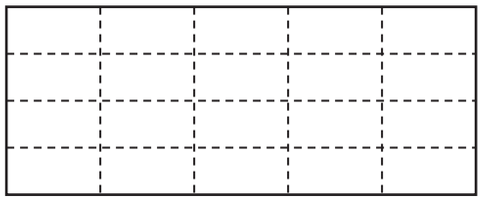
Here's another story for you to scout out. ***Joey's birthday cake is cut into 20 pieces. He and his five friends take 6 of the pieces. Then his younger brother and sister together take two more pieces. What fraction of the cake has been eaten in all?***



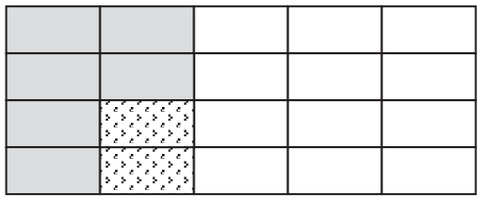
As we can see from the drawing, Joey's mom cut the cake into equal parts. She probably didn't want to deal with anyone complaining about not getting an equal share! The story talks about pieces of a whole cake, so we know we are dealing with fractional parts.

So the first thing we need to look for is the <u>total number of parts</u> we are working with. That will tell us how many equal parts the whole needs to be divided into for the drawing. It will also give us the denominator we need to describe the parts and the whole. Here we are working with twentieths.

We already know that we can describe the <u>whole</u> cake using this same denominator—twentieths. What fraction describes all 20 pieces of the whole cake?

If you said $^{20}/_{20}$, then high five your teacher because that is the correct answer.

Now that we know what our denominators will be, we can reread the story carefully to find the numerators. And we can add those details to our drawing. How many pieces of cake did Joey and his friends take? Let's color those six pieces gray in the drawing.



Now we see that the six pieces Joey and his friends ate were $^{6}/_{20}$ of the cake. How many pieces did Joey's brother and sister take? Two more, so let's use dots to show those two pieces.

What fraction of the cake is marked with dots?

Yes, $^{2}/_{20}$. So now we can see that 8 pieces are marked in some way. That gives us the answer to the story: **$^{8}/_{20}$ of the cake is gone.**

It takes a bit of work to draw the 20 equal fractional parts and color them in. The wonderful thing about our number system is that we can use numbers and the arithmetic operations as short-cuts. Drawing the picture helps us make sure we see what is happening in the story so we can find the correct answer.

Now that you've seen how it works, let's look at the story again as an arithmetic problem.

Since fractions are another type of number in our number system, that means we can also use the arithmetic operations—addition, subtraction, multiplication, and division—with fractions to solve real-life problems.

Our problem-solving steps remind us to look for clue words that tell us what operation to use. The story asks what ***fractional part*** of the whole cake has been eaten ***in all.*** We need to know the total number of pieces that have been taken. So we know that we are not only dealing with fractions, we need to add.

We already know that when we add or subtract numbers, we have to work with the same units. Likewise, when we add or subtract fractions, we have to work with the same parts of the whole. **We need the fractions to have the same denominator.**

By the way, when we add or subtract fractions that count objects in real-life, then we need to have fractions with the same denominator AND the same units!

The next step is to write the information into number sentences. Joey and his friends take $^{6}/_{20}$ of the cake. His brother and sister take $^{2}/_{20}$ of the cake. So all we have to do is add those two fractions together to find the total. But before we can do that, we have to check our denominators. Are they the same? Since we are working with only one cake that is divided into twentieths, it's easy to spot the parts: twentieths. Both fractions are given in twentieths, so we're ready to add.

To add fractions that are based on the same number of parts of the whole—the same denominator—all we do is add the numerators. We don't have to add the denominators because they tell us the parts of the whole that we are working with.

The cake is divided into twentieths, so we know that our fractions will be based on twentieths. Looking at the picture of the cake we can see that Joey and his friends ate $^{6}/_{20}$ of the cake and his brother and sister ate $^{2}/_{20}$ of the cake. So we must add those two fractions together to find the part of the cake that they all ate.

Remember, when we are adding fractional parts, we are adding parts of the same whole. So that means the denominator of our answer will be based on that same whole. Since the cake is divided into twentieths the answer will be in twentieths.

$$\frac{6}{20} + \frac{2}{20} = \frac{?}{20}$$

Now all we have to do is add the numerators to find our answer.

$$\frac{6}{20} + \frac{2}{20} = \frac{8}{20}$$

Our answer of $^{8}/_{20}$ matches what we found when we drew the picture of the cake. Again we know that **$^{8}/_{20}$ of the cake is gone.**

Sometimes students think they need to add the denominators, too. Let's see why that is the wrong thing to do. If we add the denominators, 20 plus 20 equals 40. We might say that the answer is $^{8}/_{40}$. But think about what that fraction stands for. It shows us 8 fractional parts of something that is divided into fortieths. Look back at the picture of the cake. Is it divided into 40 parts? No.

When we are adding fractions, the denominators tell us how many parts the whole is divided into. We're not changing the total number of parts the whole is divided into. We're simply adding different fractional parts of the same whole. That's why we do NOT add the denominators.

Practice

(1) $^{4}/_{8} + {}^{2}/_{8} =$ _____

(2) $^{1}/_{7} + {}^{3}/_{7} =$ _____

(3) $^{7}/_{10} + {}^{1}/_{10} =$ _____

(4) $^{2}/_{5} + {}^{3}/_{5} =$ _____

(5) $^{5}/_{12} + {}^{4}/_{12} =$ _____

(6) $^{9}/_{18} + {}^{4}/_{18} =$ _____

(7) $^{7}/_{15} + {}^{2}/_{15} =$ _____

(8) $^{1}/_{16} + {}^{14}/_{16} =$ _____

(9) $^{16}/_{40} + {}^{20}/_{40} =$ _____

(10) $^{8}/_{24} + {}^{9}/_{24} =$ _____

Now it's time for you to scout out the answers to these real-life stories.

Practice

Find the answers. Use a separate sheet of paper to show your work. You can draw models to help you see what is happening in the stories.

(1) Jack and George rode their bikes to the library. They parked their bikes in the bike rack out front. The bike rack has places for ten bikes. There were already five bikes parked in the rack. What fractional part of the bike rack is holding bikes now?

(2) Quinn made cupcakes for the Christmas program at church. She put all 30 cupcakes in a box. Before the program started, 7 of the cupcakes had already been taken. After the program, 13 more cupcakes had been taken. What fractional part of the box of cupcakes has been taken?

(3) Owen found 12 bugs to add to his collection. Yesterday he used pins to put 4 of them in the display case that holds his collection. Today he added 6 more. What fractional part of the bugs he found has been added to the case?

(4) There are 9 apples in a bowl. If Shane eats one and Miles eats one, what fractional part of the apples have they eaten?

(5) There are 25 chairs set up in a circle for the meeting. So far 12 people have taken their seats. If 10 more people sit down, what fractional part of the chairs are full?

(6) Daniel's mom handed him a box of pencils and asked him to sharpen them. There are 18 pencils in the box. This morning Daniel had time to sharpen 6 of the pencils. In the afternoon he was able to sharpen 7 more. What fractional part of the box of pencils has been sharpened?

(7) Tate is helping his brothers feed their 16 animals. So far the brothers have feed 9 of the animals. If Tate feeds 3 more, what fractional part of the animals has been fed?

(8) Nathan and Reagan filled 5 bags of trash cleaning out the garden to get it ready for the summer. If each boy carries two bags to the street to be picked up, what fractional part of the bags is at the street?

(9) The parking lot has spaces for 15 cars. Three workers have already parked their cars. So far 7 customers have also parked their cars. What fractional part of the parking lot is filled?