Learning Math with Kayla

Book 4 Place values, Multiplying large numbers

Vicki Meyer

Illustrator Sue Lynn Cotton

The Learning Math with Kayla Books

Book 1 Adding and subtracting like fractions
Book 2 Multiplying fractions
Book 3 Learning multiplication facts
Book 4 Place values, Multiplying large numbers
Book 5 Adding and subtracting unlike fractions
Book 6 Learning about improper fractions and mixed numbers
Book 7 Dividing fractions
Book 8 Adding and subtracting large numbers
Book 9 Solving long division problems
Book 10 Working with decimals and percents
Book 11 Learning about negative numbers
Book 12 Problem solving!

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About the Kayla Books

The Kayla books tell the story of a fourth grade girl who has gotten so far behind in her math class that she is not able to understand what her teacher is trying to teach her. Her math teacher, Mr. Williams, is aware of how poorly Kayla is doing and decides a tutor would be the best way to help her to learn her math.

In this fourth book, Kayla's tutor, Ms. Gibbs, introduces her to place values. With this new knowledge Kayla learns how to multiply large numbers. In later books Ms. Gibbs continues to teach Kayla much of the math she needs to be more successful in school. Because Kayla does her math homework, she *is* successful!

There are twelve books in this series. Whether you're a fourth grader, in middle school or in high school; a Mom or Dad or a Grandparent, you can learn along with Kayla.

The story is told by Kayla, right before she goes off to college.

About Kayla

I have been asked if Kayla is a real person. She and others in the book are composites of the many kids I have tutored, plus myself as a kid. I remember one time I missed a whole week of school and when I returned to my math class, I was completely lost. I was too shy to ask for help and my math grade suffered because of it.

About the Author

After Vicki raised six really smart kids, she began studying for her Ph.D. in order to keep up with them. She taught at the university level for about 25 years, then began tutoring elementary school students. Vicki soon found a new career for herself, tutoring math for at-risk kids, writing about her experiences, and putting together the Kayla books.

Vicki lives with her husband, Ed, in Sarasota, Florida.

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And a special thanks to my husband, Ed, for all of his great suggestions, his skillful editing, and especially his patience. I would not be able to complete the books without him.

DEDICATION

To my Mother, Phyllis Hurtova, who was prevented from going past the fourth grade by political unrest in Czechoslovakia, yet continued to be a life-long learner.

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Chapter 1

Stomach Flu

I woke up during the night with a really bad stomach ache. I raced to the bathroom. I just made it! Whew! As I was going back to my room, Momma came out in the hall.

“What’s the matter, Kayla?” she asked.

“Oh, Momma, my stomach started hurting all of a sudden and I had to run to the bathroom real fast. But don’t worry, I got there just in time.”

Momma felt my forehead. “You feel hot,” she said, looking worried. “Why don’t you just lie down with me?”

I went to her room but before I could lie down, Momma put a great big towel on my side of the bed. She then went to the kitchen and got her big soup pot. She put it right next to the bed.

Momma was just getting in the other side of the bed when I threw up right into that big pot. Boy, was I glad it was there! I don't think I would have made it to the bathroom this time.

Momma got right out of bed and took the pot away. Then she got me a cup of cool water. She said, "Now don't swallow this, Kayla. It's for rinsing out your mouth. Just spit it out in this little bowl."

I did just as she told me. She then took a cool washcloth and wiped my face and gently patted it dry. I felt a whole lot better. I put my head down and fell right to sleep.

When I woke up, I didn't know what time of the day it was. I did know that I didn't have breakfast, though. I was hungry!

Momma must have heard me moving around and came to my room. Oh, I mean *her* room. I was still in her bed. She felt my forehead and said my fever was down. I could tell she was relieved. She asked me how I felt.

"Hungry," I said. "May I please have some breakfast?"

"Breakfast?" Momma said, surprised. "Why Kayla, it's almost noon. What about if I fix you up some nice chicken rice soup? I don't want you to eat too much."

I didn't. I thought I was hungry but after eating just a little bit of soup, I felt full.

"That's fine for now," Momma said. "You can have a nice supper later on. Why don't you just go to your own room and see if you can get a little sleep?"

Momma knows a lot about sick people. She's a nurse's assistant. She works at a great big hospital taking care of people who are real sick. She helps them get better.

I went to my room but I didn't feel like sleeping. I felt wide awake. While I was lying in bed I started thinking. Maybe I could do some of my math homework. The next day was Thursday and I wanted to be ready for Ms. Gibbs. And then I started to wonder. Hmm, maybe Momma would like to work on fractions with me.

I heard her working in the kitchen so I called out, "Momma, will you work on my fractions with me?"

She came to my room and said, “I don’t know how to do fractions. I never learned how to do them when I was in school.”

I wasn’t sure how much math Momma knew. I remember asking her a question about math when I was in 3rd grade. She didn’t know the answer. I forgot what it was that I asked her. Anyway, she just said she was never any good in math.

Hmmm. Maybe I can teach Momma some fractions. After all, she taught me so many things. She taught me how to read and she still reads to me most nights.

I can read by myself, of course, but I still like her to read stories to me. Sometimes she just puts the book down and tells me stories from her head. I like that best.

The more I thought about it, the more I thought Momma would like to learn about fractions and I would like to teach her.

“Momma,” I said to her, “Will you please color some fraction bars with me? I’ll tell you what to do. It’ll be fun. Pleeeese?”

“Well, all right but just for a little bit,” Momma said. “I took off work today to stay with you but I have a lot of housework to do. And I need to go grocery shopping, too.”

Chapter 2

Teaching Momma fractions

Momma and I sat at the kitchen table. I drew a fraction bar with three sections, just as I had done for Cleveland. I took out the colored pencils. I told Momma she could choose any color she wanted to. She chose red. I asked her to color one section of the bar with it. I colored my section green.

After we colored our sections I said, just like Ms. Gibbs, "This fraction bar is divided into thirds. I colored in one-third of the bar and you colored one-third. How much did we color altogether?"

Momma answered right away, "Why, we colored two-thirds of the bar."

Reader, if you would like to review this, look on page 8 in Book 1. In that book, Ms. Gibbs and I colored sections of a ***circle****, but whether it's a circle, fraction bar, or anything else: one-third plus one-third equals two-thirds – and it always does!*

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

Wow! Momma is learning fast. I drew more bars and we practiced adding and subtracting fractions. Momma was getting them all right. She said, "I can understand what we're doing. But when I was in school I remember fractions seemed a whole lot harder than what we're doing now.

“Why I remember once, when I was just about your age, I got sick with the flu, just like you did today. But it took me much longer to get better. I missed a whole week of school. When I returned to my math class, my teacher was talking about turning fractions upside-down.”

“Upside-down?” I asked, puzzled. “You had to turn fractions upside-down?”

“Well, yes. We were supposed to put the top number on the bottom and the bottom number on the top. That’s upside-down, isn’t it?” Momma asked.

“Gee, I never heard of upside-down fractions. Why were you supposed to turn them upside down?” I asked.

“I don’t know. I never figured it out,” Momma said. “I was getting all mixed up. I guess I wasn’t smart enough to do fractions so I just stopped paying attention. I used to read stories in my math class instead.”

“What?!” I exclaimed. I was so surprised when Momma said that. I can’t picture Momma reading stories in her math class. Why, I can’t even picture Momma in a math class.

I remember once, Momma showed me a picture of herself when she was just about my age. It didn’t look like her though. It kinda looked like me only her clothes looked funny. She had a real fancy dress on. I never wear fancy dresses.

Hmm…I wonder. Should I tell Momma that I sometimes draw flowers in my math class? I wonder, should I tell her I had to go to the Time-out Room? Maybe I will - but just not right now.

Oh, I better tell Momma that when you add and subtract fractions like we're doing, the denominators have to be the same. Ms. Gibbs said that's very important. But before I got to tell her that, she said she had some grocery shopping to do.

"I want to make you something special for dessert," Momma said. "You go back to your room and rest. There are some books on your bedside table to read if you can't sleep. I'll be back real soon."

I went back to bed, but I didn't feel like reading and I didn't feel like sleeping. All I could think about was Momma reading books in her math class. I wonder if her teacher ever caught her reading and I wonder if she had to go to a Time-out Room. I wonder...

The next thing I remember was smelling something real good. Hmm. I sat up in my bed. At first I thought I was dreaming but once I was sure I was awake, I could still smell it and I recognized that smell!

Momma must be baking sweet potato pie. That's my favorite! I bet I know what we're having for dessert tonight.

Momma peeked in my room to see if I was still sleeping. I wasn't. I was sitting up in the bed wide awake. I had a book in my hand but I was just looking at the pictures. I couldn't read. I was too hungry.

I was glad to hear Momma say, “It’s time for dinner.”

I sat with Momma at the kitchen table and ate my whole dinner. She noticed how much I had eaten and said, “Why, Kayla, you must be feeling 100 percent.”

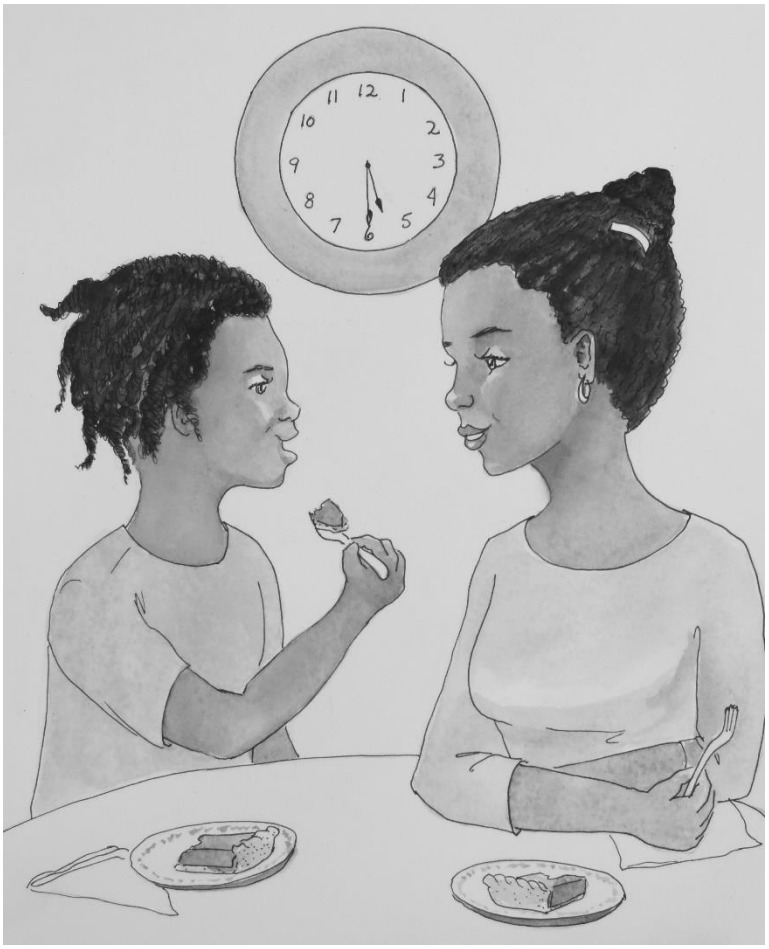
“Yes, Momma,” I said. “I *am* feeling 100 percent!”

“Do you have any room for dessert?” she asked. “I made you something special.”

“What is it?” I asked. I pretended I didn’t know what it was.

Momma didn’t answer. She got up, walked to the counter and brought back two pieces of sweet potato pie.

“Oh, Momma, sweet potato pie. My favorite!” I exclaimed. Momma looked pleased and so was I. Eating sweet potato pie with Momma made me forget all about being so sick this morning.



I wonder if I should tell her that I knew what the surprise was. Hmmm…maybe I will - but just not right now.

Chapter 3

Multiplying by nine

As I entered the tutor room, I saw Ms. Gibbs had my multiplication grid already on the table. "Good afternoon, Kayla. I heard you were sick yesterday. Are you feeling better now?"

"Yes, Ms. Gibbs," I said. "I'm feeling 100 percent!"

"100 percent! Why Kayla, I didn't know you knew about percents."

"Huh? Percents?" I asked.

"Well you just said you felt 100 percent," Ms. Gibbs answered with a little smile.

"Oh, but that's just an expression my momma uses. I'm feeling fine, Ms. Gibbs."

"Well I'm glad you're feeling fine. We can talk about percents another time," Ms. Gibbs said. "Right now I'd like you to do a little more work on your multiplication grid. Can you tell me how much nine times seven is?"

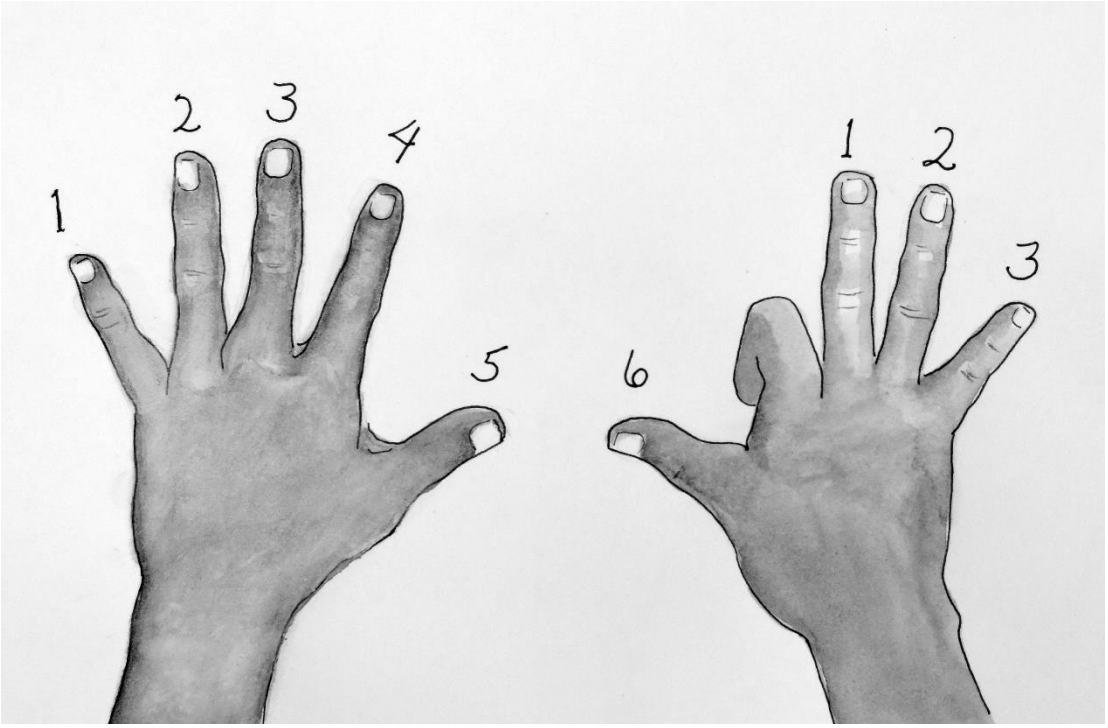
"Nine times seven is sixty-three," I answered, as I put sixty-three in my grid. "And seven times nine equals sixty-three too," and I wrote the other sixty-three in my grid.

"And oh, Ms. Gibbs, guess what! I already knew how to multiply by nines just by using my fingers - but I sorta forgot I knew. But now I remember. Should I show you?"

I didn't wait for an answer. "Just watch me," I said. "I'll multiply seven times nine because I already know that that's sixty-three.

"First I put my hands in front of me, palms down. And then I start counting my fingers from the left until I get to seven – oh, thumbs count, too – and then I bend down my seventh finger.

Now here's the tricky part: I count the fingers to the left of my bent finger; one, two, three, four, five six. So **six** is the first digit of my answer. Then I count the fingers to the right of my bent finger; one, two, three. So **three** is the second digit of my answer. My answer is **sixty-three**, and that's what nine times seven is: sixty-three! See? It works!



9 X 7 = 63

“So I didn’t really have to memorize nine times seven. I could have just used my fingers to figure it out, but I memorized it anyway.”

“Well,” Ms. Gibbs said, it seems to me it was easier and a lot faster just to memorize nine times seven, don’t you think?”

“Hmm... maybe it is a little faster. But still, don’t you think it’s a neat trick?”

“I’m not so sure,” Ms. Gibbs answered. “I’ll show you what I learned about multiplying nines when I was just about your age.

“Let’s begin with nine times two and see if you can find the pattern. The first digit of your answer is always one less than the number you’re multiplying nine by.

“One less than two is one, so the first digit is a one. The second digit is the number which when added to the first digit will give you nine. One plus what equals nine?” Ms. Gibbs asked.

“Eight,” I answered confidently.

Ms. Gibbs wrote the equation:

9 X 2 = 18

“Now let’s see you continue. I want you to write the rest of the equations up until nine times nine. Remember the rules I just told you and let me know when you see the pattern.”

I did what Ms. Gibbs said, and began writing the equations:

9 X 3 = 27
9 X 4 = 36
9 X 5 = 45
9 X 6 = 54
9 X 7 = 63

“I can see the pattern!” I said excitedly. “I can see that when the first digits of the answers go **up** by one; two, three, four, five, and six, the second digits go **down** by one; seven, six, five, four, and three. So that must be why the two digits always add up to the same thing. That’s kinda cool!”

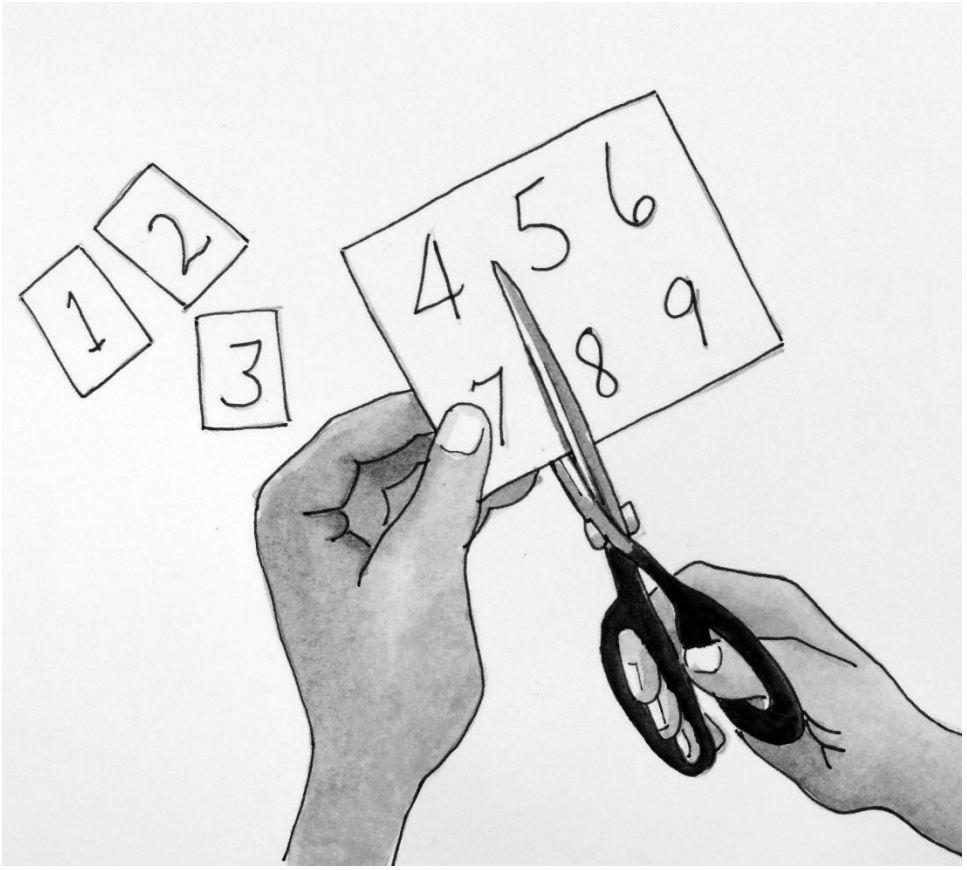
“Yes, that is kind of cool,” Ms. Gibbs said, “Now finish the nines, please. You only have two left,” Ms. Gibbs said.

I did, and they were easy:

9 X 8 = 72
9 X 9 = 81

“And as you can see, Kayla, this is not some kind of trick. It’s just a shortcut. It’s good to use shortcuts, but only if you understand them. Otherwise you might get mixed up.”

Then Ms. Gibbs took an index card from her folder. On it she wrote the numbers from one to nine. I watched as she cut the card into small pieces, with one number on each piece.



“Now, this is what I want you to do.” Ms. Gibbs said. “This is like a little game. You can play it by yourself or with someone else. Turn all the cards over. Then pick a card and whatever number is on the card you say, as fast as you can, the number that will add up to nine.

“OK, Kayla, let’s play. Please pick a card.”

I picked the number, “3.”

I used my fingers to quickly count up to nine but I didn’t think Ms. Gibbs saw me. “Six,” I answered. I was pretty fast.

“That’s correct. Now practice this at home and see if you can say the answer just a little faster and *without* counting on your fingers,” Ms. Gibbs said.

Oh-oh, she saw me!

“There is nothing wrong with counting on your fingers,” Ms. Gibbs explained. “People have been doing it since very early times. Why, the reason we have a base ten system is because we have ten fingers. Now if we had eleven fingers, we probably would have a base eleven system.”

A base eleven system? Boy, am I glad we have only ten fingers! Hmm, what if we did have eleven fingers? I wonder what hand the extra finger would be on.

“And there are other systems besides the base ten system,” Ms. Gibbs continued. “Computers use a base two system.”

“A base two system?” I asked. “Hmm. Computers don’t have fingers so they must use something else.”

“You’re right, Kayla,” Ms. Gibbs said with a smile, “Computers have tiny switches that can be either ON or OFF, sort of like having only two fingers! We can talk about that another time if you’d like.

“Now for this next week, I want you to learn your nine times tables. You can use these cards to practice with,” Ms. Gibbs said as she put a paper clip on them. “Just pick a card and say what other number you need for the numbers to equal nine.

“See if you can do this without using your fingers. If you need to count on your fingers, then go ahead and do it. But then, the next time, see if you can say the number without using your fingers.

Always counting on your fingers is just a habit. With just a little effort, you could do simple problems like this without using your fingers. If you practice doing problems like this in your head, it will help you become math savvy."

"Savvy? Math savvy?" I asked.

"Yes. Being math savvy means you have a good common-sense understanding of math," Ms. Gibbs explained. "People who are math savvy can work many problems in their heads because they understand numbers so well."

I didn't say anything, but I was thinking that it would be fun to work problems in my head. I'd like to be math savvy.

"If you practice just a little every day you'll soon know all your nine times tables. Next week I will ask you them and if you get them all right and can answer quickly and *without* using your fingers, you'll be able to put eleven new numbers in your grid! Won't that be nice?

Gee, if I can put eleven more numbers on my grid, I'll be almost done. Well, maybe not *almost* done, but I'll have a lot of numbers in my grid. I wonder how many empty boxes I'll have left.

I was looking at the grid trying to figure out how many more boxes I have to fill in when Ms. Gibbs said, "It's getting late and we still have a lot of work to do."

Chapter 4

Trying to multiply large numbers

"Now, Kayla, last week you learned how to multiply big numbers that are multiples of ten and you did a good job with them. But I noticed that you have trouble multiplying other big numbers.

Let's start with this problem and see where the trouble lies," Ms. Gibbs said, as she wrote the problem.

```
 273
X326
```

I looked at the problem and said, "Well, you know, Ms. Gibbs, I'm not so good at multiplying big numbers like this."

"Just do it in steps, Kayla," she suggested. "First just multiply by six. You can do that, can't you?"

"Yes, I can do that." I wrote out the problem and began multiplying. Six times three is uh…eighteen; I put down the eight and regrouped the one.

```
  1
 273
 X6
   8
```

OK, now six times seven is forty-two. That's easy! I made sure I add the one that I just regrouped; that makes forty-three. I put down the three and regrouped the four.

```
 41
 273
 X6
 38
```

Let's see, six times two is twelve, plus the four that I regrouped makes sixteen. I wrote down the sixteen and then read the answer out loud, "Sixteen hundred and thirty-eight!"

```
 41
 273
 X6
1638
```

“Good,” Ms. Gibbs said. “Now let’s see you multiply 273 by 26.

I wrote out the problem again, this time with 26 instead of just 6, and began to multiply by six. But right away I realized I just did that, so I copied the answer “1638” down again.

Now all I have to do is multiply 273 by 2. Two times three is six; I put down the six. Two times seven is fourteen; I put down the four and regrouped the one. Two times two is four, plus one more is five. So, 273 times 2 is 546. When I add this to 1638, my answer is 2184.

```
  1
 273
X 26
1638
 546
2184
```

I did it and I think it’s right…or maybe it’s wrong…I’m not sure…

“That’s not right!” Ms. Gibbs said.

Reader, put a big X through Kayla’s problem, because it’s not right!

“You see, the two in the 26 isn’t really a two, it’s a twenty.”

“A twenty?” I asked, as I looked again at the two. It sure looks like a two to me.

“Kayla, you need to learn about **place values**!”

Chapter 5

Place values

“As you know, there are only ten digits, zero through nine. But with these ten digits, Kayla, we can make any number we want. Isn’t that amazing?” Ms. Gibbs asked.

I nodded my head but just a little. I really wasn’t amazed. And I wasn’t so sure I would like place values. I remember Mr. Williams said something about it once, or maybe it was twice. I really didn’t get what he was saying, though. I think I might have been drawing flowers at the time.

“Kayla, this shouldn’t be too hard because you’re already familiar with place values. You use them every time you talk about money.”

“I do?” I asked. But I really didn’t think I did. I don’t see how I could use place values if I don’t even know what they are!

“Just suppose you have nine cents. Show me how you would write that amount down,” Ms. Gibbs said.

I wrote down 9¢.

“Now suppose someone gave you one cent more. Show me how you would write that amount down.”

I wrote down 10¢.

“See, Kayla? Because there are only ten digits, 0 to 9, you knew you had to put a 1 in the tens column and a 0 in the ones column.”

I nodded my head a little, but I was thinking – Well, that's just the way you're supposed to talk about money.

Ms. Gibbs continued, "The value of a digit depends on its place. I have a chart right here in my bag that will help you understand this. Let's take a look at it."

I looked at the chart and noticed right away that the words were written sideways – but I could read them anyway.

First Ms. Gibbs wrote a 9 right under the word "Ones," and then she wrote a 0 right under the 9, and a 1 to the left of the 0, under the word "Tens."

Millions	Hundred Thousands	Ten Thousands	Thousands	Hundreds	Tens	Ones
						9
					1	0

"See? The nine means there are nine ones; that's your nine cents. And when someone gave you one cent more, you correctly wrote down '10¢.' The number '10' really means there is 1 ten and 0 ones – or you could say 1 dime and 0 pennies!"

"Huh? I knew that?" I thought to myself. I guess I must have, because I did it. But I never, *ever* thought about it the way Ms. Gibbs described it.

I was starting to see how you can use place values when you talk about money even if you didn't know anything about them. Maybe learning about place values won't be so hard after all.

Ms. Gibbs continued, "Now let's suppose someone gave you five dollars more. Then you would have $5.10. You would have to put the 5 in the Hundreds column, wouldn't you? Please put the 5 in the Place Value chart to show the amount $5.10."

I did, and here's what it looks like now:

Millions	Hundred Thousands	Ten Thousands	Thousands	Hundreds	Tens	Ones
						9
				5	1	0

"Now let's get back to our multiplication problem. But before we begin, I'd like you to put the number we're multiplying by, 326, into the chart. Just listen to the way I say it: 'three hundred and twenty-six.'"

"OK, I can do this," I said. "The 3 goes into the 'Hundreds' column, the 2 goes into the 'Tens' column because twenty is just two tens, and the 6 goes into the 'Ones' column."

Reader, can you put three hundred and twenty-six in for Kayla? If you want to see if you did it right, look on page 34.

Millions	Hundred Thousands	Ten Thousands	Thousands	Hundreds	Tens	Ones
						9
				5	1	0

"Good," Ms. Gibbs said. "As you can see, each column is a multiple of ten; that's what our base ten system means."

"Oh, I get it now - I *really* get it!" I said.

Reader, I hope you really get it too!

"Now that you really understand place values, Kayla, you'll be able to multiply large numbers."

Chapter 6

Multiplying large numbers

"Here is the problem again. You were correct when you multiplied 273 by 6, so let's start there," Ms. Gibbs said as she wrote out the problem.

273
X6
1638

Reader, if you want to review how Kayla got this answer,

see page 17.

"Now, I'm going to multiply 273 by 20, Ms. Gibbs said as she wrote this problem.

273
X20

"Now when multiplying 273 by 20, some students put down a whole row of zeros like this to show that they're multiplying a three-digit number by zero," Ms. Gibbs said as she wrote

273
X20
000

But then she added, "That's not necessary."

Reader, please put a big line through those unnecessary zeros!

"Here's a little faster way. Because I understand about place values, I know I have to put down just one zero on the right. This zero is a place holder for the zero in the twenty.

273
X20
60

So now I can just multiply by the two. Two times three is six so I put down the six," Ms. Gibbs explained.

"Now I'll multiply two times seven; that's fourteen. As you know, I can only put one digit down at a time.

Since fourteen is a two-digit number, I'll put down the four and carry the one.

$$\begin{array}{r} {\scriptstyle 1} \\ 273 \\ \underline{\times 20} \\ 460 \end{array}$$

"Carry?" I asked.

"Oh! Oh! I know you were taught to say 'regroup the number'. I was taught to say 'carry' it." "Regroup" and "carry" mean just about the same thing," Ms. Gibbs explained.

"Since I can put only one digit down, the four, I have to carry – oh, I mean *regroup* the one. Kayla, I'll try to remember to use the word 'regroup' since that's what you're familiar with.

"Now the next step is multiplying the two by two. That's easy; it's four and then I add the one I *regrouped*. Four plus one is five and now we're done multiplying by twenty.

$$\begin{array}{r} {\scriptstyle 1} \\ 273 \\ \underline{\times 20} \\ 5460 \end{array}$$

"That seems like a lot of work," I said as I watched.

"Oh, we're not done yet. Just keep following along with what I'm doing, Kayla. Now I'm going to multiply 273 by three hundred. This time I'll put *two* zeros on the right to show that I'm multiplying by hundreds. Since I've taken care of the zeros in the three hundred, I can just multiply by the three.

"Three times three is nine, so I put down the nine to the left of the two zeros. Three times seven is twenty-one. I'll put down the one and regroup the two. Now I'll just need to multiply three times two and add the two that I regrouped. That's eight and now I'm done with this part of the problem.

$$\begin{array}{r} {\scriptstyle 2} \\ 273 \\ \underline{\times 300} \\ 81900 \end{array}$$

Do you understand what I just did?" Ms. Gibbs asked.

I nodded my head. I was following along and I think I was getting it. But this seems like a lot of work just to multiply some numbers. No wonder I get mixed up!

Ms. Gibbs must have read my mind because she said, "This may seem like a lot a work but we just have one step left. Do you know what the last step is?"

Hmm, I think we're supposed to add them together but I wasn't sure so I didn't say anything. I just shrugged my shoulders a little.

"Now we have to just add the products together," Ms. Gibbs said.

Oh, I knew that. Why didn't I just say it?!

Ms. Gibbs wrote the answers to all the multiplication problems she did and added them together. "I have to make sure I put them in the right columns and be sure to keep the columns straight or else the answer will be all wrong. Then I would have to start again," she warned.

1638
5460
81900
88998

"That's really a lot of work just to multiply numbers. Do you have any short cuts?" I asked.

Well, if you have your place values down pat, instead of multiplying in three separate problems like I just did, you can multiply all the numbers in one problem. That's the way it's usually done.

There is one extra thing you have to remember when you do it this way: After you add on any regrouped number, put a line through it so you don't get mixed up. Would you

like to do the problem that way? If you need help I'll be right here."

I slowly shook my head "no" but I don't think Ms. Gibbs saw me. After she wrote out the problem, she put the paper right in front of me to solve. So I decided to try it.

I can probably do the first part since I already did it and I got it right. So that's what I did.

~~4~~ ~~1~~
273
X326
1638

After I added the regrouped 1 and 4, I remembered to put lines through them like Ms. Gibbs said I should.

I also remembered what Ms. Gibbs said: the two wasn't really a two because it's in the "Tens" column, and that makes it a 20. That's why she put the zero on the right in the next line. Then after she did that, it was OK to multiply by two so that's what I did and this is what I got.

~~1~~
~~4~~ ~~1~~
273
X326
1638
5460

I put the 1 that I regrouped from 2 x 7 = 14 in the line above, and after I added it: 2 x 2 + 1 = 5, I drew a line through it.

Now all I have to do is multiply by three – oh, I mean three *hundred*. I can do that. I first put the two zeros on the right to take care of the two zeros in 300, then I just multiplied by three. Three times three is nine, so I put a 9 next to the two zeros. Three times seven is twenty-one, so I put down the one and regrouped the 2. Now there's just 3 x 2 plus the 2 I just regrouped which gives me 8, and I think I'm all done multiplying: I looked up at Ms. Gibbs to see if she thought so too. She nodded her head and said, "Go ahead, Kayla, finish the problem.

2
1
~~4~~ ~~1~~
273
X326
1638
5460
81900

OK I just have to add them all together, so that's what I did and this is what I got.

I quickly looked back at Ms. Gibbs' answer and saw that the answers were the same. I was a little surprised but not a whole lot because I kinda knew I did it right.

"Why that's very good," Ms. Gibbs said with a big smile. "Now remember, if you do get mixed up, you can always do the multiplication in steps like I did. In fact, it might be a good idea to practice both ways until you get this way down pat.

"Now you're ready to work some multiplication problems," Ms. Gibbs said, and she gave me this problem:

Just suppose in one school, there are 18 children in each classroom, and there are 3 classrooms for each grade. The grades are kindergarten through 5th grade. How many children are there in the school altogether?

Ms. Gibbs just showed me about multiplication so I knew I was supposed to multiply. Let's see. I just need to multiply the number of kids in one classroom by the number of classrooms for each grade. That will give me the number of kids in each grade.

And there are five grades in our school – oh, and there's kindergarten too, so that makes six. I had to use my fingers to help me multiply these numbers but I think I got the right answer.

After I checked it over to be sure, I confidently said, "There are 324 kids in the whole school."

```
  2
  1
 41
 273
X326
1638
5460
81900
88998
```

```
  2
 18
X3
54
```

```
  2
 54
X 6
324
```

“Good,” Ms. Gibbs replied, “but there’s more to the problem.

“Now what if the cost of books and supplies for each student averages $58? What is the cost of books and supplies for this school?”

That’s another multiplication problem. So I multiplied.

$$\begin{array}{r} {\scriptstyle 1\,2} \\ {\scriptstyle \cancel{1}\,\cancel{3}} \\ 324 \\ \underline{\times 58} \\ 2592 \\ \underline{16200} \\ 18792 \end{array}$$

I read the answer out loud. “Eighteen thousand seven hundred and ninety-two.”

I looked up at Ms. Gibbs thinking she would say how good I was but instead she said:

“The question asks what is the cost of the books and supplies. You multiplied the number of children in the school by the amount spent on supplies for each child so the answer should be the total cost in dollars.”

“Huh?” I said. “Oh, it’s eighteen thousand seven hundred and ninety-two dollars. Wow, that’s a lot of money!”

Ms. Gibbs said, “Yes, that is a lot of money, but if the supplies help the students, the money is well spent.

“Kayla, I know you’ll be using a calculator to work big problems like this in school and in real life. But still it’s important for you to know how to do them on your own. A good understanding of the way multiplication works is part of being math savvy,” she said.

Hmm, I *do* understand how to multiply these big numbers. Gee, maybe I *am* becoming math savvy!

“Now here’s the very last problem for you today. Please pay attention,” Ms. Gibbs said. She put the paper with the problem in front of me and then read the problem out loud.

“A big store had a contest for its workers. The owner of the store brought all the workers to the storage room and pointed out the many jars of jelly beans on the shelves. “As you can see,” she said, “there are four shelves of jelly beans and there are twenty-eight jars on each shelf. In each jar, there are one hundred and two jelly beans. The first person to correctly tell me the total number of jelly beans on the shelves wins a brand new bicycle.

“Some workers started to guess. One yelled out, ‘five thousand!’ Another shouted, ‘one thousand!’ Still another said, ‘One thousand and ninety-nine!

“Alfa, a high school boy, quietly and confidently told the owner the exact number of jelly beans in the store. He didn’t guess, he somehow just figured it out. When he was done working for the day, he rode his new bike home from the store.

“How did Alfa figure out how many jellybeans there are in the store? And how could he have done it so fast? Can you figure it out, Kayla?” Ms. Gibbs asked.

OK, I can do this. If I just multiply the number of jars on each shelf by the number of shelves of jellybeans, I’ll get the number of jars altogether.

```
  3
 28
X4
112
```

Now since there are, uh - I had to look at the paper again - one hundred and two jellybeans in each jar, all I have to do is multiply the number of jars by 102, the number of

jellybeans in each jar, and I'll get the number of jellybeans altogether. So that's what I started to do.

112
X102
224

After I multiplied by the 2, I wasn't sure what to do next because of the zero. Well, according to what I learned about place values, that zero means there are no "Tens" in 102. There is a 1 is in the "Hundreds" place, so the next thing I should do is multiply by one hundred. If I put two zeros on the right in the next line all I have to do is multiply 112 by one and then I'm done. Oh, I still have to do is add the numbers up so that's what I did.

112
X102
224
11200
11424

I quickly checked my answer so to be sure I didn't make some dumb mistake, added the comma and then confidently said to Ms. Gibbs, "There are eleven thousand four hundred and twenty-four jelly beans in the store."

"Yes, that's right," Ms. Gibbs said. "I was watching you multiply and I saw you did everything right. And that was very clever of you to treat the zero properly when multiplying by 102! That shows you understand place values."

When I'm done with school for the day, I think I'll ride my new bike home.

…just kidding!!!

Reviewing what I learned

I thought I had a good way to multiply numbers by nine just by using my fingers, but Ms. Gibbs taught me a better way. I'll just tell you about this better way.

The first digit of the answer is one less than the number you're multiplying nine by. The second digit of the answer is the number that, when added to the first number, will give you nine. You'll be able to understand this better if I give you an example.

Say I want to multiple nine times two. One less than two is one. That's the first digit of my answer. The second digit must be eight because one and eight equals nine so:

9 X 2 = 18

See? This works for all the nine times tables until nine. I have all the nine times tables written out on pages 12 and 13. Take a look at them. Notice that when the first digit goes up by one, the second digit goes down by one. And that's why they always add up to nine!

Don't forget, just because you understand how it works, you still have to practice multiplying by nine. That's what I did and now I have my nine times tables down-pat!

To practice them, make up some cards for yourself like Ms. Gibbs did for me. I practiced my nine times tables by picking a card, any card, and then saying, as fast as I could, the number that I would have to add to make nine.

At first, I used my fingers for counting but soon, I was saying the answer without using my fingers. I surprised myself that I was so good - and so fast! I bet you will be too. That is, if you practice!

Now on to multiplying big numbers. I used to have trouble doing this, but Ms. Gibbs helped me understand place values and now I can multiply big numbers. I didn't think I knew anything about place values but I found out I did.

And I bet you do too because that's the way you talk about money. We all do! That's because it's the only way we can talk about money.

Just think of the ones column as the penny column and the tens column as the dime column. Oh, in case you're wondering, there is no nickel column because everything is in base ten. That just means our numbering system is based on multiples of ten and the place value chart is too. And do you know why? It's because we have ten fingers! Isn't that interesting?

Understanding place values is important when you multiply big numbers. Let's take this number, "123," and I'll explain.

The three is just a plain old three because it's in the ones column. But the two is really a twenty because it's in the tens column and two times ten equals twenty. The one is in the hundreds column so that means the one is really one hundred.

So if you multiply by the two, which is really a twenty, you have to put a zero way on the right to take care of the zero in twenty. Then you can just multiply by two. The same idea applies to the one in the number, 123, because the number one is really one hundred. So you have to put two zeros on the right, and then you can just multiply by the one.

It's good to think of the numbers in columns and remember, you can only put one number in each column. That's why if you get a double digit answer, you can only put one of the digits down. Put the digit on the right down and regroup the one on the left. That

means put it above the next number you're going to multiply because you're going to add it to what you get after you multiply that number.

Oh, and don't forget to put a line through that number after you added it. If you don't, you might get mixed up. Got it so far?

After you're done with all the multiplication, you have to add up all the answers. Then you'll be done! Make sure you keep your columns straight or else you might make a mistake and your answer will be all wrong even though you multiplied everything right.

All this sounds complicated but if you first do the problems in steps, it might be easier. Ms. Gibbs did a problem that way on pages 23 to 25. I did the very same problem in just one step on page 26 and 27 and we got the same answer! If you didn't get the same answer as we did, try to figure out your mistake and do it over again.

Don't get discouraged. Sometimes I have to do problems over and over again until I get them right. That's how you learn stuff and believe me, I've learned a lot of good stuff. And you will too!

On page 22, I asked you to write out the number "326" in the place value chart. The correct way to do it is on the next page. Turn the page to see if you got it right!

Millions	Hundred thousands	Ten thousands	Thousands	Hundreds	Tens	Ones
				3	2	6

Reader, I put some extra lines in this place value chart. That's just in case you want to put some more numbers in.

Practice Problems

Please put your answers for the first six problems in the Place Value Table on the next page.

1. Supposing you had 52 cents and someone gave you 50 cents more. How much money would you have?

2. Alfa makes $9 in one hour. In one week he worked two days, five hours each day. How much money did he make in that week?

3. A school bus has seats for 26 passengers. There were five buses, each filled up with students and counsellors, going to the museum. How many people went to the museum? (The bus drivers did not go into the museum.)

4. How much is 7,000 X 600?

5. How much is 20,000 X 900?

6. How much is 9,000 X 7,000?

Solve the following equations. Watch the signs!

7a. $\frac{1}{4} + \frac{3}{4} =$

7b. $\frac{1}{9} \times \frac{2}{7} =$

7c. $\frac{1}{9} \times \frac{3}{9} =$

7d. $\frac{4}{5} - \frac{1}{5} =$

7e. $\frac{5}{4} - \frac{1}{4} =$

7f. $\frac{5}{4} + \frac{1}{4} =$

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

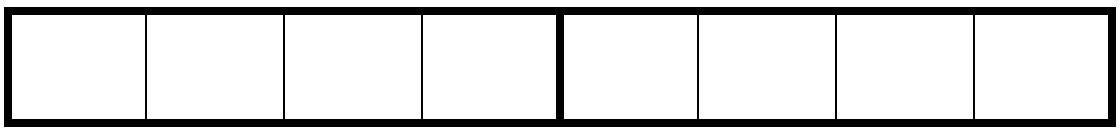
7h. $\frac{3}{8} - \frac{3}{8} =$

	Ten Millions	Millions	Hundred thousands	Ten thousands	Thousands	Hundreds	Tens	Ones
1.								
2.								
3.								
4.								
5.								
6.								

8a. What is three-fourths of one-half? _____

Use one of your colored pencils to show your answer in the fraction bar below.

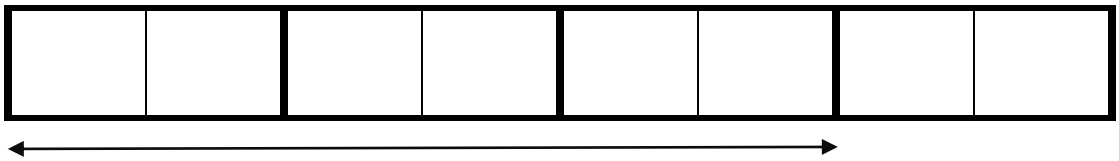
Hint: Remember that the “of” in a fraction problem just means to multiply.



One-half of the fraction bar

8b. What is one-half of three-fourths? _____

Use one of your colored pencils to show your answer in the fraction bar below.

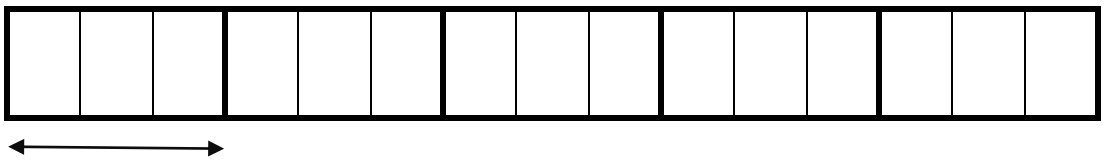


Three-fourths of the fraction bar

Are the areas you colored in these two fraction bars the same? They're supposed to be! That's because three-fourths of one-half is the same as one-half of three-fourths.

9a. What is two-thirds of one-fifth? _____

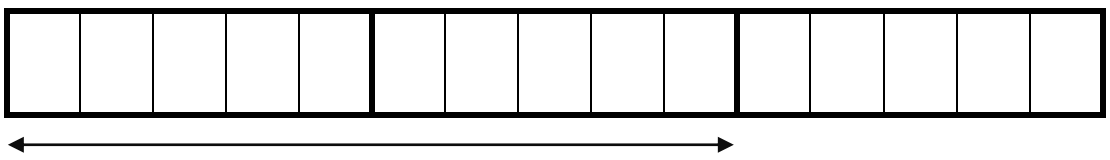
Use a colored pencil to show your answer in this fraction bar.



One-fifth

9b. What is one-fifth of two-thirds? _____

Use a colored pencil to show your answer in this fraction bar.



Two-thirds of the fraction bar

Are the areas you colored in those two fraction bars the same? They're supposed to be! That's because two-thirds of one-fifth is the same as one-fifth of two-thirds. That sounds kinda confusing, but you can see that it's true.

Ms. Gibbs said it's a good idea to practice multiplying big numbers both ways: in separate steps and all at once. I've written the next problem, 732 x 326, two different ways: with separate steps so you can practice that way, and without the steps. See if you get the same answer both ways. You're supposed to, of course!

10.

732	732	732	732
X6	X20	X300	X326

If you got the same answer both ways, you should be able to do the next four problems without the steps. If you get mixed up, just do them in steps. The most important thing is that you practice until you get multiplying big numbers down pat. That's what I did.

11.	12.	13.	14.
729	437	593	642
X62	X36	X723	X503

Reader, did you notice the lines with the little arrows under the fraction bars on 36 and 37? I put them there because I thought it would help you solve those problems. Did they help?

And if you had trouble with problem 14, review how Kayla solved a similar problem on page 30.

Something extra

The word “savvy” means knowledgeable and well-informed. It originally came from the French word “savez” which means “to know”.

Some people who didn’t speak French liked the sound of this word and started to use it themselves. They tried to imitate the French-speaking people, but pronounced it a little differently. Over a period of time, the spelling changed but the meaning didn’t. A person who is savvy knows a lot.

If you want to be “word savvy,” you should know what the word “savvy” means. If you want to be “math savvy,” you should know a lot of math. One way to be math savvy is to learn math with Kayla and be sure to study what you learned. That's important. If you study your math, you’ll have it down-pat! And if you have your math down-pat, you’ll be math savvy. If you don’t, well maybe you won't!

Answers

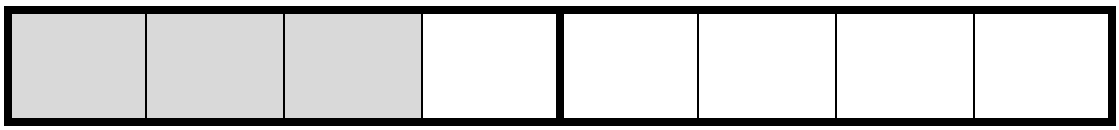
	Ten Millions	Millions	Hundred Thousands	Ten Thousands	Thousands	Hundreds	Tens	Ones
1.						1	0	2
2.					9	0	0	0
3.						1	3	0
4.		4	2	0	0	0	0	0
5.	1	8	0	0	0	0	0	0
6.	6	3	0	0	0	0	0	0

7a. $\frac{4}{4} = 1$ 7b. $\frac{2}{63}$ 7c. $\frac{3}{81}$ 7d. $\frac{3}{5}$

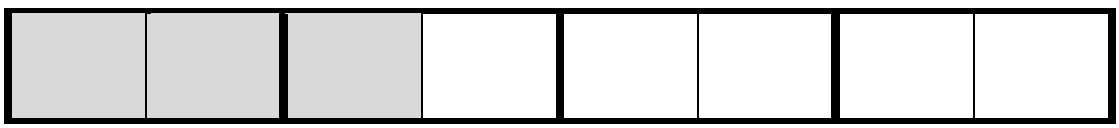
7e. $\frac{4}{4} = 1$ 7f. $\frac{6}{4}$ 7g. 5 7h. 0

8. The answer is three-eighths: $\frac{3}{8}$

This fraction bar has eight sections, and is split in half, with four equal sections in each half. Three-fourths of one half equals three sections, and since there are eight sections altogether, three-eighths of the fraction bar is the answer.

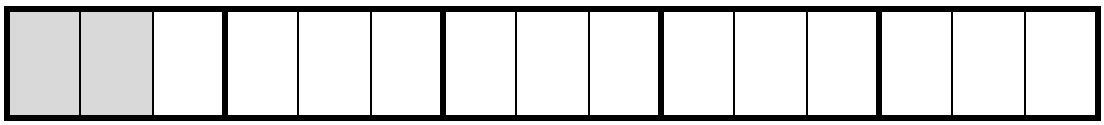


The fraction bar below is the same as the one above it, but the sections are split up into four equal groups of two. Each group of two sections equals one-fourth of the bar. Three of these groups of two equal three-fourths of the fraction bar. One half of this three-fourths is just three sections. Just like with the above fraction bar, three of the eight sections equals three-eighths.

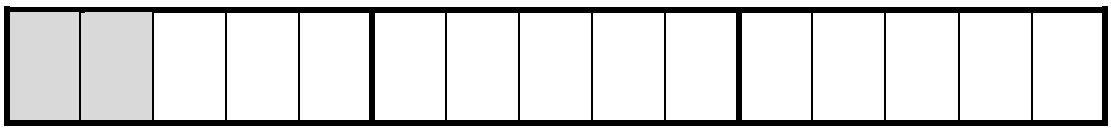


9. The answer is two-fifteenths: $\frac{2}{15}$

This fraction bar has 15 sections, and is split up into five groups of three. Each group of three is one-fifth of the fraction bar, and two-thirds of one-fifth is just two sections, or two-fifteenths.



The fraction bar below is the same as this one, but just split up differently. There are three groups of five sections, so the total number of sections is still fifteen. Two-thirds of the fraction bar is ten sections, and if we take one-fifth of ten sections, we get two sections, or two-fifteenths.



10.

1 1					1 1
732	732	732	4392		732
X6	X20	X300	14640		X326
4392	14640	219600	+219600		4392
			238632		14640
					219600
					238632

Reader, did you figure out why I left that blank space in Problem 10? It was so you would have room to add up the three answers when you multiplied separately.

11.

```
  1 5
  ~~1~~
  729
 X62
 1458
43740
45198
```

12.

```
  1 2
 ~~2~~ ~~4~~
  437
 X36
 2622
13110
15732
```

13.

```
  6 2
  ~~1~~
 ~~2~~
  593
 X723
 1779
11860
415100
428739
```

14.

```
  2 1
 ~~1~~
  642
 X503
 1926
321000
322926
```

About tutoring math

As you have seen in this book, tutoring is not just for kids. Teaching math to adults who had not learned math in school or who forgot the math they had learned is another possibility. And these adults, if they have kids of their own, will be able to tutor them!

Don't worry about not being a math expert. Just as long as you understand what you're tutoring, you'll be able to help others to understand too.