Grade 5

Math

Coursebook

Oak Meadow

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1 Addition and Carrying

Mental Math

Mental math games are simple to do and provide a great mental workout that will get your brain all warmed up for learning something new. The only rule is to **do the math in your head**, without writing it down. (If you want to use your fingers and talk aloud while you are figuring out the answer, that's fine.) After you arrive at your answer, you might want to write it down and then do the problem on paper to check your answer. It's fun to do mental math games with other people—you can take turns challenging each other.

Here's the mental math game for this lesson. There are two different versions so you can play the game several times this week, whenever you sit down to do your math work.

ASSIGNMENT SUMMARY

- ☐ Play mental math games.
- ☐ Read New Skills instruction.
- ☐ Complete Lesson 1 New Skills Practice.
- ☐ Complete Lesson 1 Test and Learning Checklist.

Version 1: Play a card game where each person draws two cards at a time and adds them up. The player with the highest pair collects all four cards and sets them aside. Keep going until the whole deck is used up. See who ends up with the most cards.

Version 2: Draw two cards at a time from a deck and double each card before adding the two numbers together. For instance, if you draw a 3 and a 5, you will first double them (resulting in 6 and 10), and then add the two numbers together (16). For a bigger challenge, triple each card before adding the numbers together.

New Skills

Adding Whole Numbers Using Carrying

We'll start the year with some skills you'll probably remember from last year. When we add numbers with digits that total more than nine, we need to move or "carry" one digit over to the next place value column.

Example: Add 79 and 156.

$$\begin{array}{r} {\scriptstyle 1\ 1\ \ } \\ 79 \\ +156 \\ \hline 235 \end{array}$$

Write both numbers so the place value columns are lined up, then start from the right and add each column. Add 6 and 9, which gives you 15. Write the 5 below the line and carry the 1 to the next column, writing it above the 7. Then add 7 and 5, which gives you 12, and add the 1 you carried, and this gives you 13. Write the 3 below the line and carry the 1, writing it at the top of the next column. Next, add the 1 in the bottom row to the 1 you carried, and you get 2. Write that down below the line, for a final answer of 235.

Example: Add 408 and 604.

$$\begin{array}{r} {\scriptstyle 1\ \ \ } \\ 408 \\ +604 \\ \hline 1{,}012 \end{array}$$

Add 8 and 4, which gives you 12. Write the 2 below the line and carry the 1 to the next column, writing it above the 0. Add 1, 0, and 0 and you get 1, which you write below the line. Finally, add 6 and 4 to get 10. Write it below the line. Since the answer is larger than three digits, you'll need to include a comma, so count three digits from the right and add a comma.

Solving Word Problems Using Addition

Word problems give you a chance to use your math skills in a practical way to practice solving problems that arise in the world around you.

When problems arise in your everyday life that require you to use math, these problems don't come with labels that say, "addition problem" or "subtraction problem." You have to be able to look at the problem and figure out what skill you'll need to use to solve the problem. To do this, you have to look for certain clues.

Addition problems always involve finding the total amount of several items. These problems can take a variety of forms, but there are common words that are used, such as *all*, *together*, and *total*. Whenever you see words such as these, you know you'll use addition to solve the problem.

Example: John has 24 books in his room and Mary has 33 books. How many books do they have together?

$$\begin{array}{r} 24 \\ +\,33 \\ \hline 57 \end{array}$$

When solving a word problem, you translate your numeric answer (57) into words, writing a complete sentence: *They have 57 books together.* Always include the unit you are measuring in your answer (in this case, books).

Notice that question could have been, "How many books do they have in all?" or "What is the total number of books they have?" and the solution would have been the same.

Another kind of addition problem involves an item that is increased by more items of the same kind, and you must find out the new total. These are *then and now* problems, because they involve a change between the way something used to be and the way it is now.

Example: Crystal's puppy used to weigh 19 pounds. In the past week, the puppy has gained 2 more pounds. How much does she weigh now?

$$\begin{array}{r} {\scriptstyle 1} \\ 19 \\ +\ \ 2 \\ \hline 21 \end{array}$$

The answer is written in a complete sentence: *Crystal's puppy now weighs 21 pounds.*

Adding Columns of Whole Numbers

Often you have to add more than two numbers. To do this, you have to add the numbers in a column.

Example: Add 34, 205, and 19.

$$\begin{array}{r} {\scriptstyle 1} \\ 34 \\ 205 \\ +\ \ 19 \\ \hline 258 \end{array}$$

The most important point to remember when you're adding columns of numbers is to **keep the numbers lined up properly** according to place value. This means to keep all the ones places, tens places, and hundreds places in a straight line. Once all the digits are lined up properly, just add and carry each column of digits as you would normally.

Example: Add 19, 97, 351, 209, and 55.

$$\begin{array}{r} {\scriptstyle 2\ 3\ \ } \\ 19 \\ 97 \\ 351 \\ 209 \\ +\ \ 55 \\ \hline 731 \end{array}$$

New Skills Practice

Complete the following worksheets in your math workbook:

- Lesson 1 New Skills Practice: Adding, Carrying, and Columns of Numbers
- Lesson 1 Test

Show all your work and write a complete sentence for each word problem. Remember to include the label of what you are measuring (pounds, years, miles, apples, etc.).

When you complete the Lesson 1 New Skills Practice, **check your answers** in the back of the workbook. Circle any incorrect answers on your worksheet, and then redo these problems to try to get the correct answer. If you need help, please ask an adult or go back over the instructions in this lesson. Once you understand the material, complete the Lesson 1 Test (also found in the math workbook). Your parent will check your answers for the test and have you redo any incorrect problems.

If you need more practice with any of these skills, you will find additional practice worksheets in the back of the workbook. Each extra practice worksheet is also listed in the table of contents so you can easily find the one you need. These extra practice worksheets are not required assignments; they are only there if you want more practice.

FOR ENROLLED FAMILIES

You will be sending the Lesson 1 Test to your Oak Meadow teacher at the end of the next lesson. Please score the Lesson 1 Test, and write the number correct over the total number at the top of the page. For instance, if there are 25 problems in the test and your student gets two wrong, you would write $\frac{23}{25}$ at the top. Circle any incorrect problems, and have your student redo them. Encourage your child to talk through the problem aloud so you can see where the error occurred and help your child fix it.

Please have your child check the answers and make corrections on any practice worksheets. These are not being sent to your teacher, but your student will gain valuable skills and confidence from doing them. **All math work must be checked and corrected** so that your student learns how to perform each skill accurately and consistently. You should always check the answers and score the lesson tests so that you can help your child with any skills that are problematic.

In the meantime, feel free to contact your teacher if you have any questions about the assignments or the learning process. You can use the Learning Checklist that your student fills out at the end of each lesson test to keep track of your child's progress.

Lesson

2

Place Value and Rounding

Mental Math

Here are some mental math games for this week. Remember, **do all the math in your head**. These games don't take long but they really help spark your brain activity. Do a quick mental math game to get your brain firing before every math session. Feel free to make up games of your own and get others involved.

Version 1: Add up the ages of everyone in your family. Feel free to include pets, friends, grandparents, and neighbors. See how high you can get.

Version 2: Start with the age of the oldest person in your family. Subtract your age from that number. Then subtract your age from the age of the second oldest person in the family. See how many ways you can play with the ages of family members. For instance, if you add up all the children's ages (you can include pets' ages, too, if you'd like), do they add up to more or less than the age of one parent?

ASSIGNMENT SUMMARY

- ☐ Play mental math games.
- ☐ Do the Lesson 2 Skills Check worksheet.
- ☐ Read New Skills instruction.
- ☐ Complete Lesson 2 New Skills Practice.
- ☐ Complete Lesson 2 Test and Learning Checklist.

Skills Check

In the last lesson, you worked on adding, carrying, and columns of numbers. Do the following worksheet (found in your math workbook) to keep your skills sharp and clear up any areas of confusion.

- Lesson 2 Skills Check

New Skills

Adding Larger Whole Numbers

The addition process that we used with 2- and 3-digit numbers is the same process that's used with larger numbers. In fact, there's no limit to the size of numbers you can add using this same process. You just align each number according to place value (making sure the ones line up, the tens line up, etc.), and then add one column at a time (starting with the last digit on the right). Carry any necessary digits over to the next place value column. If the answer is more than three digits, always remember to count three places from the right and insert a comma.

Example: Add 798 and 3,476

$$\begin{array}{r} {\scriptstyle 1\ \ 1\ 1\ \ } \\ \ \ 798 \\ +3{,}476 \\ \hline 4{,}274 \end{array}$$

If problems are presented in a horizontal format (beside each other), instead of in a vertical format (above each other), simply convert the problem to a vertical format and solve as usual. Remember to align the last digits and keep all the other digits aligned.

Example: 5,927 + 163

$$\begin{array}{r} {\scriptstyle 1\ \ \ \ 1\ \ } \\ 5{,}927 \\ +\ \ \ 163 \\ \hline 6{,}090 \end{array}$$

Identifying Place Value

In any whole number, each digit occupies a certain place in the number, and this place has a particular value. So we say that each digit in a number has a certain place value. With whole numbers, we count place value from the digit at the right and move to the left. For example, in the number 248,967 the place value of each digit is as follows:

Hundred Thousands	Ten Thousands	Thousands	Hundreds	Tens	Ones
2	4	8,	9	6	7

What does a place value mean? It tells us the value of any particular digit in that number. For example, the 7 in the number above is in the ones place, so it is worth 7 ones, or just 7. The digit 6 is in the tens place, so it's worth 6 tens, or 60. The digit 9 is in the hundreds place. This means that it is worth 9 hundreds, or 900. The 8 is in the thousands place, so it's worth 8 thousands, or 8,000. The 4 is in the ten thousands place, so it's worth 4 ten thousands, or 40,000. Finally, the 2 is in the hundred thousands place, so it is worth 2 hundred thousands, or 200,000. Notice that the comma always separates the hundreds place from the thousands place.

Why is place value important? First, it enables us to read numbers correctly, so that when we see a number like the one above, we can correctly name it *two hundred forty-eight thousand, nine hundred sixty-seven*. Also, it helps us to complete basic operations in math. For example, when we are adding and have to carry digits from one column to another, we are using place value. Look at the following example:

$$\begin{array}{r} {\scriptstyle 1\ 1\ \ } \\ 196 \\ +\ \ 47 \\ \hline 243 \end{array}$$

When we add 6 and 7 to get 13, we bring down the 3 and carry the 1 to the next column. When we do this, what we're actually doing is separating the tens digit from the ones digit in the number 13 and putting each digit where it belongs, with other digits that have the same place value. In the number 13 above, the 3 is in the ones place, so we bring it down below the line and leave it in the ones place. Since the 1 in the number 13 is in the tens place, we move it to the top of the tens place so we can add it to the other digits that are there. Although we put a 1 there, we're actually carrying 1 ten, or 10. We continue to add and carry in this same way with the other digits in the number.

Example: What is the value of the 7 in 579?

The 7 is in the tens place, so the value is 7 tens, or 70.

Example: What is the value of the 5 in 563,248?

The 5 is in the hundred thousands place, so the value is 5 hundred thousands, or 500,000.

Writing Large Numbers in Words

When we want to write a large number using words instead of numerals, there are a few rules that can help. The first rule is to **write it like you would say it**.

For a three-digit number, like 317, you would say or write *three hundred seventeen*. Note that there is no "and" in this number—the number is **not** *three hundred and seventeen*.

For a four-digit number, you'd first say or write the number in the thousands place and then the three-digit number that follows. So 4,317 would be *four thousand, three hundred seventeen*. Again, note that there is no "and" in this number—the number is **not** *four thousand and three hundred seventeen*.

For a five-digit or six-digit number, you'd follow the same rules:

54,317 *fifty-four thousand, three hundred seventeen*

154,317 *one hundred fifty-four thousand, three hundred seventeen*

Notice that the comma is ALWAYS in the same place whether you are writing in words or in numbers, and the word "and" is not used in any whole number.

Many people get confused about when to use a hyphen when writing numbers. You only need a hyphen if you have a compound number—a number that is made up of two words, like fifty-four or thirty-seven. Hyphens are not needed to attach number words to place value words like *million, thousand*, or *hundred*. You wouldn't write *three-hundred-fifty* for 350, but instead write *three hundred fifty*.

So that's it! That's all the rules. You can apply these three rules to any number, no matter how large.

1. **Write it like you would say it.**
2. **Only use a hyphen for compound numbers from twenty-one to ninety-nine.**
3. **Put a comma where the comma goes in the number itself.**

Example: Write 395,264 in words.

Three hundred ninety-five thousand, two hundred sixty-four

Example: Write 208,501 in words.

Two hundred eight thousand, five hundred one

When writing numbers in words, sometimes people will add "and" in place of a zero when they are writing or speaking (such as *two hundred **and** eight thousand, five hundred **and** one*) but this is not correct. Just refer to the three rules above if you get confused.

Place Value up to One Billion

So far you've explored place values from ones to hundred thousands, but numbers, of course, can go much higher than that. The range of numbers extends into millions, billions, trillions, quadrillions, and far beyond. In this course, however, we will only explore place value as far as billions. To understand the place relationship of these larger numbers, look at the following example of the place values for the number 3,258,961,470:

(one) Billions	Hundred Millions	Ten Millions	(one) Millions	Hundred Thousands	Ten Thousands	(one) Thousands	Hundreds	Tens	Ones
3,	2	5	8,	9	6	1,	4	7	0

If we were to say this number aloud, we would say *three billion, two hundred fifty-eight million, nine hundred sixty-one thousand, four hundred seventy.* At first, this may just look like a lot of confusing numbers, but if you look closely you can see that there is a pattern to it.

Each major place is a thousand times as large as the last (three zeros more), so if we write out the major divisions, they look like this:

One	1
One thousand	1,000
One million	1,000,000
One billion	1,000,000,000

After the ones place, each major place has a comma. There is a comma after thousands, a comma after millions, and a comma after billions. In between the commas, there are three places, and these places also form a pattern. Each major place is really the ones place of that value, so there is one, then one thousands, then one millions, then one billions. The ones place is always to the right of the tens place of that number, which is to the right of the hundreds place. For example, the (one) thousands place is followed by the ten thousands then the hundred thousands. Next follows (one) millions, then ten millions, then hundred millions. This pattern is always the same for every three digits.

We show this pattern when we add commas to large numbers. We start from the ones place, count 3 places and insert a comma. Then we count 3 more places and insert a comma, 3 more places and insert a comma, and so forth. The commas indicate the major places and make it easier to read the number.

Example: Write 5,693,009 in words.

Five million, six hundred ninety-three thousand, nine

Translating from words to numbers is easy because all you have to do is write the first number and a comma, then the next number and a comma, and keep going until all the words and commas are used up.

Example: Write seventeen billion, three hundred nine million, nine hundred thirty-two thousand, five hundred twelve.

17,309,932,512

Rounding Whole Numbers

Many times we don't need an exact answer to a question we have; we only need an approximate answer, especially when we are working with very large numbers. When this is the case, we often round a number to the nearest hundred, thousand, million, or other place value. When we round a number, we look one digit to the right of the place value that we want to round to. If this digit is 5 or more, we round up. If it's less than 5, we keep the present value. This sounds confusing, but the following examples will make this clearer.

Example: Round 12,763 to the nearest thousand.

The digit that is in the thousands place is 2, so we look one digit to the right of that place, which is 7 (in the hundreds place). Since 7 is more than 5, we round up. This means we add 1 to the 2 and make it 3, for a final answer of 13,000. Notice that the remaining digits following the rounded digit become zeros.

Rounding tells us that this number (12, 763) is closer to 13,000 than it is to 12,000, so we round up to 13,000.

Example: Round 14,251 to the nearest thousand.

Since we want to round to the nearest thousand, we look one digit to the right, which is the hundreds place. The digit in the hundreds place is a 2. Since this is less than 5, we keep the present value of the digit in the thousands place. So the final answer is 14,000. Rounding shows that 14,241 is closer to 14,000 than to 15,000, so we round down to 14,000.

Example: Round 1,850 to the nearest hundred.

This time we are rounding up or down to the nearest hundred. The digit in the hundreds place is 8, so we look one digit to the right to see what number is in the tens place. Since it is a 5, we round up (remember, if it's 5 or more, we round up), so the final answer is 1,900.

Example: Round 1,935,649 to the nearest million.

To round to the nearest million, we look at the 1 in the millions place and see that 9 is the next digit to the right. Since 9 is more than 5, we round the 1 up to a 2. The answer is 2,000,000.

New Skills Practice

Complete the following worksheets in your math workbook:

- Lesson 2 New Skills Practice: Place Value, Rounding
- Lesson 2 Test

The New Skills Practice worksheet lets you practice what you've just learned, and the test will cover all the skills covered so far. Remember to show all your work and write a complete sentence for each word problem, including the label of what you are measuring (pounds, years, miles, apples, etc.). If you need more practice with any of these skills, you can use the additional practice worksheets in the back of the workbook.

When you complete the New Skills Practice, **check your answers** in the back of the workbook. Circle any incorrect answers on your worksheet, and then redo these problems to try to get the correct answer. Ask for help if you need it, or go back over the instructions in this lesson. Once you understand the material, complete the Lesson 2 Test. Your parent will check your answers for the test and have you redo any incorrect problems.

FOR ENROLLED FAMILIES

After your student completes the Skills Check, New Skills Practice, and Lesson 2 Test, please have your student complete the Lesson 2 Assessment Test. Make sure the skills worksheets and the Lesson 2 Test have been corrected and your student has fixed any errors BEFORE taking the Assessment Test. All lesson tests should be scored (by you) and corrected (by your student) before being submitted to the teacher along with the Assessment Test. If you have any questions about this, please let your teacher know.

At the end of this lesson, submit the following three items to your Oak Meadow teacher:

- Lesson 1 Test
- Lesson 2 Test
- Lesson 2 Assessment Test

Do not include any of the practice worksheets (Skills Check, New Skills Practice, or extra practice worksheets).

Include any additional notes about the lesson work or anything you'd like your teacher to know. Feel free to include questions with your documentation—your teacher is eager to help.

If you have any questions about what to send or how to send it, please refer to your Parent Handbook and your teacher's welcome letter. Your teacher will respond to each submission of student work with detailed comments and individualized guidance. In the meantime, your student should proceed to lesson 3 and continue working.

Lesson

6 Checking Addition and Subtraction

Mental Math

Version 1: Using a deck of cards, draw two cards at once and subtract the smaller from the larger. The ace is worth 1 and each face card is worth 10. See how quickly you can get through the deck.

Version 2: Draw two cards and add them up. Then draw another two cards and add them together. Now subtract the smaller number from the larger. Keep going until the deck is finished.

Skills Check

You have been working on many different skills so far. Do the following worksheet and check your answers to keep your skills sharp.

- Lesson 6 Skills Check

New Skills

Checking Subtraction by Adding

When we have to do a lot of regrouping while subtracting, sometimes it can get very confusing, and when we're finished we're not sure if we have the correct answer. Fortunately, there is an easy way to check subtraction answers, so we can be sure that we have the correct answer.

Example: Subtract 489 from 7,012 and check your answer.

$$\begin{array}{r} {\scriptstyle 10} \\ 6\ 9\ \not{0}\ {}^{12}\not{2} \\ 7,\not{0}\not{1}\not{2} \\ -\quad 4\,8\,9 \\ \hline 6,5\,2\,3 \end{array}$$

ASSIGNMENT SUMMARY

- ☐ Play mental math games.
- ☐ Do the Skills Check worksheet.
- ☐ Read New Skills instruction.
- ☐ Complete New Skills Practice.
- ☐ Complete Lesson 6 Test and Learning Checklist.

First we solve the problem as usual, and we get the answer of 6,523. To check this answer, we add the answer, 6,523, to the number directly above it, 489. If we're correct, we should get 7,012, the original number on top.

$$\begin{array}{r} {\scriptstyle 1\ \ 1\ 1\ \ } \\ 4\,8\,9 \\ +\,6,5\,2\,3 \\ \hline 7,0\,1\,2 \end{array}$$

When you are checking your answer, begin by drawing a line below the answer (in this case, below 6,523), add a plus sign, and then do the math. If you end up with the same number that is at the top of the original problem (in this case, 7,012), you know your answer is correct.

Checking Addition by Subtracting

You can use the same technique to check addition problems; simply subtract one of the two numbers in the original problem from the answer. If your original answer is correct, the result should be the second number. For instance, if you added 18 and 12, your answer would be 30. If you subtract 12 from 30, you end up with 18—this lets you know that your original answer (30) is correct. Or you could subtract 18 from 30, and your answer would be 12, again letting you know that your original answer is correct.

From now on, you should get into the habit of always checking your work. This helps you avoid simple errors that result in an incorrect answer. Yes, it is more work, but it is an important skill to learn. Checking your work only takes a few extra seconds and it will make a big difference in eliminating mistakes.

New Skills Practice

Complete the following worksheets in your math workbook:

- Lesson 6 New Skills Practice: Checking Subtraction by Adding, Checking Addition by Subtracting
- Lesson 6 Test

Remember to show all your work—in this lesson, that means you will **solve the problem and then use addition or subtraction to check your answer**. Check your answers in the answer key and circle any incorrect answers before reworking these problems.

Once you understand the material, complete the Lesson 6 Test. You do not have to show your work when checking your answers on the test, but you can if you'd like (or you can check your answers on a scrap piece of paper, which is how you will normally do it throughout the course). Your parent will check your answers for the test and have you redo any incorrect problems.

FOR ENROLLED FAMILIES

At the end of this lesson, submit the following three items to your Oak Meadow teacher:

- Lesson 5 Test
- Lesson 6 Test
- Lesson 6 Assessment Test

Make sure the two lesson tests have been graded (by you) and then corrected (by your child). Do not include any of the practice worksheets with your submission.

Lesson 7

Graphs

Mental Math

Version 1: Recite your phone number—if you don't know it, this is a good time to learn it. Starting with the first two numbers, add the numbers together. For instance, if your phone number was 987-6543, first you would add 9 + 8. Then when you have the total, you would add 7 to that number, and keep adding the numbers to the total one at a time.

Version 2: Add up the numbers of your birthdate: year plus month plus day. For instance, if you were born on July 4, 2005, first you have to figure out which number month is July, counting from January as month 1 (July is the seventh month). Then you add the year plus month plus day (2005 + 7 + 4) in your head. Do this with the birthdates of several other people.

ASSIGNMENT SUMMARY

- ☐ Play mental math games.
- ☐ Do the Skills Check worksheet.
- ☐ Read New Skills instruction.
- ☐ Complete New Skills Practice.
- ☐ Complete Lesson 7 Test and Learning Checklist.

Skills Check

Do the following worksheet to practice some of the skills you have learned. Remember to always check your answers to be sure you are doing the problems correctly.

- Lesson 7 Skills Check

New Skills

Bar Graphs and Line Graphs

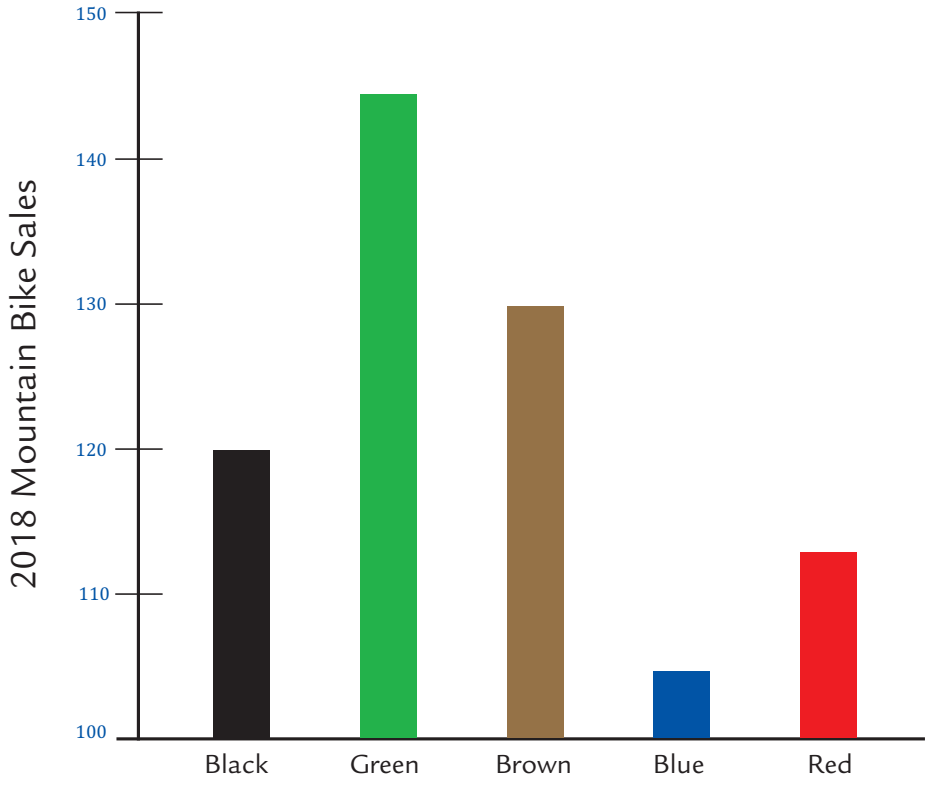
When we see a lot of information in a printed form, sometimes it can be very confusing. There is an old proverb that says, "A picture is worth a thousand words," and if we want to understand something better it often helps to convert the words into a picture. When we present information as a picture, we often use a form called a ***graph***. There are many different types of graphs, but two common types are bar graphs and line graphs.

Bar graphs are very useful when we want to show amounts of items in different categories.

Example: Jim's Bike Shop carries mountain bikes in five different colors: black, green, brown, blue, and red. In 2018, Jim sold the following numbers of these colors of mountain bikes:

Black	120
Green	145
Brown	130
Blue	105
Red	113

When we look at the information in this form, we can see the numbers and we can even compare them to each other, but we don't have a visual image of the comparative value of the numbers to one another. This is where a bar graph is very useful. When we display this information as a bar graph, it looks like this:



When we look at this graph, we can easily see that Jim's Bike Shop sold more green mountain bikes than any other color, and that blue was the least favorite color. The height of the bars indicates the value of the category that's printed below the bars. For example, the top of the bar labeled "Black" is even with 120, because Jim sold 120 black mountain bikes in 2018. The top of the bar labeled "Green" is midway between 140 and 150, because Jim sold 145 green mountain bikes in 2018. As you can see, it's called a bar graph because the colored bars show the information.

A bar graph has a ***vertical axis*** and a ***horizontal axis***. These are the two thin lines that start from the same point in the lower left corner and extend up and to the right. In this graph, the horizontal axis has words below it, and the vertical axis has numbers to the left of it.

The words at the bottom are categories. In this case, they are colors of mountain bikes. The numbers on the left represent, as the title says, "2018 Mountain Bike Sales." It's important always to put a label next to the numbers on the vertical axis, so that it's clear what the numbers represent.

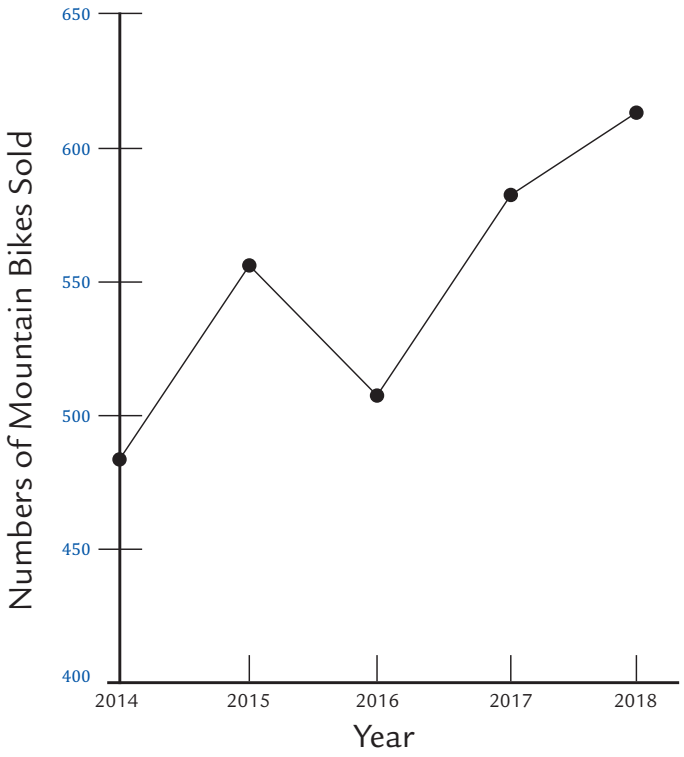
Just like when you are making a time line, the exact layout of the numbers on the vertical axis of a graph will vary depending upon the range of numbers you want to display. You should make sure that the difference between each number displayed is the same, and that there is equal spacing between the numbers, so the scale is accurate.

Bar graphs are very useful when we want to compare information for certain categories during a particular period of time. But when we want to present a visual display of information that occurs over time, a ***line graph*** is the appropriate kind of graph to use.

Example: Jim's Bike Shop sold the following numbers of mountain bikes in each year listed below. Show these sales figures on a line graph.

Year	Number Sold
2014	483
2015	558
2016	509
2017	587
2018	613

To create this graph, we draw the vertical axis and horizontal axis and enter the dates and numbers. Then we place a dot directly above the year at a level equal to the sales figures listed for that year. Once we've placed the dots, we simply connect them to create the line graph. This graph clearly shows the increases and decreases in sales during this period.



New Skills Practice

Complete the following worksheets in your math workbook:

- Lesson 7 New Skills Practice: Bar Graphs, Line Graphs
- Lesson 7 Test

Remember to show all your work. Check your answers and circle any incorrect answers before reworking these problems. Ask for help or use the additional practice worksheets if you need to.

Once you understand the material, complete the Lesson 7 Test. Your parent will check your answers for the test and have you redo any incorrect problems.

Lesson

24 Common Denominators

Mental Math

Version 1: Think of how many ways can you add coins to equal 25 cents. How many ways can you add coins to get 50 cents?

Version 2: Ask someone to tell you an amount of money in dollars and cents, and then tell them at least three different combinations of dollars and cents that will equal that amount. Do this for several amounts.

Skills Check

Complete the following worksheet to practice some of the skills you have learned.

- Lesson 24 Skills Check

New Skills

Common Denominators

In all of the fraction examples and problems we've been working with so far, both denominators within a given problem have been the same. As long as this is the case, we only have to add or subtract the numerators to solve the problem. But if the denominators in a problem are not the same, we can't just add or subtract the numerators; we have to rename one or both of the fractions by finding what is called a ***common denominator***. This is a number that can be divided evenly by both denominators in the problem.

Adding Fractions with Different Denominators

You've already learned how to find equivalent fractions with specific denominators. You can apply these skills to finding a common denominator.

Example: $\frac{3}{8} + \frac{1}{4}$

ASSIGNMENT SUMMARY

- ☐ Play mental math games.
- ☐ Do the Skills Check worksheet.
- ☐ Read New Skills instruction.
- ☐ Complete New Skills Practice.
- ☐ Complete Lesson 24 Test and Learning Checklist.

Step 1: Since the denominators are different, we can't just add the numerators. We have to find a common denominator. The easiest way to do this is to **use the largest denominator** in the problem. This doesn't always work, but we try this first. In this example, the largest denominator is 8 and the smallest denominator is 4. Does 4 go into 8 evenly? Yes, 4 × 2 = 8, so 8 will be our common denominator.

Step 2: Once we've determined what the common denominator will be, we create an equivalent fraction with that value as the new denominator. Since $\frac{3}{8}$ already has the correct denominator, we only have to find the equivalent fraction for $\frac{1}{4}$. We say, "How many times does 4 go into 8?" Since we know that 4 × 2 = 8, we multiply $\frac{1}{4}$ by $\frac{2}{2}$ to find the equivalent fraction.

$$\frac{1}{2} \times \frac{2}{2} = \frac{2}{8}$$

Step 3: Now that we know the equivalent fraction for $\frac{1}{4}$ with a denominator of 8 is $\frac{2}{8}$, we write the problem in vertical format and solve as usual:

$$\begin{array}{r} \frac{3}{8} = \frac{3}{8} \\ +\frac{1}{4} = \frac{2}{8} \\ \hline \frac{5}{8} \end{array}$$

The easiest way to find a common denominator is to use the largest denominator in the problem, but when this doesn't work, we have to try another way.

Example: $\frac{2}{3} + \frac{3}{4}$

Step 1: Since the denominators are different, we again have to find a common denominator. In this problem we can't use the largest denominator, because 3 won't divide evenly into 4, so we have to try another approach. If the largest denominator won't work, then the next way to find a common denominator is to **multiply the two denominators**. In this example, we would multiply 3 by 4 and get 12. This is the common denominator.

Step 2: We create an equivalent fraction with the common denominator as the new denominator. In this case, we have to find equivalent fractions for both fractions, so we'll start with $\frac{2}{3}$. We ask ourselves, "3 times what is 12?" Since the answer is 4, we'll multiply $\frac{2}{3}$ by $\frac{4}{4}$ to find the equivalent fraction, which is $\frac{8}{12}$.

Now we'll do the same for the next fraction in the problem, $\frac{3}{4}$. We ask ourselves, "4 times what is 12?" The answer is 3, so we multiply $\frac{3}{4}$ by $\frac{3}{3}$ to find the equivalent fraction, which is $\frac{9}{12}$.

Step 3: Now that we've renamed both fractions with a common denominator of 12, we can complete the problem as usual:

$$\begin{array}{r} \frac{2}{3} = \frac{8}{12} \\ +\frac{3}{4} = \frac{9}{12} \\ \hline \frac{17}{12} = 1\frac{5}{12} \end{array}$$

Since we ended up with an improper fraction, we reduced it to its lowest terms, a mixed number. Remember, a problem is not finished until the answer is expressed in its lowest terms.

Subtracting Fractions with Different Denominators

The process for finding a common denominator in subtraction problems is the same as finding one in addition problems. For either process, we follow the same steps:

Example: $\frac{3}{4} - \frac{1}{2}$

Step 1: Find the common denominator.

Always try the easiest way first; see if the largest denominator in the problem can be a common denominator. Does 2 divide into 4 evenly? Yes, it does. 2 × 2 = 4. We can use 4 as the common denominator.

Step 2: Create an equivalent fraction with the common denominator.

Since you're using 4 as the common denominator, you don't have to change $\frac{3}{4}$. You only have to change $\frac{1}{2}$. Ask yourself, "How many times does 2 (the denominator of $\frac{1}{2}$) go into 4 (the common denominator)?" The answer is 2, so you'll multiply $\frac{1}{2}$ by $\frac{2}{2}$, and the equivalent fraction will be $\frac{2}{4}$.

Step 3: Write the equivalent fractions and subtract as necessary.

$$\begin{array}{r} \frac{3}{4} = \frac{3}{4} \\ -\frac{1}{2} = \frac{2}{4} \\ \hline \frac{1}{4} \end{array}$$

Example: $\frac{1}{2} - \frac{1}{3}$

Step 1: Find the common denominator.

You can't use the largest denominator, because 2 won't divide evenly into 3, so you use the next approach: multiply the two denominators. 2 × 3 = 6, so the common denominator is 6.

Step 2: Create an equivalent fraction with the common denominator.

You'll have to create equivalents for both fractions, so start with $\frac{1}{2}$. Ask yourself, "How many times does 2 (the denominator of $\frac{1}{2}$) go into 6 (the common denominator)?" The answer is 3, so you'll multiply $\frac{1}{2}$ by $\frac{3}{3}$, and the equivalent fraction will be $\frac{3}{6}$.

Next, create an equivalent fraction for $\frac{1}{3}$. Ask yourself, "How many times does 3 (the denominator of $\frac{1}{3}$) go into 6 (the common denominator)?" The answer is 2, so you'll multiply $\frac{1}{3}$ by $\frac{2}{2}$, and the equivalent fraction will be $\frac{2}{6}$.

Step 3: Write the equivalent fractions and subtract as necessary.

$$\begin{array}{r} \frac{1}{2} = \frac{3}{6} \\ -\frac{1}{3} = \frac{2}{6} \\ \hline \frac{1}{6} \end{array}$$

Sometimes this whole process can be a little confusing. To avoid this, it helps to follow the same steps consistently:

Example: $\frac{3}{4} - \frac{2}{3}$

First, write the fractions in vertical format and add the equal sign and the common denominator, like this:

$$\begin{array}{r} \frac{3}{4} = \frac{\quad}{12} \\ -\frac{2}{3} = \frac{\quad}{12} \\ \hline \end{array}$$

Next, look at the denominator in the top fraction. Say to yourself, "4 (the denominator) goes into 12 (the common denominator next to it) 3 times. Then look at the numerator in the top fraction and say, "3 times 3 (the numerator) is 9." Write the 9 above the 12 in the top fraction.

$$\begin{array}{r} \frac{3}{4} = \frac{9}{12} \\ -\frac{2}{3} = \frac{\quad}{12} \\ \hline \end{array}$$

Then look at the denominator in the bottom fraction. Say to yourself, "3 goes into 12 4 times. Look at the numerator in the bottom fraction and say, "4 times 2 is 8." Write the 8 above the 12 in the bottom fraction.

$$\begin{array}{r} \frac{3}{4} = \frac{9}{12} \\ -\frac{2}{3} = \frac{8}{12} \\ \hline \end{array}$$

Finally, subtract and, if necessary, reduce to lowest terms.

$$\begin{array}{r} \frac{3}{4} = \frac{9}{12} \\ -\frac{2}{3} = \frac{8}{12} \\ \hline \frac{1}{12} \end{array}$$

New Skills Practice

Complete the following worksheets in your math workbook:

- Lesson 24 New Skills Practice: Common Denominators, Adding and Subtracting Fractions with Different Denominators
- Lesson 24 Test

Show all your work and check your answers, reworking any incorrect problems.

FOR ENROLLED FAMILIES

At the end of this lesson, submit the following three items to your Oak Meadow teacher:

- Lesson 23 Test
- Lesson 24 Test
- Lesson 24 Assessment Test

Communicate with your teacher about any areas in which your student needs extra support.

Lesson

25 Lowest Common Denominator

Mental Math

Version 1: You'll need four dice for this game. Roll two dice and add up the total. Roll two more dice and add up that total. Create a fraction in your head with the smaller number on top. Can this fraction be reduced? Now create a fraction in your head with the larger number on top (an improper fraction). Reduce this fraction to a mixed number. For instance, if you roll a 3 and a 4, you add them up to get 7; then you roll the second pair of dice and get a 1 and 2, you add them up to get 3. Create a fraction with the smaller number on top: $\frac{3}{7}$. Can you reduce this? No. Create a fraction with the larger number on top: $\frac{7}{3}$. Reduce the improper fraction to $2\frac{1}{3}$. Start over and repeat the process several times.

Version 2: You'll need three dice for this game. Roll two dice and create a fraction in your head with the smaller number on top. Now roll the third die. Using the number on the die, create an equivalent fraction for your original fraction. For instance, if you first roll a 3 and a 4, your fraction is $\frac{3}{4}$. If you roll the third die and get a 6, you will use it to create an equivalent fraction by multiplying both the numerator and the denominator by 6 to get $\frac{18}{24}$. Re-roll your third die several times to create a variety of equivalent fractions with your original fraction. Start over, rolling two dice to get a new fraction, and then rolling the third die for a new number to use in making equivalent fractions.

ASSIGNMENT SUMMARY

- ☐ Play mental math games.
- ☐ Do the Skills Check worksheet.
- ☐ Read New Skills instruction.
- ☐ Complete New Skills Practice.
- ☐ Complete Lesson 25 Test and Learning Checklist.

Skills Check

Complete the following worksheet to practice some of the skills you have learned.

- Lesson 25 Skills Check

New Skills

Finding the Lowest Common Denominator

When we're looking for a common denominator for two fractions in a problem, there are several ways to find this. So far we've mentioned two ways to find a common denominator:

1. **Use the largest denominator in the problem.**
2. **Multiply the two denominators.**

This second approach, multiplying the two denominators, will always give us a common denominator, but often this denominator will be quite large and must be reduced to lowest terms at the end of the problem. To avoid having to reduce fractions at the end of the problem, we always look for the ***lowest common denominator***, or LCD. Sometimes, the first two approaches will give us the LCD. If not, we use a third approach:

3. **Compare the multiples of both denominators and choose the lowest multiple that both fractions have in common.**

Multiples are simply the numbers that occur when you multiply your original number. Multiples of 2 are 2, 4, 6, etc.; multiples of 5 are 5, 10, 15, etc.; multiples of 12 are 12, 24, 36, and so on. Multiples can go on forever, but we usually only need to look at the first few multiples in order to find the lowest common multiple.

Example: $\frac{1}{4}+\frac{1}{6}$

As usual, we first look to see if we can use the largest denominator in the problem as a common denominator, but we find that this doesn't work. We can't divide 4 into 6 evenly. So we try the second approach: we multiply the two denominators. We can do this, but we end up with 24 for a denominator. This will work, but let's see if we can find a smaller denominator. To do this, we compare the first few multiples of the two denominators:

4	8	12	16	20	24	28
6	12	18	24	30	36	42

We find that 24 is a multiple of both denominators, but 12 is also a multiple, and since 12 is a lower number, we choose that as the lowest common denominator.

Once we've found the LCD, we complete the problem as usual:

$$\begin{aligned} \frac{1}{4} &= \frac{3}{12} \\ +\frac{1}{6} &= \frac{2}{12} \\ \hline \frac{5}{12} & \end{aligned}$$

Finding the lowest common multiple will always give us the lowest common denominator.

Example: $\frac{1}{8} - \frac{1}{12}$

We look at the largest denominator, but 12 won't work as a common denominator. We can multiply the two denominators together (to get 96) but that's a really high number, so instead we compare the multiples of the denominators:

8	16	24	32	40	48	56
12	24	36	48	60	72	84

The lowest common denominator is 24, so we'll use that to create equivalent fractions and then solve the problem:

$$\begin{array}{r} \frac{1}{8} = \frac{3}{24} \\ -\frac{1}{12} = \frac{2}{24} \\ \hline \frac{1}{24} \end{array}$$

Finding lowest common denominators is an important part of solving math problems, and you've learned three strategies for finding lowest common denominators:

1. **Use the largest denominator in the problem.**
2. **Multiply the two denominators.**
3. **Compare the multiples of both denominators to find the lowest common multiple.**

As you use these strategies, you'll begin to recognize when to use each of them to find the lowest common denominator quickly.

An important part of finding lowest common denominators is understanding your multiplication tables well. If you still don't know your multiplication tables by heart, work with them a little bit every day until you can repeat them all automatically, without having to think about them or figure them out. When you know your multiplication tables thoroughly, finding lowest common denominators will be very easy.

Explain the process of finding the LCD to a parent or friend. Demonstrate it on paper as you explain the process. See if you can explain all three strategies you've learned.

New Skills Practice

Complete the following worksheets in your math workbook:

- Lesson 25 New Skills Practice: Lowest Common Denominator
- Lesson 25 Test

Remember to show all your work—that means showing each step as you find the common denominators and solve the problems. Check your answers in the answer key and circle any incorrect answers before reworking these problems. Ask for help or complete additional practice worksheets if you need to.

Once you understand the material, complete the lesson test. Your parent will check your answers for the test and have you redo any incorrect problems.