

Module 3

Representing and Renaming Whole Numbers

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REPRESENTING AND RENAMING WHOLE NUMBERS

Relevant Expectations for Grade 6

- represent ... whole numbers ... to 1 000 000, using a variety of tools (e.g., number lines with appropriate increments, ...)
- demonstrate an understanding of place value in whole numbers ... to 1 000 000, using a variety of tools and strategies
- read and print in words whole numbers to one hundred thousand, using meaningful contexts (e.g., the Internet, reference books)

Possible reasons why a student might struggle in representing and renaming whole numbers

Many students struggle in interpreting and representing large numbers, sometimes only with numbers greater than 10 000 and sometimes even with numbers between 1000 and 10 000. Some of the problems include:

- not recognizing or being able to use the periodic nature of the place value system to read or interpret larger numbers (e.g., not realizing that 32 415 is 32 thousand and 415)
- confusion about the place value column names
- not realizing that the same digit in a different place represents a much greater amount if it is to the left in a number or a lesser amount if it is to the right
- difficulty in skip counting by hundreds, thousands, or ten thousands
- difficulty interpreting numbers with many internal zeroes (e.g., 30 002 is more of a problem than 32 145)
- writing a number as they hear it (e.g., three thousand forty as 3040)
- an inability to recognize that a number can be written with any place value unit, e.g., 3420 is 3420 ones or 342 tens
- difficulty recognizing which larger numbers are realistic descriptions for common real-life situations

Additional considerations

It is important that students learn to separate the thousands period from the ones period when writing numbers. When the number is a 4-digit number, that separation is optional. For example, we could write 4212 or 4 212.

DIAGNOSTIC

Administer the diagnostic

Provide place value charts and counters for students to use. If they appear to be dependent on the chart to respond to Questions 2 to 6, they might benefit from the package of materials for students struggling with these questions.

If students need help in understanding the directions of the diagnostic, clarify an item's intent.

Using the diagnostic results to personalize intervention

Intervention materials are included on each of these topics:

- Representing Numbers to 100 000
- Representing Numbers to 10 000
- Renaming Numbers to 100 000
- Renaming Numbers to 10 000
- Whole Numbers Multiplied and Divided by 10, 100, 1000

You may use all or only part of these sets of materials, based on student performance with the diagnostic.

| Evaluating Diagnostic Results | Suggested Intervention Materials |
|--|---|
| If students struggle with Questions 1c–f, 2b, 3a, b, e, 4c, 6b, c, 8a, b. | Use Representing Numbers to 100 000 |
| If students struggle with Questions 1a, b, 2a, 3c, d, 4a, b, 5, 6a, d, 8c, d | Use Representing Numbers to 10 000 |
| If students struggle with Questions 7d–g | Use Renaming Numbers to 100 000 |
| If students struggle with Questions 7a–c | Use Renaming Numbers to 10 000 |
| If students struggle with Question 9 | Use Whole Numbers Multiplied and Divided by 10, 100, 1000 |

Begin with the earliest lessons required. Be aware that success with an early lesson may lessen the need for a later lesson that seemed to be a problem at the time the diagnostic was initially used.

Materials

- Place Value Chart (1) (2) templates
- counters

Diagnostic

1. Continue to skip count for three more numbers.

- 800, 900, 1000, ...
- 6700, 8800, 8900, ...
- 1700, 1800, ...
- 38 000, 37 000, ...
- 27 000, 28 000, ...
- 32 100, 42 100, 52 100, ...

2. What does the 5 in each number mean? What does the 4 in each number mean?

- 5040
- 40 540

3. Find two descriptions that match each number in the table below. Write the two letters for the matching descriptions underneath the number.

| | | | | |
|---------|---------|-----------|-----------|-----------|
| a) 3300 | b) 3030 | c) 30 300 | d) 30 000 | e) 33 000 |
|---------|---------|-----------|-----------|-----------|

| | |
|---|--|
| A 3 ten thousands + 3 tens | F Three thousand three hundred |
| B 3 thousands + 3 tens | G Three thousand thirty |
| C 2 ten thousands + 3 hundreds + 3 tens | H thirty thousand thirty |
| D 2 ten thousands + 3 hundreds + 3 tens | I thirty thousand three hundred thirty |
| E 3 thousands + 3 hundreds | J thirty three thousand thirty |

Diagnostic

4. The standard form for a number is the way we usually write numbers. For example, the standard form for one hundred two is 102. Write each number in standard form.

- four hundred fifteen
- seven thousand four hundred
- twenty thousand thirty

5. Are the two 5s in the number 5550 worth the same value or not? Explain.

6. Write two different numbers to match each description.

- 3 in the thousands place and 2 in the hundreds place
- 5 in the thousands place and 2 in the tens place
- 2 in the ten thousands place, 1 in the tens place
- 3 in the ten thousands place, 4 in the thousands place

Diagnostic

7.

- How many C containers could you fill with 220 items?
- How many C containers could you fill with 4200 items?
- How many B containers could you fill with 4200 items?
- How many D containers could you fill with 51 000 items?
- How many C containers could you fill with 51 000 items?
- How many B containers could you fill with 32 400 items?
- How many B containers could you fill with 32 400 items?

8. Match each number to what it most likely describes.

| | |
|-----------|---|
| a) 44 240 | The number of days a grade 4 student has lived |
| b) 14 200 | The number of people in a small city (not a town) |
| c) 850 | The number of students in a school |
| d) 4220 | The number of people at a professional hockey arena |

Diagnostic

9. Calculate:

- $100 + 43 =$
- $1000 + 30 =$
- $10 + 420 =$
- $4200 + 100 =$
- $20\ 030 + 10 =$
- $2540 + 10 =$

Solutions

- 1100, 1200, 1300
 - 9000, 9100, 9200
 - 9900, 10 000, 10 100
 - 40 000, 41 000, 42 000
 - 29 000, 30 000, 31 000
 - 62 100, 72 100, 82 100
- 5 thousand (or 5000), 4 tens (or 40)
 - 4 ten thousands (or 40 000), 5 hundreds (or 500)
- Matches:
 - C; I
 - A; H
 - E; F
 - B; G
 - D; J
- 413
 - 7400
 - 20 030
- no, The first 5 is worth 5 thousand but the second one is only worth 50.
- e.g., 3200 and 3201
 - e.g., 34 100 and 34 001
 - e.g., 21 111 and 20 010
 - e.g., 5020 and 5120
- 32
 - 42
 - 420
 - 51
 - 510
 - 324
 - 3240
- the number of people in a small city
 - the number of people at a professional hockey arena
 - the number of students in a school
 - the number of days a grade 6 student has lived
- 4200
 - 30 000
 - 4200
 - 42
 - 3003
 - 254

Place Value Chart (1)

| Thousands | | Hundreds | | Tens | | Ones | |
|-----------|--|----------|--|------|--|------|--|
| | | | | | | | |
| | | | | | | | |
| | | | | | | | |

Place Value Chart (2)

| Thousands | | Hundreds | | Tens | | Ones | |
|-----------|--|----------|--|------|--|------|--|
| | | | | | | | |
| | | | | | | | |
| | | | | | | | |

USING INTERVENTION MATERIALS

The purpose of the suggested student work is to help them build a foundation for working with larger numbers to continue later into hundred thousands, millions, and billions.

Each set of intervention materials includes a single-task Open Question approach and a multiple-question Think Sheet approach. These approaches both address the same learning goals, and represent different ways of engaging and interacting with learners. You could assign just one of these approaches, or sequence the Open Question approach before, or after the Think Sheet approach.

Suggestions are provided for how best to facilitate learning before, during, and after using your choice of approaches. This three-part structure consists of:

- Questions to ask before using the approach
- Using the approach
- Consolidating and reflecting on the approach

Representing Numbers to 10 000

Open Question

Materials

- Place Value Chart (2) template
- counters
- base ten blocks

Questions to Ask Before Using the Open Question

Ask students to model 99 with the base ten blocks. Then place one more block beside it.

- ◇ How would you write the number for what you see now? (100)
- ◇ What blocks would you use to show it? (a hundreds block)
- ◇ Why did you need a new size block? (since there were more than 10 tens)

Repeat the activity beginning with 999 and one extra block.

Make sure students understand that the thousands cube represents the number written as 1000.

- ◇ How would you show two thousand? (two thousands cubes)
- ◇ How would you show two thousand twenty? (two thousands cubes and two tens blocks)

Using the Open Question

Provide base ten blocks, Place Value Chart (2), and counters for students to use.

Suggest a way for students to sketch a base ten block model. Perhaps they can use a square with the number 1000 in it to represent a thousands block, a somewhat smaller square with the number 100 in it to represent a hundreds block, a thin rectangle to represent 10 and a small square to represent 1.

Make sure students understand:

- how 2013 can be represented by 6 blocks
- that each number they represent uses 5 blocks, in total, but that the blocks include a thousands block but only three sizes altogether

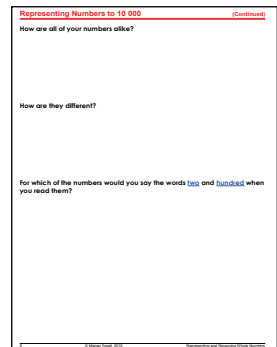
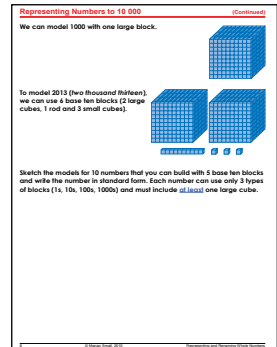
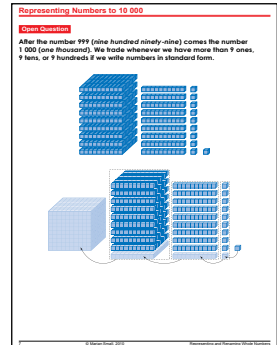
By viewing or listening to student responses, note if they:

- can translate between models and symbolic representations of numbers in the thousands
- notice that if 5 blocks are used, the digits of the number are fairly small
- realize that there cannot be a 0 digit in the hundreds column if the word hundred is said when the number is read
- realize that the number 2 cannot be in the tens position if the words used to read the number include two but not twenty

Depending on student responses, use your professional judgement to guide specific follow-up.

Consolidating and Reflecting on the Open Question

- ◇ How do you know that 5001 could not have been one of your numbers? (It would use 6 blocks, not 5.)
- ◇ How do you know that your number has to have a 0 digit in it? (You couldn't use one of the kinds of blocks so there would be 0 of that type.)
- ◇ How do you know that there could never be more than 3 of any kind of block? (because you have to have 3 kinds of blocks, so you would have to add 3 numbers to get to 5. None of the numbers could be 4 or you would only be able to add two numbers.)
- ◇ How do you know that all of your numbers have 4 digits? (because you have to use a thousand)
- ◇ How do you know that you could say a number where the 2 is not in the hundreds place even if you know you have to say two and hundred when you read it? (Maybe the 2 is in the thousands place and there is a 1 in the hundreds place.)



| One | Ten | Hundred | Thousand | One | Ten | Hundred | Thousand |
|-----|-----|---------|----------|-----|-----|---------|----------|
| | | | | | | | |

Solutions

1310
1130
1031
1013
1301
1103
1220
1022
1202
2210
2201
2120
2102
2210
2120
3110
3011
3101

Numbers are alike: e.g., All of the blocks have four digits and only one 0 digit. The greatest number of large blocks is 3 and the least number is 1. The digits are all 1, 2, or 3. There is always at least one digit repeated.

Numbers are different: e.g., Some of the numbers are in the 3000s, some in the 2000s and some in the 1000s. Some of the numbers are even and some are odd.

1220, 1202, 2210, 2201, 2120, 2102, 2210, 2120

Materials

- Place Value Chart (2) template
- counters
- base ten blocks

Questions to Ask Before Using the Think Sheet

Have students join in as you count by 100s up to 1100: 700, 800, 900, ...

See if students are comfortable saying 10 hundred, or 1 thousand, after 900 and if they realize that 11 hundred (or 1 thousand 1 hundred) would come after 1 thousand or 10 hundreds. If not, help them understand how the count continues.

Say the number *four hundred two*. Ask students to write the number as they usually would.

- ◇ Why did you put a 0 in the tens spot? (There are no tens, only hundreds and ones.)
- ◇ How did you know that your number needed 3 places? (because there are hundreds)
- ◇ How are the numbers for four hundred two and four hundred twenty alike? different? (They both have a 4, 0, and 2, but they are in different places.)

Using the Think Sheet

Read through the introductory box with the students.

Make sure they:

- understand why the thousands column (another name for 10 hundreds) is to the left of the hundreds column.
- realize they can use the counters on Place Value Chart (2) to help them represent numbers

Assign the tasks.

By viewing or listening to student responses, note if they:

- can transfer between symbolic and written forms of numbers
- can skip count by hundreds
- recognize that a digit in a column to the left is worth more than the same digit in a column to the right
- have a sense of when numbers in the thousands might actually be used

Depending on student responses, use your professional judgement to guide further follow-up.

Consolidating and Reflecting: Questions to Ask After Using the Think Sheet

- ◇ How can you tell whether a number will have four digits? (if there are thousands)
- ◇ Why might you read a 4-digit number and not say the word hundred? (if there is a 0 in the hundreds column)
- ◇ Why is the 9 in 4900 worth less than the 4? (There are only 9 hundreds, compared to 4 thousands.)
- ◇ If one number is 2000 more than another, which digits would look different? Which wouldn't? (The thousands digit would be 2 extra, but all the other digits would be the same.)
- ◇ How did you think of a situation to use a number more than 1000? (e.g., I figured out that if seven pages of writing is about 2000 words, then 14 pages of writing is about 4000 words.)

Representing Numbers to 10 000 (Continued)

Think Sheet

To describe the number of students in a large school, we often use numbers in the thousands. For example, the number of students in a large high school might be 1200 (one thousand two hundred).

If we started at 100 and counted by 100s, 1200 is the 12th number: 100, 200, 300, 400, 500, 600, 700, 800, 900, 1000, 1100, 1200.

We can use base ten blocks and a place value chart to help us when we read or write a number. Each time we have 10 ones, tens, or hundreds, we can trade for 1 of the next highest value.

If we have 1 more than 999, we have 1000 since we can trade the ones, tens, and hundreds.

Representing Numbers to 10 000 (Continued)

We can use blocks to model numbers.

We say three thousand forty. We write 3040 (standard form). We can also use counters or digits in a place value chart to represent the numbers.

| Thousands | Hundreds | Tens | Ones |
|-----------|----------|------|------|
| 3 | 0 | 4 | 0 |

We use a 0 in our number to show that there is no value in a column. If we didn't use a 0, we would not know that the 3 in 3040 was worth 3 thousands.

There are other ways to describe three thousand forty, including:

- 3 thousands + 40 ones
- 3000 + 40
- 3 thousands + 4 tens

Representing Numbers to 10 000 (Continued)

1. Model each number with base ten blocks. Show each number on a place value chart. Draw in the dots for counters or use digits. Then write the number in standard form.

- 3 thousands + 2 hundreds

| Thousands | Hundreds | Tens | Ones |
|-----------|----------|------|------|
| 3 | 2 | | |
- 7 thousands + 4 hundreds + 1 ten

| Thousands | Hundreds | Tens | Ones |
|-----------|----------|------|------|
| 7 | 4 | 1 | |
- 2 thousands + 320

| Thousands | Hundreds | Tens | Ones |
|-----------|----------|------|------|
| 2 | 3 | 2 | 0 |
- 1000 + 300 + 20 + 4

| Thousands | Hundreds | Tens | Ones |
|-----------|----------|------|------|
| 1 | 3 | 2 | 4 |
- 4 thousands + 30 ones

| Thousands | Hundreds | Tens | Ones |
|-----------|----------|------|------|
| 4 | | 3 | 0 |
- six thousand twenty-one

| Thousands | Hundreds | Tens | Ones |
|-----------|----------|------|------|
| 6 | 2 | 0 | 1 |

Representing Numbers to 10 000 (Continued)

2. What words would you say to read each number?

- 1515
- 3104
- 3140
- 5005

3. Continue to skip count by 100 two more times.

- 3721, 3821, 3921, _____
- 8700, 8800, 8900, _____
- 2831, 2731, 2631, _____

4. The digit 5 appears two times in the number 5053.

- How much does each 5 represent?
- Which 5 has the greater value?

Solutions

1. a) 3200

| Thousands | Hundreds | Tens | Ones |
|-----------|----------|------|------|
| ●●● | ●● | | |

b) 7410

| Thousands | Hundreds | Tens | Ones |
|-----------|----------|------|------|
| ●●●●● | ●●●● | ● | |

c) 2320

| Thousands | Hundreds | Tens | Ones |
|-----------|----------|------|------|
| ●● | ●●● | ●● | |

d) 9324

| Thousands | Hundreds | Tens | Ones |
|-----------|----------|------|------|
| ●●●●● | ●●● | ●● | ●●●● |

e) 4030

| Thousands | Hundreds | Tens | Ones |
|-----------|----------|------|------|
| ●●●● | | ●●● | |

f) 6021

| Thousands | Hundreds | Tens | Ones |
|-----------|----------|------|------|
| ●●●●● | | ●● | ● |

g) 5203

| Thousands | Hundreds | Tens | Ones |
|-----------|----------|------|------|
| ●●●●● | ●● | | ●●● |

Representing Numbers to 10,000 (Continued)

5. Write a number in standard form to fit the rule. Write that number of least one other way.

- a number between 4200 and 4300
- a number between 6790 and 6800
- a number that is just a little more than 4199
- a number that is about 2000 more than 1317
- a number that is almost 600 more than 2832
- a number that is about 500 less than 4302

6. Read the facts.

The population of Elora, ON is about 5000.
There were about 5500 athletes at the Vancouver Olympics.
There are about 2000 words on 7 typed pages.
An 8000 m high mountain is really high. There are only about 15 of them in the world, all in Asia.
Think of something that might be described by a number that is between 1000 and 9000? How do you know?

Place Value Chart (2)

| | | | |
|-----------|--|-----------|--|
| Ones | | Ones | |
| Tens | | Tens | |
| Hundreds | | Hundreds | |
| Thousands | | Thousands | |

-
2. a) one thousand five hundred fifteen
b) three thousand one hundred four
c) three thousand one hundred forty
d) five thousand three
3. a) 4021, 4121
b) 9000, 9100
c) 2931, 3031
4. a) 5 thousand (5000) or 5 tens (50)
b) the first one at the left
5. a) e.g., 4220, $4000 + 200 + 20$
b) e.g., 6792, 6 thousands + 7 hundreds + 92 ones
c) e.g., 4200, 4 thousands + 2 hundreds
d) e.g., 3300, e.g., 3 thousands + 300 ones
e) 3430, e.g., $3000 + 400 + 30$
f) 3800, e.g., 3 thousands + 8 hundreds
6. e.g., There are about 4000 words on 14 typed pages.

Renaming Numbers to 10 000

Materials

- Place Value Chart (2) template
- counters

Open Question

Questions to Ask Before Using the Open Question

On Place Value Chart (2), place 2 counters in the thousands column.

◇ *Why can you trade these two counters for 20 counters in the hundreds column? (because 1000 is actually 10 hundreds, so 2000 is 20 hundreds)*

Have students do the trade. Discuss how this shows that another name for 2000 is 20 hundreds.

◇ *Suppose you traded all the hundreds counters for tens. How many counters would there be in the tens column? (200 tens)*

◇ *How do you know? (Each hundred is worth 10 tens so there would be 200 tens.)*

Point out that the student has now represented 2000 as 20 hundreds and 200 tens, but it is still the same amount.

Using the Open Question

Provide Place Value Chart (2) and counters for students to represent how many of each place value amount they are using.

Make sure that they understand that if, for example, they use a 100 penny box, they could place 1 counter in the hundreds column.

By viewing or listening to student responses, note if they recognize that the same number that can be represented as thousands can be represented as hundreds or tens.

Depending on student responses, use your professional judgement to guide specific follow-up.

Consolidating and Reflecting on the Open Question

◇ *Why do all of your values end in 0? (because the smallest box is a 10 penny box)*


◇ *Are there more ways to box up 3000 or 4000 pennies? (There are more ways to show 4000 since you could take all of the ways that you showed 3000 and just stick another 1000 penny box with them or you could take all of those ways and stick ten 100 penny boxes with them. That is already more ways.)*

◇ *How can you predict how many hundred penny boxes you could use if you know how many thousand penny boxes? (It is 10 times as many.)*

Renaming Numbers to 10 000

Open Question

A school is trying to collect 1 million pennies. They are organizing the coins into small boxes. The boxes hold either 10, 100, or 1000 pennies.



Choose 4 different numbers of pennies that could be in the boxes.

Rules:

- You can only have two sizes of boxes each time.
- You must completely fill a box you use.
- You must use at least 10 of one kind of box each time.
- Write down each of the 4 numbers of pennies in standard form and tell how many of what size boxes might hold that many pennies.

Make sure every number is more than 1000 but less than 9999.

Record how many of each size of box might be used.

| Number | Box Type 1 | How many (more than 10) | Box Type 2 | How many |
|--------|------------|-------------------------|------------|----------|
| 1) | | | | |
| 2) | | | | |
| 3) | | | | |
| 4) | | | | |
| 5) | | | | |
| 6) | | | | |

Place Value Chart (2)

| Thousands | Hundreds | Tens | Ones |
|-----------|----------|------|------|
| | | | |

| Thousands | Hundreds | Tens | Ones |
|-----------|----------|------|------|
| | | | |

Solutions

- e.g., 6200 = three 1000 penny boxes and thirty-two 100 penny boxes or four 1000 penny boxes and twenty-two 100 penny boxes
- 8200 = three 1000 penny boxes and fifty-two 100 penny boxes or eight 1000 penny boxes and twenty 100 penny boxes
- 4480 = four 1000 penny boxes and forty-eight 10 penny boxes or four 1000 penny boxes and three 100 penny boxes and eighteen 10 penny boxes
- 7790 = seven 1000 penny boxes and seventy-nine 10 penny boxes or seven 1000 penny boxes and seven 100 penny boxes and nine 10 penny boxes
- 5280 = fifty 100 penny boxes and twenty-eight 10 penny boxes or five 1000 penny boxes and twenty-eight 10 penny boxes
- 7220 = seventy 100 penny boxes and twenty-two 10 penny boxes or seven hundred twenty-two 10 penny boxes

I picked different numbers all that had 0s in the ones place. For each one, I used the biggest boxes possible first. Then I traded big boxes for equivalent little boxes.

Think Sheet

Questions to Ask Before Using the Think Sheet

- ◇ Suppose you didn't have any 1000 cubes but you did have hundred blocks and 10 blocks. How could you show 1000? (I could use 10 hundreds.)
- ◇ How many tens would the thousand be worth? (100 tens)
- ◇ How do you know? (Each hundred is worth 10 tens so if there are 10 of them, that would be 100 tens.)
- ◇ Why does it make sense that the number of tens is bigger than the number of hundreds or thousands? (because 10 is smaller than 100 or 1000, so it takes more of them to make a number)

Using the Think Sheet

Read through the introductory box with the students. Make sure they understand how the trading is being done – both trading down and trading up.

Assign the tasks.

By viewing or listening to student responses, note if they can:

- rename numbers with different units, e.g., thousands as hundreds or tens, and hundreds as tens
- predict how the values will change when the units change
- recognize that you can always rename to smaller units using whole numbers but not necessarily to larger units using whole numbers

Depending on student responses, use your professional judgement to guide further follow-up.

Consolidating and Reflecting: Questions to Ask After Using the Think Sheet

- ◇ Why can you think of 18 hundreds as if there were 18 chips in the hundreds place? (because the number in the hundreds place tells how many hundreds)
- ◇ How do you know that 18 hundreds will be more than 1000? (1000 is only 10 hundreds)
- ◇ How do you know it will be less than 2000? (2000 is 20 hundreds and that's more than 18)
- ◇ How do you know that 320 tens are more than 1000? (It takes 10 tens to make 100, so it takes 100 tens to make 1000. 320 tens are more than 100 tens.)
- ◇ Why can you think of 3010 as either 301 tens or 3010 ones? (It is automatically that many ones. 3 thousand is 30 hundreds and that's 300 tens and there is one more ten as well, so it is 301 tens.)
- ◇ You know that a number is 24 hundreds. How do you know how many tens it is? (It is 240 tens since each hundred is 10 tens.)
- ◇ Why is it easier to write 4000 as a certain number of tens than to write 4001 as a certain number of tens? (because 4000 is 400 tens but 4001 isn't enough for an extra ten.) [Note: 4001 can be written as 400.1 tens, but students at this level will not likely consider this option.]

Solutions

1. a) 1800 b) 3200 c) 1500 d) 4000
2. e.g.,
 - a) 3, 0, 1, 0 b) 0, 30, 1, 0 c) 0, 0, 301, 0 d) 2, 10, 0, 10
3. a) 15, 150 b) 221 c) 14, 35 d) 80, 2, 802
4. a) 4, 2 b) 4, 3 c) 4, 1
5. a) Agree: If you can write it as, for example, 35 hundreds, you just multiply by 10, and it is 350 tens.
 b) Disagree: For example, 3100 is 31 hundreds but it is more than 3 thousands, but less than 4 thousands.
 Note: A student might realize that it is 3.1 hundreds and agree.

Materials

- Place Value Chart (2) template
- counters
- base ten blocks

Renaming Numbers to 10 000 (Continued)

Think Sheet

To show the number 3240, we can use 3 thousands + 2 hundreds + 4 tens. Each 1000 is 10 hundreds, so 3 thousands = 30 hundreds.

| | | | |
|-----------|----------|------|------|
| Thousands | Hundreds | Tens | Ones |
| 3 | 2 | 4 | 0 |

That means 3240 is also 32 hundreds + 4 tens. And each 100 is 10 tens, so 32 hundreds is 320 tens.

| | | | |
|-----------|----------|------|------|
| Thousands | Hundreds | Tens | Ones |
| 3 | 2 | 4 | 0 |

That means 3240 is also 324 tens. To check, we can work backwards.

If we have 324 chips in the tens place, we can trade them 10 at a time, for 32 chips in the hundreds place. There are 4 chips left in the tens place.

| | | | |
|-----------|----------|------|------|
| Thousands | Hundreds | Tens | Ones |
| 3 | 2 | 4 | 0 |

We can trade the hundreds chips, 10 at a time, for 3 thousand chips. That leaves 2 chips in the hundreds place. The number is 3240.

Renaming Numbers to 10 000 (Continued)

Using the idea of trading, we can see that, for example, 1520 is:

1520 = 1 thousand + 5 hundreds + 2 tens, or
 1520 = 15 hundreds + 2 tens, or
 1520 = 152 tens, or
 1520 = 1 thousand + 52 tens.

Renaming Numbers to 10 000 (Continued)

1. Write each number in standard form.

a)

| | | | |
|-----------|----------|------|------|
| Thousands | Hundreds | Tens | Ones |
| 1 | 8 | 0 | 0 |

b)

| | | | |
|-----------|----------|------|------|
| Thousands | Hundreds | Tens | Ones |
| 3 | 2 | 4 | 0 |

c)

| | | | |
|-----------|----------|------|------|
| Thousands | Hundreds | Tens | Ones |
| 0 | 0 | 3 | 0 |

d)

| | | | |
|-----------|----------|------|------|
| Thousands | Hundreds | Tens | Ones |
| 3 | 2 | 4 | 0 |

2. Your school has collected 2010 bread tags. They are in boxes that hold either 10, 100, or 1000 tags. The boxes are all full. There could be some loose tags, too. Use a combination of box size you might use to fit these tags.

| | | | |
|-------------|------------|-----------|---|
| Box of 1000 | Box of 100 | Box of 10 | 1 |
| a) | | | |
| b) | | | |
| c) | | | |
| d) | | | |

Renaming Numbers to 10 000 (Continued)

3. Complete to make these true:

a) 1500 = ___ hundreds OR ___ tens
 b) 2010 = ___ tens
 c) 1435 = ___ hundreds + ___ ones
 d) 8020 = ___ hundreds + ___ tens OR ___ tens

4. Think about how to write each number in standard form. Tell how many digits each number has and how many 0s would be at the right end of the number. The numbers in the are odd.

| | Number of digits | Number of 0s at the right end of the number |
|---|------------------|---|
| a) <input type="checkbox"/> 4 hundreds e.g. 44 hundreds | | |
| b) <input type="checkbox"/> 10 thousands e.g. 10 thousands | | |
| c) <input type="checkbox"/> 32 tens e.g. 932 tens | | |

5. Explain why you agree or disagree.

a) Any number that you can write as a certain number of hundreds, you can also write as a certain number of tens.

b) Any number that you can write as a certain number of hundreds, you can also write as a certain number of thousands.

Representing Numbers to 100 000

Open Question

Materials

- Place Value Chart (1) template
- counters

Questions to Ask Before Using the Open Question

Model the number 9999 on Place Value Chart (1) using 9 counters in each of the ones, tens, hundreds, and thousands place. Bring one extra one to the chart, putting it in the ones column.

- ◇ *Why shouldn't I just leave all the ones in the chart in the ones column?* (e.g., There are ten ones, so you have to trade for 1 ten.)
- ◇ *What happens next?* (e.g., You can trade the 10 tens for 1 hundred, then the 10 hundreds for 1 thousand and then the 10 thousands for 1 ten thousand)
- ◇ *What do you notice about the headings on the 2nd column from the right and the 5th column?* (They both have the word "ten" in the title.)
- ◇ *Suppose you are reading a number with a 2 in the tens column but nowhere else in the number. Would you say the word "2" when you read the number?* (No, you would say twenty.)

Using the Open Question

Provide Place Value Chart (1) and counters in case students want them.

Let students know that the five listed words must be included when they read their numbers, but that other words could also be included.

By viewing or listening to student responses, note if they realize that:

- the number must have 5 digits since there are two words that end in "...ty" and one of the words is thousand
- the digits 4 and 2 must be in the tens or ten thousands places
- the digits 5 and 2 must be in the ones, hundreds, or thousands place
- a number is actually the sum of numbers based on the position of digits in the place value chart
- a number with a 0 as a digit can be expressed as the sum of numbers that do not refer to that place value column

Depending on student responses, use your professional judgement to guide specific follow-up.

Consolidating and Reflecting on the Open Question

Observe the numbers students form.

- ◇ *How did you know that there was a 4?* (e.g., because it says forty and forty is 4 tens)
- ◇ *How did you know that the 4 didn't go in the hundreds place?* (If 4 is in the hundreds place you say four, not forty.)
- ◇ *How did you know that the five didn't go in the tens column?* (because it says five and not fifty)
- ◇ *How did you know that the number had at least 4 digits?* (because the word thousand had to be used)
- ◇ *How did you know that the number had 5 digits?* (because there were the words twenty and forty. That means I had to use a tens column each time. Once I used the tens column for one digit, I had to use the ten thousands column for the other number.)

Representing Numbers to 100 000

Open Question

After the number 9999 (nine thousand nine hundred ninety-nine) comes the number 10 000. We include whatever we have more than 9 ones, 9 tens, 9 hundreds, or 9 thousands to describe a number in standard form.

| Ten Thousands | Thousands | Hundreds | Tens | Ones |
|---------------|-----------|----------|------|------|
| 0 | 0 | 0 | 0 | 0 |

After that comes 10 001 (ten thousand one), 10 002 (ten thousand two), and so on.

Write as many numbers as you can that use the words below when you say them. The words do not have to be in this order and you can say other words too.

thousand, forty, twenty, five, two

How are all of your numbers alike?

How are they different?

Which of your numbers could you write as additions of numbers in the form:
 ... ten thousands + ... thousands + ... tens + ... ones
 Explain how.

Place Value Chart (1)

| Thousands | Hundreds | | Tens | | Ones | |
|-----------|-----------|----------|------|------|-----------|----------|
| | Thousands | Hundreds | Tens | Ones | Thousands | Hundreds |
| | | | | | | |

Solutions

Possible values using just those words are:

42 025
45 022
25 042
22 045

If other words are added, any numbers of these forms are possible:

42 ■25
42 52■
45 ■22
45 22■
22 ■45
22 54■
25 ■42
25 24■

If students know about numbers in the millions, they might include other numbers, e.g., 25 040 302.

e.g., Numbers are all alike: they use at least 5 digits (since 4 and 2 have to be in the ten thousands and tens place somewhere) and the 5 and 2 have to be in hundreds and ones or one thousand columns somewhere

Using the words given: 42 025, 45 022, 25 042, 22 045

42 025 as 4 ten thousands + 2 thousands + 2 tens + 5 ones

45 022 as 4 ten thousands + 5 thousands + 2 tens + 2 ones

25 042 as 2 ten thousands + 5 thousands + 4 tens + 2 ones

22 045 as 2 ten thousands + 2 thousands + 4 tens + 5 ones

They all have 0 in the hundreds place.

Note: Some students might include numbers like 42 325 writing them as 4 ten thousands + 5 thousands + 32 tens + 5 ones.

Materials

- Place Value Chart (1) template
- counters

Questions to Ask Before Using the Think Sheet

Have students join in as you count by 1000s up to 11 000: 2000, 3000, 4000, ...

See if they are comfortable saying 10 thousand after 9 thousand and if they realize that 11 thousand would come after 10 thousand. If not, help them understand how to continue.

- ◇ *Say the number four thousand two hundred.* Ask students to write the number as they usually would. *Why did you put zeroes in those two spots? (There are no tens or ones, only hundreds and thousands.)*
- ◇ *How did you know that your number needed 4 places? (because there are thousands)*
- ◇ *How are the numbers for four thousand two, four thousand twenty and four thousand two hundred different? (They all have two zeroes, but they are in different places.)*
- ◇ *Why might you need more than 4 digits to write a number? (If you had more than 9999)*

Using the Think Sheet

Read through the introductory box with the students. Make sure they understand that a period is a group of three columns, one that is 100 of a unit, one that is 10 of the same unit and one that is 1 of that same unit. If they ask why there is no hundred thousands column, point out that we are simply not using the hundred thousands column yet.

Make sure students realize they can use the counters on Place Value Chart (1) to help them represent numbers.

Assign the tasks.

By viewing or listening to student responses, note if they:

- can transfer between symbolic and written forms of numbers
- can skip count by thousands
- recognize that a digit in a column to the left is worth more than the same digit in a column to the right
- have a sense of when numbers in the ten thousands might actually be used

Depending on student responses, use your professional judgement to guide further follow-up.

Consolidating and Reflecting: Questions to Ask After Using the Think Sheet

- ◇ *How can you tell whether a number will have five digits? (if there are at least ten thousands)*
- ◇ *Why might you read a 5-digit number and never say the word "hundred"? (if there is a 0 in the hundreds column)*
- ◇ *Why is the 9 in 42 900 worth less than the 4? (It is only 9 hundreds, compared to 40 thousands.)*
- ◇ *If one number is 20 000 more than another, which digits would look different? Which wouldn't? (The tens thousand digit would be 2 extra, but all the other digits would be the same unless you had to trade up.)*
- ◇ *How did you think of a situation to use a number more than 10 000? (e.g., I have been in Cornwall and Brantford and know how big they are. I think that Cornwall is about the same size as Brantford so I think that population would be the right size.)*

Representing Numbers to 100 000 (Continued)

Think Sheet

Sometimes we need to use large numbers. For example, the number of people in Belleville, Ontario is about 50 thousand (50 thousand).

Because our number system is very practical, we can figure out how this number must be written, even if we never saw it before.

Just like we can count by 1s to get to 50:
"46, 47, 48, 49, 50"

We can count by 1000s to get to 50 thousand:
"46 thousand, 47 thousand, 48 thousand, 49 thousand, 50 thousand"

We write these as: 46 000, 47 000, 48 000, 49 000, 50 000.

When reading or writing a number, it is helpful to think of a place value chart divided into sections of 3 columns called periods. Every time we have more than 999 items in a period, we name a new period to the left.

Up to now, we've used the ones period and the thousands period. 1000 is what we write after we had more than 999 ones.

| Thousands period | | | Ones period | | |
|------------------|----------|------|-------------|----------|------|
| Thousands | Hundreds | Tens | Thousands | Hundreds | Tens |
| | | | | | |

Representing Numbers to 100 000 (Continued)

We can use counters or digits in the place value chart to show numbers. The charts below both show: 32 thousands + 4 hundreds.

We read it as thirty-two thousand four hundred.

We write 32 400 (standard form). There is a space between the numbers in the two periods.

| Thousands period | | | Ones period | | |
|------------------|----------|------|-------------|----------|------|
| Thousands | Hundreds | Tens | Thousands | Hundreds | Tens |
| 3 | 2 | | | 4 | |

| Thousands period | | | Ones period | | |
|------------------|----------|------|-------------|----------|------|
| Thousands | Hundreds | Tens | Thousands | Hundreds | Tens |
| 3 | 2 | | | 4 | |

There are other ways to describe thirty-two thousand four hundred including:

32 thousands + 400 ones
32 000 + 2000 + 400
3 ten thousands + 2 thousands + 4 hundreds

We use a 0 in the standard form of a number if there are no models needed in that place value column to represent the number. If we didn't use the zeroes, we would not know that the 3 in 32 400 was ten thousands. It would be exactly like 324 where 3 means 3 hundreds.

Representing Numbers to 100 000 (Continued)

1. Show each number on a place value chart. You can draw dots or use digits.

Write the number in standard form.

a) 3 ten thousands + 2 hundreds

| Thousands period | | | Ones period | | |
|------------------|----------|------|-------------|----------|------|
| Thousands | Hundreds | Tens | Thousands | Hundreds | Tens |
| 3 | | | | 2 | |

b) 7 ten thousands + 2 thousands + 4 hundreds + 1 ten

| Thousands period | | | Ones period | | |
|------------------|----------|------|-------------|----------|------|
| Thousands | Hundreds | Tens | Thousands | Hundreds | Tens |
| 7 | 2 | | | 4 | 1 |

c) 28 thousands + 500

| Thousands period | | | Ones period | | |
|------------------|----------|------|-------------|----------|------|
| Thousands | Hundreds | Tens | Thousands | Hundreds | Tens |
| 2 | 8 | | | 5 | |

d) 12 000 + 300 + 20 + 4

| Thousands period | | | Ones period | | |
|------------------|----------|------|-------------|----------|------|
| Thousands | Hundreds | Tens | Thousands | Hundreds | Tens |
| 1 | 2 | | | 3 | 204 |

e) 47 thousands + 30 ones

| Thousands period | | | Ones period | | |
|------------------|----------|------|-------------|----------|------|
| Thousands | Hundreds | Tens | Thousands | Hundreds | Tens |
| 4 | 7 | | | | 30 |

Representing Numbers to 100 000 (Continued)

f) sixty-three thousand twenty-one

| Thousands period | | | Ones period | | |
|------------------|----------|------|-------------|----------|------|
| Thousands | Hundreds | Tens | Thousands | Hundreds | Tens |
| 6 | 3 | | | 2 | 1 |

g) fifteen thousand two hundred three

| Thousands period | | | Ones period | | |
|------------------|----------|------|-------------|----------|------|
| Thousands | Hundreds | Tens | Thousands | Hundreds | Tens |
| 1 | 5 | | | 2 | 3 |

2. Write the words you would say to read each number.

a) 15 015
b) 31 040
c) 31 004
d) 50 003

3. Continue to skip count by 1000 two more times.

a) 37 021, 38 021, 39 021, _____
b) 87 000, 88 000, 89 000, _____
c) 26 031, 27 031, 28 031, _____

4. The digit 5 appears three times in the number 55 053.

a) How much does each 5 represent?
b) Which 5 shows the greatest value?

Solutions

1. a) 30 200

| Thousands | | Ones | | |
|-----------|------|----------|------|------|
| Tens | Ones | Hundreds | Tens | Ones |
| ●●● | | ●● | | |

b) 72 410

| Thousands | | Ones | | |
|--------------|------|----------|------|------|
| Tens | Ones | Hundreds | Tens | Ones |
| ●●●●●● ●● | ●● | ●●●●● | ● | |

c) 22 320

| Thousands | | Ones | | |
|-----------|------|----------|------|------|
| Tens | Ones | Hundreds | Tens | Ones |
| ●● | ●● | ●●● | ●● | |

d) 12 324

| Thousands | | Ones | | |
|-----------|------|----------|------|------|
| Tens | Ones | Hundreds | Tens | Ones |
| ● | ●● | ●●● | ●● | ●●●● |

e) 47 030

| Thousands | | Ones | | |
|-----------|--------------|----------|------|------|
| Tens | Ones | Hundreds | Tens | Ones |
| ●●●● | ●●●●●● ●● | | ●●● | |

f) 63 021

| Thousands | | Ones | | |
|-------------|------|----------|------|------|
| Tens | Ones | Hundreds | Tens | Ones |
| ●●●●●● ● | ●●● | | ●● | ● |

Representing Numbers to 100 000 (Continued)

5. Write a number in standard form to fit the rule. Then write that number of local one other way.

- a number between 42 000 and 43 000
- a number between 47 000 and 48 000
- a number that is just a little more than 41 999
- a number that is about 20 000 more than 13 517
- a number that is almost 6000 more than 28 312
- a number that is about 5000 less than 42 002

6. Read these facts:

- Some hockey arenas hold about 15 000 people.
- The population of Cornwall, ON is close to 45 000 people.
- The area of Parliament Hill is 88 480 m².
- A small computer file might use 55 000 bytes of memory.

Think of something that might be described by a number that is between 10 000 and 99 000. Explain your thinking.

Place Value Chart (1)

| | | | |
|-----------|--|-----------|--|
| Ones | | Ones | |
| Tens | | Tens | |
| Hundreds | | Hundreds | |
| Thousands | | Thousands | |

g) 15 203

| Thousands | | Ones | | |
|-----------|-------|----------|------|------|
| Tens | Ones | Hundreds | Tens | Ones |
| ○ | ○○○○○ | ○○ | | ○○○ |

2. a) fifteen thousand fifteen
b) thirty one thousand forty
c) thirty one thousand four
d) fifty thousand three
3. a) 40 021, 41 021
b) 90 000, 91 000
c) 29 031, 30 031
4. a) the first 5 is 50 000 (or 5 ten thousands); the second 5 is 5000 (or 5 thousands);
the last 5 is 50 (or 5 tens)
b) the first one (at the left)
5. a) e.g., 42 100, 42 thousand + 1 hundred
b) e.g., 67 912, 6 ten thousands + 7 thousands + 9 hundreds + 12 ones
c) e.g., 42 000, 4 ten thousands + 2 thousands
d) e.g., 33 500, 3 ten thousands + 3 thousands + 5 hundreds
e) e.g., 34 000, 34 thousands
f) e.g., 38 000, 38 thousands
6. e.g., the cost of our new car. I know that it cost \$19,000 and 19 thousand is between 10 thousand and 99 thousand.

Renaming Numbers to 100 000

Open Question

Questions to Ask Before Using the Open Question

On Place Value Chart (1), place 2 counters in the ten thousands column.

- ◇ Why can you trade these two counters for 20 counters in the thousands column? (because 10 000 is 10 thousands, so 20 000 is 20 thousands)

Have students do the trade. Discuss how this shows that another name for 2 ten thousands is 20 thousands.

- ◇ You traded all the thousands counters for hundreds. How many counters would there be in the hundreds column? (200)
- ◇ How do you know? (Each thousand is worth 10 hundreds so there would be 200 hundreds.)

Point out that the student has now represented 20 000 as 20 thousands and 200 hundreds, but it is still the same amount.

Using the Open Question

Provide Place Value Chart (1) and counters for students to represent how many of each place value amount they are using.

Make sure that they understand that if, for example, they use a 100 penny box, they could place 1 counter in the hundreds column.

By viewing or listening to student responses, note if they recognize that the same number that can be represented as thousands, can be represented as hundreds or tens.

Depending on student responses, use your professional judgement to guide specific follow-up.

Consolidating and Reflecting on the Open Question

- ◇ Why do all of your values end in 0? (because the smallest box is a 10 penny box)
- ◇ Why are there more ways to describe a number greater than 10 000 than a number less than 10 000? (If you could use a box that holds 10 000 pennies, you could always trade for boxes that hold thousand, hundred or ten pennies. But if it is less than a ten thousand size penny box, you might only be able to trade twice, not three times.)
- ◇ How can you predict how many boxes that hold 100 pennies you could use if you know how many boxes that hold 1000 pennies? (It is 10 times as many.)
- ◇ How many 100 penny boxes would you use if you knew how many boxes that hold ten thousand pennies? (It is 100 times as many.)

Solutions


- e.g., 42 000 = three 10 000 penny boxes and twelve 1000 penny boxes or two 10 000 penny boxes and twenty two 1000 penny boxes
 41 800 = four 10 000 penny boxes and eighteen 100 penny boxes or four 10 000 penny boxes and one hundred eighty 100 penny boxes
 60 220 = six 10 000 penny boxes and twenty-two 10 penny boxes or five 10 000 penny boxes and thirty-nine 100 penny boxes
 20 900 = eighteen 1000 penny boxes and twenty-nine 100 penny boxes or twenty 10 000 penny boxes and nine 100 penny boxes
 29 220 = twenty-nine 1000 penny boxes and twenty-two 10 penny boxes or twenty 10 000 penny boxes and nine hundred twenty two 100 penny boxes
 8570 = eighty 100 penny boxes and fifty-seven 10 penny boxes or seven 1000 penny boxes and fifteen 100 penny boxes and 7 ten penny boxes

- e.g., First, I chose the boxes and then I did all the trading I had to.
 I made sure to use more than 10 of at least one of the box sizes.
 I made sure I did not use the same combination of box sizes more than once.

Materials

- Place Value Chart (1) template
- counters

Renaming Numbers to 100 000
Open Question
 A school is trying to collect 1 million pennies. They are organizing the coins into small boxes. The boxes hold either 10, 100, 1000, or 10 000 pennies.



Choose 4 different numbers of pennies that could be in those boxes.

The rules:

- You can only have two sizes of boxes each time.
- The boxes must be full.
- You must use at least 10 of one kind of box each time.
- You cannot use the same combination of box sizes more than once.
- Write down each of the 4 numbers of pennies in standard form and tell how many of what size boxes might hold that many pennies.

Make sure every number is more than 1000.
 Record how many of each size of box might be used.

Think of several possibilities for each number.

| Number | Box Type 1 (more than 10) | Box Type 2 (more than 100) | How many |
|--------|------------------------------|-------------------------------|----------|
| 11 | | | |
| 31 | | | |
| 31 | | | |
| 41 | | | |
| 51 | | | |
| 61 | | | |

Place Value Chart (1)

| Thousands | Hundreds | | Tens | | Ones | |
|-----------|-----------|----------|------|------|-----------|----------|
| | Thousands | Hundreds | Tens | Ones | Thousands | Hundreds |
| | | | | | | |
| | | | | | | |
| | | | | | | |
| | | | | | | |

Think Sheet

Questions to Ask Before Using the Think Sheet

Point out how the name ten thousands actually tells you that each ten thousand is worth 10 one thousands.

- ◇ How much is each 1 thousand worth? (10 hundreds)
- ◇ How many tens would one thousand be worth? (100 tens)
- ◇ How do you know? (Each hundred is worth 10 tens so if there are 10 of them, that is 100 tens.)
- ◇ Why does it make sense that the number of tens is bigger than the number of hundreds or thousands? (because 10 is smaller than 100 or 1000, it takes more of them to make a number)

Using the Think Sheet

Read through the introductory box with the students. Make sure they understand how the trading is being done – both trading down and trading up.

Assign the tasks.

By viewing or listening to student responses, note if they can:

- rename numbers with different units, e.g., ten thousands or thousands as hundreds or tens, and hundreds as tens
- predict how the values will change when the units change
- recognize that you can always rename to smaller units using whole numbers but not necessarily to larger units using whole numbers

Depending on student responses, use your professional judgement to guide further follow-up.

Consolidating and Reflecting: Questions to Ask After Using the Think Sheet

- ◇ Why can you think of 320 hundreds as if there were 320 chips in the hundreds place? (because the number in the hundreds place tells how many hundreds)
- ◇ How do you know that 320 hundreds will be more than 1000? (1000 is only 10 hundreds)
- ◇ How do you know it will be more than 10 000? (10 000 is 100 hundreds)
- ◇ Why can you think of 32 010 as either 3201 tens or 32 010 ones? (It is automatically that many ones. You could trade the 32 thousands for 320 hundreds and then 3200 tens, but there is another ten too.)
- ◇ How do you know that 200 tens is less than 10 000? (because 200 tens is 20 hundreds and that's only 2 thousands)
- ◇ You know that a number is 82 hundreds. How do you know how many tens it is? (It is 820 tens since each hundred is 10 tens.)
- ◇ Why is it easier to write 4000 as a certain number of tens than to write 4001 as a certain number of tens? (because 4000 is 400 tens but 4001 isn't enough for an extra ten) [Note: 4001 can be written as 400.1 tens, but students at this level will not likely consider this option.]

Solutions

1. a) 18 000 b) 32 000 c) 15 000 d) 81 300
2. e.g.,
 - a) 3, 2, 0, 1, 0 b) 0, 32, 0, 1, 0 c) 0, 0, 320, 1, 0 d) 0, 0, 0, 3201, 0
3. a) 15, 150 b) 221 c) 140, 35 d) 870, 2, 8702
4. a) 5, 2 b) 5, 3 c) 5, 1
5. a) Agree: If you can write it as, for example, 35 hundreds, you just multiply by 10, and it is 350 tens.
 b) Disagree: For example, 3100 is 31 hundreds but it is more than 3 thousands, but less than 4 thousands.
 Note: A student might realize that it is 3.1 hundreds and agree.

Materials

- Place Value Chart (1) template
- counters

Renaming Numbers to 100 000 (Continued)

Think Sheet

To show the number 32 400, we can use 3 ten thousands + 2 thousands + 4 hundreds. Each 10 000 is 10 thousands, so 3 ten thousands = 30 thousands. That means 32 400 is also 32 thousands + 4 hundreds. Each 1000 is 10 hundreds, so 32 thousands is 320 hundreds. That means 32 400 is also 324 hundreds. To check, we can work backwards: If we have 324 chips in the hundreds place, we can trade them 10 at a time, for 32 chips in the thousands place, with 4 chips left in the hundreds place. We can trade the thousands chips, 10 at a time, for 3 ten thousand chips. That leaves 2 chips in the thousands place. The number is 32 400.

Renaming Numbers to 100 000 (Continued)

Using the idea of trading, we can see that, for example, 15 020 is:

- 15 020 = 1 ten thousand + 5 thousands + 2 tens, or
- 15 020 = 15 thousands + 2 tens, or
- 15 020 = 150 hundreds + 2 tens, or
- 15 020 = 150 hundreds + 20 ones, or
- 15 020 = 1502 tens.

Renaming Numbers to 100 000 (Continued)

1. Write each number in standard form.
 - a) 18 thousands
 - b) 320 hundreds
 - c) 150 hundreds
 - d) 8130 tens
2. Your school has collected 32 010 bread tags. They are in boxes that hold either 10, 100, 1000 or 10 000 tags. The boxes are full. There are some loose tags, too. List 4 combinations of box sizes you might use to fit these tags.

| | Box of 10 000 | Box of 1000 | Box of 100 | Box of 10 | 1 |
|----|---------------|-------------|------------|-----------|---|
| a) | | | | | |
| b) | | | | | |
| c) | | | | | |
| d) | | | | | |
3. Complete to make these statements true:
 - a) 18 000 = _____ thousands OR _____ hundreds
 - b) 22 100 = _____ hundreds
 - c) 14 035 = _____ hundreds + _____ ones
 - d) 87 020 = _____ hundreds + _____ tens OR _____ tens

Renaming Numbers to 100 000 (Continued)

4. Think about how to write each number in standard form. Tell how many digits each number has and how many 0s would be at the right end of the number. The numbers in the □ are not 0s.

| | Number of digits | Number of 0s at the right end of the number |
|--------------------------------------|------------------|---|
| a) □□□ hundreds e.g. 314 hundreds | | |
| b) □□ thousands e.g. 23 thousands | | |
| c) □□□ tens e.g. 5132 tens | | |
5. Explain why you agree or disagree.
 - a) Any number that you can write as a certain number of hundreds, you can also write as a certain number of tens.
 - b) Any number that you can write as a certain number of hundreds, you can also write as a certain number of thousands.

Whole Numbers Multiplied and Divided by 10, 100 or 1000

Materials
• Base ten blocks

Open Question

Note: It is important to avoid language such as “adding 0s” at the end of numbers because we have taught students that adding 0 does not change a number. It is better to talk about “putting 0s” at the end of the number.

Questions to Ask Before Using the Open Question

- ◇ *What does 3×10 mean? (3 groups of 10)*
- ◇ *If you used base ten blocks, why would you use 3 tens blocks? (3 tens blocks is what 3 tens means)*
- ◇ *How much is it worth? (It is worth 30.)*
- ◇ *What does 10×3 mean? (It means 10 groups of 3.)*
- ◇ *Show that with blocks and do all the trading you can. How much is it worth? (30)*
- ◇ *Does it make sense that both answers are the same? (Yes, since $3 \times 10 = 10 \times 3$)*
- ◇ *Why can you think of multiplying by 10 as trading a block for the next biggest block? (10 ones is a ten and that's the next biggest block. The same works for 10 tens being a hundred.)*
- ◇ *What is 10×12 ? (120)*
- ◇ *What do you notice about the number? (It is the same number you started with, but with a 0 at the end.)*
- ◇ *Why does that make sense? (Multiplying by 10 makes something 10 times as big, so a ten turns into a hundred and 2 ones turns into 2 tens.)*
- ◇ *What does $40 \div 10$ mean? (How many tens are in 40?)*
- ◇ *How many is it? (4)*

Using the Open Question

Make the base ten blocks available to students.

Make sure they understand the points made at the top of the page about multiplying and dividing by 10 and 100. You may want to have them actually show 370 as 37 tens blocks (by trading the hundreds for tens, or the ones for tens).

By viewing or listening to student responses, note if they recognize what multiplying and dividing by 10, 100, or 1000 actually means.

Depending on student responses, use your professional judgement to guide specific follow-up.

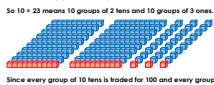
Consolidating and Reflecting on the Open Question

- ◇ *Was it easier to complete the multiplication sentences or the division ones or were they equally easy? (I thought the multiplication was easier since you can just put in any number you want. You have to remember what kinds of numbers to use for the division ones.)*
- ◇ *If you think of multiplying by 100 as multiplying by 10 twice, why does it make sense that the trading you do for multiplying by 100 works the way you figured out? (If you trade each block for the next biggest block, that is multiplying by 10. If you do it again, that's multiplying by 10 again. So you could have just traded for a block that was 100 times as big in the first place.)*
- ◇ *What's the difference between the results for $3800 \div 100$ and $3800 \div 10$? (One is 38 and the other is 380.)*
- ◇ *Why does that difference make sense? (If you divide by 100, you are finding out how many hundreds are in a number and that's fewer than the number of tens, so it makes sense.)*

Whole Numbers Multiplied and Divided by 10, 100, 1000

Open Question

When we multiply a number by 10, we have 10 of that number.
So 10×23 means 10 groups of 2 tens and 10 groups of 3 ones.



Since every group of 10 tens is traded for 100 and every group of 10 ones is traded for 1 ten, we end with 2 hundreds and 3 tens.
 $370 \div 10$ is a way to ask how many tens blocks we need to show 370.

Fill in the blanks with missing digits and complete each sentence. Answer each part a different way.

1. If you have 10×2 you would have 10 groups of ____.
After you traded, you would have ____ thousands blocks, ____ hundreds blocks, ____ tens blocks, and ____ ones blocks.
The value of the product is ____.

If you have 10×2 you would have 10 groups of ____.
After you traded, you would have ____ thousands blocks, ____ hundreds blocks, ____ tens blocks, and ____ ones blocks.
The value of the product is ____.

Whole Numbers Multiplied and Divided by 10, 100, 1000 (continued)

2. If you have 100×2 you would have 100 groups of ____.
After you traded, you would have ____ ten thousands blocks, ____ thousands blocks, ____ hundreds blocks, ____ tens blocks, and ____ ones blocks.
The value of the product is ____.

If you have 100×2 you would have 100 groups of ____.
After you traded, you would have ____ ten thousands blocks, ____ thousands blocks, ____ hundreds blocks, ____ tens blocks, and ____ ones blocks.
The value of the product is ____.

3. If you have 1000×2 you would have 1000 groups of ____.
After you traded, you would have ____ ten thousands blocks, ____ thousands blocks, ____ hundreds blocks, ____ tens blocks, and ____ ones blocks.
The value of the product is ____.

If you have 1000×2 you would have 1000 groups of ____.
After you traded, you would have ____ ten thousands blocks, ____ thousands blocks, ____ hundreds blocks, ____ tens blocks, and ____ ones blocks.
The value of the product is ____.

4. You write ____ $\div 10$ to figure out how many ____ blocks you need to show ____.
The value of the quotient is ____.

You write ____ $\div 10$ to figure out how many ____ blocks you need to show ____.
The value of the quotient is ____.

Whole Numbers Multiplied and Divided by 10, 100, 1000 (continued)

5. You write ____ $\div 100$ to figure out how many ____ blocks you need to show ____.
The value of the quotient is ____.

You write ____ $\div 100$ to figure out how many ____ blocks you need to show ____.
The value of the quotient is ____.

4. You write ____ $\div 1000$ to figure out how many ____ blocks you need to show ____.
The value of the quotient is ____.

You write ____ $\div 1000$ to figure out how many ____ blocks you need to show ____.
The value of the quotient is ____.

Solutions

e.g.,

1. 245, 245, 2, 4, 5, 0, 2450 OR 259, 259, 2, 5, 9, 0, 2590
2. 234, 234, 2, 3, 4, 0, 0, 23 400 OR 430, 430, 4, 3, 0, 0, 0, 43 000
3. 23, 23, 2, 3, 0, 0, 0, 23 000 or 96, 96, 9, 6, 0, 0, 0, 96 000
4. 230, tens, 230, 23 OR 4500, tens, 4 500, 450
5. 4 500, hundreds, 4500, 45 OR 3200, hundreds, 3200, 32
6. 12 000, thousands, 12 000, 12 OR 8 000, thousands, 8 000, 8

Think Sheet

If students are still not comfortable working with numbers greater than 10 000, have them skip questions 1c, 2c, 2g, and 3c.

Note: It is important to avoid language such as “adding 0s” at the ends of numbers because we have taught students that adding 0 does not change a number. It is best to talk about “putting 0s” at the end of the number.

Materials

- Place Value Chart (2) template
- counters
- base ten blocks

Questions to Ask Before Using the Think Sheet

Have students show 21 on Place Value Chart (2) using counters. Ask them to make 10 groups of the same amount.

- ◇ *Can you leave the number like that or do you trade? (You trade since there is more than 9 in a column.)*
- ◇ *Once you trade, what do you have? (2 hundreds and 1 ten)*
- ◇ *How do you write that as a number? (210)*
- ◇ *What do you notice? (It is the original number with a 0 on the end.)*

Now have students show 17 tens by putting 17 chips on the tens place. Have them do any necessary trading.

- ◇ *How much is 17 tens? (It is 170.)*
- ◇ *What do you notice? (It is the same number but with a 0 at the end.)*

Using the Think Sheet

Read through the introductory box with the students. Provide base ten blocks and/or Place Value Chart (2) and counters to assist the students.

Assign the tasks.

By viewing or listening to student responses, note if they realize that:

- to multiply by 10, 100 or 1000, you can either trade blocks for blocks of greater value or simply think of that many tens, hundreds or thousands
- if a number can be written as x tens, it can easily be divided by 10 or if a number can be written as x hundreds, it can easily be divided by 100
- multiplying by 100 is like multiplying by 10 twice in a row
- multiplying by 1000 is like multiplying by 10 three times in a row
- dividing by 100 is like dividing by 10 twice in a row
- multiplying and subsequently dividing by 10 reverse each other

Depending on student responses, use your professional judgement to guide further follow-up.

Consolidating and Reflecting: Questions to Ask After Using the Think Sheet


- ◇ *If I give you a number to multiply by 100, how can you do it in your head? (I would just put two 0s on the end.)*
- ◇ *Why does that make sense? (e.g., If a number is 100 times as big, things that were tens and ones becomes thousands and hundreds.)*
- ◇ *What sorts of numbers are easy to divide by 100? (Numbers that end in two zeroes) Why? (If they end in two 0s, you can write them as a group of hundreds. If you divide by 100, you just find out how many hundreds there were in the first place.)*

Whole Numbers Multiplied and Divided by 10, 100, 1000 (Continued)


Think Sheet

To multiply by 10, 100, or 1000 we only need to think about where the digit in a number is placed.

To show that 45×10 means 45 tens, we can put 45 counters in the tens place and trade groups of 10 counters for 1 hundred counter or we can use 45 tens rods and trade each 10 tens for 1 hundred rod.



The product is 450. 10 tens is 1 hundred. 40 tens is 400 and 5 tens is 50. We can think of 10×45 as 10 groups of 4 tens and 10 groups of 5 ones.



We have 40 tens and 50 ones, that is 4 hundreds and 5 tens is 50.

45×100 means 45 hundreds (4500).
 100×45 means 10 groups of 10 groups of 4 tens and 10 groups of 10 groups of 5 ones. That's 4500.
 45×1000 means 45 thousands or 45 000. 1000×45 means 1000 groups of 45 tens which is 45000 tens, or 45 ten thousands, and 1000 groups of 5 ones, or 45 000.

Whole Numbers Multiplied and Divided by 10, 100, 1000 (Continued)

We don't need to use multiplication facts to divide tens by 10 or hundreds by 100 or thousands by 1000.

For example, 32 tens \div 10 means how many tens are in 32 tens. If there are 32 groups of 10, the number of tens is 32.

Since 32 tens = 320, $320 \div 10 = 32$.

In the same way, 3200 is 52 hundreds. That means there are 52 groups of 100. $3200 \div 100 = 32$.

$18\ 000 \div 1000 = 18$ because there are 18 groups of 1000 in 18 thousand.

1. Complete each with the right word or number. The first one is done for you.

a) $42 \times 10 = 42$ (tens) b) $37 \times 100 = 37$ _____

c) $82 \times$ _____ = 82 thousands d) _____ $\times 100 = 43$ hundreds

e) _____ $\div 10 = 19$ tens

2. Complete each.

a) $10 \times 57 =$ _____ b) $10 \times 402 =$ _____

c) $100 \times 100 =$ _____ d) $1000 \times 7 =$ _____

e) $5300 \div 100 =$ _____ f) $5300 \div 10 =$ _____

g) $14\ 000 \div 1000 =$ _____

Whole Numbers Multiplied and Divided by 10, 100, 1000 (Continued)

3. Complete each.

a) _____ $\times 10 = 587$ b) _____ $\times 100 = 38$

c) _____ $\times 100 = 37\ 000$ d) _____ $\times 491 = 4910$

e) _____ $\times 80 = 8000$

4. How could you do these calculations using just one multiplication or division?

a) multiply by 10 two times in a row

b) divide by 10 two times in a row

c) multiply by 10 three times in a row

d) divide by 10 three times in a row

e) multiply by 10 and then divide by 100

f) multiply by 100 and then divide by 10

5. Multiplying by 100 makes something 100 times as big. In what real situation might that happen?

Whole Numbers Multiplied and Divided by 10, 100, 1000 (Continued)

4. Why don't you need to use your multiplication facts to multiply or divide by 10, 100, or 1000?

Solutions

- b)** hundreds **c)** 1000 **d)** 43 **e)** 19
- a)** 570 **b)** 4020 **c)** 10 000 **d)** 7000
e) 53 **f)** 530 **g)** 16
- a)** 5870 **b)** 3800 **c)** 370 **d)** 10
e) 100
- a)** multiply by 100 **b)** divide by 100
c) multiply by 1000 **d)** divide by 1000
e) divide by 10 **f)** multiply by 10
- e.g., changing metres to centimetres
- e.g., because the digits just change place value. They don't actually change since the place value chart is based on multiplying and dividing by 10

| | | | |
|-----------|--|-----------|--|
| Ones | | Ones | |
| Tens | | Tens | |
| Hundreds | | Hundreds | |
| Thousands | | Thousands | |