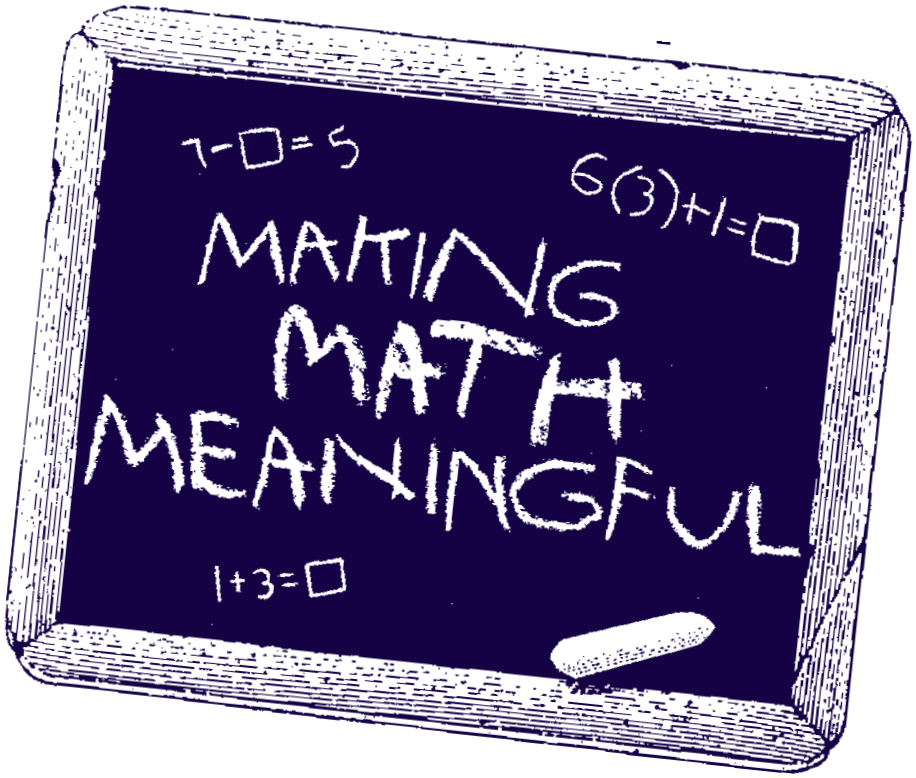
Level 5
Revised Edition



by David Quine

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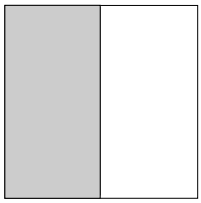
The Cornerstone Curriculum Project
2006 Flat Creek Place
Richardson, Texas 75080
(972) 235-5149

4 A FRACTIONAL PARTS

Observing The Idea

As you work through this activity certain questions are KEY Questions. These are indicated by an asterisk (*).

1. Look at the diagram below.



*a. How many parts is the region divided into?

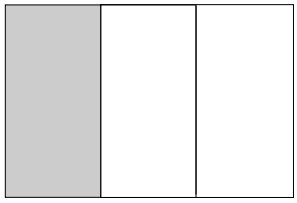
*b. Are the two parts the same size?

*c. The region is said to be divided into what fractional part?

d. What part of the whole region is shaded?

e. Write the fraction representing the portion of the region that is shaded.

2. Look at the second diagram.



*a. How many parts is the region divided into?

*b. Are the three parts the same size?

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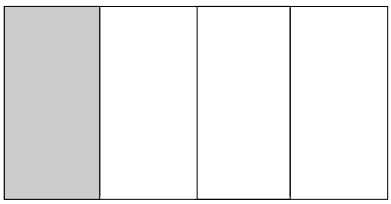
1. *Look at the diagram below.*



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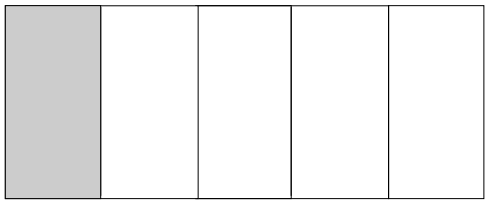


*a. How many parts is the region divided into?

*b. Are the five parts the same size?

*c. The region is said to be divided into what fractional part?

d. What part of the whole region is shaded?

e. Write the fraction representing the portion of the region that is shaded.

3. The fractions representing the four diagrams:

$\frac{1}{2}$, $\frac{1}{3}$, $\frac{1}{4}$, $\frac{1}{5}$

4 In the fraction, what does the number above the line represent?

5. In the fraction, what does the number below the line represent?

Naming The Idea

Sandwiches are cut into halves and shared. Pies are divided into equal parts and slices are set for an anniversary or birthday party. The recipe for fresh homemade bread calls for a third cup of milk.

Fractions represent equal parts of a whole.

The number below the line represents how many equally sized pieces or slices the whole has been cut into. The number below the line is called the Denominator of the fraction.

$$\frac{\quad}{\text{Denominator}}$$

The number above the line represents how many of these parts or pieces have been selected. The number above the line is called the Numerator of the fraction.

$$\frac{\text{Numerator}}{\text{Denominator}}$$

Expanding The Idea

1. Look at the diagram below.

*a. How many parts is the region divided into?

The denominator is then _____?

*b. Are the three parts the same size?

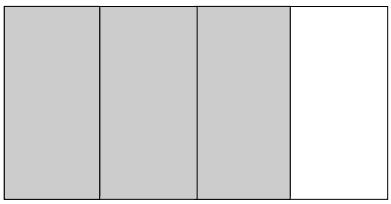
*c. The region is said to be divided into what fractional part?

d. What part of the whole region is shaded?

The numerator is then _____?

e. Write the fraction representing the portion of the region that is shaded.

1. *Look at the diagram below.*



*a. How many parts is the region divided into?

The denominator is then _____?

*b. Are the four parts the same size?

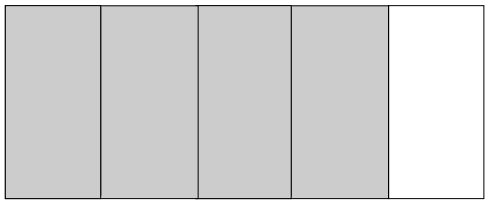
*c. The region is said to be divided into what fractional part?

d. What part of the whole region is shaded?

The numerator is then _____?

e. Write the fraction representing the portion of the region that is shaded.

2. *Look at the diagram below.*



*a. How many parts is the region divided into?

The denominator is then _____?

*b. Are the five parts the same size?

*c. The region is said to be divided into what fractional part?

d. What part of the whole region is shaded?

The numerator is then _____?

e. Write the fraction representing the portion of the region that is shaded.

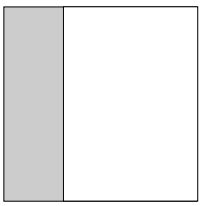
3. Write the fractions representing the seven diagrams:

_____ , _____ , _____ , _____ , _____ , _____ , _____

4 The denominator tells _____ .

5. The numerator tells _____ .

1. Byron and I were going to share a sandwich. I told him that I would cut it into halves. The diagram looks like the way the sandwich was cut.



*a. How many parts was the sandwich cut into?

*b. What part of the whole region is shaded?

c.. Was the sandwich cut into halves? Yes No

d. If your answer is *no,* why not?

e. Correct the diagram to show were the sandwich should have been cut?

2. Draw diagrams for the following fractions:

a. $\frac{4}{5}$ b. $\frac{3}{4}$ c. $\frac{7}{8}$

3. The denominator tells _____ .

4. The numerator tells _____ .

5. For an object to be cut into fraction parts the parts must be _____ .

4 B EQUAL OR NOT EQUAL PARTS

Observing The Idea

Using lego type blocks or unifix cubes try to divide each group into the fractional parts. Indicate if it is possible by checking 'yes' or 'no'.

1. *Join 8 cubes together…*

Can they be divided into			
	halves?	____ Yes	____ No
	thirds?	____ Yes	____ No
	fourths?	____ Yes	____ No
	sixths?	____ Yes	____ No
	eighths?	____ Yes	____ No

2. Join 12 cubes together…

Can they be divided into			
	halves?	____ Yes	____ No
	thirds?	____ Yes	____ No
	fourths?	____ Yes	____ No
	sixths?	____ Yes	____ No
	eighths?	____ Yes	____ No
	twelfths?	____ Yes	____ No

3. Join 15 cubes together…

Can they be divided into			
	halves?	____ Yes	____ No
	thirds?	____ Yes	____ No
	fourths?	____ Yes	____ No
	fifths?	____ Yes	____ No
	tenths?	____ Yes	____ No
	fifteenths?	____ Yes	____ No

4. Join 6 cubes together…

Can they be divided into			
	halves?	____ Yes	____ No
	thirds?	____ Yes	____ No
	fourths?	____ Yes	____ No
	sixths?	____ Yes	____ No

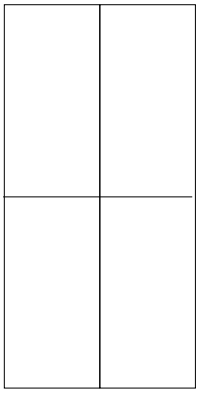
5. Join 18 cubes together…

Can they be divided into			
	halves?	____ Yes	____ No
	thirds?	____ Yes	____ No
	fourths?	____ Yes	____ No
	sixths?	____ Yes	____ No
	eighths?	____ Yes	____ No
	twelfths?	____ Yes	____ No
	eighteenths?	____ Yes	____ No

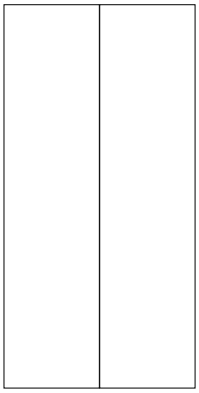
Draw lines to divide the fractional parts into smaller parts.
The first one has been done for you.

1. *These regions have been divided into halves.…*

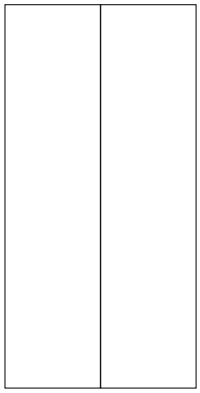
Example:



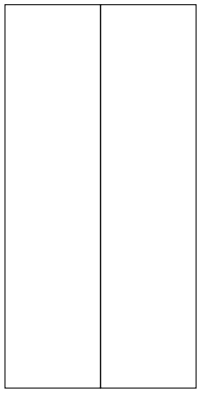
a.
Change to fourths



b.
Change to sixths

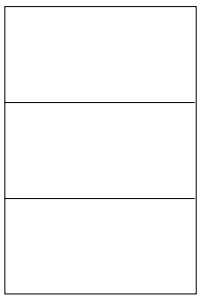


c.
Change to eighths

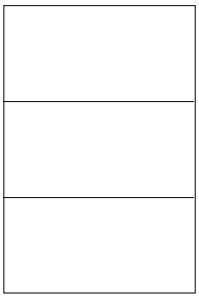


d.
Change to tenths

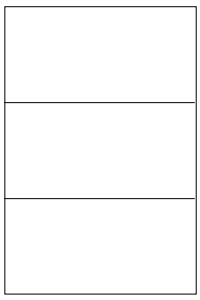
2. These regions have been divided into thirds.…



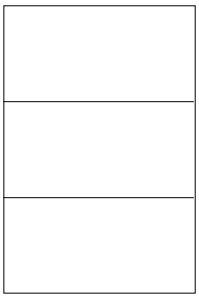
a.
Change to sixths



b.
Change to ninths



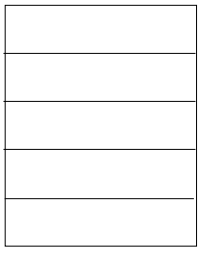
c.
Change to tenths



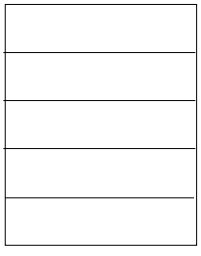
d.
Change to twelfths.

3. Theses regions have been divided into fifths.

a.
Change to tenths



b.
Change to twelfths

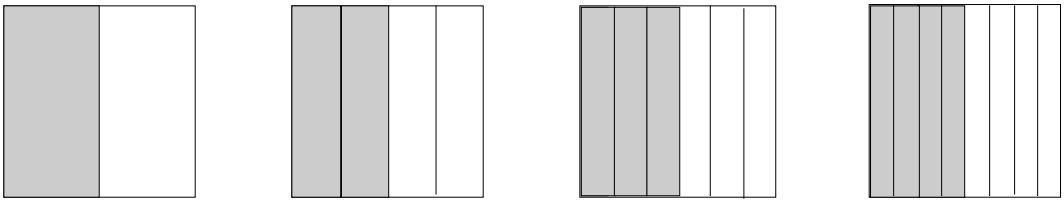


c.
Change to fifteenths

d.
Change to twentieths.

Naming The Idea

Write the fraction to describe each shaded region for each diagram.



_____ _____ _____ _____

Compare the shaded area for each of the diagrams above.

$\frac{1}{2}$, $\frac{2}{4}$, $\frac{3}{6}$, $\frac{4}{8}$ all represent the same amount of space in the diagrams above.

This means that $\frac{1}{2}$ is the same as $\frac{2}{4}$ which is the same as $\frac{3}{6}$ which is the same as $\frac{4}{8}$

Therefore, $\frac{1}{2} = \frac{2}{4} = \frac{3}{6} = \frac{4}{8}$

All fractions that represent the same fractional part are said to be EQUIVALENT FRACTIONS.

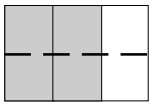
Expanding The Idea

Find the equivalent fraction. Use the diagrams to assist you.

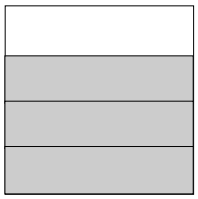
1. 

$\frac{2}{3} = \frac{\square}{6}$

Think: $\frac{2}{3}$ is the same as $\frac{\square}{6}$?



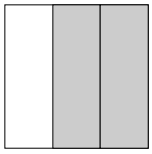
Draw a horizontal line through the region to change it to sixths, six equal parts. How many of the six parts are shaded? Therefore, 2/3 is the same as how many sixths?

2. 

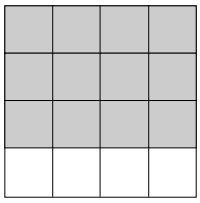
$\frac{3}{4} = \frac{\square}{8}$

To make this region into eighths, eight equal parts, what would you need to do?

$\frac{3}{4}$ is the same as how many eighths?

3. 

$\frac{2}{3} = \frac{\square}{12}$

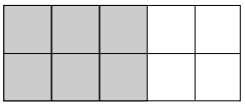
4. 

$\frac{12}{16} = \frac{\square}{4}$

Hint: This problem is the reverse of the ones studied so far. The whole is divided into 16 parts. Can you see how to think of it as only four parts? Notice that there are four rows and four columns.

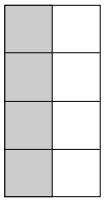
12/16 is the same as how many fourths?

5. $\frac{6}{10} = \frac{\square}{5}$



The whole is divided into 10 parts. Can you see how to think of it as only five parts? Notice that there are five columns.

$\frac{6}{10}$ is the same as how many fifths?

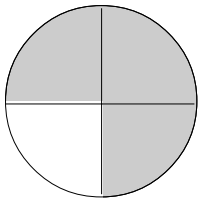
6. 

$\frac{4}{8} = \frac{\square}{2}$

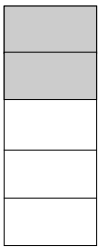
Expanding The Idea

Find the equivalent fraction. Use the diagrams to assist you.

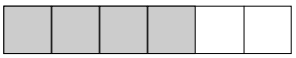
1. What is the name in eighths for $\frac{3}{4}$ of this whole area?



2. $\frac{2}{5}$ is equivalent to how many tenths?



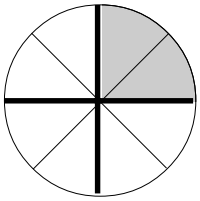
3. $\frac{4}{6}$ is how many thirds?



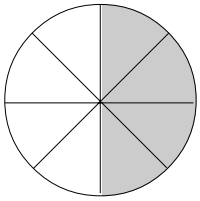
4. What is the name in tenths for $\frac{3}{5}$?

5. What is the name in sixths for $\frac{2}{3}$ of this whole?

6. What is the name in fourths for $\frac{2}{8}$ of this whole region?

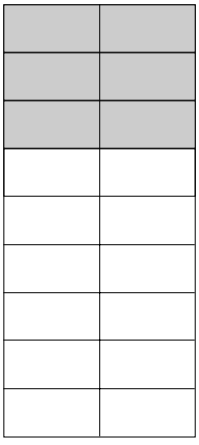


7. $\frac{4}{6}$ is equivalent to how many halves?



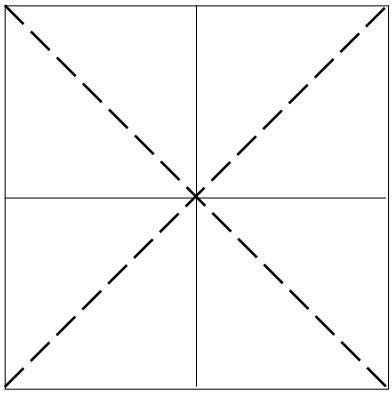
8. What is the name in ninths for this shaded region?

$$\frac{6}{18} = \frac{\square}{9}$$



Solve the sentences by finding equivalent fractions.

1.

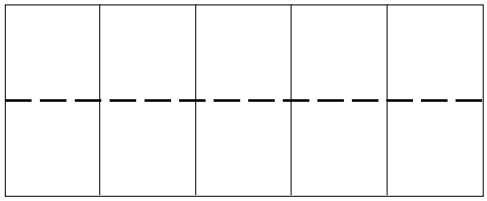


$\frac{1}{4} = \frac{\square}{8}$ $\quad \frac{4}{4} = \frac{\square}{8}$ $\quad \frac{1}{2} = \frac{\square}{8}$

$\frac{2}{4} = \frac{\square}{8}$ $\quad \frac{1}{2} = \frac{\square}{4}$ $\quad \frac{2}{2} = \frac{\square}{8}$

$\frac{3}{4} = \frac{\square}{8}$ $\quad \frac{2}{2} = \frac{\square}{4}$

2.

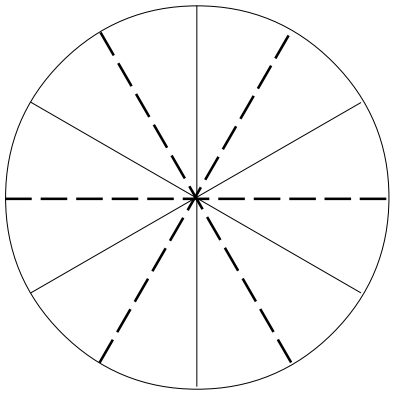


$\frac{1}{5} = \frac{\square}{10}$ $\quad \frac{3}{5} = \frac{\square}{10}$ $\quad \frac{1}{2} = \frac{\square}{10}$

$\frac{2}{5} = \frac{\square}{10}$ $\quad \frac{4}{5} = \frac{\square}{10}$ $\quad \frac{2}{2} = \frac{\square}{10}$

$\frac{5}{5} = \frac{\square}{10}$

3.



$\frac{1}{3} = \frac{\square}{6}$ $\quad \frac{1}{3} = \frac{\square}{12}$ $\quad \frac{2}{12} = \frac{\square}{6}$

$\frac{2}{4} = \frac{\square}{8}$ $\quad \frac{1}{2} = \frac{\square}{4}$ $\quad \frac{4}{12} = \frac{\square}{6}$

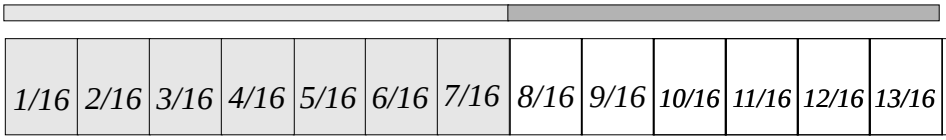
$\frac{3}{3} = \frac{\square}{12}$ $\quad \frac{6}{12} = \frac{\square}{6}$ $\quad \frac{6}{12} = \frac{\square}{6}$

$\frac{8}{12} = \frac{\square}{6} = \frac{\square}{3}$

4 C ADDING & SUBTRACTING

Observing The Idea

Draw a line 7/16 of STRIP A. Add on to this line 6/16 of STRIP A.
How long is the line?



1/16	2/16	3/16	4/16	5/16	6/16	7/16	8/16	9/16	10/16	11/16	12/16	13/16	14/16	15/16	16/16

1. Draw a line 1/2 of STRIP A.
   Add on to this line 3/8 of STRIP A.
   How long is the line?

2. Draw a line 6/8 of STRIP A.
   Then erase 3/8 of STRIP A.
   How long is the line?

3. Draw a line 3/4 of STRIP A.
   Then erase 5/16 of STRIP A.
   How long is the line?

4. How much should you add on to 5/8 of strip A
   to make it equal in length to 3/4 of strip A?

5. How much should you take away from 11/16 of STRIP A
   to make it equal in length to 1/8 of STRIP A?

Strip A — ONE UNIT long.															
							1/2								2/2
			1/4				2/4				3/4				4/4
	1/8		2/8		3/8		4/8		5/8		6/8		7/8		8/8
1/16	2/16	3/16	4/16	5/16	6/16	7/16	8/16	9/16	10/16	11/16	12/16	13/16	14/16	15/16	16/16

1. Draw a line 2/6 of STRIP B.
   Then add 3/6 of STRIP B. How long is the line?

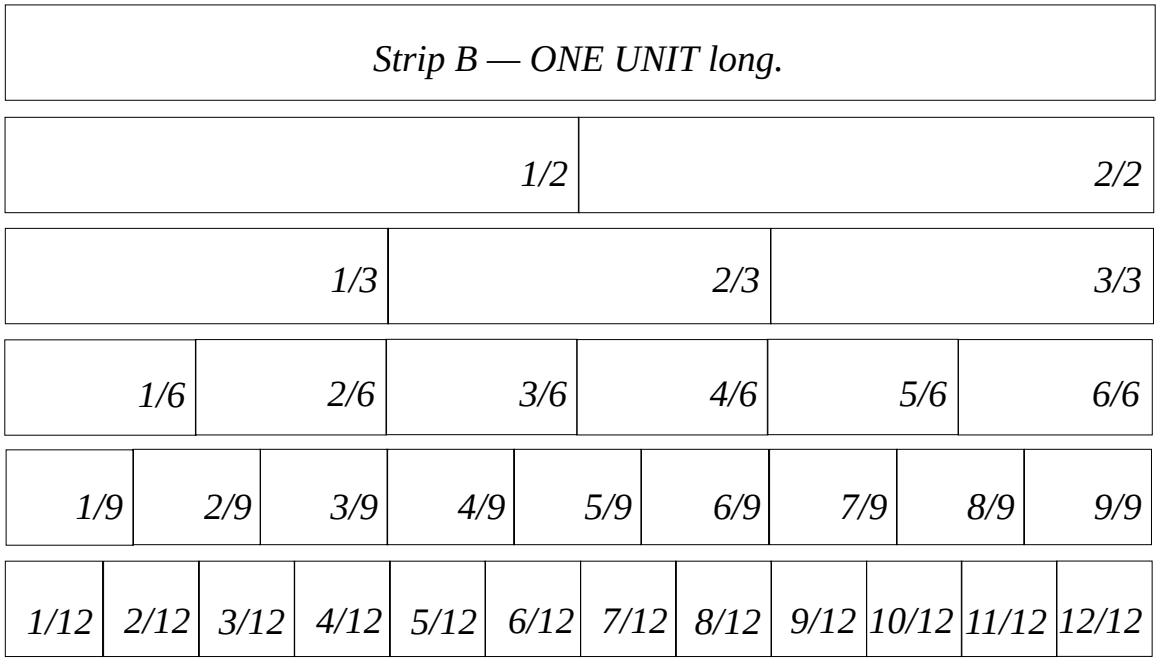
2. How long are 1/2 of STRIP B and 3/12 of STRIP B together?

3. Draw 6/9 of STRIP B. Then erase 4/9 of STRIP B. How long is the line now?

4. Draw 1/2 of STRIP B. Then erase 5/12 of STRIP B. How much is left?

5. How much should you add on to 2/9 of STRIP B
   to make it equal in length to 2/3 of STRIP B?

6. How much should you take away from 7/12 of STRIP B
   to make it equal in length to 1/6 of STRIP B?



1. Draw a line that is 2/4 of STRIP C and 1/4 of STRIP C together.

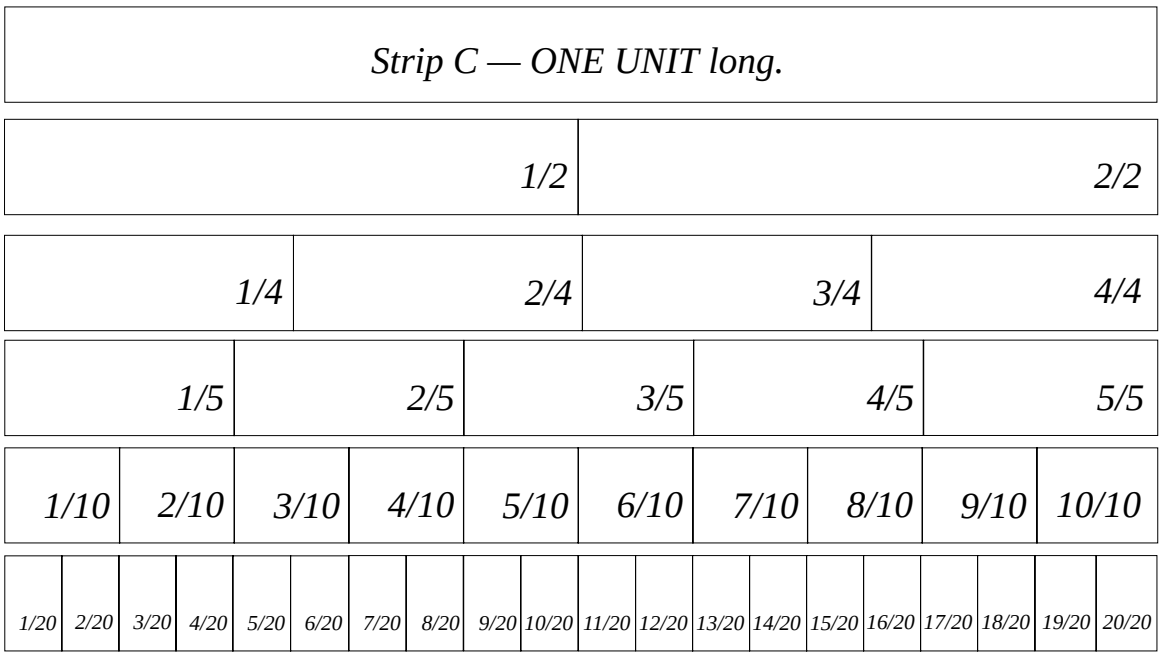
2. Draw a line that is 2/5 of STRIP C and 2/10 of STRIP C together.

3. Draw a line 12/20 of STRIP C.
   Then erase 5/20 of STRIP C.
   How long is the line?

4. Draw 6/10 of STRIP C.
   Then erase 2/5 of STRIP C.
   How long is the line?

5. How much should you add on to 7/20 of STRIP C
   to make it equal in length to 5/10 of STRIP C?

6. How much should you take away from 3/4 of STRIP C
   to make it equal in length to 3/5 of STRIP C?



1. Draw a line that is 1/6 of STRIP D and 3/6 of STRIP D together.
   How long is the line?

2. Draw a line that is 2/4 of STRIP D and 2/12 of STRIP D together.
   How long is the line?

3. Draw a line 8/12 of STRIP D.
   Then erase 6/12 of STRIP D.
   How long is the line?

4. Draw 3/4 of STRIP D.
   Then erase 3/12 of STRIP D.
   How long is the line?

5. How much should you add on to 1/12 of STRIP D
   to make it equal in length to 1/3 of STRIP D?

6. How much should you take away from 2/3 of STRIP D
   to make it equal in length to 2/4 of STRIP D?

Strip D — ONE UNIT long.											
										1/2	*2/2*
								1/3	*2/3*	*3/3*	
							1/4	*2/4*	*3/4*	*4/4*	
					1/6	*2/6*	*3/6*	*4/6*	*5/6*	*6/6*	
1/12	*2/12*	*3/12*	*4/12*	*5/12*	*6/12*	*7/12*	*8/12*	*9/12*	*10/12*	*11/12*	*12/12*

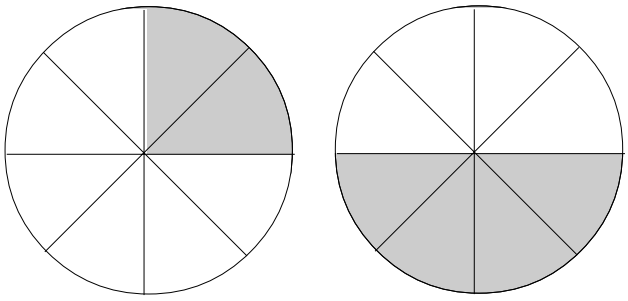
PIZZA KITCHEN

Using the diagrams for each problem, write an addition or subtraction equation to represent the story and then solve it.

EXAMPLE NUMBER 1

Jane sold 2/8 of a pizza to her first customer and 4/8 of it to her next customer. How much did her first two customers buy altogether?

First: Color 2/8. Second: Color 4/8.



How many eighths are colored? _____

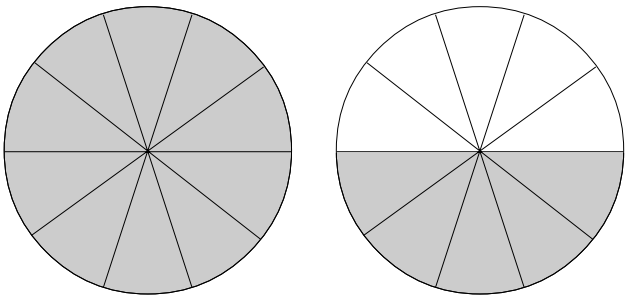
This can be written:

$$\frac{2}{8} + \frac{4}{8} = \frac{6}{8}$$

EXAMPLE NUMBER 2

Jane divided a pizza into ten equal slices. She ate 5 slices for lunch.
How much was left?

First: Color 10/10. Second: Erase 5/10.

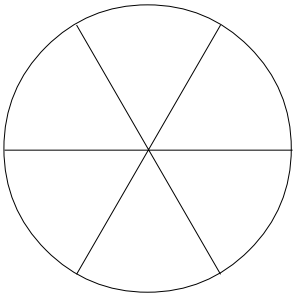


How many tenths are left? _____

This can be written:

$$\frac{10}{10} - \frac{5}{10} = \frac{5}{10}$$

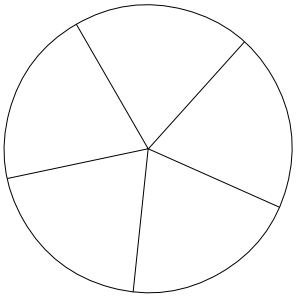
1. Vic had a coupon for a free 2/6 of a pizza. He bought 1/6 more. How much of a pizza did he get altogether?



How many sixths did he buy? _____

This can be written:

2. There was 4/5 of a whole pizza cooling on the counter. Cindi ordered 3/5 of a pizza. How much of the pizza was left after she took her part?

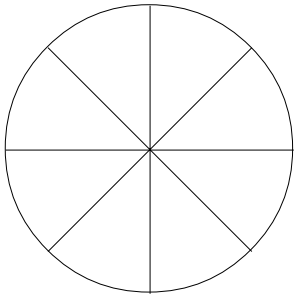


How many fifths are left? _____

This can be written:

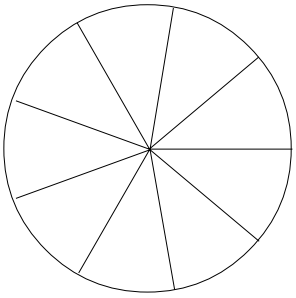
Here are more stories about Jane's Pizza Kitchen.
Use the fractional parts on each picture to help you answer the questions.

1. Jane ate 2/8 of a pizza for lunch and 5/8 of it for dinner. How much did she eat for lunch and dinner together?



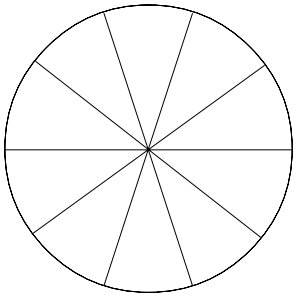
This can be written: _____

2. Two orders were placed for pizza. The first was 2/9 and the second was 5/9. How much was ordered altogether?



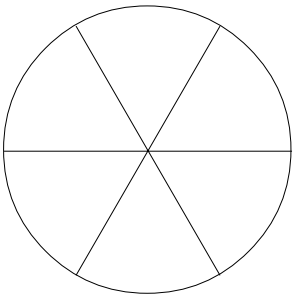
This can be written: _____

3. Jane's neighbor, bought 7/10 of a whole pizza. She ate only 1/10 of the whole pizza. She saved the rest for another meal. How much did she save?



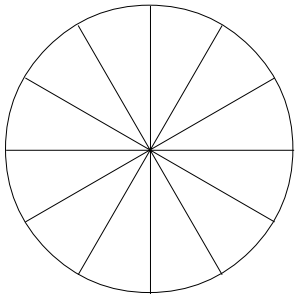
This can be written: _____

4. The Thaxton's ordered 1/3 of a pizza. Then they ordered 1/3 more. What part of a pizza did they order?



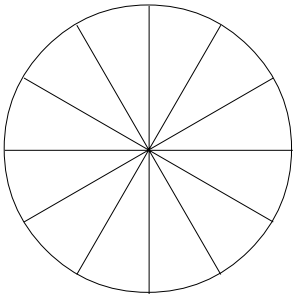
This can be written: _____

5. Steve bought 6/12 of a pizza and started eating. He started home after he had eaten 3/12 of the pizza. How much was left?



This can be written: _____

6. The Pizza Kitchen was a success! To celebrate, Jane made an extra large pizza. She gave away 11/12 of the pizza. How much was left?



This can be written: _____

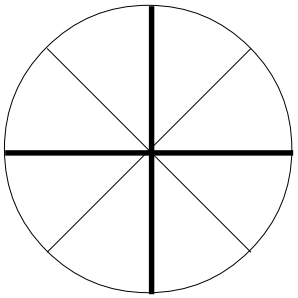
Expanding the Idea

COLORING PROBLEMS

Several of our children were coloring shapes.
Use the pictures and what you learned in Activity 29B
to help you answer the questions.

EXAMPLE

Bonney colored 1/4 of the shape.
Brett colored 3/8 more.
How much did they color altogether?



What makes this problem so difficult is that they colored different fractional parts: Bonney colored fourths and Brett eights.

How much did they color altogether? _____

To answer this question you must apply what was taught in Activity 29B.
In that section you learned how to make equivalent fractions.

In the diagram above the fourths are highlighted with darker lines. Actually color 1/4 of the circle. How many eighths did you color?

Therefore, $\frac{1}{4}$ is the same as $\frac{2}{8}$.

In order to add or subtract fractions it is necessary for the fractional parts to be the same. This is often referred to as

FINDING THE COMMON DENOMINATOR.

Since Bonney colored in fourths and Brett in eighths, it is necessary to find the common denominator. In this case, it is necessary to think of 1/4 as 2/8.

The problem can be restated:
Bonney colored 2/8 of the shape
Brett colored 3/8 more.

What equation would represent this situation?

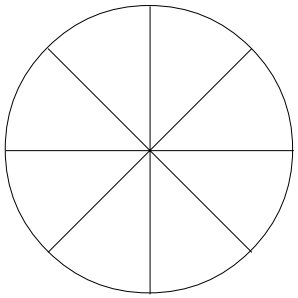
$$\frac{1}{4} + \frac{3}{8} = \frac{2}{8} + \frac{3}{8} = \frac{5}{8}$$

How much did they color altogether? _____

Finding the common denominator means to find a fractional equivalent.
If you need to review the idea of equivalent fractions turn back to Activity 29B now.

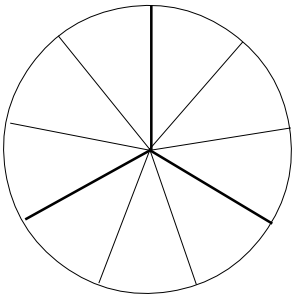
Here are more stories about coloring.
Use the fractional parts on each picture and equivalent fractions (common denominator) to help you answer the questions.

1. First, 3/8 of the circle was colored. Then 3/8 more. How much was colored altogether?



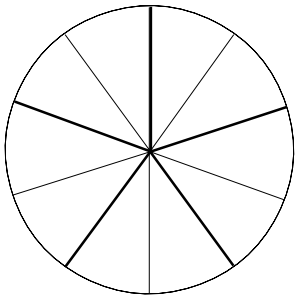
This can be written: _____

2. After Bethany colored 1/3 of the circle, Bonney colored 2/9. How much was colored altogether?



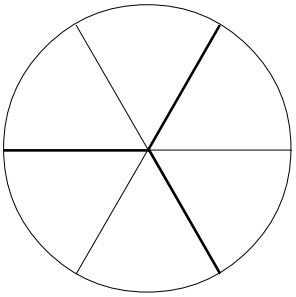
This can be written: _____

3. This colorer colored 3/10 of the circle in blue and 2/5 in red. How much did she color altogether?



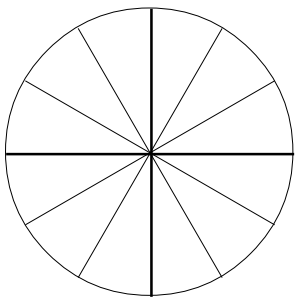
This can be written: _____

4. After Bonney colored 2/3 of this circle, she decided to erase 2/6. How much was still colored?



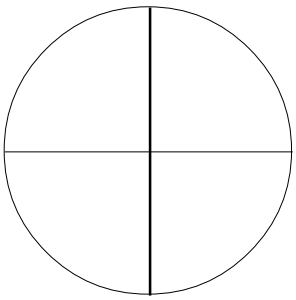
This can be written: _____

5. This circle was colored 3/4 red and 1/12 blue. How much was colored altogether?



This can be written: _____

6. Bonney colored 3/4 of the circle green. Brett erased 1/2 of the circle. How much was still colored?



This can be written: _____

To solve these equations it is necessary to find the common denominator. Refer back to Activity 29B for help.

EXAMPLE: $\frac{4}{5} - \frac{3}{10} = \square$

To solve this equation it is necessary to change 4/5 to tenths.

Since $\frac{4}{5} = \frac{8}{10}$

Then $\frac{4}{5} - \frac{3}{10}$ can be written $\frac{8}{10} - \frac{3}{10} = \frac{5}{10}$

It is customary to make the answer as the equivalent fraction with the smallest possible denominator.

Since $\frac{5}{10}$ is equivalent to $\frac{1}{2}$

Then $\frac{4}{5} - \frac{3}{10} = \frac{1}{2}$

1. $\frac{3}{4} - \frac{9}{20} = \square$

First find an equivalent fraction so that both fractions have a common denominator.

Can I change 3/4 to twentieths?

$\frac{3}{4} = \frac{}{20}$

Can I change 9/20 to fourths?

$\frac{9}{20} = \frac{}{4}$

Rewrite the equation with the equivalent fraction and complete the subtraction:

Can the answer be reduced to an equivalent fraction with a smaller denominator?

$\frac{6}{20} = \square$

Look at each sentence in each box.

The first sentence is the problem.
The second is what you must think in order to solve the problem.

1. $\frac{2}{8} + \frac{1}{4} =$ ☐

   Think …

   $\frac{2}{8} + \frac{2}{8} =$ ☐

2. $\frac{1}{3} + \frac{1}{9} =$ ☐

   Think …

   $\frac{3}{9} + \frac{1}{9} =$ ☐

3. $\frac{1}{8} + \frac{3}{4} =$ ☐

   Think …

   $\frac{1}{8} + \frac{6}{8} =$ ☐

4. $\frac{2}{5} + \frac{5}{10} =$ ☐

   Think …

   $\frac{4}{10} + \frac{5}{10} =$ ☐

5. $\frac{7}{10} - \frac{3}{5} =$ ☐

   Think …

   $\frac{7}{10} - \frac{6}{10} =$ ☐

6. $\frac{5}{12} - \frac{1}{4} =$ ☐

   Think …

   $\frac{5}{12} - \frac{3}{12} =$ ☐

Look at the math equation in each box.
To find the solution you may need to find an equivalent fraction.

1. $\frac{3}{4} + \frac{1}{8} = \square$

Think …

2. $\frac{1}{4} + \frac{2}{3} = \square$

Think …

HINT FOR NUMBER 2:
To solve this problem you must think:
Since 1/4 = 2/8 = 3/12
and since 2/3 = 4/6 = 6/9 = 8/12,
Then 3/12 + 8/12 = _____

3. $\frac{1}{10} + \frac{3}{20} = \square$

Think …

4. $\frac{4}{9} + \frac{1}{2} = \square$

Think …

HINT FOR NUMBER 4:
To solve this problem you must think:
Since 4/9 = 8/18
and since 1/2 = 9/18
Then 8/18 + 9/18 = _____

5. $\frac{2}{3} - \frac{1}{5} = \square$

Think …

HINT FOR NUMBER 5:
To solve this problem you must think:
Since 2/3 = 4/6 = 6/9 = 8/12 = 10/15
and since 1/5 = 2/10 = 3/15
Then 10/15 - 3/15 = _____

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

Think …