ $14.92

one cent = one hundredth of a dollar

Exercise Seven

Round to the nearest cent.

a) \$42.008 *≈\$42.01*

b) \$ 0.233 *≈\$ 0.23*

c) \$25.255 _____

d) \$10.141 _____

e) \$0.706 _____

f) \$100.999 _____

g) \$13.8234 _____

h) \$50.5029 _____

i) \$0.9834 _____

j) \$2.8977 _____

Answers to Exercise Seven

a) ≈\$42.01 b) ≈\$0.23 c) ≈\$25.26 d) ≈\$10.14 e) ≈\$0.71

f) ≈\$101.00 g) ≈\$13.82 h) ≈\$50.50 i) ≈\$0.98 j) ≈\$2.90

Rounding Decimals to the Nearest Thousandth

Which is the thousandths place? _____

Example A: Round to the nearest thousandth (1000^{th}).

2.0486

↓

2.04<u>8</u> 6 ≈ 2.049

Example B: Round to the nearest thousandth (1000^{th}).

29.4324

↓

29.43<u>2</u> 4 ≈ 29.432

Exercise Eight

Review: Round the following numbers as called for at the left of the chart.

a) Tenth	2.34 ***≈2.3***	3.75	1.028	2.749	0.072
b) Thousandth	0.1234 ***≈0.123***	1.8032	7.0052	2.80719	0.00049
c) Whole number	21.2 ***≈21***	2.7	12.05	6.49	0.8
d) Hundred	275	490	1 260	4 720	1 050
e) Hundredth	1.732	2.466	3.074	80.27	0.005
f) Ten	68	32	824	675	104
g) Thousandth	0.7286	0.5027	1.2345	0.0075	7.9999

⇨ Use rounded numbers to estimate answers in daily situations, in math problem solving, and to get an idea of the answer before you figure something out on a calculator. Numbers that are rounded off make calculations simpler.

Answers to Exercise Eight

a) Tenth	2.34 ***≈2.3***	3.75 *≈3.8*	1.028 *≈1.0*	2.749 *≈2.7*	0.072 *≈0.1*
b) Thousandth	0.1234 ***≈0.123***	1.8032 *≈1.803*	7.0052 *≈7.005*	2.80719 *≈2.807*	0.00049 *≈0.000*
c) Whole number	21.2 ***≈21***	2.7 *≈3*	12.05 *≈12*	6.49 *≈6*	0.8 *≈1*
d) Hundred	275 *≈300*	490 *≈500*	1 260 *≈1 300*	4 720 *≈4 700*	1 050 *≈1 100*
e) Hundredth	1.732 *≈1.73*	2.466 *≈2.47*	3.074 *≈3.07*	80.27 *80.27*	0.005 *≈0.01*
f) Ten	68 *≈70*	32 *≈30*	824 *≈820*	675 *≈680*	104 *≈100*
g) Thousandth	0.7286 *≈0.729*	0.5027 *≈0.503*	1.2345 *≈1.235*	0.0075 *≈0.008*	7.9999 *≈8.000*

Exercise Nine

Round the numbers to estimate the answer. Draw a box around the estimate that is the best answer.

a)	**Question** 47 × 52 ≈ ***Estimation*** *50 × 50 = 2 500*	240 **2 500** 250 2 600
b)	**Question** 3.2 × 4.875 ≈ ***Estimation*** *3 × 5 = 15*	6 8 **15** 17
c)	**Question** 4 149 ÷ 20 ≈	2 000 200 20 230
d)	**Question** 2 895 + 2895 ≈	600 6 000 4 000 5 000
e)	**Question** 118 + 289 ≈	300 350 400 5000
f)	**Question** 91 × 79 ≈	7200 800 8 000 720
g)	**Question** 347 ÷ 50 ≈	7 70 700 8
h)	**Question** 4 892 - 3 012 ≈	1 500 1 000 2 000 3 500
i)	**Question** 29.75 ÷ 3.02 ≈	6 8 10 20
j)	**Question** 12.82 + 9.04 ≈	21 23 22 20
k)	Mr. Jones drives an average of 285 km per week. **Estimate** how many kilometres he drives in one year (52 weeks).	He drives approximately _____ kilometres in one year.

Answers to Exercise Nine

a)	**Question** 47 × 52 ≈ ***Estimation*** *50 × 50 = 2 500*	240 [2 500] 250 2 600
b)	**Question** 3.2 × 4.875 ≈ ***Estimation*** *3 × 5 = 15*	6 8 [15] 17
c)	**Question** 4 149 ÷ 20 ≈ *Estimation 4 000 ÷ 20 =*	2 000 [200] 20 230
d)	**Question** 2 895 + 2895 ≈ *Estimation 3 000 + 3 000 =*	600 [6 000] 4 000 5 000
e)	**Question** 118 + 289 ≈ *Estimation 100 + 300 =*	300 350 [400] 5000
f)	**Question** 91 × 79 ≈ *Estimation 100 × 80 =*	720 800 [7 200] 8 000
g)	**Question** 347 ÷ 50 ≈ *Estimation 350 ÷ 50 =*	[7] 70 700 8
h)	**Question** 4 892 - 3 012 ≈ *Estimation 5 000 – 3 000 =*	1 500 1 000 [2 000] 3 500
i)	**Question** 29.75 ÷ 3.02 ≈ *Estimation 30 ÷ 3 =*	6 8 [10] 20
j)	**Question** 12.82 + 9.04 ≈ *Estimation 13 + 9 =*	21 23 [22] 20
k)	**Estimation:** 300 × 50 = 15 000	He drives approximately 15 000 kilometres in one year.

Topic D: Self-Test

Mark /17 Aim 14/17

A. Round to the nearest hundred. **3 marks**

a) 749 _____ b) 691 _____ c) 1 101 _____

B. Round to the nearest whole number. **3 marks**

a) 0.831 _____ b) 6.24 _____ c) 79.98 _____

C. Round to the nearest tenth. **3 marks**

a) 8.29 _____ b) 6.533 _____ c) 93.018 _____

D. Round to the nearest hundredth. **3 marks**

a) 34.792 _____ b) 6.459 _____ c) 8.899 _____

E. Round to the nearest thousandth. **3 marks**

a) 5.4392 _____ b) 0.8208 _____ c) 21.4925 _____

F. Estimate the answer. **2 marks**

Mary baby-sat for her twin nephews for 6.75 hours on Saturday. She is paid $8.40 an hour. Estimate her earnings by first rounding the numbers in the problem to whole numbers. Show how you worked out the estimate.

Answers to Topic H Self-Test

Part A

a) 700 b) 700 c) 1 100

Part B

a) 1 b) 6 c) 80

Part C

a) 8.3 b) 6.5 c) 93.0

Part D

a) 34.79 b) 6.46 c) 8.90

Part E

a) 5.439 b) 0.821 c) 21.493

Part F

Estimation – 7 hours $\times$ $8 = $56

Unit 1 Review

This section is for extra practice and review. If you are unsure about how to do something, look back at the lesson on that skill.

Reading and writing decimals:

1) Write as decimals:

a) $\frac{4}{10}$ = _____

b) $\frac{25}{100}$ = _____

c) $\frac{37}{100}$ = _____

d) $\frac{3}{100}$ = _____

e) $\frac{207}{10000}$ = _____

f) $3\frac{787}{1000}$ = _____

g) $4\frac{11}{100}$ = _____

h) $5\frac{12}{1000}$ = _____

i) $38\frac{12}{100}$ = _____

j) $78\frac{43}{10000}$ = _____

2) Write these decimals as common fractions:

a) 0.7 = _____

b) 0.06 = _____

c) 0.49 = _____

d) 0.02 = _____

e) 0.473 = _____

f) 3.078 = _____

g) 47.397 = _____

h) 2.173 = _____

i) 0.63 = _____

j) 6.07 = _____

3) Write as common fractions and as decimals:

a) Three tenths _____ _____

b) Fifty nine hundredths _____ _____

c) Three hundred and sixty one thousandths _____ _____

d) Fifty one thousandths _____ _____

e) Four hundred thirty one ten thousandths _____ _____

f) Seven and seven tenths _____ _____

g) Nine hundred seventy and eighty nine hundredths _____ _____

h) Nine and four hundred twelve thousandths _____ _____

i) Six hundredths _____ _____

4) Write the amount of money with numerals, using a $ sign:

a) Seven dollars and seventy eight cents _____

b) Eighty eight cents _____

c) Five hundred dollars and five cents _____

d) Seven dollars _____

e) Three hundred twenty four cents _____

f) Eight cents _____

g) Ninety nine dollars and ninety cents _____

h) Five thousand three hundred twenty two dollars _____

i) Eighty nine cents _____

5) Complete the chart. The first two are done for you as examples.

	Decimal	**Fraction**	**In words**
a)	0.0005	$\frac{5}{1000}$	Five thousandths
b)	0.07	$\frac{7}{100}$	Seven hundredths
c)		$\frac{86}{1000}$	
d)		$7\frac{11}{100}$	
e)			Fourteen and seven thousandths
f)	647.8		
g)		$103\frac{62}{1000}$	
h)	75.13		
i)			Forty two and three tenths
j)	0.789		
k)			Ten and five hundred sixty seven thousandths

Comparing decimals:

6) Cross out the zeros that are not needed:

a) 0.5060

b) 07.0307

c) 900.380

d) 05.200

e) 01000.03010

f) 700.030

g) 03.70

h) 6.03

7) Compare the decimals and then put the correct sign between the decimals (<, >, =):

a) 4.3_____43

b) 78.9_____7.89

c) 8.03_____8.031

d) 0.35_____0.350

e) 0.2_____0.289

f) 3.5_____3.05

g) 042.9003_____042.9

h) 17.34_____13.34

i) 4.01_____5.01

Rounding decimals:

8) Round the following decimals:

a) To the nearest tenth:

i. 3.84 _____

ii. 4.75 _____

iii. 89.034 _____

iv. 0.09 _____

v. 3.97 _____

b) To the nearest hundredth:

i. 2.754 _____

ii. 4.3856 _____

iii. 5.9754 _____

iv. 1.8032 _____

v. 37.439 _____

c) To the nearest thousandth:

i. 0.1376 _____

ii. 78.4788 _____

iii. 1.8044 _____

iv. 2.7499 _____

v. 0.00057 _____

d) To the nearest whole number:

i. 0.39 _____

ii. 78.78 _____

iii. 4.44 _____

iv. 80.745 _____

v. 901.399 _____

Answers to Review

1)

a) 0.4 b) 0.25 c) 0.37 d) 0.03 e) 0.0207 f) 3.787

g) 4.11 h) 5.012 i) 38.12 j) 78.0043

2)

a) $\frac{7}{10}$ b) $\frac{6}{100}$ c) $\frac{49}{100}$ d) $\frac{2}{100}$ e) $\frac{473}{1000}$ f) $3\frac{78}{1000}$

g) $47\frac{379}{1000}$ h) $2\frac{173}{1000}$ i) $\frac{63}{100}$ j) $6\frac{7}{100}$

3)

a) $\frac{3}{10}$ 0.3 b) $\frac{59}{100}$ 0.59 c) 300 $\frac{61}{1000}$ 300.061

d) $\frac{51}{1000}$ 0.051 e) $\frac{431}{10000}$ 0.0431 f) $7\frac{7}{10}$ 7.7

g) $970\frac{89}{100}$ 970.89 h) $9\frac{412}{1000}$ 9.412 i) $\frac{6}{100}$ 0.06

4)

a) \$7.78 b) \$0.88 c) \$500.05 d) \$7.00 e) \$3.24 f)\$0.08

g) \$99.90 h) \$5 322.00 i) \$0.89

5)

	Decimal	**Fraction**	**In words**
a)	0.0005	$\frac{5}{1000}$	Five thousandths
b)	0.07	$\frac{7}{100}$	Seven hundredths
c)	0.086	$\frac{86}{1000}$	Eighty six thousandths
d)	7.11	$7\frac{11}{100}$	Seven and eleven hundredths
e)	14.007	$14\frac{7}{1000}$	Fourteen and seven thousandths
f)	647.8	$647\frac{8}{10}$	Six hundred forty seven and eight tenths
g)	103.062	$103\frac{62}{1000}$	One hundred three and sixty two thousandths
h)	75.13	$73\frac{13}{100}$	Seventy five and thirteen Hundredths
i)	42.3	$42\frac{3}{10}$	Forty two and three tenths
j)	0.789	$\frac{789}{1000}$	Seven hundred eighty nine thousandths
k)	10.567	$10\frac{567}{1000}$	Ten and five hundred sixty seven thousandths

6)

a) 0.506$\cancel{0}$ b) $\cancel{0}$7.0307 c) 900.38$\cancel{0}$ d) $\cancel{0}$5.2$\cancel{00}$ e) $\cancel{0}$1000.03010$\cancel{0}$ f) 700.03$\cancel{0}$

g) $\cancel{0}$3.7$\cancel{0}$ h) 6.03

7)

a) < b) > c) < d) = e) < f) >

g) > h) > i) <

8)

a) i 3.8	ii 4.8	iii 89.0	iv 0.1	v 4.0
b) i 2.75	ii 4.39	iii 5.98	iv 1.80	v 37.44
c) i 0.138	ii 78.479	iii 1.804	iv 2.750	v 0.001
d) i 0	ii 79	iii 4	iv 81	v 901

Test time!

Please see your instructor to get
your practice test.

When you are confident, you can
write your unit 1 test.

Congratulations!