# MATH LESSONS FOR A LIVING EDUCATION

Level 6

Angela O'Dell

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# Dedication

To Walter O'Dell, one of my biggest cheerleaders, a hero of our country, and the only grandpa I ever knew. I typed the last lessons of this book on the day you went to heaven. Grandpa, I'll miss you.

**Author Bio:**

As a homeschooling mom and author, **Angela O'Dell** embraces many aspects of the Charlotte Mason method yet knows that modern children need an education that fits the needs of this generation. Based upon her foundational belief in a living God for a living education, she has worked to bring a curriculum that will reach deep into the heart of home-educated children and their families. She has written over 20 books, including her history series and her math series. Angela's goal is to bring materials that teach and train hearts and minds to find the answers for our generation in the never-changing truth of God and His Word.

# Scope and Sequence

# How to Use This Book

Although this book was written mostly for the student, the story segments help the teacher build/strengthen a relationship with each student. The storyline of *Math Lessons for a Living Education Book 6* is not written to introduce math concepts; it is meant to bring the element of character and relationship to the study of math. Children learn best when they can learn through relationship. The story in this book is prayerfully crafted to reach into many issues that children this age are facing . . . the question of a personal faith in God, the question of trust in God's goodness even in the midst of hardship, the decision of letting God use pain for their good, etc. Read the story together, knowing that it is our tendency to push our children into independent learning at this age. Although a certain amount of independence is important, it is also extremely important that we maintain an element of closeness. **Our children need contact with us more at this age than almost at any other time. Stay close. Stay plugged in. Stay involved.**

- The concepts of math are a conversation between your student and the text. This book is meant to grow your child's faith in God, critical thinking ability, and confidence in their God-given ability.
- Think of this math book as a type of unit study — a holistic approach, complete with a variety of hands-on projects, practice problems, conversational explanations, research and application, **Use Your Words!** narration assignments, amazing facts that show God's outstanding math ability, and a solid mathematical foundation for future math studies.
- **A note about quizzes:** If you have used the previous books in this series, you are aware that they contain very few quizzes. This is because they are written in such a way that your child is consistently showing you what they know. Book 6 is also written in this way, BUT, because quiz and test taking is a skill that they need in life, they have been made available in the teacher guide. If you, as the teacher, do not want your child to take every single lesson quiz, simply use the lesson practice and review. You decide what your student needs and adjust this course to fit them. Please also note that lesson 22 of this book is ten days worth of work on some additional, rather advanced concepts. Please preview this lesson and read the note at the beginning of it. Also note that there is an optional, but highly recommended, two-day student presentation at the end of the book. You might want to tell your student about it, so he or she can be thinking on what to present.

Ingenious Creator
Feature Focus

**Ingenious Creator Feature Focus**

You will see that each lesson has a variety of Ingenious Creator Feature Focus elements. May your child be encouraged and amazed at the power and creativity, the order and patterns of our God and the creation He has blessed us with. (You will notice that these elements have been "pulled" from the story segment in some way, and as much as possible, are labeled or explained using the math concepts/elements they have been working with.)

> **Have you not known? Have you not heard? The everlasting God, the Lord, the Creator of the ends of the earth, neither faints nor is weary. His understanding is unsearchable. —Isaiah 40:28**

# Needed Supplies for This Course

- ☐ Three-ring binder (1.5–2 inches)
- ☐ Page protectors (a package of 25 should be enough)
- ☐ Clear laminating paper
- ☐ 4 Large, good quality, storage bags (zipper closure work best)
- ☐ Index cards (lined work best)
- ☐ File box for index cards (make sure it accommodates the size of cards you choose)
- ☐ A simple but sturdy calculator
- ☐ Modeling clay (either air dry or bake-to-harden)
- ☐ A good ruler
- ☐ A good protractor
- ☐ Several colors of highlighters
- ☐ A set of fine line whiteboard markers
- ☐ A whiteboard and eraser
- ☐ A student atlas of the United States
- ☐ A road atlas, or a variety of road maps
- ☐ Access to either a set of encyclopedias or the Internet
- ☐ A room thermometer
- ☐ A sturdy storage tub for storing all of your math supplies
- ☐ Money — a variety of bills and coins (this can be real money or money manipulatives)

Please prepare all of the charts provided in the appendix before starting this course.

# Working with Whole Numbers

Lesson 1

**Storm!**

The wind was hot — scorching, really. Thick clouds that had hung ominously silent over the countryside for what seemed like an eternity were now swirling and churning like clothes in a washing machine. The weather radio blared in the kitchen, sending out a warning — possible severe weather caused by the cold front sweeping in from the northwest.

Everyone scurried to ready the farm for the storm. The girls and Mom quickly removed the clothes from the line. Grandma and Grandpa gathered the barn cats and locked them in the garden shed. Dad moved the tractor into its place behind the barn and sent the boys to secure the animals in their barn stalls.

Charlie and Hairo, heads bowed and eyes closed to slits against the windblown dust, pushed their way back through the gusts toward the kitchen door of the farmhouse. Now the rain came like someone had turned on a celestial faucet — each mammoth drop smacking with such ferocity that the boys felt as if they were being stung by hundreds of angry hornets. Panting, they hurried to join the rest of the family in the basement.

As the storm bellowed and howled with a vengeance, the family huddled together in the safety of the farmhouse basement. Grandpa looked serious but relieved to have his whole family with him in the old musty basement.

"Grandpa, do you think the storm will cause any serious damage?" Natty asked, her brown eyes huge in her serious face. A loud CRACK from outside made her jump and scoot closer to Grandpa Peter. Natty shuddered with the memory of the mudslides that she and her birth family had survived in their hut on the outskirts of Lima, Peru. The Peruvian children's birth parents had died of sickness, leaving the two children to be raised by a children's home, which was supported by the Stevens' home church. Natalia, Natty to her family and friends, and her brother, Hairo, had been adopted by the Stevens family several years ago.

"I don't know, Natty," Grandpa Peter responded in a serious tone, "but I hope not. I'm praying safety over the animals more than anything." Natty nodded and slipped her small hand between her grandpa's big strong fingers. Grandpa Peter smiled and looped his arm around her, pulling her closer to his side. Natty laid her cheek against her grandpa's chest, where she could hear his strong heartbeat. It made her feel safe, somehow.

"Listen!" Charlie whispered, going to the foot of the stairs, "I think the storm has passed. Should I go check, Dad?" After receiving a quick nod of permission, Charlie bounded up the stairs, two at a time, and into the kitchen. The rest of the family waited in the basement to hear the all-clear from Charlie.

"What is it, Charlie?" Charlotte called up the stairs. "Is everything okay now?" Natty and little Ella crowded in behind her, peering up into the light above.

"Yeah, the storm has passed," Charlie's voice sounded hesitant. "But, Grandpa, I think you better come see this."

The whole family came up out of the basement then, blinking, as their eyes adjusted to the brightness of the kitchen. The storm had passed, thundering like an angry bull across the fields, into the distance. It was what it had left behind that shocked the family — an obvious path of destruction cut through the farmland.

There were broken branches everywhere, and scattered crates, buckets, and garden tools, which had blown through the garden shed's broken door. One branch had landed on the farm truck, leaving a large dent in the hood,

as well as a crack in the windshield. Grandma let out a cry of dismay when she saw one of her prized apple trees lying splintered in half — one piece had landed precariously close to the kitchen window. But what made everyone gasp in shock was the barn! The roof appeared to be almost completely gone. Bales of hay lay strewn in a wide path stretching out of sight.

"I wouldn't be surprised if it was a tornado that took the roof — or perhaps a straight-line wind," Grandpa Peter commented, as the family cautiously picked their way through the broken branches, wooden crates, and garden tools scattered all over the farm yard. Grandma Violet stooped to pick up a piece of her apple tree, and Ella helped her carry it.

Charlotte and Natty scooped up the wet and bedraggled barn kitties that crept out from the garden shed, shaking with cold and shock. Mom ran her hands down their sides and looked carefully at each little paw, murmuring comfortingly all the while. "They're okay, girls," she assured them, "just scared . . . and soaked . . . which, for a cat, is torture!" She chuckled as the cats immediately began bathing themselves, trying to straighten their crazy hairdos with their rough, pink tongues.

Dad and Grandpa reached the barn door first. Charlie and Hairo ran forward to help the two men move a heavy branch that was wedged against the door. Carefully, they unbolted the door and pulled it open.

"Oh, thank You, Jesus!" Grandma exclaimed as, one by one, the animals were accounted for.

"The roof was ripped off and smashed all over the back pasture, Grandpa!" Charlie yelled from outside.

"And all of the hay is strewn across the field — all the way down to the creek! Whoa, what a mess!" Hairo added with a whistle.

"Dad, it looks like we lost the hay loft and most of the roof," Sean Stevens updated Grandpa Peter. After assessing the damages, he climbed back down from the barn's top floor. "I also noticed that the old Farmall C has a very heavy branch fallen across the seat; it may have broken it. But, Dad, remember the old tractor we have for parts? I believe that seat will work just fine on the C."

"That's fine, Son. We can take a look in a while," Grandpa looked around the yard. "This could have been so much worse, Sean. We could have lost the whole barn and all of the animals. That would have been devastating. Thank You, Lord, for looking out for us!" Grandpa bowed his head in thankfulness. "And most of all, thank You for protecting our family."


"Amen!" Grandma Violet came to stand beside her husband of many years. They had farmed this land for decades, raised their family here, and watched their grandchildren explore and learn about the world around them. This farm was important to both of them, but their family was most precious of all. Grandma Violet slipped her arm around her husband's waist as they stood together and surveyed the damage to their property.

You may have guessed that meteorologists (scientists who study the weather) have to know how to work with numbers. In fact, numbers are a very large part of weather predictions. This shouldn't be a surprise though, because you have learned by now that there are numbers all around us. You know that we measure objects with numbers. We explain how fast our family car is moving or how long a trip is by using numbers, so it makes sense that we measure the wind's speed and temperatures, as well as describe the relationship of the sun to the earth, all with numbers.

You have learned in your previous years of math study that we can use numbers in almost unlimited and creative ways. As you have moved through your learning journey with numbers, you have learned that the value of a number is dependent upon its place value within a larger number.

You have mastered addition, subtraction, multiplication, and division of small numbers, as well as large numbers. In this first lesson of *Math Book 6*, you are going to review everything you have learned so far concerning operations with whole numbers. Each lesson in this lesson will guide you through a concept that has been learned previously. I have supplied a short explanation of each concept at the beginning of each lesson, followed by plenty of practice problems.

But first, a few things you should know!

**Math Vocabulary:**

addend + addend = sum

minuend − subtrahend = difference

factor x factor = product

dividend ÷ divisor = quotient

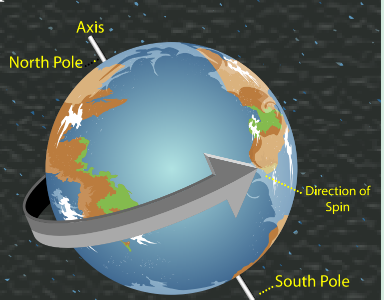
Ingenious Creator

Feature Focus

**Weather — created and controlled by God the Creator**

When God created the heavens and earth (recorded and described in Genesis 1), He set in motion the elements that cause weather. The weather changes as the earth turns on its axis and moves into orbit around the sun. Weather is not random, though!

> **When God fixes the weight of the wind and limited the water by measure, when He established a limit for the rain and the path for lightning…**
>
> **—Job 28: 25–26**



Name______________________________

# Exercise 1 Day 1

**Place value / writing large numbers / odds and evens**

**Concept #1: Place Value**

When we are working with whole numbers, it is very important to understand place value. Study the concept below and solve the problems. As you work through the problems, it may help to narrate the process to your teacher. Do you understand completely? If not, take the time now to gain more confidence and understanding.

Let's review the place value up to through the millions.

| One Hundred Millions | Ten Millions | One Millions , | Hundred Thousands | Ten Thousands | Thousands , | Hundreds | Tens | Ones |
|---|---|---|---|---|---|---|---|---|
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**Solve these problems**

1. Circle the digit in the ten's place:

95 32,685 201

2. Circle the digit in the ten thousand's place:

235,687 89,700 1,456,834

3. Circle the digit in the hundred's place:

4,982,100 910 789,351

4. Fill in the place value chart with this number:

831,223 387,900,126 34,492

5. **Use Your Words!** Explain to your teacher everything you know about place value.

Teacher check ______

Name______________________________

# Exercise 1

Day 1

In this math book, you will discover a section titled *Use Your Words*! When you come to these, you will be required to think through a concept and write it in your own words (or if your teacher prefers, explain orally). It is an important skill to be able to summarize the information you have learned. You can do this by thinking through the process and writing step-by-step directions to complete the process. This is the objective of this exercise: If you can write it (or explain) clearly enough for someone who does not know the concept to understand it, this shows that you are truly taking responsibility for your own learning. Critical thinking and responsibility are important milestones in your life.

**Concept #2: Writing Large Numbers**

There are certain rules that we have to follow when we are writing large numbers.

**Rule #1**: When we are writing number words, we use a hyphen between all numbers that are said as a compound word, between twenty-one and ninety-nine.

**Example:** thirty-five has a hyphen because it is two number words together; thirty has no hyphen because it is one number word.

**Rule #2:** When we write out a large number which is made up of many number words, we use commas where we would if we wrote the number in numeric form.

**Example:** The large number, 62,345,856, is written: sixty-two million, three hundred forty-five thousand, eight hundred fifty-six. Compare the numeric form and the number word form. Do you see how the commas are in the same places?

Note: Some people say "and" a lot when they are reading numbers. They may read the number used in the example to the left as: sixty-two million, three hundred AND forty-five thousand, eight hundred AND fifty-six. This is incorrect! DO NOT say "and" when you are reading whole numbers.

Practice saying and writing these numbers in number words.

6. 45,782 ____________________________________________

7. 329,216,335 ____________________________________________

8. 6,894 ____________________________________________

9. 561 ____________________________________________

10. 429,531,085 ____________________________________________

11. **Use Your Words!** Explain to your teacher what you know about writing and saying large numbers.

Teacher check ______

**Concept #3: Odds and Evens**

We have learned that all numbers are either odd or even. An odd number cannot be evenly divided into two equal groups; there will always be one left over. An even number can always be divided into two equal groups with nothing left over.

Odd numbers always end in these numbers: 1, 3, 5, 7, 9

Even numbers always end in these numbers: 0, 2, 4, 6, 8

12. Look at all of the numbers in problems 1–4 and 6–10 in this exercise. Above or beside each number, write O for odd or E for even.

13. **Use Your Words!** Explain what you know about odd and even numbers.

Name____________________________ 

# Exercise 2 Day 2

**Rounding tricks**

When we work with numbers, we often need to round them to make it easier to do computations with them. For example, we may need to quickly estimate what several large numbers are all together. It is important to know the process of rounding and estimating.

I am going to teach you some fun tricks to remember when you are rounding, but first let's review the steps of rounding.

**Example:** Round 367 to the hundreds place.

Decide what two "hundreds" 367 is between. 300 and 400

Underline the digit in the place to which you are rounding. (3)

**Trick #1:** Ask the neighbor number if you should round to the smaller hundred or the larger hundred. Is the neighbor number to the right (6) five or bigger? If it is, round to the bigger hundred. If it is smaller than five, round to the smaller hundred.

**Trick #2:** Turn all the neighbors to the right of the place to which you are rounding into place holder zeros. 367 becomes 400.

Now you try it:

Round these numbers to the ten's place.

1. 423 ______________
2. 45 ______________
3. 391 ______________
4. 56 ______________
5. 1,257 ______________

Round these numbers to the hundred's place.

6. 23,490 ______________________
7. 823 ____________________
8. 127,947 ____________________
9. 309 ______________________
10. 989 ______________________

Round these numbers to the thousand's place.

11. 34,980 ________________________
12. 5,459 ________________________
13. 178,251 ________________________
14. 29,589 ________________________
15. 1,474,910 __________________________

16. **Use Your Words!** Explain the process of rounding.

Name______________________________

Exercise 3 Day 3

**Addition (short and long)**

Numbers are amazing, aren't they? They can show how many socks we own, or they can show how many socks our whole family owns. When we want to combine two or more numbers, we use an operation called adding. By adding two numbers (addends) together, we come up with an answer called the sum. Remember, addends may be added in any order without changing the sum.

Let's start with a review of simple addition.

We can add horizontally.

1. 20 + 6 =
2. 34 + 10 =
3. 42 + 8 =
4. 90 + 6 =
5. 35 + 4 =
6. 12 + 12 =

We can add vertically.

7. $\begin{array}{r} 46 \\ +\ 23 \\ \hline \end{array}$

8. $\begin{array}{r} 85 \\ +\ 14 \\ \hline \end{array}$

9. $\begin{array}{r} 13 \\ +\ 14 \\ \hline \end{array}$

10. $\begin{array}{r} 68 \\ +\ 11 \\ \hline \end{array}$

11. $\begin{array}{r} 54 \\ +\ 14 \\ \hline \end{array}$

12. $\begin{array}{r} 76 \\ +\ 13 \\ \hline \end{array}$

**We can add with carrying.**

In this problem, when we add the one's column, we end up with more than what can fit in the one's place (a number larger than 9). This means that we have to carry the group of ten up to the top of the ten's column and add it to the rest of the ten's.

Example: $\begin{array}{r} 1\phantom{6} \\ 56 \\ +\ 16 \\ \hline 72 \end{array}$

Example: $\begin{array}{r} 11\phantom{7} \\ 367 \\ 134 \\ +\ 501 \\ \hline 1{,}002 \end{array}$

Add with carrying.

13. $\begin{array}{r} 239 \\ +\ 34 \\ \hline \end{array}$

14. $\begin{array}{r} 567 \\ +\ 189 \\ \hline \end{array}$

15. $\begin{array}{r} 199 \\ +\ \ \ 1 \\ \hline \end{array}$

16. $\begin{array}{r} 469 \\ +\ 11 \\ \hline \end{array}$

17. $\begin{array}{r} 613 \\ +\ 18 \\ \hline \end{array}$

18. $\begin{array}{r} 399 \\ +\ 10 \\ \hline \end{array}$

Name______________________________

# Exercise 3

Day 3

You can add more than two numbers.

Horizontal addition.

19. 12 + 34 + 10 =

20. 31 + 17 + 11 =

21. 10 + 5 + 13 =

Vertical addition.

22. $\begin{array}{r} 124 \\ 12 \\ +\ 15 \\ \hline \end{array}$

23. $\begin{array}{r} 56 \\ 13 \\ +\ 11 \\ \hline \end{array}$

24. $\begin{array}{r} 354 \\ 45 \\ +\ 10 \\ \hline \end{array}$

You can use rounding to estimate the answer to an addition problem by rounding the addends before adding. This will give you an estimated answer. For example:

$$\begin{array}{r} 610 \\ +\ 489 \\ \hline \end{array} \longrightarrow \begin{array}{r} 600 \\ +\ 500 \\ \hline 1{,}100 \end{array}$$

Now you try some:

Round to estimate the sums.

25. $\begin{array}{r} 439 \\ +\ 227 \\ \hline \end{array}$

26. $\begin{array}{r} 981 \\ +\ 238 \\ \hline \end{array}$

27. $\begin{array}{r} 561 \\ +\ 484 \\ \hline \end{array}$

28. $\begin{array}{r} 735 \\ +\ 652 \\ \hline \end{array}$

29. **Use Your Words!** Explain the process of adding with carrying.

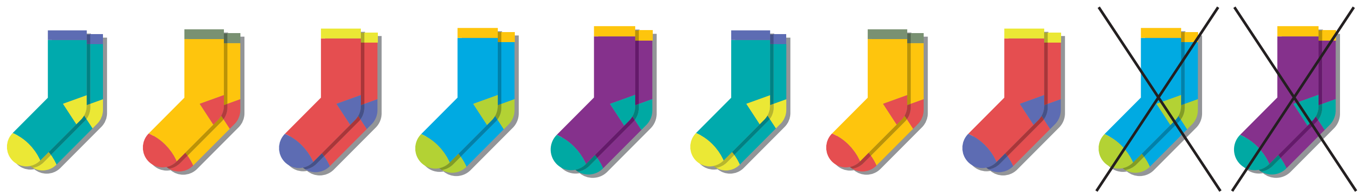
Name________________________________

Exercise 4 Day 4

**The Short and Long of Subtraction**

What happens when you lose a pair of socks, and your mom asks you how many you have left? You know you used to have 10 pairs of socks, but you lost one when you came in from playing in the snow. Then you realize that your boot had eaten your favorite pair, and now another pair has been lost forever in the clutter under your brother's bed. Things aren't looking so good for your sock drawer! You stop to think, I used to have 10 pairs of socks, but my boots ate 1 pair, and then my brother's clutter claimed another pair… so that's 10 minus (that means take away) 1 is 9, and 9 minus 1 is 8. If this keeps up, I'm going to run out of socks before the end of the winter! But you try to stay positive as you answer your mom, "I have 8 pairs of socks left, Mom. At least I still have one for every day of the week, plus one more just in case…"

So, what does that look like on paper?



Example: 10 - 1 = 9 9 - 1 = 8

We can subtract horizontally.

1. 26 - 4 =
2. 54 - 2 =
3. 49 - 8 =
4. 98 - 6 =
5. 67 - 4 =
6. 12 - 12 =

We can subtract vertically.

7. $\begin{array}{r} 56 \\ -\ 22 \\ \hline \end{array}$

8. $\begin{array}{r} 95 \\ -\ 34 \\ \hline \end{array}$

9. $\begin{array}{r} 32 \\ -\ 11 \\ \hline \end{array}$

10. $\begin{array}{r} 65 \\ -\ 11 \\ \hline \end{array}$

11. $\begin{array}{r} 54 \\ -\ 24 \\ \hline \end{array}$

12. $\begin{array}{r} 66 \\ -\ 16 \\ \hline \end{array}$

We can subtract where we have to borrow a group of ten from the ten's place.

Example: $\begin{array}{r} 3\overset{4}{\cancel{5}}{}^{1}6 \\ -\ 237 \\ \hline 119 \end{array}$

We can subtract where we have to borrow a group of ten from the ten's place and a group of a hundred from the hundred's place.

Example: $\begin{array}{r} \overset{7}{\cancel{8}}{}^{1}\overset{1}{\cancel{2}}{}^{1}3 \\ -\ 654 \\ \hline 169 \end{array}$

Name________________________________

# Exercise 4

Day 4

Subtract. Circle the problems in which you used borrowing.

13. $\begin{array}{r} 245 \\ -\ 231 \\ \hline \end{array}$

14. $\begin{array}{r} 478 \\ -\ 399 \\ \hline \end{array}$

15. $\begin{array}{r} 23 \\ -\ 15 \\ \hline \end{array}$

16. $\begin{array}{r} 981 \\ -\ 756 \\ \hline \end{array}$

17. $\begin{array}{r} 671 \\ -\ 445 \\ \hline \end{array}$

18. $\begin{array}{r} 387 \\ -\ 222 \\ \hline \end{array}$

Using the same process, try these:

19. $\begin{array}{r} 6{,}231 \\ -\ 4{,}999 \\ \hline \end{array}$

20. $\begin{array}{r} 23{,}612 \\ -\ 19{,}212 \\ \hline \end{array}$

21. $\begin{array}{r} 10{,}000 \\ -\quad 999 \\ \hline \end{array}$

22. $\begin{array}{r} 51{,}309 \\ -\quad 24{,}648 \\ \hline \end{array}$

23. $\begin{array}{r} 183{,}272 \\ -\quad 61{,}151 \\ \hline \end{array}$

We can use rounding to estimate an answer in a subtraction problem by rounding the minuend and the subtrahend before finding the estimated difference.

For example:

Round to the nearest 100. $\begin{array}{r} 910 \\ -\ 750 \\ \hline \end{array} \longrightarrow \begin{array}{r} 900 \\ -\ 800 \\ \hline 100 \end{array}$

Now you try it!

24. $\begin{array}{r} 823 \\ -\quad 189 \\ \hline \end{array}$

25. $\begin{array}{r} 612 \\ -\quad 477 \\ \hline \end{array}$

26. $\begin{array}{r} 952 \\ -\quad 899 \\ \hline \end{array}$

27. $\begin{array}{r} 215 \\ -\quad 173 \\ \hline \end{array}$

28. **Use Your Words!** Explain the process you used to solve problem 14 of this exercise.

Name______________________________

Exercise 5 Day 5

**Multiplication Basics and Multiplication Facts Review**

In your previous years of studying math, you have learned that skip counting is another way to learn the factors in a multiplication family. When you skip count by 2, you use this pattern:

| | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|
| 2, | 4, | 6, | 8, | 10, | 12, | 14, | 16, | 18, | 20... |
| (1x2) | (2x2) | (3x2) | (4x2) | (5x2) | (6x2) | (7x2) | (8x2) | (9x2) | (10x2) |

As you can see, you are adding another group of 2 to each number to get the next number. You are probably very familiar with counting by 2s . Explain to your teacher how skip counting is related to multiplication. In the following problems, show how skip counting and multiplication go together, like I did with the 2s above.

1. Skip count by 3 to 30:

2. Skip count by 4 to 40:

3. Skip count by 5 to 50:

4. Skip count by 6 to 60:

5. Skip count by 7 to 70:

6. Skip count by 8 to 80:

7. Skip count by 9 to 90:

8. Skip count by 10 to 100:

9. Review your multiplication facts. Complete your laminated multiplication drill from the appendix of this book. If there are any that you need to practice, make flashcards to drill them until you know them very well.

Name______________________________

# Exercise 6 Day 6

**Long Multiplication**

Now that we have reviewed the basics of multiplication, let's move on and really stretch our minds! Study the steps in the example:

```
    55
  x 15
  ----
   275
+  550   <- This zero is a place holder.
  ----
   825
```

1. Multiply the top factor by the number in the one's place of the bottom factor.
2. Place a zero to hold the one's place and then multiply the top factor by the number in the ten's place of the bottom factor
3. Add both partial factors together to complete the problem.

Now you try it:

1. $41 \times 22$

2. $64 \times 12$

3. $88 \times 11$

4. $230 \times 12$

5. $301 \times 15$

6. $412 \times 34$

Now let's make the numbers bigger! You will need to use carrying. Study the example:

```
     245
   x 110
  ------
     000
    2450
+  24500
  ------
  26,950
```

Follow the same steps as before.

You will need 2 place holder zeros, one for the one's place and one for the ten's place.

Now you try it!

7. $398 \times 645$

8. $1{,}247 \times 409$

9. $723 \times 579$

10. $3{,}622 \times 1{,}275$

**You can use rounding to estimate** in multiplication by rounding each of the factors before multiplying them to find the estimated product. This example shows a multiplication problem with one large factor (303) and one smaller factor (4). You can use the same process with larger problems, simply by rounding both numbers and multiplying like usual.

Example:

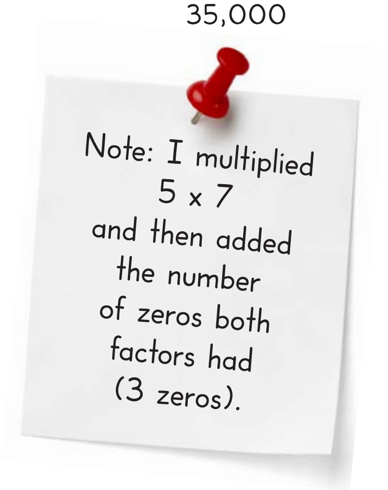
$$\begin{array}{r} 303 \\ \times \quad 4 \\ \hline \end{array} \longrightarrow \begin{array}{r} 300 \\ \times \quad 4 \\ \hline 1{,}200 \end{array}$$

You try a few! The first one is done for you.

11. $\begin{array}{r} 544 \\ \times \ 67 \\ \hline \end{array} \longrightarrow \begin{array}{r} 500 \\ \times \ 70 \\ \hline 35{,}000 \end{array}$

12. $\begin{array}{r} 782 \\ \times \ 89 \\ \hline \end{array}$

13. $\begin{array}{r} 923 \\ \times \ 52 \\ \hline \end{array}$




14. **Use Your Words!** Explain the process you worked through in problem 9 of this exercise.

Name______________________________

# Exercise 7

Day 7

**Division basics**

You have learned that addition and subtraction are related. In the space below,

1. **Use Your Noodle — draw a doodle!** showing how addition and subtraction go together.

2. Now, let's quickly review the concept of division! If you have 6 cookies, and your mom says, "That's way too many! Share half of those with your brother!" How many cookies will each of you have? ______ That's division. How did you do it? Draw a doodle below. Underneath that, draw a doodle of how multiplication and division are related.

3. Do a quick review of your division facts! Study these multiplication facts and write the matching division facts that go with them.

| | | |
|---|---|---|
| Example: $12 \times 12 = 144$ | division: | $144 \div 12 = 12$ |
| $3 \times 4 = 12$ | division: | |
| $5 \times 3 = 15$ | division: | |
| $9 \times 3 = 27$ | division: | |
| $4 \times 4 = 16$ | division: | |
| $5 \times 6 = 30$ | division: | |

Now you write three multiplication equations and their matching division facts.

a.

b.

c.

Name________________________________

# Exercise 7

Day 7

What if you wanted to divide a dividend by a divisor and the quotient doesn't come out even? What if there is something remaining? Don't worry — when this happens, you have a remainder! This can happen in simple division equations, as well as long division.

Example:

$$\begin{array}{r|rl} & 1\ \ 1 & \text{Remainder 1} \\ \hline 2 & 2\ \ 3 & \\ & -2\ \ \downarrow & \\ \hline & 0\ \ 3 & \\ & 2 & \\ \hline & -\ 1 & \end{array}$$

1. $4\overline{)1\ \ 4}$

2. $5\overline{)1\ \ 2}$

3. $6\overline{)2\ \ 0}$

4. $7\overline{)3\ \ 0}$

5. $4\overline{)5\ \ 4}$

6. $7\overline{)4\ \ 6}$

7. $5\overline{)7\ \ 9}$

8. $2\overline{)9}$

**Use Your Words!** Explain the process you worked through in problem 5 of this exercise.

Name______________________________



**Division tricks and three ways of writing division**

You may have learned in your previous years of math study that division has a few tricks up its sleeve, which make it easier to work out a division equation.

Study them below:

A number is divisible by 2 if it is an even number.

A number is divisible by 5 if the one's digit is 0 or 5.

A number is divisible by 10 if the one's digit is 0.

A number is divisible by 3 if the sum of the digits is divisible by 3.

A number is divisible by 6 if it is divisible by 2 and 3.

Any number is divisible by 8 if the last three digits are divisible by 8.

A number is divisible by 9 if the sum of the digits is divisible by 9.

A number is divisible by 4 if the last two digits are both zeros, or if they are divisible by 4.

~~872~~    231    328    90    810    33    54    765

Using the numbers above, write them on the lines below next to all the numbers they are divisible by. The first one is done for you.

1. Divisible by 2: 872 ______________________
2. Divisible by 3: ______________________
3. Divisible by 4: 872 ______________________
4. Divisible by 5: ______________________
5. Divisible by 6: ______________________
6. Divisible by 8: 872 ______________________
7. Divisible by 9: ______________________
8. Divisible by 10: ______________________

Optional:
If you are struggling with any of the divisibility rules, take the time now to study and review them. You may want to make flash cards to keep on hand throughout your school year.

Review of the three ways of writing a division problem.

$\div$

Name______________________________

# Exercise 8

Day 8

30 divided by 5

$5\overline{)\,30}$  $30 \div 5$  $\frac{30}{5}$

You try it! Write each division sentence in all three ways.

9. 65 divided by 5

10. 72 divided by 8

11. 56 divided 2

12. 320 divided by 3

13. 90 divided by 10

14. 81 divided by 9

15. 40 divided by 8

**Long division**

Today, we are going to tackle reviewing long division. To refresh your mind on the process, study the examples below. The first one shows a one-digit divisor, while the second one shows a two-digit divisor. **Remember: the steps of division are 1. divide 2. multiply 3. subtract 4. bring down the next number 5. repeat if needed.**

Examples:

```
      4,6 6 4 R.2
   ___________
 7 | 3 2,6 5 0
   - 2 8
     ---
       4 6
       4 2
       ---
         4 5
       - 4 2
         ---
           3 0
         - 2 8
           ---
             2
```

```
          3,0 2 2 R.3
       ___________
 2 2 | 6 6,4 8 7
     - 6 6
       ---
         0 4
           0
         ---
           4 8
         - 4 4
           ---
             4 7
           - 4 4
             ---
               3
```

Now you try it!

1. $3\overline{)458}$

2. $9\overline{)1,781}$

3. $4\overline{)7,210}$

4. $12\overline{)6,412}$

5. $20\overline{)8,120}$

6. $12\overline{)1,2864}$

Name______________________________

# Exercise 9

Day 9

You can use rounding to estimate the quotient of a division problem by first rounding both the dividend and the divisor before dividing.

Example: $321 \div 31 =$

$300 \div 30 = 10$ ← Simply round each number to the nearest largest place value. In this case you are rounding the dividend to the hundred's place and the divisor to the ten's place.

**Now you try it!** Round the dividend and the divisor to quickly find the estimated answer of each problem.

7. $562 \div 12 =$

8. $912 \div 29 =$

9. $1{,}178 \div 63 =$

10. $469 \div 46 =$

11. $382 \div 41 =$

**Use Your Words!** Explain the process you worked through in problem 2 of this exercise.

Name______________________________

# Exercise 10 Day 10

**Practice and Review**

Please use this exercise to practice any concepts with which you may have difficulties, in preparation for your lesson quiz.

Add:

1. $\begin{array}{r} 452 \\ 651 \\ +\ 714 \\ \hline \end{array}$

2. $\begin{array}{r} 891 \\ +\ 662 \\ \hline \end{array}$

3. $\begin{array}{r} 123{,}742 \\ +\ 723{,}947 \\ \hline \end{array}$

Subtract:

4. $\begin{array}{r} 34{,}982 \\ -\ 12{,}999 \\ \hline \end{array}$

5. $\begin{array}{r} 723{,}174 \\ -\ 412{,}999 \\ \hline \end{array}$

6. $\begin{array}{r} 126{,}890{,}645 \\ -\ 101{,}777{,}944 \\ \hline \end{array}$

Multiply:

7. $\begin{array}{r} 823 \\ \times\ 28 \\ \hline \end{array}$

8. $\begin{array}{r} 2{,}196 \\ \times\ 327 \\ \hline \end{array}$

9. $\begin{array}{r} 32{,}890 \\ \times\ 631 \\ \hline \end{array}$

Divide:

10. $12\overline{)652}$

11. $32\overline{)8{,}714}$

12. $65\overline{)92{,}127}$

13. **Rounding:**

In this space, write the first problem of each of the previous sections in this exercise (problems 1, 4, 7, and 10). Use rounding to estimate the answer to each one.

**Oral Review:**

14. The steps of rounding

15. The steps of adding with carrying and subtracting with borrowing

16. The steps of multiplication with carrying

17. The divisibility rules

18. The steps of long division, the three ways of writing a division problem

19. Complete the laminated multiplication table to 12 x 12

# Comprehensive Review of all Advanced Fractional Concepts

Lesson 11

**Blizzard!**

"Attention! Attention, everyone!" a voice coming over the loudspeaker system startled Charlie. "Co-op will be closing early today, due to a severe winter storm warning issued for our county," said Mrs. Reem, who sounded a bit anxious as she gave the details of the closing time, pick-up locations, and bus departures. "All children riding home with older siblings or being picked up by a family member have permission to use your personal cell phones to call or text your rides. Thank you, children!"

The Stevens children lined up in the hallway with the other students who were waiting for their parents to pick them up. The late November sky was heavy with dark clouds.

"Will there be another tornado, Charlotte?" Ella asked her sister in a worried whisper. "Like the one that ripped off Grandpa's barn roof?" Ella didn't like storms of any kind, and the sky looked extremely ominous, which made her anxious.

"No, Ella, don't worry. We don't have tornadoes in November. It's too cold. Here, let me help you with your zipper. Mom will be here any minute, and we want to be ready to dart out to get in the van as quickly as possible, okay?" Charlotte tucked her little sister's reddish curls under her purple hat and worked with the stubborn zipper, which seemed to be stuck on some fabric halfway up her front. Finally, the zipper came loose, and Charlotte smiled down at her little sister reassuringly. "Everything is going to be just fine, Ella. Remember last winter, when the electricity went out at our house because of the snow? Dad lit a fire in the wood stove and we had a 'camp-out' in the family room together. Wasn't that fun? Winter storms are much better than summer storms." Ella smiled. She did indeed remember that fun camp-out, complete with board games and hot chocolate heated on the top of the stove!

The snow was coming down thick and fast by the time Mom pulled the van into their driveway. "Charlie, go check to see if there is enough room in the garage for my van. Hairo, help me with these grocery bags. Charlotte and Natty, grab the backpacks and help Ella into the house as quickly as possible," she quickly instructed the group of children.

After Charlie waved to indicate there was room in the garage next to Grandpa's truck, Mom pulled in and turned off the van. Together, they made their way to the house, being especially careful not to slip on the icy ground. The snow was flying thick and fast; this was shaping up to be quite a blizzard!

Grandpa Peter greeted Maddie at the door, helping her to remove her heavy coat, and guiding her to a chair, where he helped her with her winter boots. After waiting for the children to leave the kitchen, he asked softly, "Have you heard from Sean?"

Maddie glanced quickly at her father-in-law and shook her head. "No, I called earlier, but it went right to voicemail. I figured he'd get back with me when he saw the missed call, but that was two hours ago. Did you try to call him?" she asked, rubbing her temples. She really didn't need this right now. What she really needed was Sean home . . . and a hot cup of tea. And for her stomach to settle down. Maddie sat back and closed her eyes. Why hadn't he called?

“I’ll try again,” Grandpa said softly, as he stood slowly and went to his room.

Lord, please have Sean answer, Maddie breathed in deeply and let it out slowly. Please keep him safe in this storm. We really need him home as soon as possible!

“Sean, this is your father. Please get back with us as soon as you get this message. Talk to you soon. Bye bye,” Grandpa was leaving another voice message as he walked slowly into the kitchen. He ended the call and laid his phone on the table next to Maddie’s, answering her questioning look with a shake of his head. “It went right to voice mail. Don’t panic, Maddie, he’s probably driving and has to really pay attention to the road. Or maybe the storm is interfering with the reception,” Grandpa Peter reached out and patted his daughter-in-law’s shoulder.

“You’re right, I think we better get ready for a power outage. By the sound of that wind, we could easily lose our electricity.”

Maddie pulled herself together and stood to her feet. “Children, all of you come here please!” She waited for her crew to gather in front of her before she gave the orders, “Charlie and Hairo, both of you bundle up and go get as much firewood as you can from the shed. Bring it in and pile it on the back porch, please.” The boys ran to obey. “Charlotte and Natty, please start filling the emergency water buckets. They are in the basement, stacked by the freezer. Fill all of them. Use the hose on the utility sink. Put the lids on them when they are filled. Don’t try to lift or move them after they are full. Try not to get water on the floor.” The girls nodded and scampered down the basement steps. “Ella, will you please help Grandma with the air mattresses? They are in the hall closet, in the container with the green lid. The air pump is in the box on the shelf above it. You can blow up three twin size mattresses and the big one for Daddy and me.” Ella nodded seriously and ran down the hall to the closet, dragged out the container with the green lid, grabbed the box with the air pump and placed it on top, then pulled it into the living room.

Maddie stood on her sturdy kitchen stool and handed down the emergency candles to Grandpa Peter. “I better get supper finished as quickly as possible,” she commented as she carefully climbed back to the solid floor. “It’s a good thing I’ve had it slow cooking in the crockpot all afternoon. All I need to do is finish the veggies. And we’ll use paper plates and plastic wear in case I can’t run water later.”

“You do that, and I think I’ll start a small fire in the stove, just to be ready,” Grandpa Peter suggested.

Supper was a quiet affair. No one asked about Dad, but everyone kept stealing little looks in Mom’s direction. She looked tense. Just as they were finishing, the lights flickered and then went off. Grandma Vi reached out and lit the candle in the middle of the table. The faces around the table looked concerned. Ella was obviously trying not to cry.

The evening dragged by, with still no word from Sean. The clock chimed 10 o’clock. After a quiet family prayer time, Grandpa Peter stood to his feet. He needed to sleep. Grandma went around and quietly kissed everyone’s cheek again and followed Grandpa into their room. One by one, the children slipped off into a restless sleep. Only Maddie remained awake. The clock chimed 2 o’clock. Still, there was no word from Sean.

**Challenge, Part 1**

In this exercise we are going to work through a thorough review and practice of adding fractions. We are going to start with simple equations and work through to the most difficult addition of fractions! Take note of any concepts you may still be unsure about. Remember to reduce wherever necessary!

Get ready! Get set! Go!

Simple!

1. $\frac{2}{8} + \frac{2}{8} =$

2. $\frac{1}{3} + \frac{1}{3} =$

3. $\frac{5}{7} + \frac{1}{7} =$

4. $\frac{1}{9} + \frac{3}{9} =$

A little more complex!

5. $\frac{1}{3} + \frac{2}{6} =$

6. $\frac{3}{5} + \frac{2}{10} =$

7. $\frac{1}{7} + \frac{1}{21} =$

Let's step it up a little! Circle your answers.

8. $4\frac{1}{7} + 2\frac{3}{7}$

9. $6\frac{1}{3} + 1\frac{2}{7}$

10. $4\frac{4}{5} + 9\frac{5}{11}$

11. $6\frac{9}{10} + 3\frac{3}{10}$

12. $7\frac{1}{3} + 4\frac{4}{6}$

13. $4\frac{4}{5} + 3\frac{7}{15}$

Now let's work through some of the elements of working with fractions.

We sometimes need to find a common denominator.

For some equations, this is simple.

Find a common denominator.

14. $\frac{3}{4}, \frac{1}{12}$

why?

15. $\frac{1}{5}, \frac{4}{15}$

why?

16. $\frac{1}{3}, \frac{2}{9}$

why?

For some equations, this can take a bit more work.

Find a common denominator.

17. $\frac{2}{7}$, $\frac{5}{10}$

18. $\frac{5}{9}$, $\frac{1}{4}$

Find the least common multiple of 7 and 10.

7:

10:

Find the least common multiple of 9 and 4.

9:

4:

Sometimes you need to find a common denominator by finding an LCM and reduce by finding the GCF.

19. $6\frac{6}{8} + 4\frac{7}{12} =$

LCM

8:

12:

GCF

8:

24:

Name______________________________

Exercise 2 Day 86

**Challenge, Part 2**

In this exercise we are going to work through a thorough review and practice subtracting fractions. Again, as you work through this exercise take note of any concepts you may still be unsure about. Remember to reduce wherever you need to.

We'll start with simple equations.

1. $\frac{2}{3} - \frac{1}{3} =$

2. $\frac{7}{10} - \frac{5}{10} =$

3. $\frac{6}{7} - \frac{5}{7} =$

4. $\frac{5}{9} - \frac{2}{9} =$

Now a little more complex.

5. $\frac{6}{8} - \frac{2}{4} =$

6. $\frac{8}{27} - \frac{1}{9} =$

7. $\frac{3}{5} - \frac{5}{15} =$

Are you ready to step it up a little?

8. $\begin{array}{r} 20 \\ -\ 18\frac{9}{11} \\ \hline \end{array}$

9. $\begin{array}{r} 6\frac{4}{7} \\ -\ 3\frac{12}{14} \\ \hline \end{array}$

10. **Use Your Words!** Orally explain to your teacher the process you used to solve # 9.

11. $\begin{array}{r} 6 \\ -\ \frac{9}{10} \\ \hline \end{array}$

12. $\begin{array}{r} 20 \\ -\ 17\frac{11}{12} \\ \hline \end{array}$

13. **Use Your Words!** Orally explain to your teacher the process you used to solve #12.

Name______________________________

# Exercise 2

Day 86

Now, let's work through some of the elements of working with subtraction of fractions.

Sometimes we have to borrow from a whole to make a larger fraction before we can subtract.

In this equation, we have to borrow a group of 10 to make enough 1s to subtract…

$$\begin{array}{r} \overset{5}{\cancel{6}}\overset{12}{\cancel{2}} \\ -\ 14 \\ \hline 48 \end{array}$$

When we borrow to make a bigger fraction, we take one from the whole number, "break" it into a fraction that equals the 1 that we borrowed and has the denominator we need to complete the subtraction problem.

$$\begin{array}{r} \overset{6\frac{7}{7}}{\cancel{7}}\frac{1}{7} \\ -\ 3\frac{4}{7} \\ \hline \end{array} \longrightarrow \begin{array}{r} 6\frac{8}{7} \\ -\ 3\frac{4}{7} \\ \hline 3\frac{4}{7} \end{array}$$

We have already learned an alternative way of solving this type of problem on day 72. In the space below, show problem 11 from the previous page solved in this alternative way. Explain what you are doing, as you work through them.

Alternative way of solving.

Write the missing number.

14. $20 = 19\,\frac{\phantom{00}}{20}$

15. $1{,}000 = 999\,\frac{\phantom{00}}{88}$

16. $55 = 54\,\frac{\phantom{00}}{17}$

17. $31 = \underline{\phantom{0000}}\,\frac{6}{6}$

18. $19 = 18\,\frac{15}{\phantom{00}}$

19. $3 = 2\,\frac{500}{\phantom{00}}$

20. **Use your words!** Written or orally, explain how #15 is true.

Name______________________________

# Exercise 3

Day 87

**Challenge, Part 3**

In this exercise, we are going to work through a thorough review and practice multiplying fractions. We are going to start with some of the elements of these concepts.

Fill in the blanks.

1. When multiplying fractions we don't have to worry about finding _____ ________________ ____________________.

   Why?

**Use Your Words!**

2. In this equation: $6 \times \frac{1}{4}$, what is the question we are trying to answer? How much is 6 groups of $\frac{1}{4}$?

3. When you multiply a fraction by a fraction, you ____________________ the numerators and the denominators.

   $\frac{2}{3} \times \frac{5}{7} =$

4. When you multiply a mixed number or a fraction by a fraction, you need to ____________________ the mixed number to an __________________ ____________________ before multiplying.

**Use Your Words!** Explain each step of what you are doing as you solve this:

$$3\frac{1}{3} \times 2\frac{1}{8} =$$

Now let's put this into action!

We'll start simple.

5. $7 \times \frac{1}{4} =$

6. $3 \times \frac{1}{10} =$

7. $\frac{2}{11} \times 11 =$

Now, let's step it up just a little! Remember to write your answer in its simplest terms.

8. $\frac{3}{5} \times \frac{6}{7} =$

9. $\frac{9}{11} \times \frac{2}{3} =$
Hint: use the GCF to reduce your answer.

10. $\frac{5}{19} \times \frac{8}{16} =$
Hint: in problems like this you can use what you know about factoring! Let's get that huge answer down to its simplest form! Use a factoring tree!

Next, we'll multiply with mixed numbers.

11. $2\frac{1}{9} \times 3\frac{6}{7} =$

Hint: in problems like this, we can think about the divisibility rules we have learned. We know that both the numerator and denominator of this improper fraction answer are divisible by 9!

12. $5\frac{1}{3} \times 7\frac{1}{2} =$

Hint: in problems like this, you can easily do the final conversion as mental math.

Let's practice a couple more of these. Use cancellation if possible.

13. $6\frac{3}{8} \times 2\frac{1}{9} =$

14. **Use Your Words!** Explain the little "tricks" you used to solve these as easily and simply as possible.

Use this information to answer questions 15–17 below.

Sean Stevens was working with Charlie and Hairo to replace the flooring in the farmhouse kitchen. The space is a rectangle, which has a width of $12\frac{3}{4}$ feet and a length of $18\frac{1}{2}$ feet.

15. Use Your Noodle — draw a doodle!

In the space below, draw a sketch of the farm kitchen floor. Label it with the dimensions.

16. Write an equation that shows how you find the square footage of flooring needed for the job. Remember: Area of a rectangle = W x L.

17. **Use Your Words!** Now go ahead and solve that equation. Write the steps of the process here:

a.

b.

c.

Use this information to solve problems 18–20 below.

Grandma Violet wanted to make Mom some of her famous chicken, veggie soup. She knew she needed to triple (3x) her recipe (which serves 4) that she usually makes for her husband and herself. Help Grandma figure out the amounts for her soup recipe.

18. The original recipe calls for $\frac{3}{4}$ cup chopped carrots, $\frac{1}{4}$ cup of chopped onion, $1\frac{1}{4}$ cup of corn, $\frac{2}{3}$ cup of diced tomato, $\frac{1}{4}$ cup green peas, and $\frac{1}{2}$ cup cut green beans. How much of each of these ingredients does Grandma need for her tripled recipe?

19. The original recipe called for $\frac{2}{3}$ cup uncooked egg noodles and 2 chicken thighs, $3\frac{3}{4}$ cups chicken stock, $\frac{1}{8}$ teaspoon poultry seasoning, $\frac{1}{4}$ teaspoon garlic salt, $\frac{1}{2}$ teaspoon of thyme, $\frac{1}{3}$ teaspoon of sage, and $\frac{1}{2}$ of a bay leaf (to be removed before serving). Help Grandma figure out how much of each of these ingredients she needs for her tripled recipe.

20. Would you like to make (or help make) Grandma Violet's famous chicken, veggie soup for your own family?

(FYI: If you have gluten-intolerant family members, you can substitute GF noodles or rice for the regular noodles.)

Here are the instructions:

In a large stockpot, place the chicken thighs with enough water to cover them. Cook until the chicken is falling off of the bone. Cut up veggies (or if you are short on time, you can use frozen mixed veggies.) Remove the chicken from the water and place in fridge to cool. Add water to the pot to bring it to about $\frac{1}{2}$ full. Add chicken broth, stock, or soup base to taste. Add all seasonings and bring broth back to a boil as you pick the meat from the chicken bones. Add meat back to broth. When the broth is boiling, add veggies. When the veggies are beginning to become tender, add noodles (or rice). Cook until noodles and veggies are tender.

**Challenge, Part 4**

In this, our final fraction challenge exercise, we are going to work through a review and practice division with fractions. We are going to start with some of the elements of these concepts.

Fill in the blanks.

1. When any fraction is multiplied by its reciprocal, the answer is ____________ ________.

2. When we have an equation like this: $9 \div \frac{1}{3}$, we first place the whole number over a ________. Next, we ________ the fraction and ________________ by its reciprocal.

   If the answer is an improper fraction, we ______________ to a ________________ ____________________. ______________________ if necessary.

   Now solve: $9 \div \frac{1}{3} =$

   In this equation, we are answering this question: How many __________ are in ________?

3. When we divide an equation like this: $\frac{2}{3} \div \frac{1}{4}$, we first ________________ the second fraction and ____________________ by its reciprocal. If needed, convert the improper fraction to a mixed number.

   Now solve: $\frac{2}{3} \div \frac{1}{4} =$

   In this equation, we are answering this question: how many _______ are in __________?

4. When we divide a mixed number by a fraction, first we __________ the mixed number to an ________________ ________________. Next, we flip the second fraction and _____________ by its _________________. Convert the answer back to a ____________________________.

   Solve this one: $2\frac{1}{5} \div \frac{1}{3} =$

   In this equation, we are answering the question: how many ________ are in __________?

5. When we divide a mixed number by another mixed number, first we _____________ both ___________________ numbers to ______________ ___________________. Next, we _______________________ the second improper fraction and ___________________ by its ______________________. Change any improper fractions to a _________________ number. Reduce __________________ ____________________.

   Solve: $2\frac{1}{5} \div 3\frac{1}{3} =$

   In this equation, we are answering this question: how many __________ are in ________?

Now let's practice these concepts.

Solve. Dividing whole numbers by fractions.

6. $8 \div \frac{1}{7} =$

7. $21 \div \frac{1}{3} =$

8. $9 \div \frac{1}{4} =$

Name______________________________

## Exercise 4 Day 88

Solve. Dividing fractions by fractions.

9. $\frac{2}{5} \div \frac{1}{7} =$

10. $\frac{9}{11} \div \frac{4}{5} =$

11. $\frac{10}{13} \div \frac{2}{7} =$

Now, let's divide mixed numbers by fractions. Use cancellation if possible.

12. $2\frac{1}{8} \div \frac{1}{6} =$

13. $4\frac{1}{4} \div \frac{2}{7} =$

14. $3\frac{1}{9} \div \frac{1}{3} =$

15. $2\frac{1}{6} \div 2\frac{2}{3} =$

16. $4\frac{1}{4} \div 1\frac{1}{9} =$

17. $3\frac{1}{9} \div 2\frac{1}{3} =$

### Ingenious Creator Feature Focus

**Snowflakes!**

Snow is so amazing! Though it can bury the ground and cover countless miles of the Earth, each snowflake is uniquely crafted by God, the Creator. He even tells them when to fall.

> **God thunders marvelously with His voice;**
> **He does great things which we cannot comprehend.**
> **For He says to the snow, 'Fall on the earth';**
> **Likewise to the gentle rain and the heavy rain of His strength.**
> **—Job 37:5–6**

# Additional Topics

Lesson 22

Teacher note: The concepts covered in this lesson are more advanced than those in your average math book at this level. Please allow your student to explore these concepts at their own speed.

Here are two options:

#1. If your state requires proof of 180 days of school work, yet you don't feel comfortable with your student tackling these concepts, there is an alternative 10-day plan (to replace the next 10 exercises) in the appendix of this book.

#2. If you do not want to complete lesson 22, and your state does not require 180 days, simply skip it and move to the Cumulative Reviews. These reviews do not include any concepts from lesson 22. Without lesson 22, your student will have completed 170 days of math.

As you move up into higher math, you will be encountering and working with many types of equations. Over the next few exercises, I am going to introduce you to some of the equations you will be seeing.

You have seen equations like this:

$$3 + 4 - 2 = 5$$

You can even do that in your head! This type of equation has more than one type of operation — both addition and subtraction.

Here is another equation with more than one type of operation:

$$5 \times 3 + 6 =$$

This equation has multiplication and addition, so which one do we do first?

In this exercise, I am going to teach you a simple but extremely important rule that will help you tremendously!

The Order of Operations Rule: In equations with addition/subtraction, along with multiplication, multiply first.

| | |
|---|---|
| So, in our equation | $5 \times 3 + 6 =$ |
| we multiply first: | $15 + 6 = 21$ |

**Order of operations — do multiplication first**

What if we have an equation that has a mix of multiplication and subtraction?

Like this: $55 - 5 \times 10 =$

Again, we multiply first: $55 - 50 = 5$

Let's work through a few more!

1. 3 x 3 + 8 =
2. 10 – 2 x 4 =
3. 40 – 5 x 6 =
4. 4 x 5 + 20 =
5. 6 x 6 – 4 =
6. 12 + 10 x 10 =

Mixed Review

7. Dad drove 130 more nails than Charlie. Charlie drove 27 more nails than Hairo. If Hairo drove 35 nails, how many nails did Dad drive? How many nails did they drive altogether?

Write these numbers as decimals.

8. six hundred fifty-five and six tenths
9. eighty-nine and thirty-four hundredths

Now write them as percents.

10. (problem 8)
11. (problem 9)

Solve

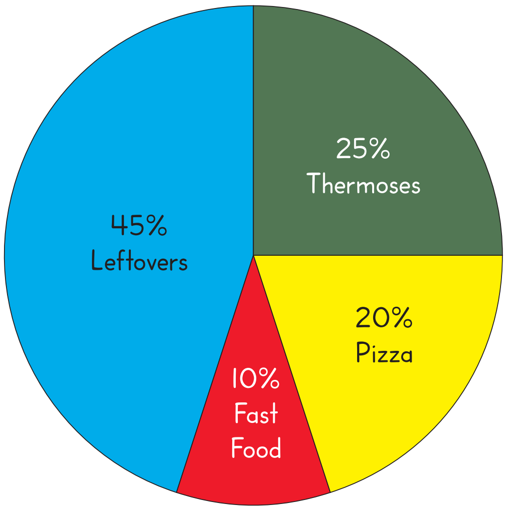
12. If Dad filled the 15-gallon tank of the van, how many quarts of gas did he pump?

Name________________________________

Exercise 1 Day 166

Use the graph to answer these questions.

Types of Lunches the 20 Carpenters Brought to the Job




13. How many guys brought cold cut and cheese sandwiches from home?

14. How many brought thermoses of soup?

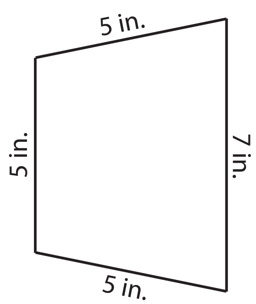
15. How many picked up fast food?

16. How many brought leftovers?

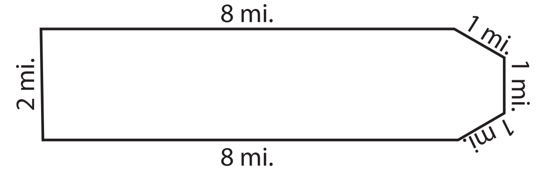
17. How many ordered a pizza?

Find the perimeter of these irregular shapes.

18. perimeter: ____________




19. perimeter: ____________




20. Complete your multiplication grid. Write your time: ________________

Name______________________________

# Exercise 2 Day 167

**Using parentheses**

In our last exercise, I told you the simple Order of Operations Rule.

Write it here:

BUT wait a minute . . .

Sometimes in real life, we HAVE to add or subtract first to get the right answer!

Like this:

What if you wanted to buy all of your friends Christmas gifts. You have 5 guy friends and 6 girl friends, and you want to spend $5 on each of them? First you need to find out how many friends you have all together.

This is what we have to do to make sure we add first but still obey the Order of Operations Rule.

We put parentheses around the numbers we need to add.

Like this:

$(5 + 6) \times 5 =$

$11 \times 5 = 55$ It will cost $55 to buy all of your friends gifts.

So, if you HAVE to add or subtract before multiplying, use parentheses.

Let's do a few more. Make up a story for each of these equations.

1. $(18 - 14) \times 6 =$
2. $(7 + 9) \times 10 =$
3. $12 \times (4 + 5) =$
4. $5 \times (3 + 12) =$
5. $(9 - 6) \times 7 =$
6. $10 \times (16 - 8) =$

Mixed Review

7. $7 \times 4 - 2 =$
8. $2 + 5 \times 5 =$
9. $12 - 18 =$
10. $5 - 12 =$
11. $0.812 \times 3.5 =$
12. $0.845 \times 0.05 =$
13. Charlotte read 7 more books than Natty. Natty read 4 more books than Ella. Ella read 7 books during the school year. How many books did Charlotte read?

14. How many books did the girls read altogether?

15. Of the books the girls read, 20% were historical novels. How many historical novels did they read?

16. Grandma Violet and Maddie Stevens made blankets for the fundraiser for the missions program at church. Each blanket would be sold for $16. If Grandma Violet made 4 blankets and Maddie made 6 blankets, how much money did they help raise?

17. Charlie and Hairo both needed new hammers. The hardware store had hammers for this price: $14 plus 7% sales tax. How much did the boys each pay for their hammers?

18. The new addition that Sean Stevens and his crew are building on the farmhouse measures 45 feet by 32 feet. What is the area of the new addition?

19. Find the area of each room:

    Family room: 30% of the area

    Kitchen: 25% of the area

    Bedroom: 25% of the area

    Bathroom (with laundry area): 20%

20. Create a circle graph to display the information from problem 19.

**Types of equations, part 1**

We learned two order of operations rules in our last two exercises.

Review them here:

1.

2.

In this exercise, we are going to add on to our list of order of operations rules.

Division is done before addition and subtraction.

For example: $30 - 10 \div 2 =$

Solve: $30 - 5 = 25$

3. $15 - 4 \div 2 =$

4. $20 - 21 \div 7 =$

5. $32 - 10 \div 2 =$

6. $12 - 42 \div 6 =$

7. $6 - 4 \div 2 =$

8. $3 - 3 \div 3 =$

9. $5 - 2 \div 2 =$

10. $4 - 20 \div 5 =$

Mixed Review

11. $16 + 2 \times 5 =$

12. $(3 + 7) \times 9 =$

13. $12 \times (5 + 5) =$

14. $17 - 5 \times 2 =$

15. Turn 25% into a decimal ______________ and a reduced fraction _____________

16. How much would your paycheck be for 20 hours of work at a job that pays $12, if the deductions were 20% of the gross?

17. Draw a pair of perpendicular lines.

18. Use your protractor and draw an acute angle of 60°.

19. 340.89 + __________________ = 466.03

20. 3,402 ÷ __________________ = 378

21. 234.86 x 2.7 = ____________________

Name______________________________

# Exercise 4 Day 169

**Types of equations, part 2**

Today we are going to learn yet another rule of order of operations.

To show addition or subtraction that needs to be done before division, put the addition or subtraction into a fraction form.

For example:

$$\frac{30-9}{3} = \frac{21}{3} = 7$$

This means that we need to subtract 30 - 9 before we divide by 3.

Let's do some of these.

1. $\frac{40+8}{8} =$
2. $\frac{18-8}{10} =$
3. $\frac{25-10}{5} =$
4. $\frac{12+6}{3} =$
5. $\frac{11+5}{4} =$
6. $\frac{42-12}{6} =$
7. $\frac{36-6}{6} =$
8. $\frac{6+8}{7} =$

Mixed Review

9. $12 - 3 \times 4 =$
10. $6 \times 9 + 10 =$
11. $(14 - 5) \times 9 =$
12. $2 \times (8 + 8) =$

Mental math

13. $\frac{0}{12} =$
14. $\frac{72}{9} =$
15. $\frac{120}{12} =$

Solve

16. Which would be a better deal — buying a coffee pot when it's on sale for 25% off of its regular price of $24, or using a coupon for $8 off?

17. There are 26 more green jelly beans than yellow jelly beans, and 12 more yellow jelly beans than black jelly beans. If there are 14 black jelly beans, how many green jelly beans are there? How many yellow jelly beans? How many jelly beans are there all together?

18. One store donated 100 blankets donated to the local disaster relief shelter and outreach center. Another store had 20 large blankets. If these blankets were distributed among 40 families, how many blankets did each family receive? Write out your equation, and solve it using the order of operations rules you have learned. (Hint: think of the division operation you have learned.)

19. Dad instructed Charlotte, Natty, and Ella to gather a bag of canned goods to donate to the church where the storm refugees were staying. Ella placed 4 cans of green beans in the bottom of the bag, Charlotte added 3 cans of kidney beans, and Natty topped it off with 3 cans of chicken noodle soup. Dad and the boys filled a bag with exactly the same. How many cans of food did the Stevens family donate? Write an equation and solve using the order of operations rules you have learned. (Hint: you will need parentheses.)

20. Mrs. Thomas brought a huge box of goodies from the bakery to donate to the shelter. In it were 10 large boxes with 6 cinnamon rolls and 6 jelly doughnuts each and a bag of 50 powdered sugar doughnut holes. How many goodies did Mrs. Thomas bring?

    Write an equation and solve using the order of operations rules you have learned. (Hint: multiply first!)

**Advanced percent problems, part 1**

We have learned how fractions, decimals, and percents are related. Now we are going to build on those concepts. The secret to learning how to lay out equations is being able to think through the question being asked and match it with what you know about equations. If you can master this skill, you can solve any problem you come across.

In percentage problems, it is important to remember that there are 3 changeable parts (or variables):

#1 part, #2 percent, and #3 total

In the next two exercises, we are going to explore these three main types of percent problems: (1) missing part problems, (2) missing percent problems, and (3) missing total problems.

Let's look at these 3 questions taken from this fact: 20 is 40% of 50, which demonstrates each kind of problem.

#1: What is 40% of 50?

#2: 20 is what % of 50?

#3: 20 is 40% of what number?

In this exercise, let's explore #1 and #2.

We have already learned the basics of #1: missing part problems. We have learned to write them like this:

what is 30% of 1,440? (This is an equation taken from problem 19 in Day 67.)

We have learned to solve this type of problem by changing the percent to a decimal and multiplying. This is a simple and straightforward way to solve this kind of problem. You can also turn the percent into a fraction before solving.

$$\frac{3\cancel{0}}{1\cancel{00}} \times 1{,}44\cancel{0} = 3 \times 144 = 432$$

Let's do a few more of these.

Convert the percents to fractions before solving.

1. 60% of 40
2. 10% of 150
3. 25% of 96
4. 70% of 900
5. 25% of 1,440

Now, let's explore problem 2: missing percent problems.

We will look at the equation a little differently this time.

Like this:

20 is what % of 50? $\longrightarrow \frac{20}{50} = \frac{?}{100}$

Although you can solve this like any other proportion, the best way to solve is to simply divide 20 by 50, which is 0.4 or 40%.

Name________________________________

# Exercise 5

Day 170

Let's work through a few of these.

6. 30 is what percent of 120?

7. 40 is what percent of 800?

8. 35 is what percent of 350?

9. 16 is what percent of 50?

10. 63 is what percent of 100?

Mixed Review

11. One crisp, clear morning it was –5°. By the end of the day, the temperature rose 20°. What was the temperature by the end of the day? Draw a thermometer to show how you solved this problem.

12. What is the perimeter of an irregular polygon with these dimensions: 12 cm, 5 cm, 7 cm, 9 cm, 4.5 cm, and 4.5 cm?

13. $9 - 6 \div 2 =$

14. $5 - 12 \div 3 =$

15. $7 - 10 \div 2 =$

16. $5 - 20 \div 4 =$

17. $\frac{13 + 3}{4} =$

18. $\frac{20 + 16}{6} =$

19. $\frac{30 - 6}{8} =$

20. $\frac{6 + 9}{5} =$

21. $(11 + 4) \text{ x } 5 =$

22. $3 \text{ x } (16 - 8) =$

Name______________________________

# Exercise 6

Day 171

**Advanced percent problems, part 2**

1. What are the three parts of a percent problem?

   a.

   b.

   c.

2. Show an example of problem type #1:

3. Show an example of problem type #2:

Today, we are going to explore percent problem type #3: the missing total problem

20 of 40% of what number?

This is what we do:

$$\frac{\text{part x 100}}{\text{percent}} \longrightarrow \frac{20 \text{ x } 100}{40} \longrightarrow \frac{200\cancel{0}}{4\cancel{0}} \longrightarrow 50$$

Let's work through a few of these.

4. 10 is 20% of what number?

5. 15 is 30% of what number?

6. 22 is 20% of what number?

7. 49 is 70% of what number?

8. 25 is 5% of what number?

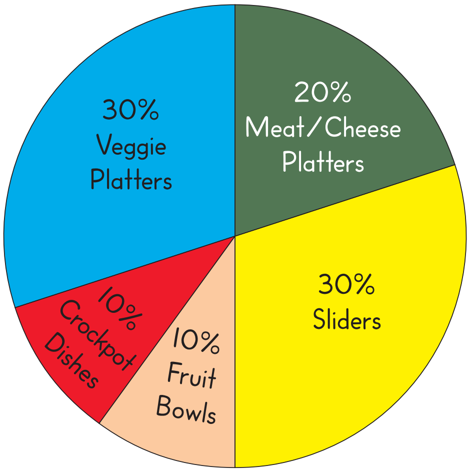
Mixed Review

9. 20 is what percent of 140?

10. What is 40% of 1,200?

11. Use this chart to answer the following questions.

Finger Food at the Welcome Home Party for Grandpa and Grandma
(60 guests brought food to share)




12. How many people brought fruit bowls?

13. How many people brought veggie platters?

14. How many people brought sliders?

15. How many people brought meat and cheese platters?

16. How many people brought homemade dishes in crockpots?

17. 6 – 13 =

18. (4 + 9) x 10 =

19. 4 + 9 x 10 =

20. 346.31 ÷ 100 =

**Measuring circles, part 1**

We have learned that a circle is not a polygon, because it is not made up of connected line segments. Because circles are not polygons, they cannot be measured like polygons.

We have learned:

A circle is named for its center point, and when measured from its center point to anywhere on its edge, the measurement is always the same. This measurement is called its radius. When we measure from side to side, drawing our line through the circle's center point, we call this measurement the diameter. The diameter is the radius x 2. The circumference is the distance around a circle.

In the next two exercises, I am going to show you how to measure the circumference of a circle and how to find the area of a circle.

First, let's discover the circumference. I want to introduce you to a little Greek letter.

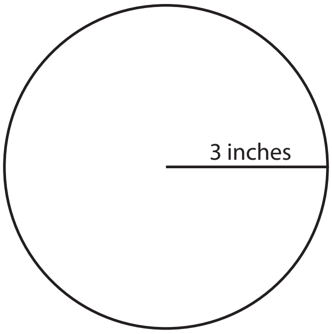
$\pi$ this is pi. The Greek letter actually stands for a never-ending decimal number, which we round to 3.14.

Here is the formula for finding the circumference of any circle:

circumference = 2 x $\pi$ x radius

which is 2 x 3.14 x radius

Let's find the circumference of this circle:




2 x 3.14 x 3 = 18.84 inches

Let's do a couple more.

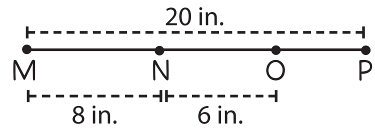
Use your calculator! Round to the nearest hundredth.

What are the circumferences of these circles?

1. Radius: 4 feet
2. Radius: 2.5 inches
3. Radius: 6.2 miles
4. Radius: 12 cm
5. Radius: 18 mm

Mixed Review

6. What is the length of Segment OP?




7. What is the diameter of a circle that has a 2.5 inch radius?

8. What is the area of a rectangle that has sides that are 9 feet and 5.5 feet long?

9. What is the perimeter of the rectangle in problem 8?

10. What is the perimeter of the rectangle in problem 8, with the answer given in inches?

11. How many inches are in 7 miles?

12. $$\begin{array}{r} 275.91 \\ 261.85 \\ 118.76 \\ +\ \ 47.11 \\ \hline \end{array}$$

13. $$\begin{array}{r} 293{,}299 \\ -\ 217{,}341 \\ \hline \end{array}$$

14. **Use Your Words!** Orally or written. Explain the three variables in a percentage problem.

15. **Use Your Words!** Orally or written. Explain what you have learned about the order of operations.

Name______________________________

Exercise 8 Day 173

**Measuring circles, part 2**

1. What Greek letter did you learn in our last exercise?
   What does it stand for in math?

2. How do you find the circumference of a circle?

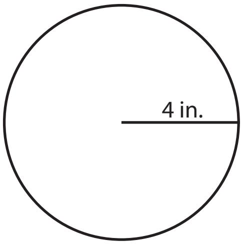
Great job!

Now let's move on to the area of circles!

Again, we need our friend, $\pi$. Here is the formula for finding a circle's area: $\pi$ x radius x radius = area

We can find the area of this circle.

3.14 x 4 x 4 = 50.24




Let's do a few of these.

Find the area of each circle. Use your calculator. Round to the nearest hundredth.

3. Radius: 1.4 inches

4. Radius: 5 feet

5. Radius: 12 km

6. Radius: 8.5 cm

7. Radius: 20 mm

Mixed Review

8. What is the circumference of the circle in problem 6?

9. What is the formula for finding the circumference of a circle?

10. What is the value of π?

Use your protractor to measure and draw these angles.

11. Acute angle: 35°

12. Obtuse angle: 97°

13. Right angle: 90°

14. Acute angle: 15°

15. **Use Your Words!** Orally or written. Explain how to find the circumference and area of a circle.

Note: Make sure you tell your teacher that you have a hands-on exploratory project coming up next. Look ahead to see what materials you will need to gather.

**Practice and Review — Hands-on exploration of circles**

Materials needed:

- Round objects of varying sizes. These can be dinner plates and plates of other sizes (use plastic if possible!), round container lids, etc. (You need at least 8–10 of these items.)
- A measuring tape
- Scrap paper
- A calculator
- A pen or pencil

Use your measuring tape to find the diameter and radius of each of your objects.

Write the diameters and radiuses here:

1.

2.

3.

4.

5.

6.

7.

8.

9.

10.

Now find the circumferences and the areas of each object.

1.

2.

3.

4.

5.

6.

7.

8.

9.

10.