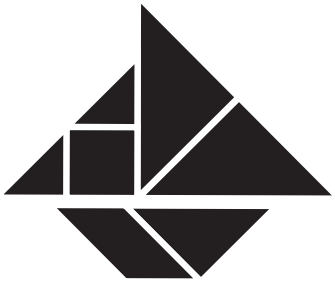


Teachers Guide

GRADE 5 – UNIT 3 – MODULE 3

BRIDGES®
IN MATHEMATICS

Module 3

Conversions

Teacher Masters

Pages renumber with each module.

Student Book Pages

Page numbers correspond to those in the consumable books.

Home Connections Pages

Page numbers correspond to those in the consumable books.

Module 3
Conversions

Overview

Students use units of computer memory—bytes, kilobytes, megabytes, and gigabytes—to explore conversions within a given system of measurement, and then extend the strategies they develop to making metric conversions. Students also continue their work adding and subtracting decimals in a vertical format and solving story problems that involve decimal amounts.

Planner

Session	P&I	PS	MF	WP	A	HC	DP
Session 1 Checkpoint & Memory Bytes Students take a checkpoint on comparing, rounding, adding, and subtracting decimals. Then the teacher introduces a series of problems involving bytes, kilobytes, and megabytes of computer memory. The class works through the first problem together and students spend the rest of the session on the remaining problems. The class will discuss their strategies in a math forum in the next session.	●				●		●
Session 2 Memory Bytes & More Math Forum Students finish their work on the Memory Bytes Student Book pages. The class then convenes for a math forum during which selected students share their thinking with regard to adding and subtracting decimal numbers. After the forum, students examine some strategies for decimal addition and subtraction combinations that are stacked vertically and complete a related assignment in their books.	●		●			●	●
Session 3 Metric Conversions The session begins with discussion about the metric measurement system and units for length, mass, and volume. Students describe strategies for converting measurements within the metric system, much as they did in Sessions 1 and 2 when converting measurements of computer memory, while the teacher models on a ratio table. Then students complete a related assignment in their Student Books.	●						●
Session 4 Place Value Patterns Students participate in a problem string that reinforces some of the place value patterns they have encountered over the past several sessions. They spend the rest of the session visiting Work Places.		●		●		●	●

P&I – Problems & Investigations, **PS** – Problem String, **MF** – Math Forum, **WP** – Work Place, **A** – Assessment, **HC** – Home Connection, **DP** – Daily Practice

Materials Preparation

Each session includes a complete list of the materials you'll need to conduct the session, as well as notes about any preparation you'll need to do in advance. If you would like to prepare materials ahead of time for the entire module, you can use this to-do list.

Task		Done
Copies	Run copies of Teacher Masters T1–T2 according to the instructions at the top of each master.	
	Run a single display copy of Student Book pages 95, 96, 98, 99, 101, and 102.	
	If students do not have their own Student Books, run a class set of Student Book pages 95–104.	
	If students do not have their own Home Connections books, run a class set of the assignments for this module using pages 53–56 in the Home Connections Book.	

Additional Resources

Please see this module's Resources section of the Bridges Educator site for a collection of resources you can use with students to supplement your instruction.

Session 1
Checkpoint & Memory Bytes

Summary

Students take a checkpoint on comparing, rounding, adding, and subtracting decimals. Then the teacher introduces a series of problems involving bytes, kilobytes, megabytes, and gigabytes of computer memory. The class works through the first problem together and students spend the rest of the session on the remaining problems. The class will discuss their strategies in a math forum in the next session.

Skills & Concepts

- Explain patterns in the number of zeroes in the product when multiplying by powers of 10 and the placement of the decimal point when multiplying or dividing by powers of 10 (5.NBT.2)
- Compare pairs of decimals to thousandths (5.NBT.3b)
- Round decimals to the nearest one, tenth and hundredth (5.NBT.4)
- Add and subtract decimals to hundredths, using concrete models or drawings and strategies based on place value, properties of operations, and the relationship between addition and subtraction (5.NBT.7)
- Convert among different-sized standard measurement units within a given measurement system (5.MD.1)
- Make sense of problems and persevere in solving them (5.MP.1)
- Look for and make use of structure (5.MP.7)

Materials

Copies	Kit Materials	Classroom Materials
Assessment Decimal Place Value Checkpoint 2		
TM T1 Decimal Place Value Checkpoint 2	• base ten pieces	
Problems & Investigations Memory Bytes		
SB 95–96* Memory Bytes **TM T2** Memory Bytes & More Forum Planner		
Daily Practice		
SB 97 Olympic Story Problems		

HC – Home Connection, **SB** – Student Book, **TM** – Teacher Master
Copy instructions are located at the top of each teacher master. ** Run 1 copy of these pages for display.*

Vocabulary

An asterisk [*] identifies those terms for which Word Resource Cards are available.

byte
decimal*
difference*
divide*
gigabyte
kilobyte
megabyte
multiply*
order
rounding*
sum or total*

Preparation

Read Session 2 to see how students might share their work from today's session. Before tomorrow's forum, use the Memory Bytes & More Forum Planner to help select students to share their work.

Assessment

Decimal Place Value Checkpoint 2

1 Open the session by letting students know that they will take a checkpoint on decimals and place value. Then they will work on some new story problems that have to do with computer memory.

2 Display Decimal Place Value Checkpoint 2 and give each student a copy. Have students look it over, ask questions, and then let them begin.

- Have a helper place one or more sets of base ten pieces at each table. Let students know they can use the pieces to help if they like.
- Encourage students to read each question carefully, and remind them they can ask you for help reading any of the questions.
- Remind students to work quietly by themselves.
- While students work, circulate around the room to make observations and answer questions.
- Give students about 15 minutes or so to do the checkpoint.
- If some students finish earlier than others, ask them to read quietly.

3 Collect students' checkpoints.

SUPPORT Since this is not a timed test, give students who are unable to complete the work more time to finish later in the day or early the next day.

Assessment Guide

See the Grade 5 Assessment Guide for scoring and intervention suggestions.

Problems & Investigations

Memory Bytes

4 Display the first Memory Bytes Student Book page and have students find it in their books. Introduce today's problem context by having students share what they know about MP3 players, music, and data sizes.

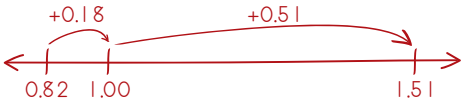
> ***Teacher*** *Who can tell me what an MP3 player does? How many songs can be on an MP3 player? How do you know? … Today we're going to solve some problems dealing with songs on MP3 players.*

5 Read problem 1a with the class, and have students solve it in their books.

> **1** She downloaded one song that was 3.82 MB and another song that was 2.69 MB.
>
> **a** How many **megabytes** of memory do the two songs use?

- When most students have finished the problem, solicit and record answer(s) on the board.
- Ask several students to share their answers and explain their thinking.
- As they share, model their strategies on number lines at the board.

> ***Juan*** *I split off the 3 and 2, and that's 5. Then I started with the 0.82. I added 0.18 to get to 1.00. Then I had to find how much I had left, that's 0.69 – 0.18 = 0.51. So I added the 0.51 and got 1.51. That plus 5 is 6.51.*



3.82 + 2.69
3 + 2 = 5
5 + 1.51 = 6.51 MB

Computer Data Storage Units

The basic unit in computer data storage is the byte, which consists of 8 binary units (bits).

The base ten relationships between bytes, kilobytes, megabytes, and gigabytes are used in this session and the next to give students practice multiplying and dividing by powers of 10.

1 KB = 1,000 bytes
= 10^3 bytes

1 MB = 1,000 KB
= 1,000,000 bytes
= 10^6 bytes

1 GB = 1,000 MB
= 1,000,000 KB
= 1,000,000,000 bytes
= 10^9 bytes

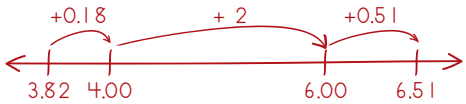
Some students may be aware that the relationships between bytes, kilobytes, megabytes, and gigabytes are often expressed differently. The binary multiples of bytes, used in many computing applications, are related by powers of two. The standard terms for these units are *kibibyte*, *mebibyte*, and *gibibyte*, but the more familiar terms above are widely used for both the base ten and base two systems.

1 KiB = 1,024 bytes
= 2^{10} bytes

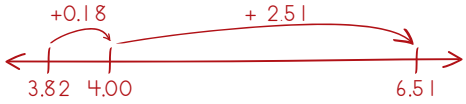
1 MiB = 1,048,576 bytes
= 2^{20} bytes

1 GiB = 1,073,741,824 bytes
= 2^{30} bytes

Max *I kept the 3.82 whole and added 0.18 to get to 4. Then I added 2. Then I added the 0.51 that was left to get 6.51.*



Carmen *I kept the 3.82 whole, too, and added 0.18, but then I added the 2.51 all at once.*



6 Point out the approximate conversions at the top of the page and ask students to consider where they have seen these relationships before.

Clarify the information as needed, and recall with students that these relationships are similar to those found in the metric system of measurement.

- 1 gigabyte (GB) is equal to 1,000 megabytes (MB).
- 1 megabyte (MB) is equal to 1,000 kilobytes (KB).
- 1 kilobyte (KB) is equal to 1,000 bytes.

7 Ask students to use the information to help solve problems 1b, 1c, and 1d in their books.

- Circulate as they are working to observe and provide support.
- Encourage students to share and compare solutions and strategies as they are working.
- When most students have finished, invite several volunteers to share their thinking with the class.
- Use ratio tables to model their explanations.

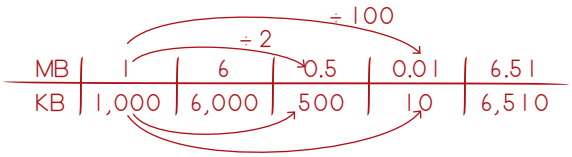
Teacher *How did you find the number of kilobytes the two songs used?*

Veronica *I know it's 6.51 MB and that each megabyte is 1,000 KB. If 1 MB is 1,000 KB, then 6 MB is 6,000 KB. For 0.51 MB, I know that 0.5 or 0.50 is half a megabyte, so that's another 500 KB. That left the 0.01 MB.*

Teacher *Wow, how did you think about that?*

Veronica *Kind of like money. 0.01 is like a penny and 1 would be the whole dollar, so to get from 1 to 0.01 I divided by 100.*

Teacher *Let me try to model all those things you just said. This seems to be a situation where a ratio table would come in handy. I'm going to set it up so we can see that 1 MB is the same as 1,000 KB. Then you multiplied by 6 to find that 6 MB is the same as 6,000 KB, right? After that, it sounds like you divided 1,000 by 2 to find out how many kilobytes there are in 5/10, or half, a megabyte. You said it was 500. Then, to find out how many kilobytes there are in 1/100 of a megabyte, you divided 1,000 by 100. Finally, you added up all your kilobytes and got 6,501 in all. Have I captured your thinking accurately?*



Veronica *Yep—that's it!*

Math Practices in Action 5.MP.1

This session is a good opportunity for students to make sense of problems and persevere in solving them. The context is likely to be familiar, but students will probably not have converted among these units before. Nonetheless, they are equipped with the models and understandings required to solve the problems.

Martin *I kind of did the same thing as you, Veronica. I knew that there were 6,000 kilobytes in 6 megabytes. Then I thought about the 0.51 megabytes as 0.510 if you want to write it in thousandths. That means 0.510 is $^{510}/_{1,000}$, so I needed another 510 KB.*

Teacher *Let's show your thinking on another ratio table, Martin. We'll set it up the same as the first one to start. Then you dealt with the decimal portion of the 6.51 megabytes by thinking of the 51 hundredths as 510 thousandths instead, correct?*

MB	1	6	0.51	6.51
KB	1,000	6,000	510	6,510

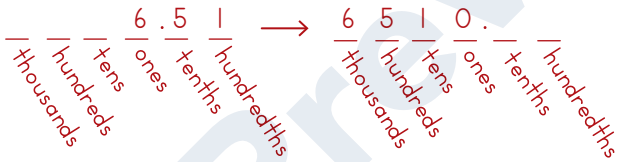
8 As you continue to discuss problem 1b, guide students to see and describe patterns in the placement of the decimal point when a decimal number is multiplied by powers of 10.

- If it has not yet come up, solicit or share a strategy for solving problem 1b that involves multiplying the entire number of megabytes (6.51) by 10, and then by 10 again, and then by 10 a third time, and finally by 1,000 all at once.

$6.51 \times 10 = 65.1$
$65.1 \times 10 = 651$
$651 \times 10 = 6{,}510$
} $6.51 \times 1{,}000 = 6{,}510$

- Note with the class that each time 6.51 is multiplied by 10 again, the decimal point shifts one place to the right as the number becomes 10 times what it was. The net effect of multiplying 6.51 by 1,000, or 10 to the third power, is a shift to the right of 3 places.

SUPPORT Work with input from the class to draw and label a sketch similar to the one shown here illustrating the shift.



9 Discuss problems 1c and 1d with the class.

Use both situations as a springboard for reinforcing the predictable shift to the right in the placement of the decimal point each time a number is multiplied by 10.

Teacher *Now we know that the two songs use approximately 6,510 kilobytes. How many bytes is that?*

Students *We need to multiply 6,510 by 1,000.*

That's like multiplying 6,510 by 10, and then 10 again, and then 10 again, so the decimal point has to move over to the right 3 more times.

That's 6,510,000 bytes. That's over six and a half million bytes! In just two songs!

10 Give students the remainder of the session to work on the Memory Bytes assignment in their books.

- Consider giving students the option of working by themselves or with a partner.
- Let them know that you'll invite some of them to share their strategies during a math forum next session.

11 As students work, circulate around the room and use your copy of the Memory Bytes & More Forum Planner to make notes about who you'll have share in tomorrow's math forum.

Take time to confer with students as necessary, especially those in need of support or challenge.

SUPPORT Work with struggling students to clarify what the problems are asking them to do. When adding or subtracting decimal numbers is called for, support them in using open number lines to model and solve the problems.

CHALLENGE Encourage students to use some of the number line strategies, including constant difference.

12 Close the session.

- Reconvene the class and ask a few students to share how they are using their whole number strategies to help them add and subtract decimals.
- Let students know that you will talk more about their strategies in tomorrow's session and that they will have time to finish the problems then if necessary.

> ***Students*** *Since I know that 82 + 18 is 100, I also know that 0.82 + 0.18 is 1.*
>
> *When I find the difference between 6.51 and 23.15, I know I could find the difference between 651 and 2,315 and then put the decimal back where it belongs.*

Daily Practice

The optional Olympic Story Problems Student Book page provides additional opportunities to apply the following skills:

- Subtract decimals to hundredths, using concrete models or drawings and strategies based on place value, properties of operations, and the relationship between addition and subtraction (5.NBT.7)
- Use written numbers and symbols to represent strategies for computing with decimals to hundredths (5.NBT.7)

Session 2

Memory Bytes & More Math Forum

Summary

Students finish their work on the Memory Bytes Student Book pages. The class then convenes for a math forum during which selected students share their thinking with regard to adding and subtracting decimal numbers. After the forum, students examine some strategies for decimal addition and subtraction combinations that are stacked vertically and complete a related assignment in their books. Finally, the teacher introduces and assigns the Decimal Practice Home Connection.

Skills & Concepts

- Add and subtract decimals to hundredths, using concrete models or drawings and strategies based on place value, properties of operations, and the relationship between addition and subtraction (5.NBT.7)
- Construct viable arguments and critique the reasoning of others (5.MP.3)
- Model with mathematics (5.MP.4)

Materials

Copies	Kit Materials	Classroom Materials
Math Forum Memory Bytes & More		
		• Memory Bytes & More Forum Planner (TM T2, with notes from Session 1) • Memory Bytes (SB 95–96, completed in Session 1) • chart paper (see Preparation)
Problems & Investigations Vertical Problems		
SB 98–99* Vertical Problems		
Home Connection		
HC 53–54 Decimal Practice		
Daily Practice		
SB 100 More Memory Bytes		

HC – Home Connection, **SB** – Student Book, **TM** – Teacher Master
Copy instructions are located at the top of each teacher master. ** Run 1 copy of these pages for display.*

Preparation

- Use the Memory Bytes & More Forum Planner to decide which four or five students you want to have share in today's forum and in what order.
- Post one or more pieces of chart paper where everyone can see them during the math forum.

Vocabulary

An asterisk [*] identifies those terms for which Word Resource Cards are available.

byte
gigabyte
kilobyte
megabyte

Math Forum

Memory Bytes & More

1 Open the session by giving students some time to complete their work on the Memory Bytes Student Book pages from the previous session.

As students work, circulate to offer support.

SUPPORT To participate fully in the math forum, students need to have worked problems 2a, 3a, and 5. If necessary, encourage students to spend their time working on these problems.

CHALLENGE Encourage students to seek the most efficient strategies for solving the problems. Encourage comparison of strategies with other students who have completed the work.

2 Gather students in the discussion area. Have them bring their Student Books and pencils

Review class expectations for math forums as needed.

3 Invite students to present their work, one at a time.

By now, students should be working comfortably on their own number lines, so their work may be a sufficient visual model. However, as it helps to see the work unfold step by step, you may still want to model student work, especially for those students struggling to understand the strategies.

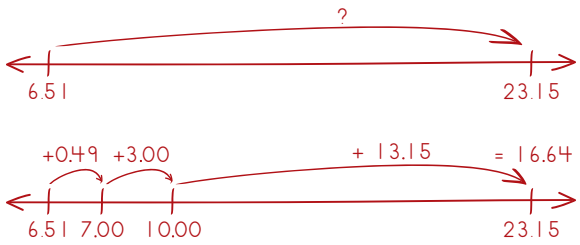
- After each presentation, invite the rest of the class to ask questions, and have the presenters respond to those questions.
- After each student finishes, ask the others if they understood what their classmate did and whether anyone else used the same or similar approach.
- If a student shares something similar that elevates the level of discussion, model what that student did with sketches numbers, and words.

Find the Difference Strategy Problem 2a

2 The next day, Paula downloaded more songs. Once she was finished, her MP3 player said it had 23.15 MB of memory used.

a How many **megabytes** did the new songs use?

Rosa *I knew she started with 6.51 MB so I started with that on the left side of my number line. Then she had 23.15 MB so I put that on the right. Then I counted up to find how many MB were in between.*

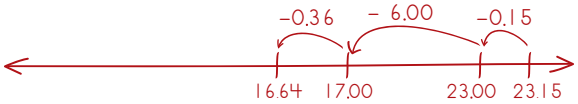


Removal (Take Away) Strategy Problem 3a

3 A few days later, Paula deleted 6.51 MB of songs from her MP3 player.

a Now how much memory is being used?

Boris *I started with 23.15 and took away 6.51 MB. First I took away 0.15 to get to 23. Then I took away 6 to get to 17. Then I had to figure out how much more to take away. I had already jumped back 6.15, so I needed to go back 0.36 farther. I landed on 16.64.*



Teacher *So, you subtracted or removed to find 23.15 – 6.51 and landed on the answer, 16.64.*

4 Before you continue, ask students to make observations, first in pairs and then as a whole group, about problems 2a and 3a and the strategies that could be used to solve them.

Both problems are represented by the same expression. Therefore, the subtraction can be solved by either removing or finding the difference. Students can use the numbers to decide which strategy is more efficient.

Teacher *Let's talk about these two strategies. I see that we represented both with the same subtraction equation. Tell me what you are thinking about solving these problems*

Students *It's like they are the same problem*

Addition and subtraction are kind of the same.

It's like the problem strings we did. You can remove when you subtract or you can count up to find the difference, but it's the same subtraction problem for both.

5 Then continue calling on students to share with the class.

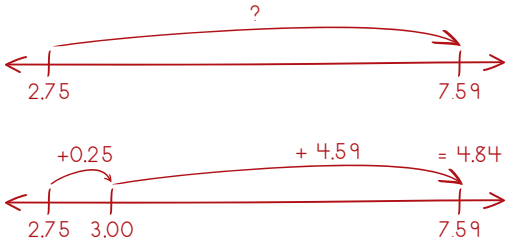
Find the Difference Strategy Problem 5

The memory display on Tyler's media player says "7.59 GB used."

5 Tyler deleted 2.75 GB of TV shows from his media player. Now how much memory is being used?

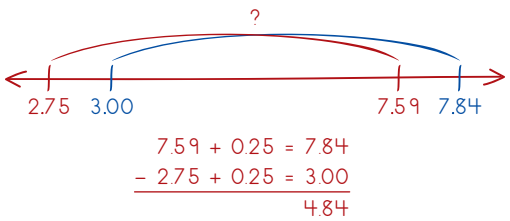
Lin *I know it says he deleted the 2.75 MB, but counting up was easier for me to find the difference between 2.75 and 7.59.*

Teacher *So, even though the problem suggested subtraction or removing, you knew you could find that answer by finding the difference?*



Constant Difference Strategy Problem 5

> ***Willie*** *I noticed that 2.75 was only a quarter away from 3, so added 0.25 to both numbers. That changed the problem to 7.84 – 3, and that's easy. It's just 4.84.*



7.59 + 0.25 = 7.84
– 2.75 + 0.25 = 3.00
4.84

6 Conclude the forum by talking with students about looking at the numbers in a problem before deciding on a strategy.

Ask students to share what they might look for that would nudge them toward using the following subtraction strategies:

- **Removal**
  When the numbers are relatively far apart, just remove.
- **Differencing**
  When the numbers are relatively close together, find the small distance or difference between the two.
- **Constant Difference**
  When the numbers are challenging, make an equivalent but easier problem by adding or subtracting the same amount to or from the minuend and the subtrahend. This is especially effective if you can shift the subtrahend to a multiple of 1, 10, 100, 1,000, and so on.

Problems & Investigations

Vertical Problems

7 Have students turn to the first Vertical Problems Student Book page as you display your copy.

The first page of Vertical Problems shows examples of applying a give and take strategy to vertical addition problems and applying a constant difference strategy to vertical subtraction problems. The second page is for students to work independently.

8 Discuss the first problem on the sheet with the class.

- Review the give and take strategy with the class.
- Guide students to connect the vertical format with the number line model.
- Have students fill in the answer.

> ***Teacher*** *Please look at the first problem, 999 + 457. What do you see? How does the vertical problem compare to the strategy on the number line?*
>
> ***Students*** *It looks like the give and take strategy on the number line to solve the 999 + 457 problem.*
>
> *The vertical problem shows the same thing.*
>
> *How?*
>
> *The +1 is the jump from 999 to 1,000. The –1 is taking that from the 457 to get the jump of 456.*
>
> ***Teacher*** *Let's write in the answer.*

Unit 3 Module 3 | Session 2

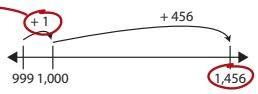
NAME | DATE

Vertical Problems page 1 of 2

Give and Take Strategy for Addition

1 Fill in the answer.

999	+ 1	1,000
+ 457	− 1	+ 456
		1,456



9 Discuss the second problem with the class.

- Note with the students that they are looking at four different ways to solve the same problem, 4.78 + 2.39. The give and take strategy is used in all four cases, but a different amount has been taken from one number and given to the other each time.
- Ask students which of the four seems easiest to solve.

There is not a "best" answer about which friendly number makes the problem easiest. Students will have different preferences. Ask them to justify their choices.

2 Fill in the answers. As you work, think about how the give and take strategy is used.

4.78	− 0.01	4.77	4.78	+ 0.02	4.80
+ 2 39	+ 0.01	+ 2.40	+ 2.39	− 0.02	+ 2.37
4.78	+ 0.22	5.00	4.78	− 0.61	4.17
+ 2.39	− 0.22	+ 2.17	+ 2.39	+ 0.61	+ 3.00

Students *I like the top two ways because I only have to add and subtract 1 or 2 pennies. That's easy.*

Yeah, but then you get problems that aren't as easy to solve. I like the one where they add 0.22 to get 4.78 up to 5. Then it's easy to subtract 0.22 from 2.39.

The last one, where they added 0.61 to make the 2.39 into 3.00 isn't too bad, either. It depends whether it's easier for someone to see the partner of 2.39 to get to 3 or the partner of 4.78 to get to 5.

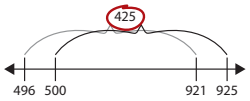
10 Discuss the third problem on the sheet with the class.

- Review the constant difference strategy with the class Reinforce the fact that the same amount must be added or subtracted to or from both numbers so that the difference or distance between them stays the same. This makes the strategy significantly different than give and take for addition.
- Guide students to connect the vertical format with the number line model.
- Have students fill in the answer.

Constant Difference Strategy for Subtraction

3 Fill in the answer.

921	+ 4	925
− 496	+ 4	− 500
		425



Teacher *How about problem 3? What's going on here?*

Students *You can't give and take with subtraction, so you give and give to change the numbers to be easier without changing how far apart they are.*

This is cool because you just have to add 4 to 496 to make it into 500.

But then you have to add 4 onto the other number too, so it's 925 – 500.

925 – 500 is way easier than 921 – 496 because of the zeros.

11 Discuss the fourth problem with the class.

- Note with the students that they are looking at two different ways to solve the same problem, 7.78 – 2.89. The constant difference strategy is used in both cases, but a different amount has been added to the minuend and the subtrahend each time.
- Ask students which of the two seems easier to solve, and why.

> **4** Fill in the answers. As you w rk, think abo t the two different ways in which the problem has been changed, and compare them. Which seems easier? Why?
>
> | | | | | | |
> |---|---|---|---|---|---|
> | 7.78 | + 0.11 | 7.89 | 7.78 | + 0.22 | 8.00 |
> | − 2.89 | + 0 11 | − 3 00 | + 2.89 | + 0.22 | − 3.11 |

Students *I like the one where they added 0.11 to both numbers because I don't have to add as much.*

I like that one because then I can just subtract 3, and that's easy.

I don't like to subtract 8.00 – 3.11. I'd rather do 7.89 – 3.00.

I think it's always easier if you can make the number you're subtracting into a friendly number.

12 Give students the remainder of the session to complete the problems on the second page of the Vertical Problems assignment.

- Circulate and ask scaffolding questions when necessary.
- As you talk with students, press them to justify the numbers they've chosen to make each of the problems easier.

13 Close the session.

Home Connection

14 Introduce and assign the Decimal Practice Home Connection, which provides more practice with the following skills:

- Round decimals to the nearest one, tenth and hundredth (5.NBT.4)
- Add and subtract decimals to hundredths, using concrete models or drawings and strategies based on place value, properties of operations, and the relationship between addition and subtraction (5.NBT.7)
- Convert among different-sized standard measurement units within a given measurement system (5.MD.1)
- Solve multi-step story problems involving conversions among different-sized standard measurement units within a given measurement system (5.MD.1)

Daily Practice

The optional More Memory Bytes Student Book page provides additional opportunities to apply the following skills:

- Add and subtract decimals to hundredths, using concrete models or drawings and strategies based on place value, properties of operations, and the relationship between addition and subtraction (5.NBT.7)
- Convert among different-sized standard measurement units within a given measurement system (5.MD.1)

Session 3
Metric Conversions

Summary

The session begins with discussion about the metric measurement system and units for length, mass, and volume. Students describe strategies for converting measurements within the metric system, much as they did in Sessions 1 and 2 when converting measurements of computer memory, while the teacher models on a ratio table. Then students complete a related assignment in their Student Books.

Skills & Concepts

- Explain patterns in the number of zeroes in the product when multiplying by powers of 10 and the placement of the decimal point when multiplying or dividing by powers of 10 (5.NBT.2)
- Convert among different-sized standard measurement units within a given measurement system (5.MD.1)
- Solve multi-step story problems involving conversions among different-sized standard measurement units within a given measurement system (5.MD.1)
- Make sense of problems and persevere in solving them (5.MP.1)
- Model with mathematics (5.MP.4)

Materials

Copies	Kit Materials	Classroom Materials
Problems & Investigations Converting Measurements		
SB 101* Equivalent Measures **SB 102*** Different Measures		• student math journals
Daily Practice		
SB 103 Meters & Meters		

HC – Home Connection, **SB** – Student Book, **TM** – Teacher Master
Copy instructions are located at the top of each teacher master. ** Run 1 copy of these pages for display.*

Vocabulary

An asterisk [*] identifies those terms for which Word Resource Cards are available.

centimeter (cm)*
gram (g)*
kilogram (kg)*
kilometer (km)*
liter (l)*
meter (m)*
metric system*
milligram (mg)*
milliliter (ml)*
millimeter (mm)*

Problems & Investigations

Converting Measurements

1 Open the session by reminding students that in this module they have discussed and converted different measurements of data. Tell them that today's focus will be on converting standard units of measure in the metric system.

2 Display a copy of the Equivalent Measures Student Book page while students find the page in their books. Give students a minute to look over the page, and then discuss it. Record notes on the page as you discuss.

- Ask students for their general observations about the charts on the page. How is the page organized? What patterns do they notice?
- Ask what type of measurement matches each set of units. (length, mass, volume) How do they know?
- Ask students what type of measurement and what unit might be reasonable for each of the following situations:
  - » how far someone drove her car (length, kilometer)
  - » how much water a person drinks in a day (volume, liter)
  - » how heavy a paperback book is (mass, grams)

3 Ask students to take out their math journals, and then to turn their attention to the *length* section of the Equivalent Measures Student Book page.

Pose the following question: If 1 centimeter equals 10 millimeters, how many millimeters are equivalent to 32 centimeters?

4 After student have had time to think about the problem, solicit responses. Model students' thinking on a ratio table.

Teacher *Raul, how many millimeters are equivalent to 32 centimeters?*

Raul *I think it's 320 millimeters.*

Teacher *How did you decide on 320 millimeters?*

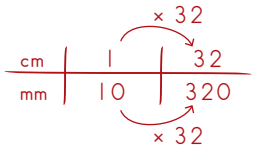
Raul *In the chart, it says that 1 cm equals 10 mm, so I kind of built up to it. I thought that 10 cm would be 100 mm, and 30 cm would be 300 mm, and 32 cm would be 320 mm.*

Teacher *Let me see if I can model your steps on a ratio table.*

cm	1	10	30	32
mm	10	100	300	320

Teacher *Amanda, is that also what you did?*

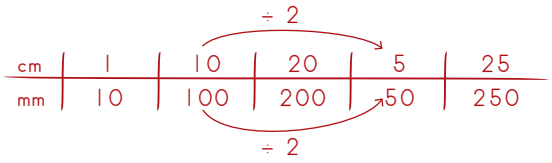
Amanda *No. I saw that 1 cm was equal to 10 mm, too, but I just knew that for 32 cm, I could multiply 32 × 10.*



5 Pose another question, and then solicit responses and model students' thinking on a ratio table. Ask, "If I have 250 millimeters of thread, how many centimeters do I have?"

Look for a student who used the place value shift to solve the problem easily. If no students divided by ten, offer the strategy yourself.

> ***Teacher*** *What are you thinking about this problem?*
>
> ***Tanisha*** *At first I thought it was just like the last one, but then I realized it was asking the question backward. I know that 1 cm is the same as 10 mm. So I built up like Raul did. 10 cm is 100 mm, and 20 cm is 200 mm. Then I knew I needed 5 more cm to make 50 mm and have 250 mm total.*
>
> ***Teacher*** *How did you know that 5 more cm was 50 mm?*
>
> ***Tanisha*** *If 10 cm is 100 mm, then 5 cm is half of that.*
>
> ***Teacher*** *So what did you get as your answer?*
>
> ***Tanisha*** *25 cm.*
>
> ***Teacher*** *Let me put what you said in a ratio table. Does this look like a record of your thinking?*



> ***Teacher*** *In the last question I asked, Amanda was able to solve the problem efficiently. I wonder if we could do the same here. Let's put the information we know in a ratio table.*

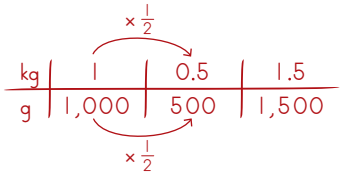
> ***Teacher*** *Can anyone think of a way to get from 10 to 250?*
>
> ***Matt*** *Oh! Yeah! It's just times 25. So if you do the same on the top, it's 25 centimeters.*
>
> ***Teacher*** *I wonder if putting the information in a ratio table helped you to see the connection. What do you think?*

6 Pose two additional questions for students to think about:

- How many grams are equivalent to 1.5 kilograms?
- 2,300 milligrams are equivalent to how many grams?

After allowing students time to solve the problems, discuss their solutions.

> ***Teacher*** *Kyra, tell us about how many grams are equivalent to 1.5 kilograms please.*
>
> ***Kyra*** *Well, one kilogram is 1,000 grams, and then .5 is the same as one-half, so it's another half a kilogram. That's 500 grams. I got 1,500 grams altogether.*



> ***Teacher*** *Alana, I saw that you just wrote your answer down. Can you tell us your thinking?*

Alana *I thought that since there are 1,000 gram in every kilogram, I could just multiply 1.5 by 1,000. I know 1.5 times 10 is 15, and 1.5 times 100 is 150, and 1.5 times 1,000 is 1,500.*

Teacher *Troy, will you please share your thinking for the last question?*

Troy *Yes. I wanted to figure out the 2,000 part first, and since I know that each 1,000 mg is a gram, that's worth 2 g. Then I had 300 mg left. I knew it couldn't be a whole gram because it wasn't 1,000 mg. I was thinking about how I had 300 out of the 1,000 I needed, and I wrote down $^{300}/_{1,000}$. That is the same as .300, or .3. In all I got 2.3 kg.*

kg	1	2	0.3	2.3
g	1,000	2,000	300	2,300

Darnell *That makes sense, but I did it differently. It was more like what Kyra said. Since I knew there were 1,000 grams in a kilogram, I went backward by a thousand. 2,300 divided by ten is 230, then 2,300 divided by 100 is 23, and 2,300 divided by 1,000 must be 2.3!*

7 Display a copy of the Different Measures Student Book page and ask student to find the page in their books. Review the directions, and let students know that they will have the rest of the session to complete the page.

While students work, circulate to answer questions, provide support, and observe strategies. Make note if you notice questions that are challenging for many students.

ELL Paraphrase story problems as needed. Review the common prefixes of measurements and their meanings.

SUPPORT Help students represent their thinking on a ratio table, especially if they are struggling to understand if they are converting from a larger to smaller or smaller to larger unit.

CHALLENGE Challenge students to think about conversions in the U. S. customary system, and discuss whether a "place value shift" approach works when solving problems like these. Assign the Challenge problem on the page.

8 When there are about five minutes left in the session, gather students and answer any questions they have. Take a few moments to address any concerns that you saw while circulating.

9 Close the session.

Daily Practice

The optional Meters & Meters Student Book page provides additional opportunities to apply the following skills:

- Add and subtract decimals to hundredths, using concrete models or drawings and strategies based on place value, properties of operations, and the relationship between addition and subtraction (5.NBT.7)
- Convert among different-sized standard measurement units within a given measurement system (5.MD.1)

Session 4
Place Value Patterns

Summary

Students participate in a problem string that reinforces some of the place value patterns they have encountered over the past several sessions. They spend the rest of the session visiting Work Places. At the end of the session, the teacher introduces and assigns the Very Small & Very Large Numbers Home Connection.

Skills & Concepts

- Demonstrate an understanding that in a multi-digit number, each digit represents ten times what it represents in the place to its right, and one-tenth what it represents in the place to its left (5.NBT.1)
- Explain patterns in the placement of the decimal point when multiplying or dividing by powers of 10 (5.NBT.2)
- Add decimals to hundredths, using concrete models or drawings and strategies based on place value (5.NBT.7)
- Look for and make use of structure (5.MP.7)
- Look for and express regularity in repeated reasoning (5.MP.8)

Materials

Copies	Kit Materials	Classroom Materials
Problem String Place Value Patterns		
		• student math journals
Work Places in Use		
2B Racing Fractions (introduced in Unit 2, Module 2, Session 2) **2C** Target Practice (introduced in Unit 2, Module 2, Session 5) **3A** Beat the Calculator: Fractions (introduced in Unit 3, Module 1, Session 3) **3B** Draw & Compare Decimals (introduced in Unit 3, Module 2, Session 1) **3C** Round & Add Tenths (introduced in Unit 3, Module 2, Session 3) **3D** Target One (introduced in Unit 3, Module 2, Session 4)		
Home Connection		
HC 55–56 Very Small & Very Large Numbers		
Daily Practice		
SB 104 Measurements		

HC – Home Connection, **SB** – Student Book, **TM** – Teacher Master
Copy instructions are located at the top of each teacher master.

Vocabulary

An asterisk [*] identifies those terms for which Word Resource Cards are available.

decimal*
divide*
multiply*
pattern*
powers of 10

Preparation

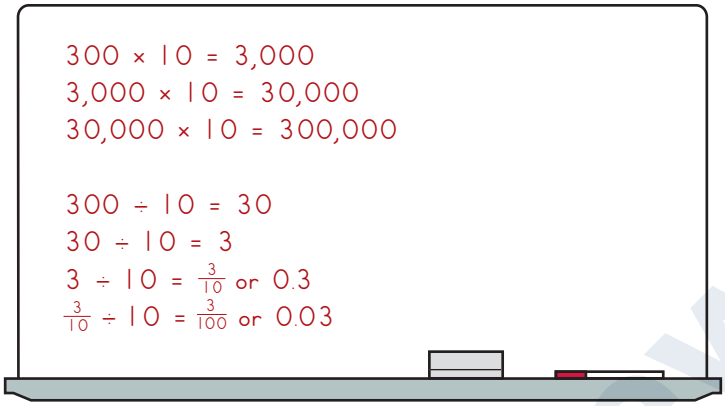
Write a list of Work Places from which students can choose today. You can just write the numbers (2B–3D) or write out the full names if you prefer. (See the Work Places in Use row of the Materials Chart for the complete list of Work Places in use today.)

Problem String

Place Value Patterns

1 Open the session by asking students to turn to a partner and talk about what happens when you multiply or divide 300 by 10, and then by 10 again, and then by 10 again.

- After students have had a minute to share ideas with a neighbor, invite volunteers to share with the group.
- Record equations on the board to make students' thinking visible to their classmates.



- Invite other students to find and describe patterns.
  - » What happens to the number of zeros in the products as 300 is multiplied by 10 again and then again?
  - » What happens to the decimal point as 300 is divided by 10 again and again?
- Then explain that you're going to have them do a problem string today that will provide more opportunities to investigate place value patterns, after which they'll visit Work Places.
- Have students date and label the next available math journal page for today's problem string.

2 Deliver each problem in the string one at a time by writing it on the board.

For each of the problems in today's string:

- Present the problem.
- Allow students time to record the answer in their journals.
- Ask students to share their thinking as you record with equations.

Problem String Place Value Patterns, Part 1

Problems	Sample Strategies & Recording	Connections
250.0 + 250.0	250.0 + 250.0 = 500.0	**Big Idea** Students will likely just know, and immediately record answers to each of these combinations. The larger point to be made has to do with place value patterns.
25.00 + 25.00	25.00 + 25.00 = 50.00	
2.500 + 2.500	2.500 + 2.500 = 5.000	
0.250 + 0.250	0.250 + 0.250 = 0.500	

3 Before moving on, ask students to share observations, first in pairs and then as a whole class, about the first four problems.

Here are some questions you might use to spark students' thinking:

- How are the problems in this first set of four alike? (All of them involve adding 25 and 25 of something—25 tens, 25 ones, 25 tenths, and finally 25 hundredths.)

- How are these problems different? (In each one, the addends are one-tenth the size of the addends in the previous problem; the answer to each problem is 10 times smaller than the one before it.)
- Find, describe, and explain patterns in the placement of the decimal point in the addends and sums. (With each new combination, the decimal point slides over one place to the left. There are 4 digits in each answer, but the decimal point moves over to the left each time, to show hundreds, tens, ones, and finally tenths.)
- When the addends in one problem are one-tenth the size of the addends in the previous problem, how do the sums compare? (The sum in the second problem is also one-tenth the size of the sum in the first problem.)

4 To further reinforce place value patterns, go back and work with input from the students to write each sum as the product of 5 times 100, 10, 1, or ⅒. When you're finished, ask students to comment on any patterns they notice, especially the position of the decimal point, which shifts one place to the left each time the multiplier decreases by a factor of 10. Encourage students to share ideas about how and why it does so.

Problem String Place Value Patterns, Part 2

Problems	Sample Strategies & Recording	Connections
250.0 + 250.0	250.0 + 250.0 = 500.0 = 5 × 100	
25.00 + 25.00	25.00 + 25.00 = 50.00 = 5 × 10	
2.500 + 2.500	2.500 + 2.500 = 5.000 = 5 × 1	
0.250 + 0.250	0.250 + 0.250 = 0.500 = 5 × ⅒	
0.28 + 0.22	0.28 – 0.03 = 0.25 0.22 + 0.03 = 0.25 = 0.50	Challenge students to use the give and take strategy to solve this combination in their journals. Then call on a volunteer to share as you model at the board with equations.
0.750 + 0.750	0.750 + 0.750 = 1.500 = 15 × ⅒	When you are finished, your recorded display on the board will look something like this, and students should have noted that as the addends and sums increase to 10 times their size from one problem to the next, the decimal point shifts one place to the right.
7.500 + 7.500	7.50 + 7.50 = 15.000 = 15 × 1	
75.00 + 75.00	75.00 + 75.00 = 150.00 = 15 × 10	
750.0 + 750.0	750.0 + 750.0 = 1500.0 = 15 × 100	
0.73 + 0.77	0.73 + 0.02 = 0.75 0.77 – 0.02 = 0.75 = 1.50	Challenge students to use the give and take strategy to solve this combination in their journals. Then call on a volunteer to share as you model at the board with equations.

Math Practices in Action 5.MP.8

Problem strings are a wonderful opportunity for students to look for and express regularity in repeated reasoning. In this session, the regularity they notice in these calculations with decimal numbers deepens their understanding of place value and contributes to computational fluency with multi-digit decimal numbers.

Work Places

5 After you finish the string, have students put away their math journals, get their folders, and choose a Work Place.

SUPPORT Suggest specific Work Places for struggling students to work on critical skills before the unit post-assessment at the end of the next module. You might also use this extended Work Place time to meet with students about whom you are the most concerned.

6 Close the session.

Home Connection

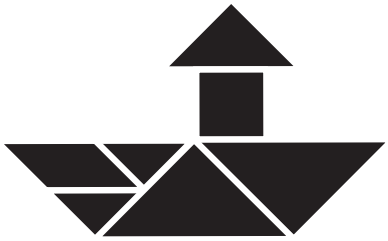
7 Introduce and assign the Very Small & Very Large Home Connection, which provides more practice with the following skills:

- Read and write decimals to thousandths represented with base ten numerals (5.NBT.3a)
- Round decimals to the nearest tenth, hundredth, and the nearest thousandth (5.NBT.4)
- Add and subtract decimals to hundredths, using concrete models or drawings and strategies based on place value, properties of operations, and the relationship between addition and subtraction (5.NBT.7)
- Convert among different-sized standard measurement units within a given measurement system (5.MD.1)

Daily Practice

The optional Measurements Student Book page provides additional opportunities to apply the following skills:

- Round decimals to the nearest one, tenth and hundredth (5.NBT.4)
- Add and subtract decimals to hundredths, using concrete models or drawings and strategies based on place value, properties of operations, and the relationship between addition and subtraction (5.NBT.7)
- Convert among different-sized standard measurement units within a given measurement system (5.MD.1)



Teacher Masters

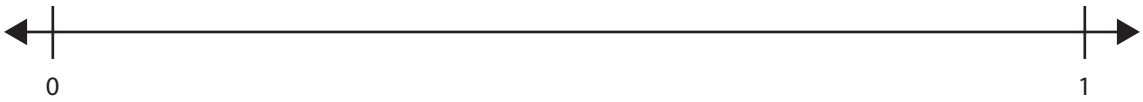
GRADE 5 – UNIT 3 – MODULE 3

BRIDGES®
IN MATHEMATICS

NAME | **DATE**

Decimal Place Value Checkpoint 2

1 Order the following by putting them in approximately the correct place on the number line: 0.56, 0.372, 0.37, 0.943, 0.09.



2 Round each number.

Number	To the Nearest 1	To the Nearest Tenth	To the Nearest Hundredth
7.385			
4.029			
15.068			

3 Write the symbol >, =, or < to compare each pair of decimal numbers.

7.110 ___ 7.011 7.009 ___ 7.090 7.801 ___ 7.80 7.029 ___ 7.201

4 Find the sums and differences. Show your work.

a 7.99 + 2.46

b 8 – 0.21

c 8 – 7.98

Memory Bytes & More Forum Planner

Use this planner to make a record of the strategies you see students using to solve problems during Session 1. Prior to Session 2, use the third column to indicate the order in which you plan to have students share during the forum.

Strategies for Solving Decimal Subtraction Problems

Strategy	Student Names and Notes	Order of Sharing in Forum
Problem 2a (How many megabytes were downloaded if Paula started with 6.51 MB and ended with 23.15 MB?)		
Find the Difference 6.51 + 0.49 = 7.00 7.00 + 3.00 = 10.00 10.00 + 13.15 = 23.15 0.49 + 3.00 + 13.15 = 16.64, so 6.51 + 16.64 = 23.15, or 23.15 – 6.51 = 16.64		
Problem 3a (How much memory is in use after deleting 6.51 of 23.15 megabytes of songs?)		
Removal (Take Away) 23.15 – 0.15 = 23.00 23.00 – 6.00 = 17.00 17.00 – 0.36 = 16.64		
Problem 5 (How much memory is free after Tyler deletes 2.75 of 7.59 gigabytes of data on a media player that has 7.92 GB of space?)		
Find the Difference 2.75 + 0.25 = 3.00 3.00 + 4.59 = 7.59 0.25 + 4.59 = 4.84, so 2.75 + 4.84 = 7.59, or 7.59 – 2.75 = 4.84		
Constant Difference 7.59 + 0.25 = 7.84 – 2.75 + 0.25 = 3.00		

Student Book

GRADE 5 – UNIT 3 – MODULE 3

BRIDGES®
IN MATHEMATICS

NAME | DATE

Memory Bytes page 1 of 2

Use the information below to help you with the problems that follow.

- 1 gigabyte (GB) is equal to 1,000 megabytes (MB).
- 1 megabyte (MB) is equal to 1,000 kilobytes (KB).
- 1 kilobyte (KB) is equal to 1,000 bytes.

Paula downloaded some music to her new MP3 player.

1 She downloaded one song that was 3.82 MB and another song that was 2.69 MB.

a How many **megabytes** of memory do the two songs use?

b How many **kilobytes** of memory do Paula's two songs use?

c How many **bytes** do Paula's two songs use?

2 The next day, Paula downloaded more songs. Once she was finished, her MP3 player said it had 23.15 MB of memory used.

a How many **megabytes** did the new songs use?

b How many **kilobytes** did the new songs use?

3 A few days later, Paula deleted 6.51 MB of songs from her MP3 player.

a Now how much memory is being used?

b How many **bytes** did Paula delete?

(continued on next page)

NAME | DATE

Memory Bytes page 2 of 2

Tyler's media player plays both music and video (such as television shows and movies). It holds 7.92 GB of songs and videos.

4 The memory display on Tyler's media player says "7.59 GB used."

a How many gigabytes of memory are still available in the media player?

b How many megabytes is that?

c How many kilobytes is that?

d How many bytes is that?

5 Tyler deleted 2.75 GB of TV shows from his media player. Now how much memory is being used?

6 After deleting the TV shows, Tyler added two movies to his media player. The memory display now says "7.61 GB used." How many gigabytes of memory do his new movies use?

7 **CHALLENGE** Tyler added some songs to his media player, and now 7.69 GB of the player's storage is full. He wants to download some episodes of a TV show that together take up 2,250 MB. Does he have enough room?

NAME | DATE

Olympic Story Problems

1 In the 2012 London Summer Olympics, Jamaican sprinter Usain Bolt ran the 200-meter sprint in 19.32 seconds, coming in first place. The sprinter who came in second, Yohan Blake, finished the race in 19.44 seconds. By how much did Bolt win the race? Show all your work.

a The sprinter who came in third, Warren Weir, finished in 19.84 seconds. Did Bolt run the race more or less than a half-second faster than the third place finisher? Show all your work and explain how you can tell.

2 In the 2012 London Summer Olympics, Usain Bolt set a new Olympic record when he ran the 100-meter sprint in 9.63 seconds. Is that less than half, exactly half, or more than half as long as it took him to run the 200-meter sprint? Show all your work.

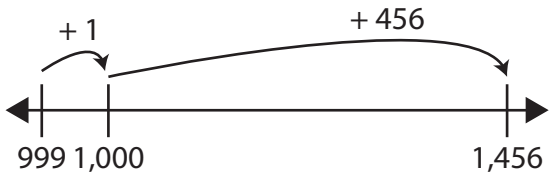
NAME | DATE

Vertical Problems page 1 of 2

Give and Take Strategy for Addition

1 Fill in the answer.

999	+ 1	1,000
+ 457	− 1	+ 456



2 Fill in the answers. As you work, think about how the give and take strategy is used.

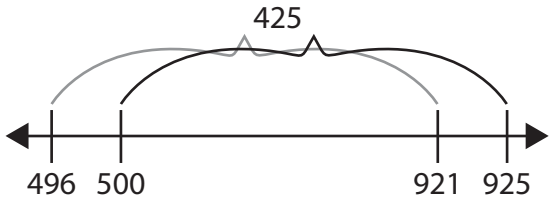
4.78	− 0.01	4.77	4.78	+ 0.02	4.80
+ 2.39	+ 0.01	+ 2.40	+ 2.39	− 0.02	+ 2.37

4.78	+ 0.22	5.00	4.78	− 0.61	4.17
+ 2.39	− 0.22	+ 2.17	+ 2.39	+ 0.61	+ 3.00

Constant Difference Strategy for Subtraction

3 Fill in the answer.

921	+ 4	925
− 496	+ 4	− 500



4 Fill in the answers. As you work, think about the two different ways in which the problem has been changed, and compare them. Which seems easier? Why?

7.78	+ 0.11	7.89	7.78	+ 0.22	8.00
− 2.89	+ 0.11	− 3.00	+ 2.89	+ 0.22	− 3.11

(continued on next page)

NAME | DATE

Vertical Problems page 2 of 2

Adding & Subtracting Decimals

5 Use the give and take strategy for addition to solve these problems. What can you take from one addend and give to the other to make each problem easier?

75.6 + 29.9	4.76 + 4.38
1.93 + 7.38	0.68 + 0.97
57.80 + 7.38	0.88 + 20.37

6 Use the constant difference strategy for subtraction to solve these problems. What can you add or subtract to or from both numbers to make each problem easier?

7.78 – 2.89	13.02 – 1.99
5.30 – 2.89	14.32 – 3.95
6.10 – 0.93	25.35 – 2.80

NAME | DATE

More Memory Bytes

Use the information below to help you solve the following problems:

- 1 gigabyte (GB) is equal to 1,000 megabytes (MB).
- 1 megabyte (MB) is equal to 1,000 kilobytes (KB).
- 1 kilobyte (KB) is equal to 1,000 bytes.

1 Write and solve an equation for each problem.

a How many bytes are in 6 KB? _____

b How many bytes are in 84 KB? _____

c How many kilobytes are in 4 MB? _____

d How many kilobytes are in 39 MB? _____

e How many megabytes are in 8 GB? _____

f How many megabytes are in 92 GB? _____

g How many bytes are in 7 MB? _____

h How many bytes are in 15 MB? _____

i How many kilobytes are in 2 GB? _____

j How many bytes are in 3 GB? _____

3 Madeline has a song that uses 2.35 MB of memory.

a How many kilobytes is that?

b How many bytes is that?

4 Madeline buys three songs. One uses 1.73 MB of memory, another uses 2.08 MB, and the third uses 3.99 MB. How many megabytes does Madeline need to store her new songs? Show your work.

NAME | DATE

Equivalent Measures

1 kilometer (km) = 1,000 meters (m) 1 meter (m) = 100 centimeters (cm) 1 centimeter (1 cm) = 10 millimeters (mm)

1 kilogram (kg) = 1,000 grams (g) 1 gram (g) = 1, 000 milligrams (mg)

1 liter (l) = 1, 000 milliliters (ml)

NAME | DATE

Different Measures

1 Solve each of the following.

a 64 cm = _____ mm **b** 125 km = _____ m **c** 3,500 mg = _____ g

d 4.3 l = _____ ml **e** 300 mg = _____ g

2 Carlton ran 1.3 kilometers on Monday and 2.4 kilometers on Tuesday. How many meters did he run on both days? Show your work.

3 Maria Jose weighed both of her pets. Her parakeet weighs 30 grams, and her turtle weighs 600 grams. How many kilograms do her pets weigh together? Show your work.

4 Walt drinks an average of 10.5 liters of water every Monday through Friday, and only 3 liters of water on the weekend. How many more milliliters of water does Walt usually drink during the weekdays than during the weekends? Show your work.

5 **CHALLENGE** Lindy was making an obstacle course for her friends to follow. She marked a 0.8 kilometer run, a 100 meter jump rope path, and a 50 meter belly crawl path. After her friends complete the course, how many kilometers will they have gone? How many meters? Centimeters? Show your work.

NAME | DATE

Meters & Meters

1 Use the information below to help you with the following problems:

- 1 kilometer (km) = 1,000 meters (m)
- 1 meter (m) = 100 centimeters (cm)
- 1 centimeter (cm) = 10 millimeters (mm)

a How many millimeters are in 5 cm?

b How many millimeters are in 48 cm?

c How many centimeters are in 9 m?

d How many centimeters are in 37 m?

e How many meters are in 6 km?

f How many meters are in 79 km?

g How many meters are in 7 km?

h How many millimeters are in 8 km?

2 Tyler is training for a running race. On Monday, he ran 8.67 km. On Tuesday, he ran 9.54 km. On Wednesday, he ran 7.99 km.

a How far did Tyler run on Monday, Tuesday, and Wednesday? Show your work.

b How much farther did Tyler run on Tuesday than on Wednesday? Show your work.

NAME | DATE

Measurements

1 Round the following measurements to the nearest whole number.

a 4.32 cm _____

b 10.09 ml _____

c 287.5 km _____

2 Round the following measurements to the nearest tenth.

a 3.01 g _____

b 67.54 m _____

c 599.93 l _____

3 Round the following measurements to the nearest hundredth.

a 15.175 kg _____

b 25.105 mm _____

c 1.006 MB _____

4 There are 1000 meters in a kilometer. How many meters are in 8.59 kilometers?

5 There are 100 grams in a hectogram. How many grams are in 17.84 hectograms?

6 Fill in the blanks.

a 0.68 + _____ = 0.7 + 0.37

b 1.26 – 0.74 = 1.25 – _____

Home Connections

GRADE 5 – UNIT 3 – MODULE 3

BRIDGES®
IN MATHEMATICS

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Decimal Practice page 1 of 2

1 Fill in the blanks to convert the units in each problem below. The following information may help you:

- 1 gigabyte (GB) is equal to 1,000 megabytes (MB).
- 1 megabyte (MB) is equal to 1,000 kilobytes (KB).
- 1 kilobyte (KB) is equal to 1,000 bytes.

a 9 KB = _____ bytes

b 43 KB = _____ bytes

c 9.6 KB = _____ bytes

d 8 MB = _____ KB

e 41 MB = _____ KB

f 7.3 MB = _____ KB

g 7 GB = _____ MB

h 56 GB = _____ MB

i 2.4 GB = _____ MB

j 16 MB = _____ bytes

2 Round each decimal number to the nearest whole number.

a 5.3

b 16.8

c 21.25

(continued on next page)

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Decimal Practice page 2 of 2

3 Round each number to the nearest tenth.

a 8.85

b 12.09

c 100.15

4 Round each number to the nearest hundredth.

a 24.275

b 36.308

c 3.495

5 Add or subtract the decimals.

2.03	5.01	25.67	100.00
+ 4.78	– 3.98	+ 14.32	– 96.75

6 Isabella is building a tree fort. The base of the fort is 78 inches wide by 92 inches long.

a What is the area of the base in square inches? Show your work.

b **CHALLENGE** What is the area of the base in square feet? Show your work.

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Very Small & Very Large Numbers page 1 of 2

1 Write two fractions that are equal to each decimal number.

0.1 _____ and _____ 0.01 _____ and _____

0.001 _____ and _____ 0.05 _____ and _____

2 Complete the chart below.

					Challenge	
Number	**0.1 less**	**0.1 greater**	**0.01 less**	**0.01 greater**	**0.001 less**	**0.001 greater**
1.2	1.1	1.3	1.19	1.21	1.199	1.201
8.73						
4.06						
6.9						
2.896						
6						

3 Round each number to the place shown to complete the chart below.

			Challenge
Number	**Nearest tenth (0.1)** Look at the 0.01 place.	**Nearest hundredth (0.01)** Look at the 0.001 place.	**Nearest thousandth (0.001)** Look at the 0.0001 place.
0.1629	0.2	0.16	0.163
0.9608			
0.0274			
6.0085			

(continued on next page)

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Very Small & Very Large Numbers page 2 of 2

4 A micrometer is one-millionth of a meter (0.000001 m): ten thousand times as short as a centimeter (0.01 m). How many micrometers long is one edge of a centimeter cube?

5 The football team for the University of Tennessee, the Tennessee Volunteers, plays its home games in the Neyland Stadium in Knoxville, Tennessee. The stadium holds about 100,000 people. (You can do an image search on the internet to see what this many people looks like.)

a How many stadiums would it take to hold 1 million people (a bit less than the number of people living in Dallas, Texas)?

b According to estimates, there are over 300 million people living in the United States. How many Neyland Stadiums would it take to hold 300 million people?

6 The table below shows the estimated population of different countries as of 2012. Round each number to complete the table.

Country	Population	Nearest 1,000,000	Nearest 100,000	Nearest 10,000
Philippines	103,775,000	104,000,000	103,800,000	103,780,000
Iran	78,868,710			
France	65,630,690			
South Korea	48,860,500			
Argentina	42,192,490			
Sudan	34,206,710			

