# Grade 4—Home Math Activities

Below are math activities that you can do at home with your child. Please note that this document is organized into 5 sections.

- Section 1—Child Activities: Place Value, Number Lines, Fractions, Fraction Addition Strategies, pp 1-16.
- Section 2—Parent Information: Fraction Subtraction Strategies & Drawings, pp 17-21.
- Section 3—Child Activities: Subtraction, pp 22-27.
- Section 4—Parent Information: Multiplication & Division Models, Strategies, and Drawings, pp 28-36.
- Section 5—Child Activities: Multiplication Practice, Money, Measurement, and Geometry, pp 37-47.

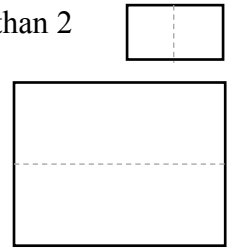
# Section 1—Child Activities

## Number Activities

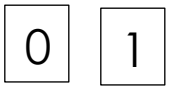
### Activity 1—Biggest, Smallest, Closest

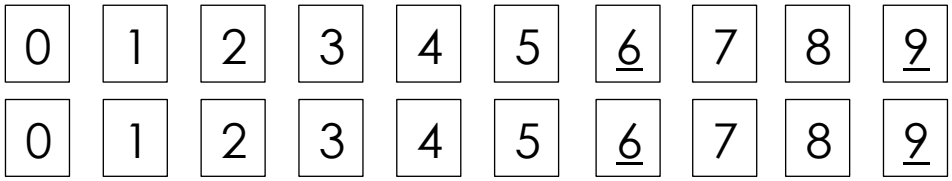
**Materials**:

- 10, 3" by 5" index cards cut in half (game pieces). Note: If there are more than 2 players you will need 5 additional index cards for each player.
- A sheet of plain paper cut in half (gameboards). Note: If there are more than 2 players you will need an additional sheet of paper for every 2 players.



- Prepare the materials:
  - Cut the 10 index cards as shown above.
  - Turn each index card to look like a tall rectangle.
  - On the first card write a large "0".
  - On the second card write a large "1".
  - Continue until you have 2 sets of cards for 0 to 9.



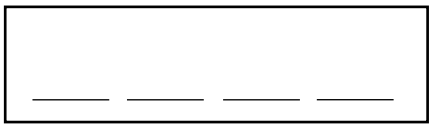

Note: For 3 players you will need 3 sets of cards. For 4 players you will need 4 sets of cards, etc.

  - Cut a plain sheet of paper into 2 pieces as shown above. Each half will be a gameboard. You'll need one gameboard per person.

- On the front of the gameboard place 3 lines across the bottom that are the width of the numeral cards. On the back of the gameboard place 4 lines across the bottom.

Front

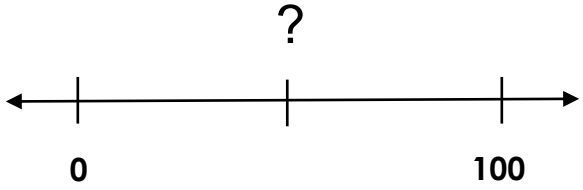
Back



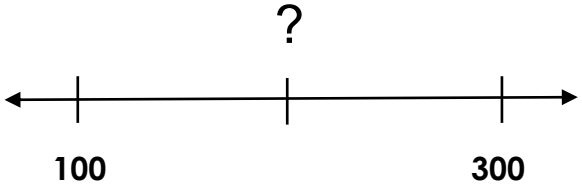
- To play the game:
  - Shuffle all of the cards together and place face down in the center of the playing area.
  - Begin with the side with 3 lines (3-digit numbers).
  - Players take turns choosing the top card off of the deck and placing in one of the spots on their gameboard. Once a piece is placed it may not be moved.
  - Goal: Make the largest number possible.
- Variations:
  - Make the smallest number possible.
  - The number closest to 500 (or another 3-digit number such as 300, 650, 720, etc.).
  - Use the 4-digit gameboard (on the back) and make the largest number possible, the smallest number possible, or the number closest to 5000 (or another 4-dgit number such as 3000, 4250, 7000, etc.)

**Open Number Lines—*Number Line Concentration* Cards**

In grade 3, your child began working with open number lines. An open number line is a number line on which only some of the hash marks are given. We use benchmarks such as halfway points to find the values on the number line. For example, in the number line below, the endpoint 0 and 100 are given. Your child is asked to find the halfway point, 50.




Your child may be asked to solve problems with "0" as one of the endpoints. He or she may also be asked to find the missing values when the starting number is a number other than 0. For example, in the problem below, your child is asked to find the value that is halfway between 100 and 300. (200)




Your child is expected to be able to identify points on an "open" number line. The activities below can be used to build comfort with the 3rd grade level problems.

**Prep:** Print, cut, and shuffle the *Number Line Concentration* cards well.

**Activity 2—Find the Match**

- Shuffle the cards well.
- Place cards face up in 4 rows with 6 cards in each row.
- Take turns finding matches.
- Each player must share how he or she knows it is a match before taking the cards.

**Activity 3—Number Line Concentration**

- Shuffle the cards well.
- Place cards face down in 4 rows with 6 cards in each row.
- Take turns turning over 2 cards and placing face up in the exact same spaces.
- If the cards match, the player must share how he or she knows it is a match before taking the cards. (The defense must make sense.)
- If the cards do not match, the player must share how he or she knows the cards do not match before turning them back over. (The defense must make sense.)
- See who can find the most matches.

**Activity 4—Who has more?**

- Shuffle the cards well.
- Deal the cards so that each player has the same number of cards.
- Each player places their cards in a stack, face down.
- Each player turns over the top card on the stack.
- The player with the greater number states how they know it is greater. He or she then takes the cards and places on the bottom of the stack.
- See who can capture all of the cards.

**Activity 5—Who has fewer?**

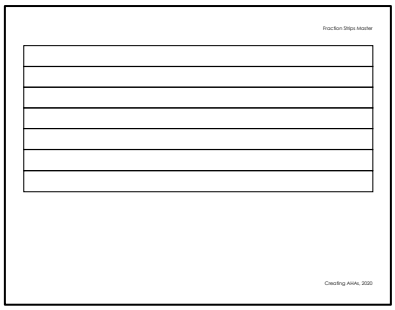
- Shuffle the cards well.
- Deal the cards so that each player has the same number of cards.
- Each player places their cards in a stack (face down).
- Each player turns over the top card on the stack.
- The player with the smaller number states how they know it is smaller. He or she then takes the cards and places on the bottom of the stack.
- See who can capture all of the cards.

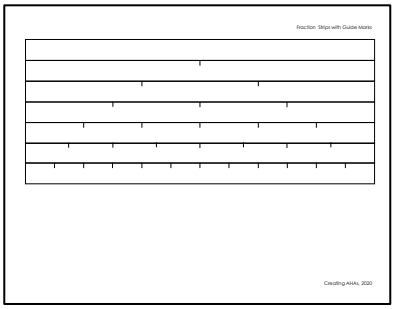
# Fractions

In grade 3 students are asked to cut a whole into 2, 4, 8, 3, or 6 equal pieces and name the pieces. In grade 4, your child is asked to cut wholes into 2, 4, 8, 3, 6 12, 5, 10 and 100 equal pieces. Cutting a whole into 10 and 100 equal pieces provides a link to decimals.

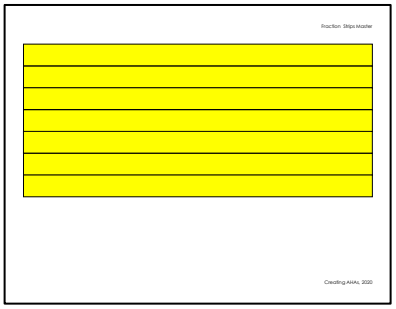
### Activity 1—The Fraction Kit

**Materials:** Copy of Fraction Strips Master and Fraction Strips with Guide Marks



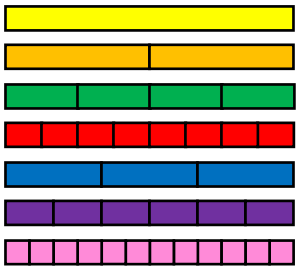




- 2 versions of the fraction strip master are available for your child's use. As a greater challenge, use only the *Fraction Strips Master*. This master has no guide marks. Print 2 copies. Have your child color each strip on one page the same color (e.g., yellow). This will provide extra wholes for later activities. On the second page color each strip different colors. Strip one should be the same color as the wholes on the first page (e.g., yellow).



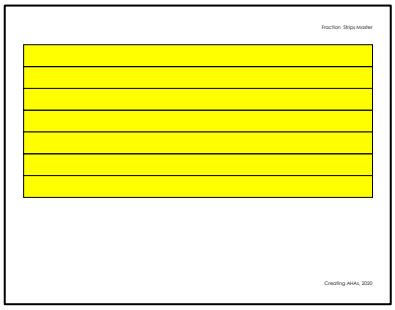


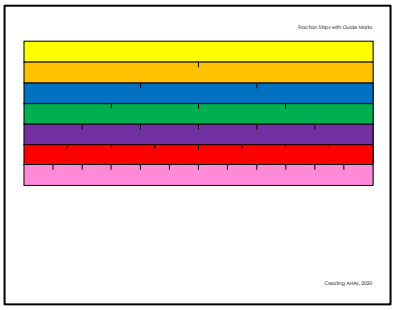
- Have your child cut each of the strips out on both pages. (Note: Colors are used in the instructions below but the specific color is not important. Any colors can be used.)
- Set the yellow strips aside (These will be our wholes).
- Have your child fold the orange strip into 2 equal pieces and cut apart.
- Have your child fold the green strip into 4 equal pieces and cut apart.
- Have your child fold the red strip into 8 equal pieces and cut apart.
- Have your child fold the blue strip into 3 equal pieces and cut apart.
- Have your child fold the purple strip into 6 equal pieces and cut apart.
- Have your child fold the pink strip into 12 equal pieces and cut apart.



**Note:** It is important that these strips are not labeled with the fraction names. We want your child to have the repeated practice of naming fractions. That is, if I have 6 pink pieces in the whole, then a pink must be 1/6. If I have 8 red pieces in a whole, then 1 red must be 1/8.

- For a less challenging version of the above, use the *Fraction Strips with Guide Marks Master*. This sheet provides guide marks for folding the strips. It is important that your child is able to create fractional units. If this is a struggle, have her or him do additional activities with play-dough. See Activity 2.

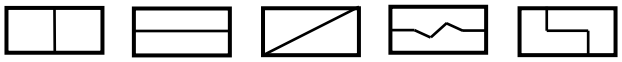




**Activity 2—Fair and square with play-dough**

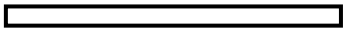
The following activity can be done if additional practice is needed making fractional parts.

- Have your child mold the play-dough into a rectangle.
- Have your child cut the rectangle into 2 equal pieces and draw a picture to match.
- Have your child see if he or she can cut their rectangle into 2 different equal pieces in more than one way.



- Have him or her draw a picture to show each way that he or she cut the rectangle.
- Repeat for a circular play-dough disc. (He or she can use the play-dough container to cut out the circular disc.)

- Have him or her draw a picture to show each way that he or she cut the disc. It may be difficult to be "creative" in cutting a circular disc into 2 sections. One possibility is shown on the right.
  **Note:** Your child should be able to prove that the sections are the same size.
- Have your child roll the play-dough into a long tube or "snake." The drawing for the snake will look like a long rectangle.



This drawing will be very useful in grades 4 and 5 as the children learn to add, subtract, multiply, and divide fractions.

**Note:** The above activities can span several days.

Repeat the above activity for 4 equal pieces on a different day.
Repeat the above activity for 8 equal pieces on a different day.
Repeat the above activity for 3 equal pieces on a different day.
Repeat the above activity for 6 equal pieces on a different day.

## Additional Practice with Simple Fractions--Activities using *Fraction 1 Concentration* Cards

**Prep:** Print, cut, and shuffle the *Fraction 1 Concentration* cards well.

### Activity 1—Name that fraction with *Fraction 1 Concentration* Cards

- Shuffle the cards well.
- Flash a card quickly.
- Have your child name the fraction they see.
- For cards showing fraction symbols (e.g., ½, ¼, ¾), have your child read in more than one way. For ¾, be sure to have your child read as three-fourths and 3, one-fourth pieces.
- Flash the card again quickly.
- Ask your child if he or she changed his or her mind.
- Show the card so your child can check.
- Repeat for the remaining cards.

### Activity 2—Write that fraction with *Fraction 1 Concentration* Cards

- Remove the fraction symbol cards from the deck (e.g., ½, ¼, ¾, etc.).
- Shuffle the remaining cards well.
- Flash a card quickly.
- Have your child write the fraction that goes with what they see (For example, ½, ¼, ¾, etc.)
- Flash the card again quickly.
- Ask your child if he or she changed his or her mind.
- Show the card so your child can check.
- Repeat for the remaining cards.

### Activity 3—Write the number word with *Fraction 1 Concentration* Cards

- Shuffle the cards well.
- Flash a card quickly.
- Have your child write the number word that goes with the image on the card (For example, one-third, three-eighths, etc.).
- Flash the card again quickly.
- Ask your child if he or she changed his or her mind.
- Show the card so your child can check.
- Repeat for the remaining cards.

### Activity 4—Fraction Match with *Fraction 1 Concentration* Cards

- Shuffle the cards well.
- Place cards face up in 4 rows with 6 cards in each row.
- Take turns finding matches.
- Each player must share how he or she knows it is a match before taking the cards.

**Activity 5—Fraction Concentration with *Fraction 1 Concentration* Cards**

- Shuffle the cards well.
- Place cards face down in 4 rows with 6 cards in each row.
- Take turns turning over 2 cards and placing face up in the exact same spaces.
- If the cards match, the player must share how he or she knows it is a match before taking the cards. (The defense must make sense.)
- If the cards do not match, the player must share how he or she knows the cards do not match before turning them back over. (The defense must make sense.)
- See who can find the most matches.

## Fractions less than 1 and Mixed Numbers

**Activity 1—All of the ways to make a fraction**

It is important for your child to understand that there are many different ways to make a fraction and mixed number using 1s, halves, thirds, fourths, sixths, eighths, twelfths. For example, 3½ can be made with 3 wholes and one-half, 2 wholes and 6 fourths, 2 wholes, 2 halves, and 3 sixths, etc.

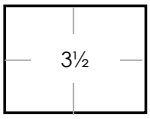
**Note:** Please allow your child to develop their own strategies for making sure they have found all of the ways. Tricks can prevent him or her from having this valuable problem-solving experience. This understanding and flexibility in playing with numbers will help them become more efficient and fluent when adding, subtracting, multiplying, and dividing.

**Prep:** Fraction kit with extra wholes, blank paper, pencil or crayon

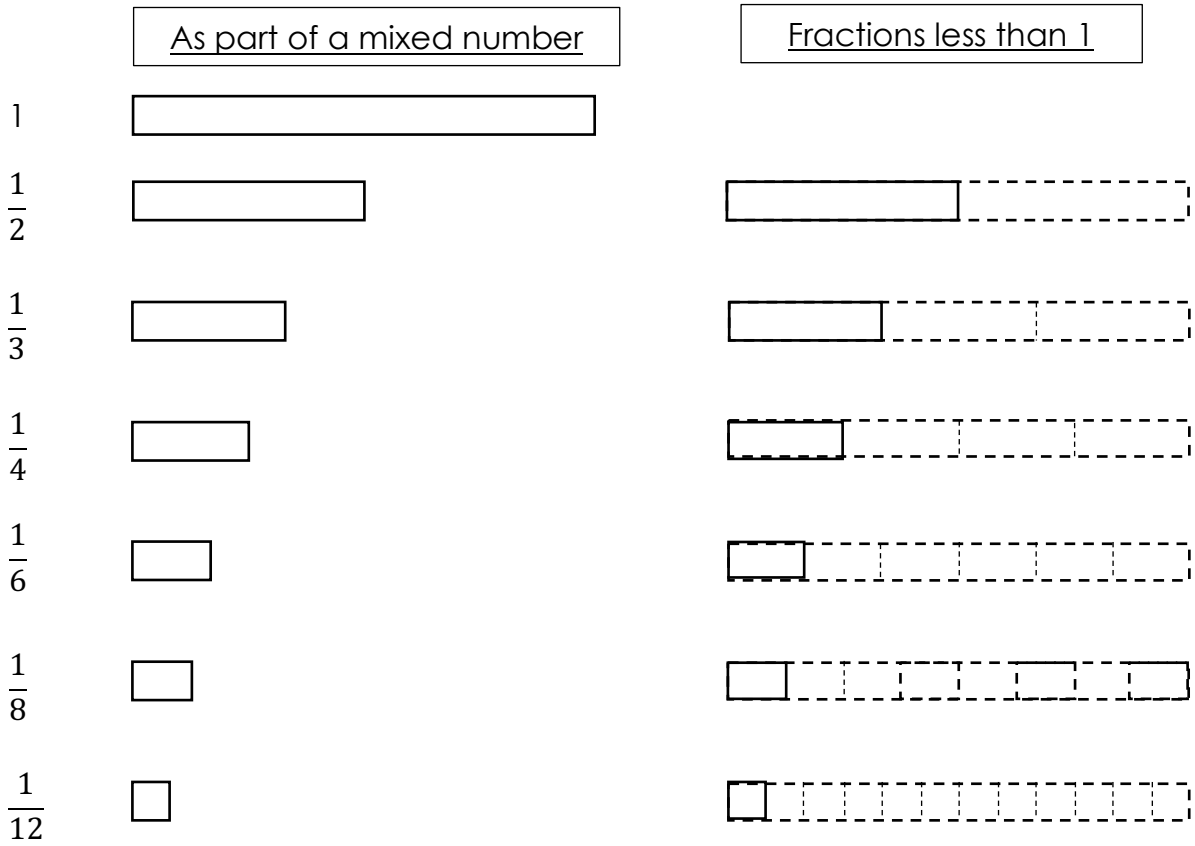
- Have your child fold a sheet of paper into 4 equal sections.

- Pick a fraction less than one or a mixed number (e.g., ¾, 3½, 2¼).

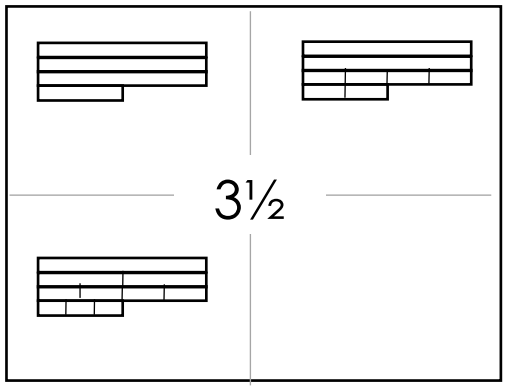
- Have your child write the number in the center of the paper.



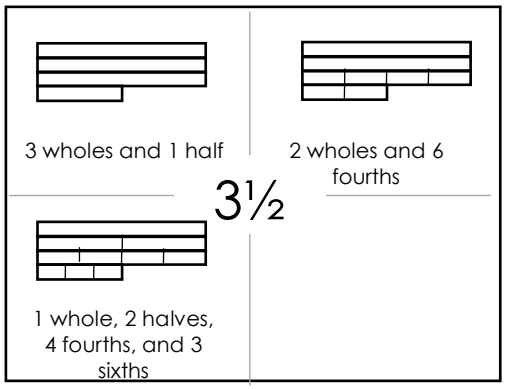
- To simplify the drawings of fractions less than 1 or mixed numbers, have your child draw the following. These drawings match the fraction kit model. Notice the use of a dashed line for the whole when drawing fractions less than 1. Instead of shading, we outline the fractional piece.




- Have your child draw as many different pictures as he or she can (one per section) for the given fraction less than one or mixed number. For example,



- After your child has drawn all of the possible pictures, have him or her label each drawing. For example,




- Repeat for other mixed numbers on other days.
- Repeat for fractions less than one on other days. Remember these drawings are a little different. They use a dashed line for the whole and outline the fractional parts.

## Comparing Fractions

Many of us learned to name a fraction such as ¾ as three-fourths or 3 out of 4. It is important for your child learn to name fractions in 3 ways: three-fourths, 3 out of 4, and 3 one-fourth pieces. In this last way of naming the fraction, your child learns that the numerator, 3, gives us the number of unit fraction pieces (in this case one-fourth). A unit fraction is a fraction with the numerator of 1. This way of reading the fraction will help your child compare fractions. In Grade 3 your child compared fractions with the same denominator. For example,

$\frac{3}{8}$ $\frac{5}{8}$

Your child should think, "Which is bigger 3, one-eighth pieces or 5, one-eighth pieces?" Understanding that you have more one-eighth pieces if you have 5 one-eighth pieces so five-eighths is greater than three-eighths.

Your child compared fractions with the same numerator. For example,

$\frac{3}{8}$ $\frac{3}{6}$

Your child should think, "Which is bigger… 3, one-eighth pieces or 3, one-sixth pieces?" Understanding that since a one-sixth piece is bigger than a one-eighth piece, then 3, one-sixth pieces would be greater.

In grade 4, your child is expected to compare fractions with different numerators and denominators. (Remember we are working with denominators 2, 3, 4,5 ,6 , 8, 10, 12, and 100.) This can be done by finding common numerators, common denominators, or comparing to 0, ½, or 1.

Example 1: To compare

$\frac{3}{5}$ $\frac{6}{8}$

we can find a common numerator. In this case we can think of 6/8 as ¾ OR we can think of 3/5 as 6/10. In both cases we have a common numerator. If we use ¾ for 6/8,

$\frac{3}{5}$ $\frac{3}{4}$

we can think, "Which is bigger… 3, one-fifth pieces or 3, one-fourth pieces?" Since 1/5 is smaller than ¼ we know that 3, one-fifth pieces would be smaller than 3, one-fourth pieces.

If we change 3/5 to its equivalent 6/10

$\frac{6}{10}$ $\frac{6}{8}$

we can think, "Which is bigger…6, one-tenth pieces or 6, one-eighth pieces?" Since 1/10 is smaller than 1/8 we know that 6, one-tenth pieces would be smaller than 6, one-eighth pieces.

Example 2: To compare ¾ and 5/8 we can find a common denominator.

$\frac{3}{4}$ $\frac{5}{8}$

In this case we can think of ¾ as 6/8.

$\frac{6}{8}$ $\frac{5}{8}$

We can think, "Which is bigger…6, one-eighth pieces or 5, one-eighth pieces. Since you have more one-eighth pieces with 6, one-eighth pieces, 6/8 must be greater.

Example 3: To compare 2/5 and 5/8 we can compare each fraction to ½.

$\frac{2}{5}$ $\frac{5}{8}$

Two-fifths (2/5) is less than one-half. We know this because 2 is less than half of 5. Another way to think about this is since double 2 is 4 we know that we need to double more than 2 to get to 5.

Five-eighths is more than one-half. We know this because half of 8 is 4. So 5 is more than half of 8. This means 5/8 is more than ½. This means that 2/5 is less than 5/8.

Your child is also expected to use the symbols >, <, and = correctly. To help with this, have your child put 2 dots next to the larger value and 1 dot next to the smaller number.

$\frac{2}{5}$ • • $\frac{5}{8}$

Your child then connects the dots.

**Activity 1—Who has more? with *Fraction 1 Concentration* Cards**

- Shuffle the cards well.
- Deal the cards so that each player has the same number of cards.
- Each player places their cards in a stack, face down.
- Each player turns over the top card on the stack.
- The player with the greater number states how they know it is greater. If the explanation makes sense, he or she then takes the cards and places on the bottom of the stack.
- See who can capture all of the cards.

**Activity 2—Who has fewer? Who has less? with *Fraction 1 Concentration* Cards**

- Shuffle the cards well.
- Deal the cards so that each player has the same number of cards.
- Each player places their cards in a stack (face-down).
- Each player turns over the top card on the stack.
- The player with the smaller number states how they know it is smaller. If the explanation makes sense, he or she then takes the cards and places on the bottom of the stack.
- See who can capture all of the cards.

## Fraction Activities using *Fraction Number Line Concentration 1 & 2* Cards

**Prep:** Print, cut, and shuffle the cards well.

**First do each of these activities with the *Fraction Number Line 1* set. When comfortable, repeat with the *Fraction Number Line 2* set.**

**Activity 1—Name that fraction with *Fraction Number Line Concentration* Cards**

- Shuffle the cards well.
- Flash a card quickly.
- Have your child name the fraction they see.
- For cards showing fraction symbols (e.g., ½, ¼, ¾), have your child read in more than one way. For ¾, be sure to have your child read as three-fourths and 3, one-fourth pieces.
- Flash the card again quickly.
- Ask your child if he or she changed his or her mind.
- Show the card so your child can check.
- Repeat for the remaining cards.

**Activity 2—Write that fraction with *Fraction Number Line Concentration* Cards**

- Remove the fraction symbol cards from the deck (e.g., ½, ¼, ¾, etc.).
- Shuffle the remaining cards well.
- Flash a card quickly.
- Have your child write the fraction that goes with what they see (For example, ½, ¼, ¾, etc.)
- Flash the card again quickly.
- Ask your child if he or she changed his or her mind.
- Show the card so your child can check.
- Repeat for the remaining cards.

**Activity 3—Write the number word with *Fraction Number Line Concentration* Cards**

- Shuffle the cards well.
- Flash a card quickly.
- Have your child write the number word that goes with the image on the card (For example, one-third, three-eighths, etc.).
- Flash the card again quickly.
- Ask your child if he or she changed his or her mind.
- Show the card so your child can check.
- Repeat for the remaining cards.

**Activity 4—Fraction Match with *Fraction Number Line Concentration* Cards**

- Shuffle the cards well.
- Place cards face up in 4 rows with 6 cards in each row.
- Take turns finding matches.
- Each player must share how he or she knows it is a match before taking the cards.

**Activity 5—Fraction Concentration with *Fraction Number Line Concentration* Cards**

- Shuffle the cards well.
- Place cards face down in 4 rows with 6 cards in each row.
- Take turns turning over 2 cards and placing face up in the exact same spaces.
- If the cards match, the player must share how he or she knows it is a match before taking the cards. (The defense must make sense.)
- If the cards do not match, the player must share how he or she knows the cards do not match before turning them back over. (The defense must make sense.)
- See who can find the most matches.

**Activity 6—Who has more? with *Fraction Number Line Concentration* Cards**

- Shuffle the cards well.
- Deal the cards so that each player has the same number of cards.
- Each player places their cards in a stack, face down.
- Each player turns over the top card on the stack.
- The player with the greater number states how they know it is greater. If the explanation makes sense, he or she then takes the cards and places on the bottom of the stack.
- See who can capture all of the cards.

**Activity 7—Who has fewer? Who has less? with *Fraction Number Line Concentration* Cards**

- Shuffle the cards well.
- Deal the cards so that each player has the same number of cards.
- Each player places their cards in a stack (face-down).
- Each player turns over the top card on the stack.
- The player with the smaller number states how they know it is smaller. If the explanation makes sense, he or she then takes the cards and places on the bottom of the stack.
- See who can capture all of the cards.

# Fraction Addition Strategies

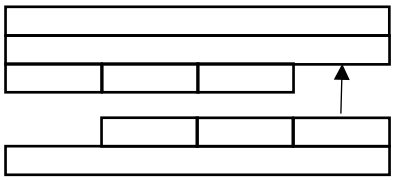
## Bridge to a whole (Associative Property)

The bridge to 10 strategy is a powerful addition strategy for your child to know. It was introduced to your child in grade 1. He or she learned that another way to think of 9 + 4 is as 10 + 3 or 8 + 6 as 10 + 4. In grade 2 we used this strategy to solve problems such as 38 + 16 knowing that it is the same as 40 + 14. In grade 3, your child learned that this strategy is really the Associative Property as he or she used it to solve problems such as 538 + 197, linking it to 535 + 200. For example, to solve 538 + 197 we thought of 538 as 535 + 3. Instead of associating the 3 with the 535 we associate it with 197, 538 + 197 = (535 + 3) + 197 = 535 + (3 + 197). So,

$$538 + 197 = 535 + 200 = 735$$

In grade 4 your child will again use this strategy as they learn to add fractions with like denominators. An important component of using this strategy with fractions is the drawing of pictures. For example, suppose your child was to add $2\frac{3}{4} + 1\frac{3}{4}$. I could draw a picture like the one below.

But if we rotate the image for $1\frac{3}{4}$ and place it under $2\frac{3}{4}$ it is much easier to see how one of the fourths can slide into the empty space of $2\frac{3}{4}$ to complete the whole (bridge to a whole).



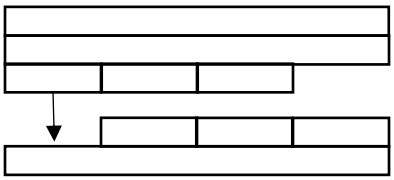
**Note:** It doesn't matter which ¼ piece we slide to complete the whole.

We are calling it Bridge to a Whole but it is the Associative Property. To find $2\frac{3}{4} + 1\frac{3}{4}$ we think of $1\frac{3}{4}$ as $\frac{1}{4} + 1\frac{2}{4}$ . So $2\frac{3}{4} + 1\frac{3}{4} = 2\frac{3}{4} + (\frac{1}{4} + 1\frac{2}{4})$. Instead of associating the ¼ with $1\frac{2}{4}$, we associate it with $2\frac{3}{4}$.

$$2\frac{3}{4} + (\frac{1}{4} + 1\frac{2}{4}) = (2\frac{3}{4} + \frac{1}{4}) + 1\frac{2}{4} = 3 + 1\frac{2}{4}$$

$$2\frac{3}{4} + 1\frac{3}{4} = 4\frac{2}{4} \text{ or } 4\frac{1}{2}$$

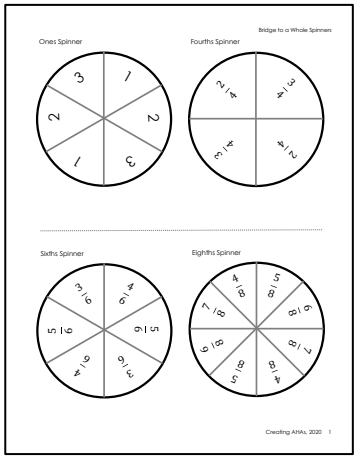
We also could have chosen to "complete the whole" for the ¾ in $1\frac{3}{4}$.



In this example, we would think of $2\frac{3}{4}$ as $2\frac{2}{4} + \frac{1}{4}$ . So,

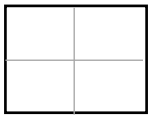
$$\begin{aligned} 2\frac{3}{4} + 1\frac{3}{4} &= (2\frac{2}{4} + \frac{1}{4}) + 1\frac{3}{4} \\ &= 2\frac{2}{4} + (\frac{1}{4} + 1\frac{3}{4}) \\ &= 2\frac{2}{4} + 2 \\ &= 4\frac{2}{4} \end{aligned}$$

## Activity 1—Bridge to a Whole—Fourths, Sixths, and Eighths

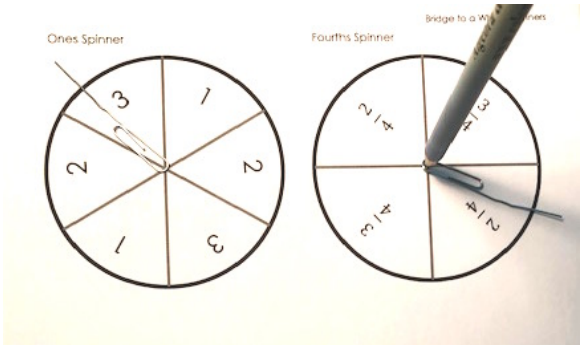



**Prep:** Print the *Bridge to a Whole Spinners* Sheet, gather paper clips to use as spinners

**Note:** The spinner page has a ones spinner, a fourths spinner, a sixths spinner, and an eighths spinner. To make a mixed number have your child spin the ones spinner and one of the fraction spinners. Put the results together to get a mixed number.



- Have your child fold a sheet of paper into 4 equal sections.
- Begin with the *ones spinner* and the *fourths spinner*. Have your child spin each spinner to get the first mixed number. For example, "$3\frac{2}{4}$".




- Have your child spin the *ones spinner* and the *fourths spinner* again to get a second mixed number. For example, suppose the spinners land on 2 and ¾. The mixed number is $2\frac{3}{4}$.
- Have your child write the related addition problem in the top left section of the paper.

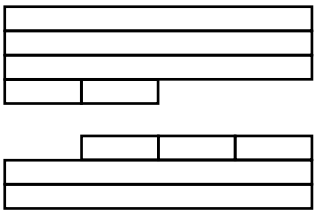
$$3\frac{2}{4} + 2\frac{3}{4}$$

- Beneath the addition problem, have your child draw a picture to match.

Remember we will draw the fractions using the following:

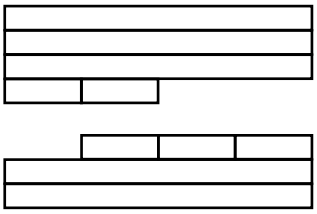
- For example,

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



- Have your child spin the ones spinner and the fourths spinners again to make the next bridge to a whole problem. Write the problem and draw the related addition picture in the 2nd section of the paper.
- Repeat until your child has created and drawn 4 problems.
- When done have your child go back and label the problems as shown below (Associative Property).

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



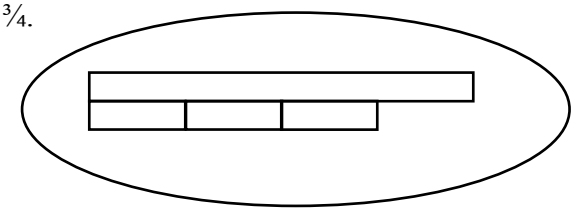
$$3\tfrac{2}{4} + 2\tfrac{3}{4} = 3\tfrac{2}{4} + (\tfrac{2}{4} + 2\tfrac{1}{4})$$
$$= (3\tfrac{2}{4} + \tfrac{2}{4}) + 2\tfrac{1}{4}$$
$$= 4 + 2\tfrac{1}{4}$$
$$= 6\tfrac{1}{4}$$

Have your child repeat for fourths on different days until he or she is comfortable representing and solving these problems. Have your child do the same activity for mixed numbers with eighths until comfortable and repeat for mixed numbers with sixths.

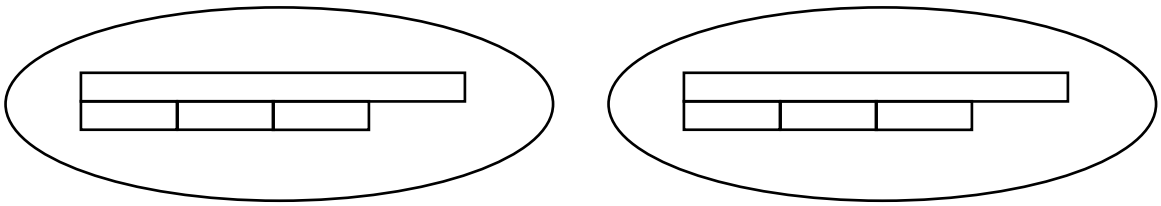
## Doubling strategies

Doubles and near doubles (doubles plus 1, doubles minus 1, doubles plus 2, doubles minus 2) are important addition strategies for your child to know. In grade 1, your child learned to double the numbers 1 to 9 (e.g., double 8 is 16, double 6 is 12). He or she may have learned to name the double (For example, when shown 7 + 7 your child names it as double 7). A near double is a problem such as 7 + 8. It is important for your child to know that this is double 7 and 1 more or 1 fewer than double 8. In grade 2 we used these strategies for doubling 2-digit numbers. In grade 3 we used these strategies to quickly solve problems such as 199 + 199. Your child can think of this problem as double 200 minus 2, 56 + 56 as double 50 plus double 6 or 112. In grade 4 we use this same strategy to solve 2 x 199 or 2 x 56.

We can also use the doubling strategy to double fractions less than one and mixed numbers. This is the foundation for multiplication of fractions and mixed numbers by a whole number. For example, we could start with a group of $1\frac{3}{4}$.



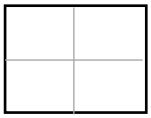
We double it.



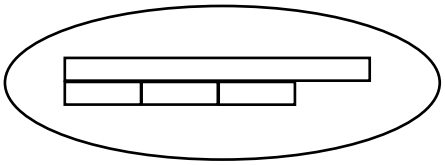
Double 1¾ can be written as, 1¾ + 1¾ or 2 x 1¾ . We can describe what we have as 2 groups of 1, or double 1, put together with 2 groups of ¾, or double ¾. So 2 x 1¾ = 2 x 1 + 2 x ¾. This is part of the Distributive Property.

**Prep:** Print *Fraction Spinners* page, gather paper clips as spinners.

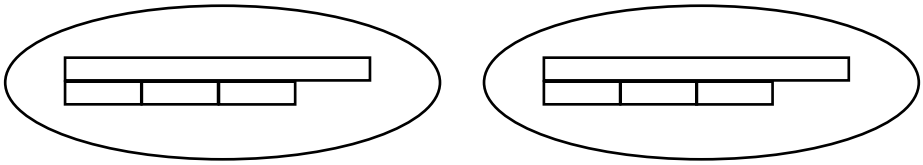
**Activity 1—Draw the double**



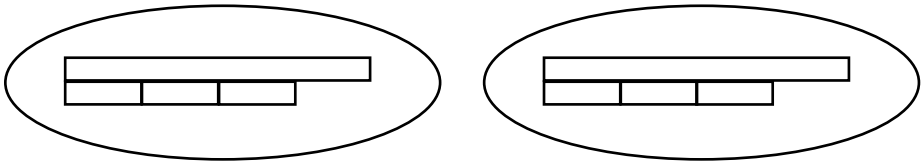
- Have your child fold a sheet of paper into 4 equal sections.
- Spin each spinner on the *Fraction Spinners* page to make a mixed number.
- In the first section of the paper, have your child draw a picture of the mixed number.



- Have your child draw the same image again to show the double.



- Have your child spin the spinners again and draw the related double in the next section.
- Repeat until your child draws a total of 4 doubles.
- After your child has finished drawing 4 different doubles, have him or her go back and label the drawings. For example,



double 1, double ¾

1¾ + 1¾ = 2 + $^{6}/_{4}$ = 2 + 1$^{2}/_{4}$ = 3$^{2}/_{4}$ or 3½

**Note:** Double ¾ or double 3, one-fourth pieces is 6, one-fourth pieces. How many wholes can we make with 6, one-fourth pieces? We can make 1 whole with 4, one-fourth pieces and we will have 2, one-fourth pieces leftover. So $^{6}/_{4}$ (6, one-fourth pieces) is the same as 1$^{2}/_{4}$.

# Section 2—Parent Information
# Subtraction Strategies and Drawings

Our goals for your child are for her or him to be:

- playful with numbers,
- flexible in the way she or he adds or subtracts,
- efficient and accurate when she or he adds or subtracts.

Many of us learned a single strategy for adding numbers and a related strategy for subtracting numbers. We often heard the words "carry" and "borrow". These strategies always work but they aren't always the most efficient. Your child learns the regrouping procedure as another way to add and subtract in grade 4. However, he or she is also expected to be able to use the variety of strategies that were taught in Grades 2 and 3 and apply them to work with fractions and mixed numbers.

Please see the Grade 2 or Grade 3 Home-based Math Activities document for descriptions of whole number subtraction strategies.

We'll begin with strategies using the fraction kit manipulatives. Whenever possible, it is important for your child to represent the problem with the actual materials, draw a picture to match, then write the related equations.

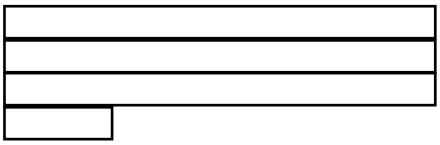
**Round and Adjust**

This strategy is one of the most efficient strategies for solving problems such as 3¼ – 1¾ .

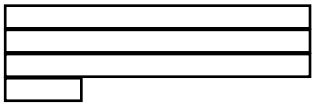
Example 1: 3¼ – 1¾

Begin with showing 3¼ using fraction kit materials (with materials and as a drawing).

Materials

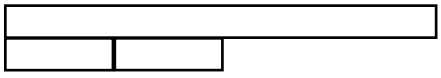


Drawings

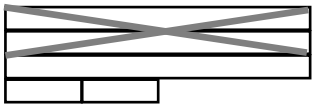


To remove 1¾, we remove 2 and then give back ¼. We rounded 1¾ to 2 and then needed to adjust (give ¼ back) because we took away one-fourth too many. The illustrations below show the changes in our materials and drawing after using this strategy.

Materials



Drawings



I removed 2 wholes and gave back ¼. (Note: It doesn't matter which of the wholes are removed or crossed out.)

$$3\frac{1}{4} - 1\frac{3}{4} = 3\frac{1}{4} - 2 + \frac{1}{4}$$

**Decompose a Whole**

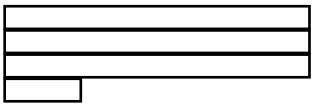
This strategy uses 2 different understandings.

- One understanding is that we can represent mixed numbers as parts and wholes. For example, 3¼ is 3 and ¼. When written as 3¼ = 3 + ¼, it is called expanded form of a number. 4th graders are expected to be able to write numbers in expanded form.
- The other understanding is that we can split a whole into fractional parts in many different ways.

Let's use this strategy for 3¼ - 1¾ .

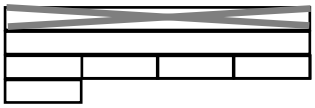
Example 1: 3¼ - 1¾

Begin with drawing 3¼.

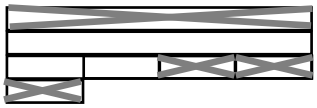


We think of 1¾ as 1 and ¾. First remove 1.

We don't have ¾ to remove so we "cut" a whole into fourths (Note: It doesn't matter which whole we cut into fourths).



We "remove" 3, one-fourth pieces and we are left with the answer (Note: It doesn't matter which of the one-fourth pieces we remove).



$3¼ - 1¾ = 3¼ - 1 - ¾ = 1\,{}^{2}/_{4}$ or 1½

## Think of Subtraction as How Many More—Missing Addend

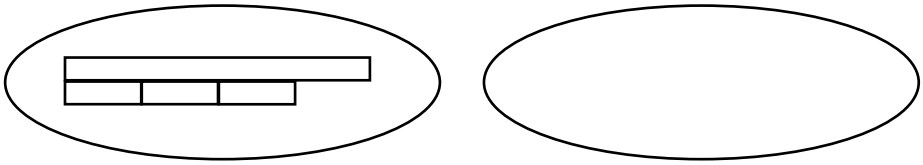
This strategy is very important for solving fraction subtraction problems. Using this strategy we think of problems such as 3¼ – 1¾ as how many more than 1¾ is 3¼ or how many do we need to add to 1¾ to get to 3¼.

$$1¾ + \_\_\_ = 3¼$$

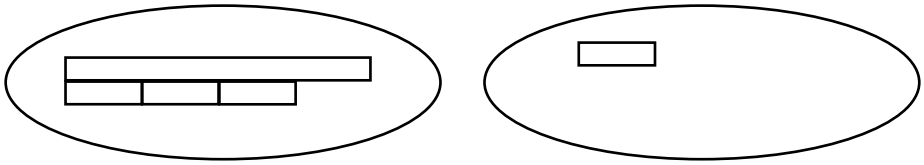
In Part 1 I'll show a missing part strategy for finding the answer using our fraction strip model. In Part 2 I'll show a counting on strategy using a number line.

**Think of Subtraction as How Many More—Missing Addend—Part 1-Finding the Missing Part**

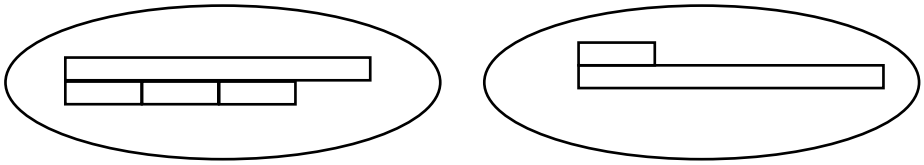
To solve 1¾ + ___ = 3¼ (or 3¼ – 1¾) using a missing part strategy, use 2 plates or sheets of paper and the fraction kit pieces. Begin with representing the part you know (1¾) on one section (this can be a plate or sheet of paper). We will put the pieces for the missing part on the other section.



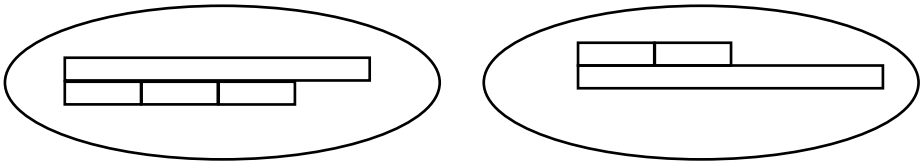
On the other section we add fourths and 1s until we reach the total (3¼). For example, if we add ¼, we have a total of 2. (**Note:** I don't have to begin by adding fourths. I could add a 1 first until I get close to the goal number.)



We add a whole and we have a total of 3.



We then add a ¼ and we have a total of 3¼.



The missing part is $1\frac{2}{4}$ or 1½.

$$1\frac{3}{4} + \boxed{1\frac{2}{4}} = 3\frac{1}{4} \quad \text{so} \quad 3\frac{1}{4} - 1\frac{3}{4} = \boxed{1\frac{2}{4}} \quad \text{or } 1\frac{1}{2}$$

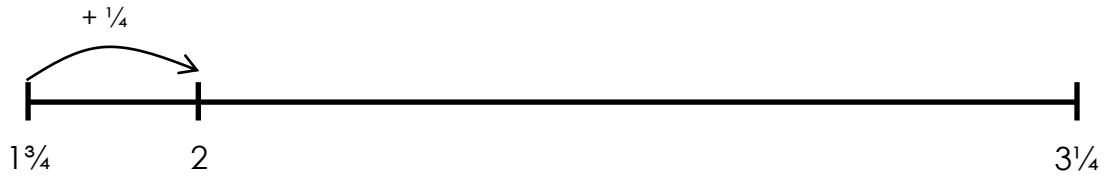
**Think of Subtraction as Missing Addend—Part 2—Counting Up on a Number Line**

To solve 1¾ + ___ = 3¼ (or 3¼ – 1¾) using a counting on strategy on a number line, we begin with an open number line with the start number on the left and the goal number on the right.

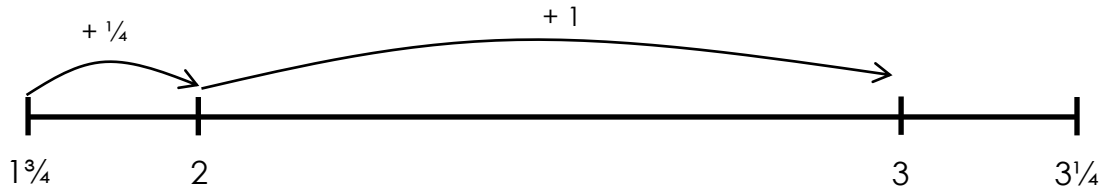

The goal is to find the distance between 1¾ and 3¼ by making jumps. Note: There are many different ways to "jump" from 1¾ to 3¼.

Example 1: 1¾ + ____ = 3¼

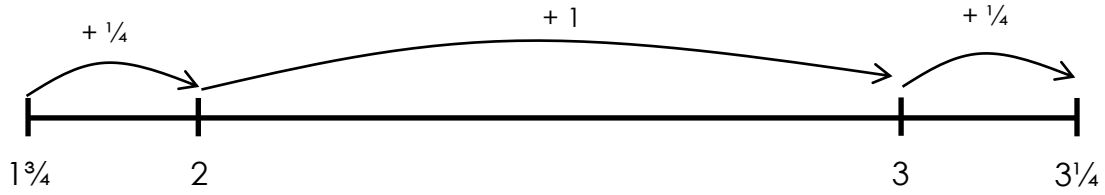
We can make a jump of ¼ to get to 2 (Count up ¼).




We can make a jump of 1 to get to 3 (Count up 1).




We can make a jump of ¼ to get to 3¼ (Count up ¼).



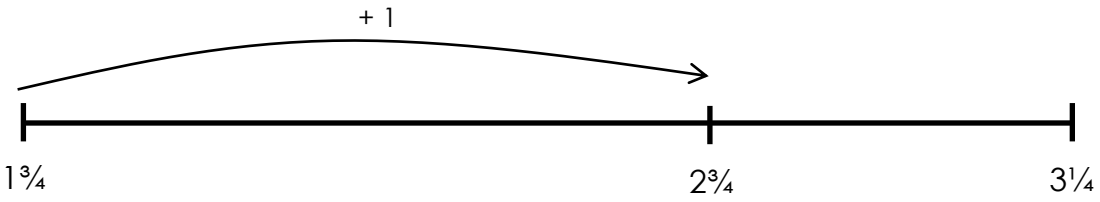

We combine the jumps to get the missing addend.

$$1¾ + \underline{\mathbf{¼ + 1 + ¼}} = 3¼$$

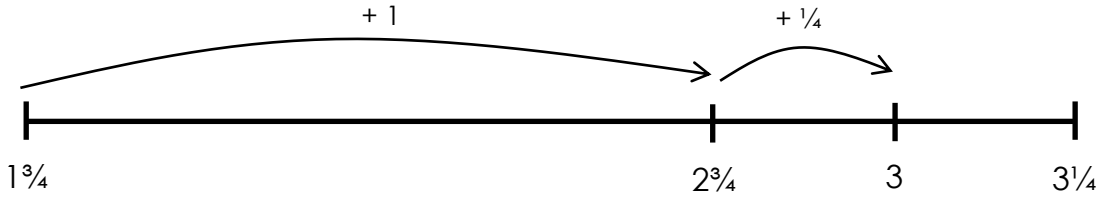
$$1¾ + \boxed{1\,{}^{2}/_{4}} = 3¼ \quad \text{so} \quad 3¼ - 1¾ = \boxed{1\,{}^{2}/_{4}} \text{ or } 1½$$

Example 2: $1\frac{3}{4} + \_\_\_\_ = 3\frac{1}{4}$

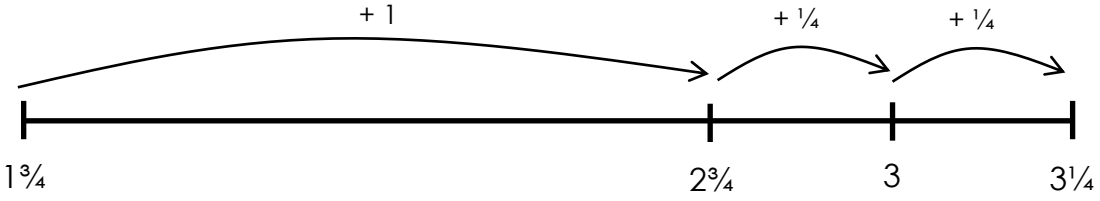
We can make a jump of 1 to get to $2\frac{3}{4}$ (Count up 1).




We can make a jump of ¼ to get to 3 (Count up ¼).




We can make a jump of ¼ to get to $3\frac{1}{4}$ (Count up ¼).




We combine the jumps to get the missing addend.

$$1\frac{3}{4} + \underline{\mathbf{1 + \frac{1}{4} + \frac{1}{4}}} = 3\frac{1}{4}$$

$$1\frac{3}{4} + \boxed{1\frac{2}{4}} = 3\frac{1}{4} \quad \text{so} \quad 3\frac{1}{4} - 1\frac{3}{4} = \boxed{1\frac{2}{4}} \text{ or } 1\frac{1}{2}$$

# Section 3—Child Activities

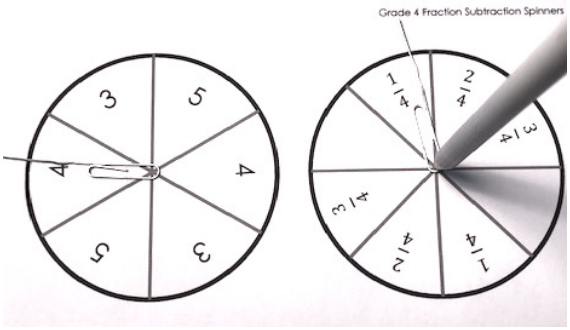
## Subtraction Activities

### Activity 1—Using multiple strategies to subtract fractions

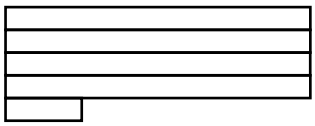
**Materials:** Fraction kit pieces (optional), Grade 4 Fraction Subtraction Spinners pages, paper clips, something to draw with and draw on.

**Note:** There are blanks on some of the spinners. If you land on a blank space, you may not have a whole number part or a fraction part.

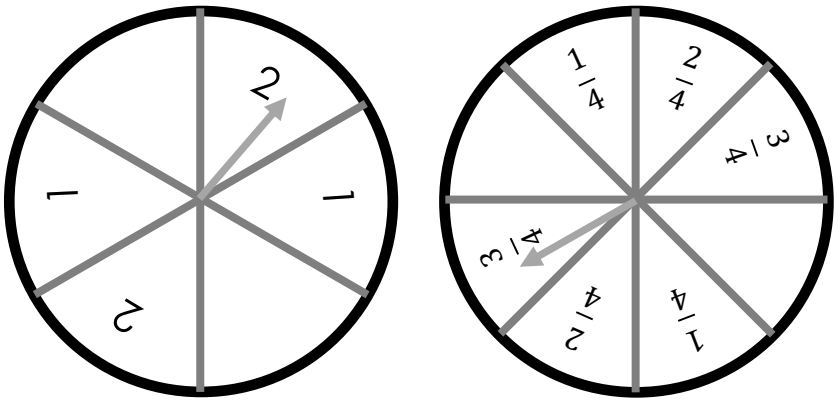
- Begin with page 1 (fourths). Have your child spin the spinners on the top of the Fraction Subtraction Spinners page 1 to get the starting mixed number. (Note: Suppose you landed on a 4 on the first spinner and a blank on the second spinner. Your starting number would be 4.)




- Have your child draw a picture to show the starting number.



- Spin the spinners on the bottom of the page to get the amount to remove.

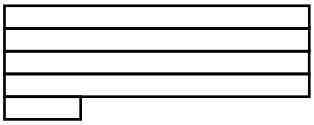


- Have your child draw pictures to show multiple ways to remove this number. (Note: Suppose you landed on a blank space on the first spinner and a blank on the second spinner. You would remove "0".) If you landed on a blank on the first spinner and ¾ on the second spinner, then you would remove ¾. If you landed on 2 on the first spinner and a blank on the second spinner, then you would remove 2.)

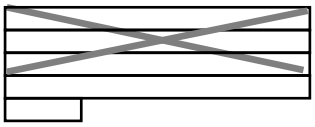
  Suppose the starting number is 4¼ and the amount to remove is 2¾.

  <u>Example 1—Using a Round and Adjust Strategy</u>

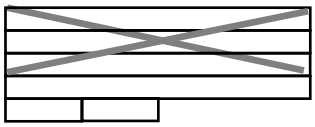
  - Begin by drawing the starting number.

  - Remove 3.

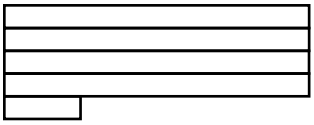
  - Give back ¼.

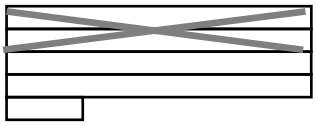
  - So $4\frac{1}{4} - 2\frac{3}{4} = 4\frac{1}{4} - 3 + \frac{1}{4} = 1\frac{2}{4}$ or $1\frac{1}{2}$

  <u>Example 2—Decompose a whole</u>

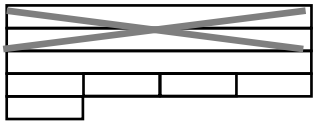
  - Begin by drawing the starting number.

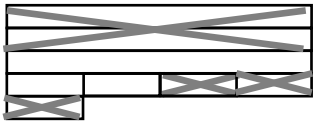
  - Since 2¾ is 2 + ¾, remove 2.

  - Separate a whole into fourths.

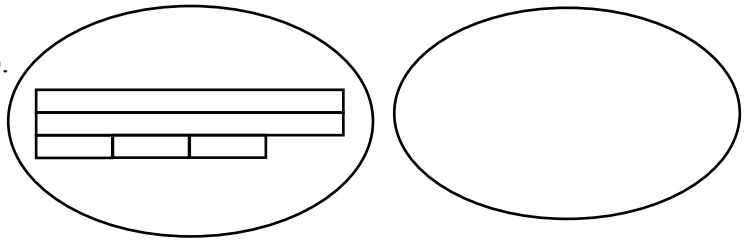
  - Remove ¾.

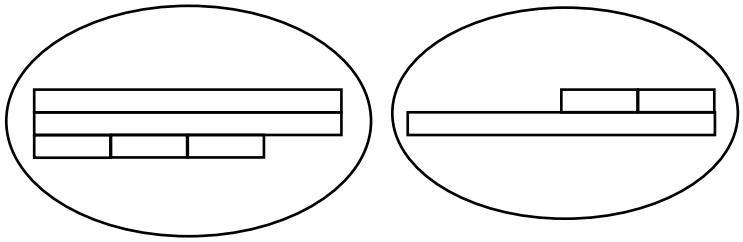
  - So, $4\frac{1}{4} - 2\frac{3}{4} = 4\frac{1}{4} - 2 - \frac{3}{4} = 1\frac{2}{4}$ or $1\frac{1}{2}$

Example 3—Find the missing part (addend)

- Think of $4\frac{1}{4} - 2\frac{3}{4}$ as $2\frac{3}{4} + \_\_\_ = 4\frac{1}{4}$ .
- Begin by drawing $2\frac{3}{4}$ in one loop.



- Count on from $2\frac{3}{4}$ by adding fourths and wholes (1) in the other loop until you reach $4\frac{1}{4}$. $\frac{1}{4}$ gets us to 3. 1 whole gets us to 4. $\frac{1}{4}$ gets us to $4\frac{1}{4}$.
- The amount in the 2nd loop is the missing addend.
- $2\frac{3}{4} + \underline{\frac{1}{4} + 1 + \frac{1}{4}} = 4\frac{1}{4}$
  or $2\frac{3}{4} + a = 4\frac{1}{4}$
  so $a = \frac{1}{4} + 1 + \frac{1}{4} = 1\frac{2}{4}$ or $1\frac{1}{2}$



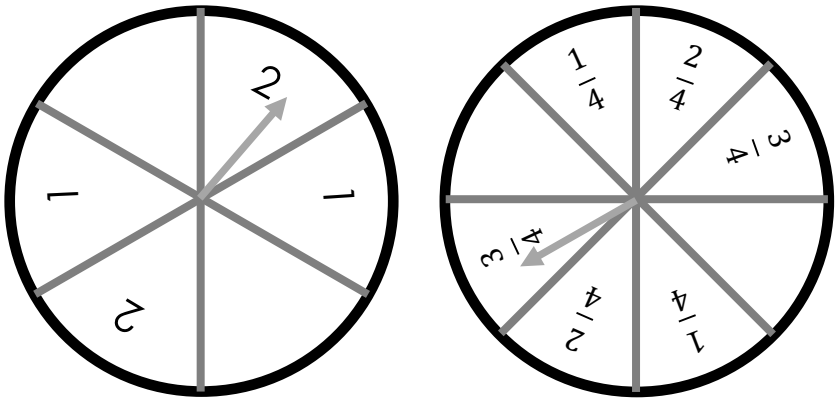
$2\frac{3}{4} + 1\frac{2}{4} = 4\frac{1}{4}$ so $4\frac{1}{4} - 2\frac{3}{4} = 1\frac{2}{4}$

Repeat with a different spinner page on a different day. Page 2 gives practice with eighths. Page 3 gives practice with sixths.

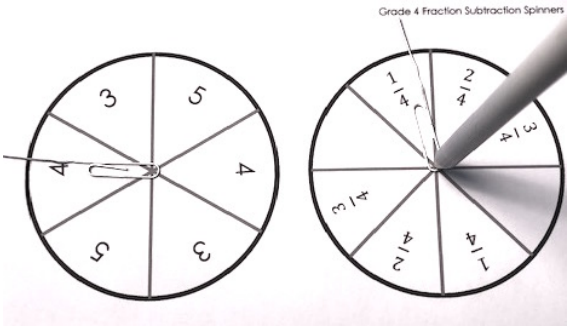
**Activity 3—How many jumps? How far apart? (Building subtraction as difference or comparison.)**

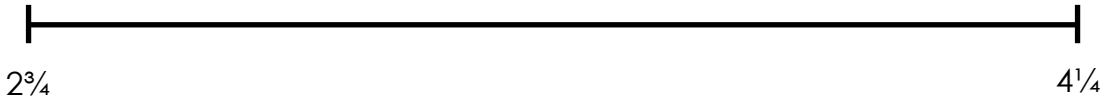
**Materials:** Grade 4 Fraction Subtraction Spinners page, paper clips for spinners.

- Have your child draw a number line.
- Have your child spin the spinners on the bottom of the Subtraction Spinners page to get a starting number. Write the number on the left endpoint of the number line.



- Have your child spin the spinners on the top of the Fraction Subtraction Spinners page to get a goal number. Write the number on the right endpoint of the number line.

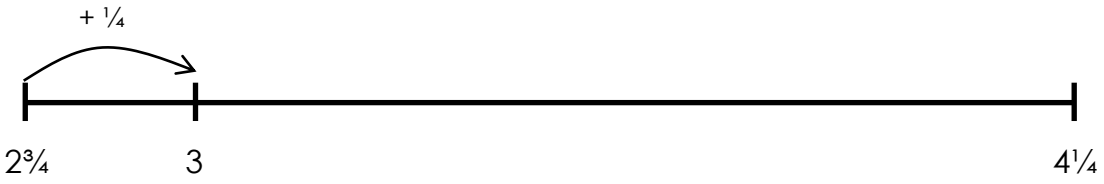


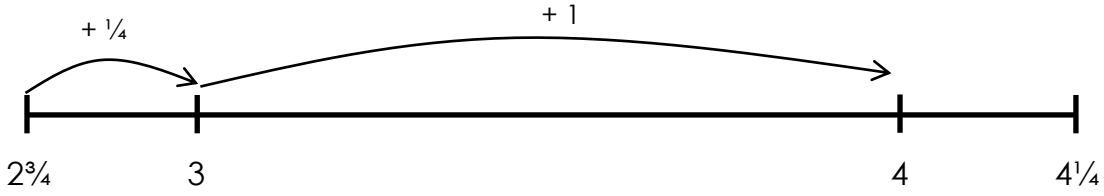

- Your child is to find how far apart the 2 numbers are by making jumps. He or she is finding how many more than 2¾ is 4¼. 2¾ + ____ = 4¼
- Have your child draw a picture to show the jumps and write the related missing addend equation.
- Have your child see if they can find the answer in more than one way.

<u>Example 1:</u> 2¾ + ____ = 4¼

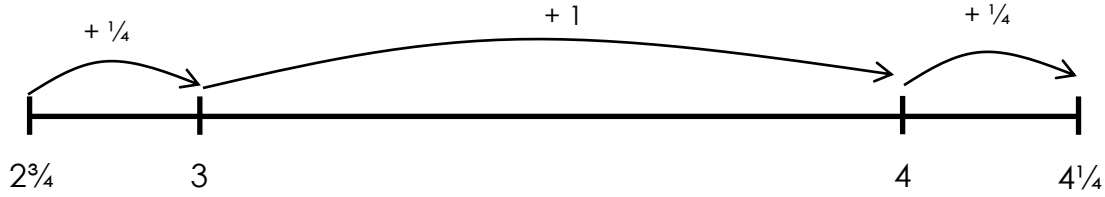
We can make a jump of ¼ to get to 3 (Count up ¼).




We can make a jump of 1 to get to 4 (Count up 1).




We can make a jump of ¼ to get to 4¼ (Count up ¼).

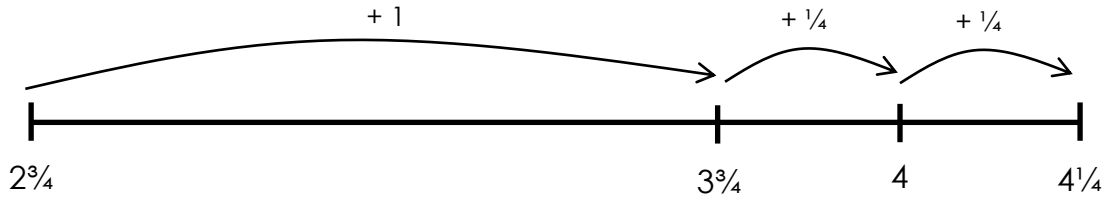


We combine the jumps to get the missing addend.

$2\frac{3}{4} + \underline{\frac{1}{4} + 1 + \frac{1}{4}} = 4\frac{1}{4}$

$2\frac{3}{4} + \boxed{1\frac{2}{4}} = 4\frac{1}{4}$ so $4\frac{1}{4} - 2\frac{3}{4} = \boxed{1\frac{2}{4}}$ or $1\frac{1}{2}$

Example 2




Have your child fill in the blank with the jumps.

$2\frac{3}{4} + \underline{1 + \frac{1}{4} + \frac{1}{4}} = 4\frac{1}{4}$

$2\frac{3}{4} + \boxed{1\frac{2}{4}} = 4\frac{1}{4}$ so $4\frac{1}{4} - 2\frac{3}{4} = \boxed{1\frac{2}{4}}$ or $1\frac{1}{2}$

Repeat the above activity for other start and goal numbers on a different day. Also use the spinner on the different pages to do similar activities on different days.

## Fraction Addition & Subtraction Practice—Using *Fraction Addition & Subtraction-Grade 4* Cards

**Prep:** Print and cut the *Fraction Addition & Subtraction-Grade 4* cards

**Activity 1—Fraction Addition & Subtraction--Find the Match**

- Shuffle the cards well.
- Place cards face up in 4 rows with 6 cards in each row.
- Take turns finding matches.
- Each player must share how he or she knows it is a match before taking the cards. (The defense must make sense.)

**Activity 2—Fraction Addition & Subtraction Concentration**

- Shuffle the cards well.
- Place cards face down in 4 rows with 6 cards in each row.
- Take turns turning over 2 cards and placing face up in the exact same spaces.
- If the cards match, the player must share how he or she knows it is a match before taking the cards. (The defense must make sense.)
- If the cards do not match, the player must share how he or she knows the cards do not match before turning them back over. (The defense must make sense.)
- See who can find the most matches.

**Activity 3—Who has more?**

- Shuffle the cards well.
- Deal the cards so that each player has the same number of cards.
- Each player places their cards in a stack, face down.
- Each player turns over the top card on the stack.
- The player with the greater number states how they know it is greater. He or she then takes the cards and places on the bottom of the stack.
- See who can capture all of the cards.

**Activity 4—Who has fewer?**

- Shuffle the cards well.
- Deal the cards so that each player has the same number of cards.
- Each player places their cards in a stack (face down).
- Each player turns over the top card on the stack.
- The player with the smaller number states how they know it is smaller. He or she then takes the cards and places on the bottom of the stack.
- See who can capture all of the cards.

# Section 4—Parent Information
# Multiplication & Division
# Models, Strategies, and Drawings

## Multiplication and Division

For many of us, learning multiplication involved memorizing the multiplication facts. Although fact fluency is important, your child is expected to understand all of the ways that we represent multiplication: equal groups, equal rows (array), equal jumps, and area. These models were introduced in grade 3 and are the models your child will see in multiplication story problems. Therefore, we want to make sure that he or she has strong visual images and the language needed to describe multiplication. Language includes: equal groups of, equal rows of, equal jumps of, or "by" (when working with area). For a problem such as
4 x 9, we could read as:

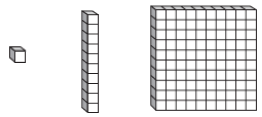
- 4 groups of 9,
- 4 rows of 9,
- 4 jumps of 9, or
- 4 by 9.

In grade 4, we expect your child to be fluent with each of these models and related language and will extend these understandings to include multiplicative comparison. Multiplicative comparison involves the language, "times as many." For example, Connor has 4 times as many football cards as his younger brother.

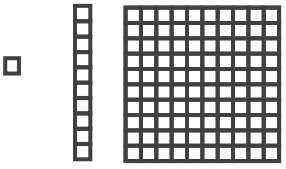
In grade 4, we extend these models from work with single by single digit multiplication to 1-digit by up to 4-digits and 2-digit by 2-digit. Many of us learned a single multiplication procedure to use when multiplying. Your child will also learn this procedure in grade 5. However, understanding and using the models mentioned above will move your child from only knowing an arithmetic approach to getting an answer to using algebraic approaches for computing. These approaches will help your child be more successful when multiplying fractions.

### Base 10 Materials

**Note:** In grades 2-5 we use Base 10 materials as models for 1s, 10s, and 100s. Your child can easily make a set for home use by cutting 10 by 10, 1 by 10, and 1 by 1 pieces from centimeter grid paper. A sheet with and without suggested cutting lines is included. For Grade 4 cut materials from at least 2 pages. For a greater challenge have your child cut the pieces from an unmarked copy without looking at the marked version. Have an extra copy or 2 available in case your child makes a mistake or if additional pieces are needed for later activities.

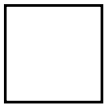


The centimeter grid paper materials will look like those to the right.



**Extending the Equal Grouping Model**

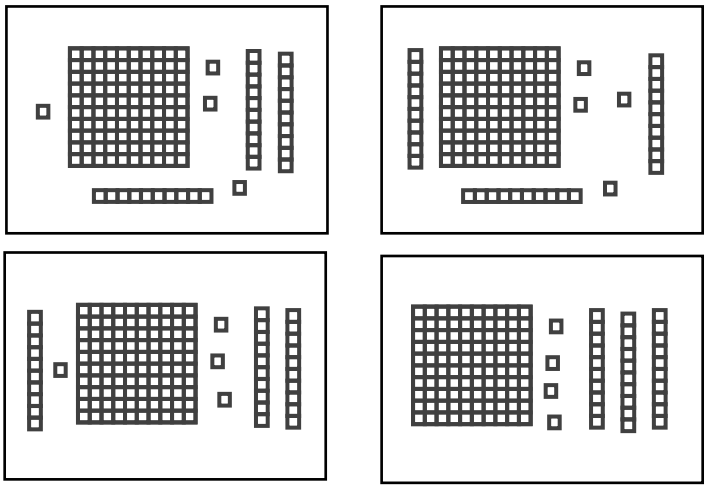
In grade 4 we use Base 10 materials to help your child visualize the Distributive Property. At first your child models multiplication problems with base 10 materials. He or she then draws a picture to match the model.

To simplify the drawings, we have your child draw a  for 100, a  for 10, and a • for 1.

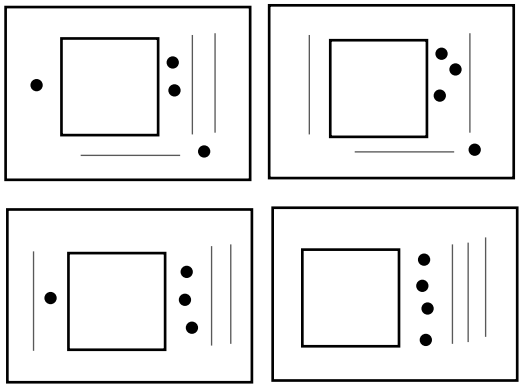
Example 1 4 x 134

- We first translate this expression into "4 groups of 134." This language helps your child understand what they are to build.
- We have your child build 4 groups of 134 with the materials.
- We then have him or her draw a picture to match.

Materials



Drawing



**Note:** It is important for your child to understand that the materials do not have to be placed in a particular order as long as they have 1 hundred, 3 tens, and 4 ones.

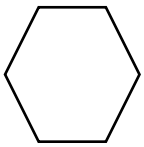
- The important question is, "What did we use to represent (build) 4 groups of 134?"
- We used 4 groups of 100 (4 x 100), 4 groups of 30 (4 x 30), and 4 groups of 4 (4 x 4). This is the Distributive Property.
  To make 134 with the Base 10 materials we thought of it as 100 + 30 + 4 (expanded form).
  So, 4 x 134 = 4 x (100 + 30 + 4) = (4 x 100) + (4 x 30) + (4 x 4)
  4 groups of 134 is the same as 4 groups of 100 put together with 4 groups of 30 put together with 4 groups of 4.
  **Note:** In (4 x 100) + (4 x 30) + (4 x 4) parentheses are not required but are helpful. For this problem your child would be correct if he or she wrote, 4 x 100 + 4 x 30 + 4 x 4.
- You may hear this being referred to as using place value, thinking of 134 as 100 + 30 + 4.

- You may also hear the term "partial products."
  If we think of 4 x 134 as 4 x 100 + 4 x 30 + 4 x 4, then 4 x 134 = 400 + 120 + 16. 400, 120, and 16 would be the partial products. You may see this written vertically as,

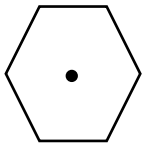
$$\begin{array}{r} 134 \\ \times\ 4 \\ \hline 400 \\ 120 \\ +16 \\ \hline 536 \end{array} \qquad \text{OR} \qquad \begin{array}{r} 134 \\ \times\ 4 \\ \hline 16 \\ 120 \\ +400 \\ \hline 536 \end{array}$$

  When we use place value or the Distributive Property the order of each partial product will not effect the answer (Commutative Property). When your child is taught the arithmetic procedure in 5th grade that we learned as children, we have them examine a way to collapse the 3 steps (3 partial products).

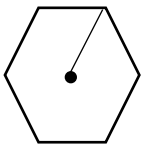
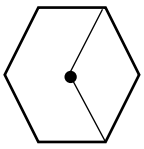
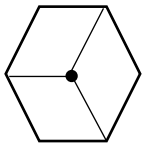
- This approach can be extended to a 1-digit times a 4-digit number. Your child will need to be able to draw a cube to represent the 1000 block (With Base 10 materials, ten 100 "flats" are combined to make a 1000). There are many ways to draw a cube. One way is to have your child first draw a hexagon with equal sides.



  Have her or him put a point where the center is.



  Your child will then draw a "Y" in the hexagon by drawing a line segment from the point to one vertex (corner). Draw 2 more line segments as shown, skipping a vertex (corner) each time.

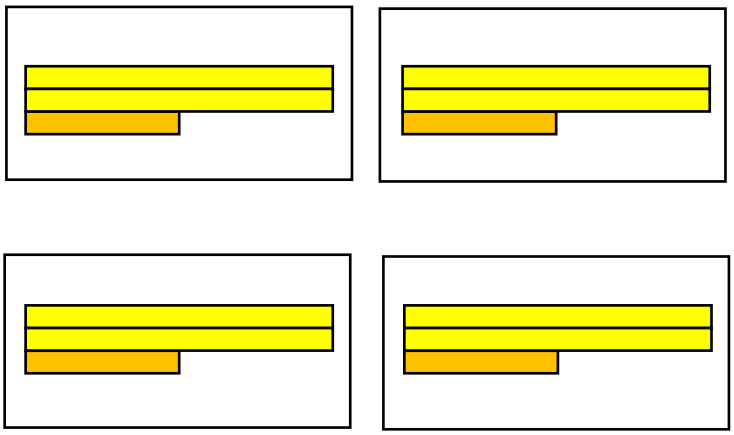




Example 2 The Distributive Property can be used for a whole number times a mixed number, 4 x 2½

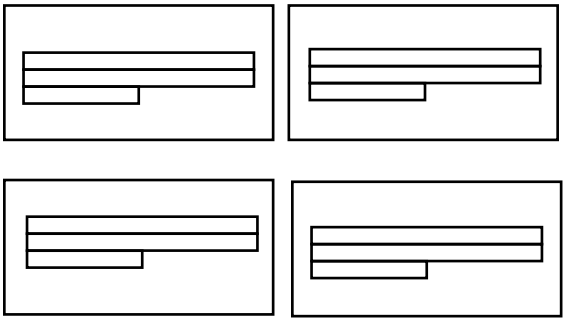
- We first translate this expression into "4 groups of 2½." This language helps your child understand what they are to build.
- We have your child build 4 groups of 2½ with the fraction kit materials. (Your child may need to make extra sets to have enough pieces.)

- We then have him or her draw a picture to match.

Materials



Drawing



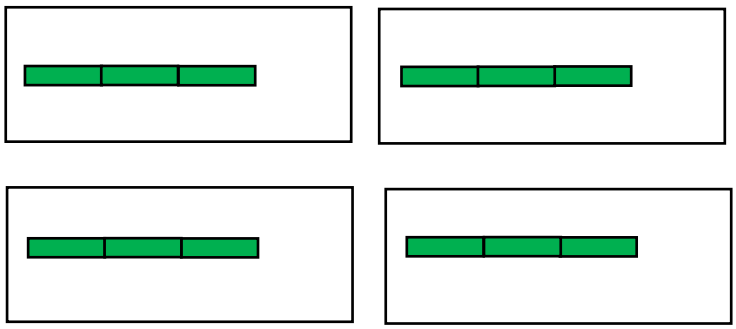
- The important question is, "What did we use to represent (build) 4 groups of 2½?"
- We used 4 groups of 2 (4 x 2) and 4 groups of ½ (4 x ½). This is the Distributive Property. To make 2½ with the fraction kit materials we thought of it as 2 + ½ (expanded form).
  So, 4 x 2½ = 4 x (2 + ½) = (4 x 2) + (4 x ½)
  4 groups of 2½ is the same as 4 groups of 2 put together with 4 groups of ½.
  **Note:** In (4 x 2) + (4 x ½) parentheses are not required but are helpful. For this problem your child would be correct if he or she wrote, 4 x 2 + 4 x ½.

$$4 \times 2\tfrac{1}{2} = 4 \times (2 + \tfrac{1}{2}) = (4 \times 2) + (4 \times \tfrac{1}{2})$$
$$= 8 + 2$$
$$= 10$$

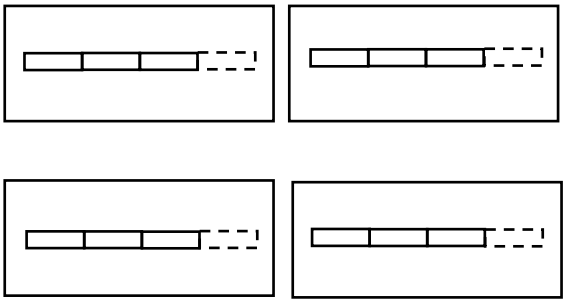
Example 3 Algebraic properties (Associative Property) can also be used for a whole number times a fraction less than 1, 4 x ¾.

- We first translate this expression into "4 groups of ¾." This language helps your child understand what they are to build.
- We have your child build 4 groups of ¾ with the fraction kit materials.
- We then have him or her draw a picture to match. Remember when drawing pictures for fractions less than 1 we used a dashed line to represent the whole and then outline the pieces that make up the fraction (See below).

Materials



Drawing

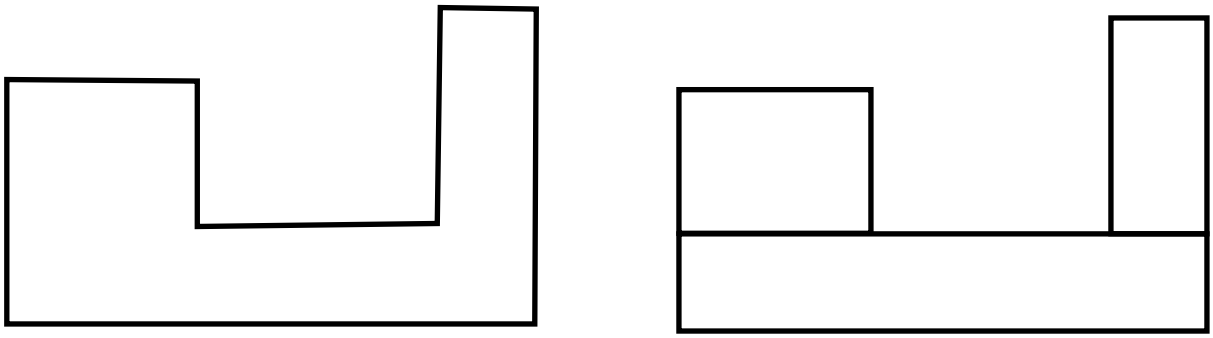


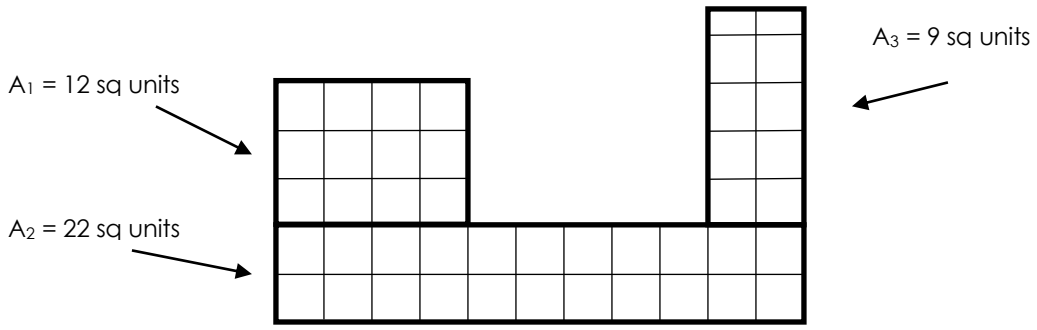
- When we ask, "What did you need to make one of the groups?" We hope your child understands that he or she needed 3, one-fourth pieces for each group (3 x ¼). **Note:** In a previous section we discussed the importance of having your child read ¾ as three-fourths and as 3, one-fourth pieces. This is another place in which the second reading is useful.
- So, 4 groups of 3, one-fourth pieces is the same as 4 x (3 x ¼). Instead of associating the 3 with the ¼ we can associate it with the 4, (4 x 3) x ¼. 4 x ¾ = (4 x 3) x ¼ = 12 x ¼. 12, one-fourth pieces can be used to make 3 wholes. These understandings are the foundation for many of the rules we learned later in school.
- Students can also find this answer by noticing that if they take the 4th group of ¾, they can use each of the ¼ pieces to complete the whole for the other 3 groups.

$$4 \times \tfrac{3}{4} = 3$$

**Multiplication Using the Area Model**

Area models are another powerful visual for developing the Distributive Property and provide the foundation for later work your child will do with algebra tiles and other materials in middle school algebra. In grade 3, your child is introduced to area as a covering in square units. Your child learned that we can divide shapes into smaller pieces. Find the area of each of those pieces and then add them together to get the total area of a shape. This is particularly useful when finding the area of shapes such as the one shown below. This shape can be cut into rectangles as shown on the right. We can then find the area of each rectangle, combine those areas and obtain the area of the original shape.





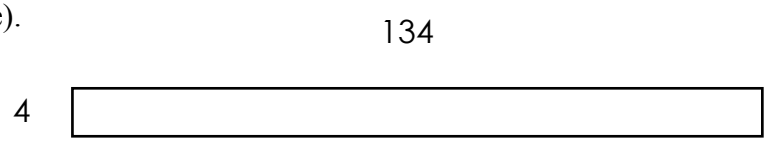

Combining the areas, $A_1$, $A_2$, and $A_3$

$$A_1 + A_2 + A_3 = 12 + 22 + 9 \text{ sq units} = 43 \text{ sq units}$$

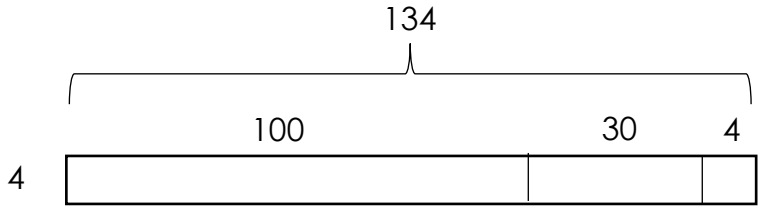
We use this same concept to represent 1-digit by up to 4-digit multiplication or 2-digit by 2-digit multiplication.

Example 1  4 x 134

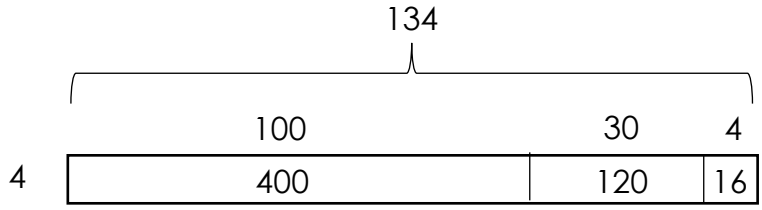
- Since we are using an area model we translate this expression into "4 by 134" (the dimensions of the rectangle).




- To make it easier to find the area of the rectangle we can cut it into smaller sections. An efficient way to cut the rectangle is to think of 134 in expanded form (use place value). We will think of 134 as 100 + 30 + 4. We'll then have 3 rectangles. One with the dimensions 4 by 100. One with the dimensions 4 by 30. One with the dimensions 4 by 4.



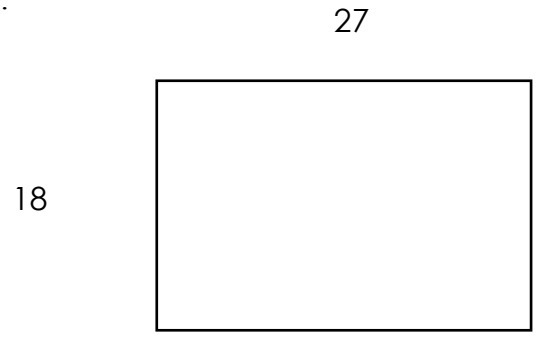

We are thinking of 4 x 134 as 4 x (100 + 30 + 4)
or (4 x 100) + (4 x 30) + (4 x 4).
This is the Distributive Property.




4 x 134 = 4 x (100 + 30 + 4)
= (4 x 100) + (4 x 30) + (4 x 4)
= 400 + 120 + 16
= 536

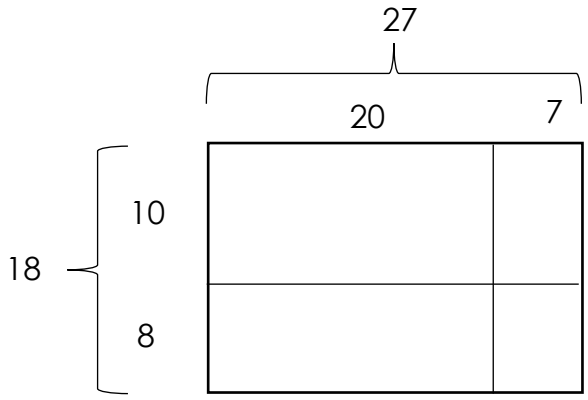
Example 2: 18 x 27

- Since we are using an area model we translate this expression into "18 by 27" (the dimensions of the rectangle).



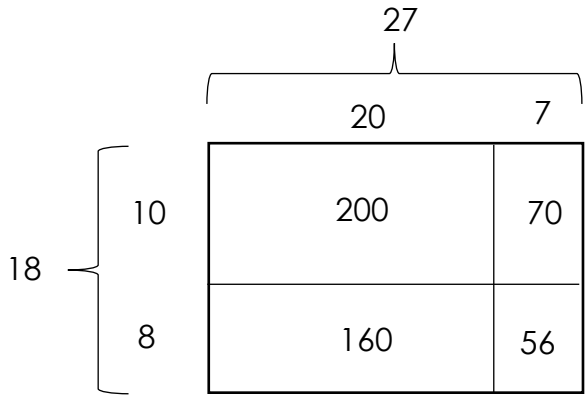
- To make it easier to find the area of the rectangle we can cut it into smaller sections. An efficient way to cut the rectangle is to think of 18 and 27 in expanded form (use place value). We will think of 18 as 10 + 8 and 27 as 20 + 7.

  Notice how we "cut" the rectangle between the 10 and the 8 and between the 20 and 7. We now have 4 rectangles. One with the dimensions 10 by 20. One with the dimensions 10 by 7. One with the dimensions 8 by 20. One with the dimensions 8 by 7.




We are thinking of 18x 27 as (10 + 8) x (20 + 7)
or (10 x 20) + (10 x 7) + (8 x 20) + (8 x 7)
This is the Distributive Property.

In algebra we will call this binomial multiplication. In 4th grade we prepare your child for this later work in algebra by learning this area model representation for multiplication.

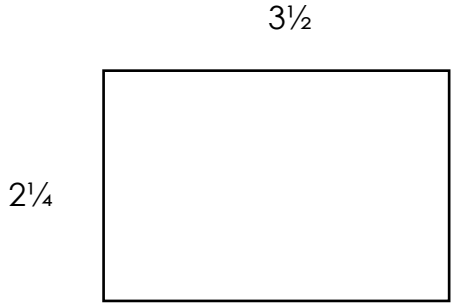



18x 27 = (10 + 8) x (20 + 7)
= (10 x 20) + (10 x 7) + (8 x 20) + (8 x 7)
= 200 + 70 + 160 + 56
= 270 + 216
= 486

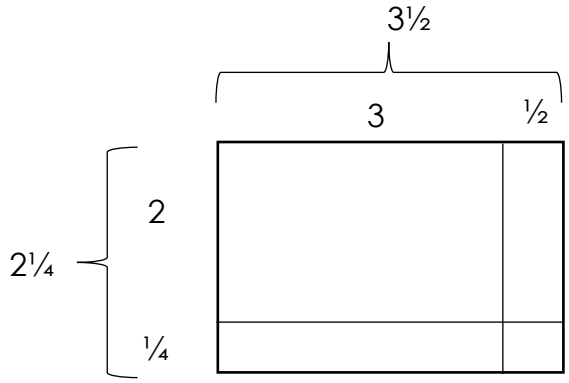
Again, the partial products are the areas that are shown within each rectangle, 200, 70, 160, and 56.

Example 3: Because we are using the Distributive Property to multiply, we can also use this to multiply mixed numbers. This will be used in grade 5. For example, 2¼ x 3½

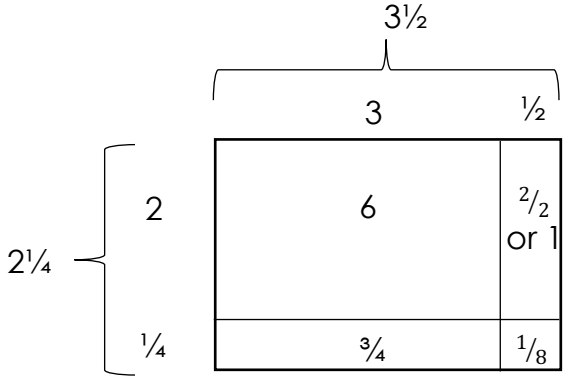
- Since we are using an area model we translate this expression into "2¼ by 3½" (the dimensions of the rectangle).




- To make it easier to find the area of the rectangle we can cut it into smaller sections. We know mixed numbers have a whole number piece and a fraction piece. For 2¼ the whole number piece is 2 and the fraction piece is ¼. We can think of 2¼ as 2 + ¼ and 3½ and 3 + ½. Notice how we "cut" the rectangle between the 2 and the ¼ and between the 3 and ½. We now have 4 rectangles. One with the dimensions 2 by 3. One with the dimensions 2 by ½. One with the dimensions ¼ by 3. One with the dimensions ¼ by ½.




We are thinking of 2¼ x 3½ as (2 + ¼) x (3 + ½)
or (2 x 3) + (2 x ½) + (¼ x 3) + (¼ x ½)
This is the Distributive Property.




$2¼ \times 3½ = (2 + ¼) \times (3 + ½)$
$= (2 \times 3) + (2 \times ½) + (¼ \times 3) + (¼ \times ½)$
$= 6 + 1 + ¾ + 1/8$
$= 7 + 7/8$
$= 7\,7/8$

**Division**

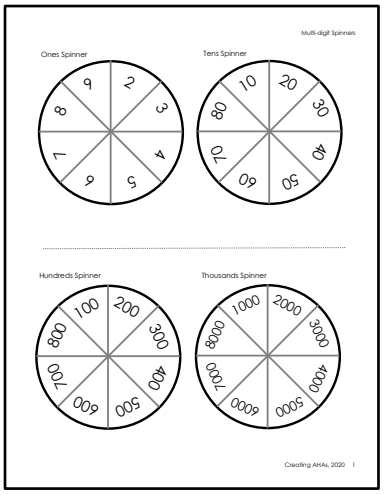
Division is the inverse of multiplication. If multiplication is combining equal groups, division is separating into equal groups or pulling off equal groups of a given number. If multiplication is combining equal rows, then division is separating into equal rows or pulling off equal rows of a given number. In grade 3, your child is expected to understand the different representations and language for division. He or she is also expected to use his or her knowledge of multiplication to divide. That is, to find 24 ÷ 6 your child can think, "What times 6 is 24?" (missing factor). In grade 4 we extend these understandings to using partial quotients (similar to partial products) to divide. If using the area model in division, we know one side length and the area. Our goal is to find the missing side length.

# Section 5—Child Activities

## Multiplication Practice—Equal Grouping Model and Area Model—Spinners

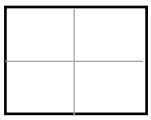
### Activity 1—1-digit by 2-digit, 3-digit, or 4-digit Multiplication—Equal Grouping Model

**Prep:** Print the Multi-digit Spinner Sheet, gather paper clips to use as spinners



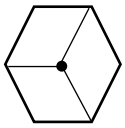
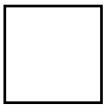

**Note:** The spinner page has a thousands spinner, a hundreds spinner, a tens spinner, and a ones spinner. To make a 2-digit number have your child spin the tens and ones spinner and put the results together to get a 2-digit number. To make a 3-digit number have your child spin the hundreds, tens, and ones spinners and put the results together to get a 3-digit number. To make a 4-digit number have your child spin the thousands, hundreds, tens, and ones spinners and put the results together to get a 4-digit number. This provides additional practice for your child to write a number when given the number in expanded form.

- Have your child fold a sheet of paper into 4 equal sections.



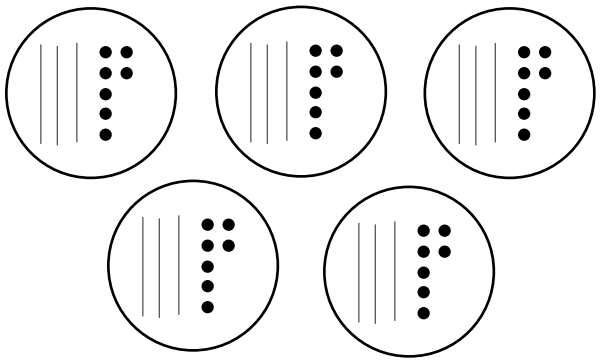
- Have your child spin the *ones spinner* to get the first factor. For example, "5".
- Have your child spin the *tens spinner* and the *ones spinner* to get the 2-digit number. For example, suppose the spinners land on 30 and 7. The 2-digit number is 37.
- Have your child write the related multiplication problem in the top left section of the paper.

5 x 37

Remember we will use  for 1000,  for 100, | for 10, and a • for 1.

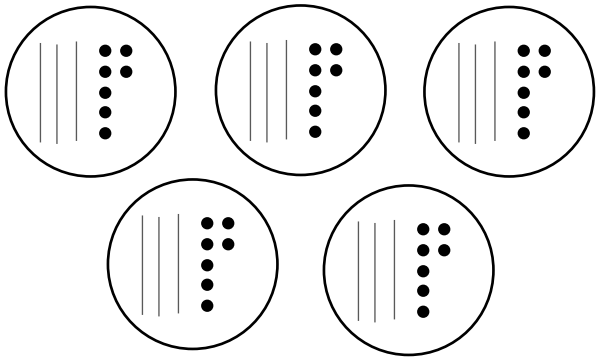
- Beneath the multiplication problem, have your child draw an equal grouping drawing to match. For example,

5 x 37



- Have your child spin the ones spinner and the tens and ones spinners again to make the next multiplication problem. Write the problem and draw the related equal grouping picture in the 2nd section of the paper.
- Repeat until your child has created and drawn 4 problems.
- When done have your child go back and label the problems as shown below (Distributive Property).

5 x 37

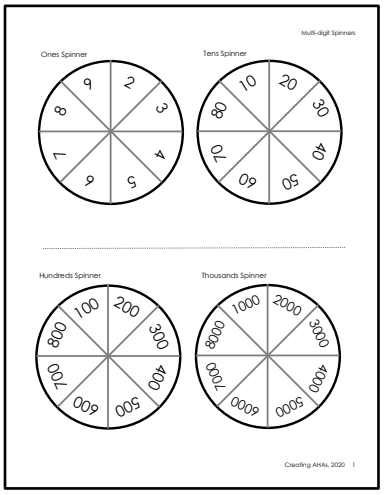


5 x 37 = (5 x 30) + (5 x 7) = 150 + 35 = 185

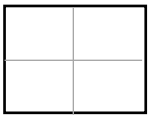
Have your child repeat for 1-digit x 2-digit on different days until he or she is comfortable representing and solving these problems. Have your child do the same activity for 1-digit x 3-digit until comfortable and repeat for 1-digit x 4-digit numbers.

**Activity 2—1-digit by 2-digit, 3-digit, or 4-digit Multiplication—Area Model**

**Prep:** Print the Multi-digit Spinner Sheet, gather paper clips to use as spinners




**Note:** The spinner page has a thousands spinner, a hundreds spinner, a tens spinner, and a ones spinner. To make a 2-digit number have your child spin the tens and ones spinner and put the results together to get a 2-digit number. To make a 3-digit number have your child spin the hundreds, tens, and ones spinners and put the results together to get a 3-digit number. To make a 4-digit number have your child spin the thousands, hundreds, tens, and ones spinners and put the results together to get a 4-digit number. This provides additional practice for your child to write a number when given the number in expanded form.



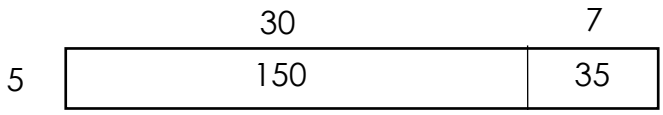
- Have your child fold a sheet of paper into 4 equal sections.
- Have your child spin the *ones spinner* to get the first factor. For example, "5".
- Have your child spin the *tens spinner* and the *ones spinner* to get the 2-digit number. For example, suppose the spinners land on 30 and 7. The 2-digit number is 37.

- Have your child write the related multiplication problem in the top left section of the paper.

5 x 37

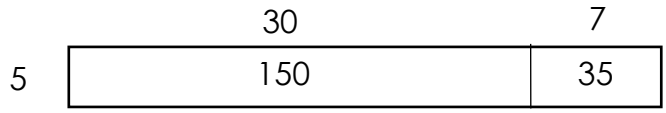
- Beneath the multiplication problem, have your child draw an area model drawing to match. For example,

5 x 37




- Have your child spin the ones spinner and the tens and ones spinners again to make the next multiplication problem. Write the problem and draw the related area model picture in the 2nd section of the paper.
- Repeat until your child has created and drawn 4 problems.
- When done have your child go back and label the problems as shown below (Distributive Property).

5 x 37




5 x 37 = (5 x 30) + (5 x 7) = 150 + 35 = 185

Have your child repeat for 1-digit x 2-digit on different days until he or she is comfortable representing and solving these problems. Have your child do the same activity for 1-digit x 3-digit until comfortable and repeat for 1-digit x 4-digit numbers.

**Activity 3—2-digit by 2-digit—Area Model**

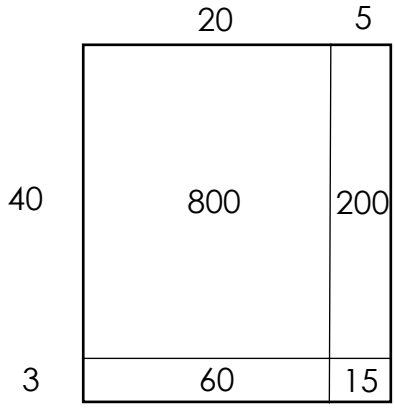
**Prep:** Print the Multi-digit Spinner Sheet, gather paper clips to use as spinners

- Have your child fold a sheet of paper into 4 equal sections.
- Have your child spin the *tens and ones spinners* to get the first 2-digit factor. For example, "43".
- Have your child spin the *tens spinner* and the *ones spinner* to get the second 2-digit factor. For example, 25.
- Have your child write the related multiplication problem in the top left section of the paper.

43 x 25

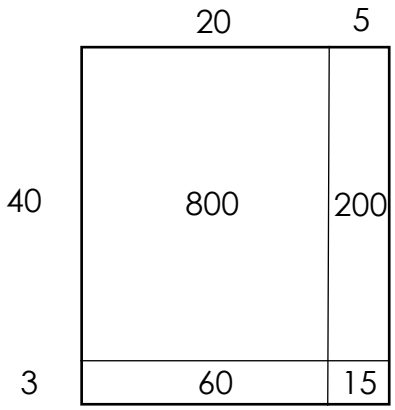
- Beneath the multiplication problem, have your child draw an area model drawing to match. For example,

43 x 25




- Have your child spin the ones spinner and the tens and ones spinners again to make the next multiplication problem. Write the problem and draw the related area model picture in the 2nd section of the paper.
- Repeat until your child has created and drawn 4 problems.
- When done have your child go back and label the problems as shown below (Distributive Property).

43 x 25




43 x 25 = (40 + 3) x (20 + 5)
= (40 x 20) + (40 x 5) + (3 x 20) + (3 x 5)
= 800 + 200 + 60 + 15
= 1075

Have your child repeat for other 2-digit x 2-digit on different days until he or she is comfortable representing and solving these problems.

**Area Model Multiplication Practice Using *Area Model Concentration* Cards**

**Activity 1—Area Model Match**

- Shuffle the cards well.
- Place cards face up in 4 rows with 6 cards in each row.
- Take turns finding matches.
- Each player must share how he or she knows it is a match before taking the cards.

**Activity 2—Area Model Concentration**

- Shuffle the cards well.
- Place cards face down in 4 rows with 6 cards in each row.
- Take turns turning over 2 cards and placing face up in the exact same spaces.
- If the cards match, the player must share how he or she knows it is a match before taking the cards. (The defense must make sense.)
- If the cards do not match, the player must share how he or she knows the cards do not match before turning them back over. (The defense must make sense.)
- See who can find the most matches.

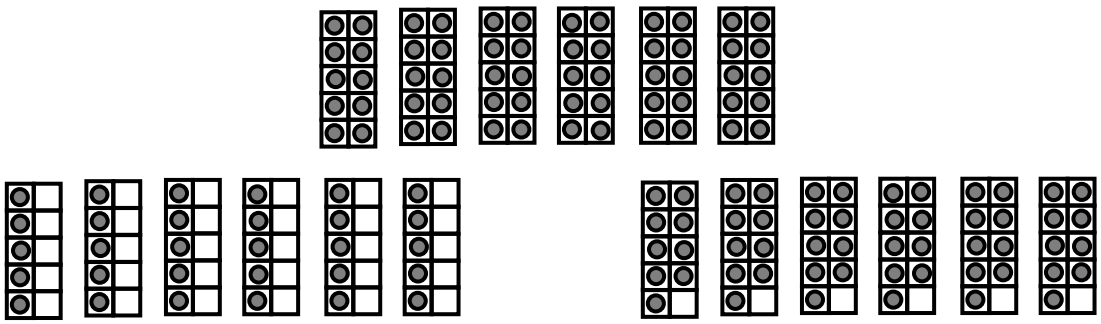
## The multiplication and division activities below were introduced in grade 3. These can be used if your child needs additional practice with early models for multiplication.

**Multiplication Fact Sequence**

When many of us learned the multiplication facts we began with the 1s and worked our way up to the 12s. We have found that changing the order a bit may help children learn their facts and more importantly learn strategies for working with larger numbers. Begin with the 0s, 1s, and 10s. The 0s are easy. Your child should know that anything multiplied by 0 will be 0. For fun have your child draw 7 groups of 0, 3 groups of 0, 3 rows of zero. While they are still giggling or looking at you with that look of disbelief, ask them to draw zero groups of 7, zero rows of 5, zero jumps of 9. You get the idea. The 0s are easy. Do a similar activity with 1s. Have your child draw 1 group of 7 and 7 groups of 1. Although the totals are the same, it is important for your child to know that the pictures will be different.

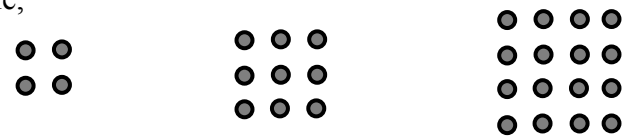

The 10s are one of the next easiest. Your child can picture filled 10 frames or base 10 rods. 5 tens is 50, 8 tens is 80.

Once your child is comfortable with the 10s facts either do the 5s or the 9s. The 5s are half of the 10s facts. For example, if 6 tens is 60, 6 fives is half of that or 30. The 9s are 1 fewer in each group. For example, if 6 tens is 60, 6 nines would be 60 minus 6 or 54.



Once your child is fluent with the 0s, 1, 10s, 5, and 9s he or she can practice the doubles. This would have them learn the 2s (doubles—he or she began doubling in grade 1), followed by the 4s (double doubles), followed by the 8s (double, double, double). Repeated doubling is a powerful strategy for mentally multiplying larger numbers by 2, 4, or 8. Repeated halving is used to divide by 2, 4, or 8.

The next multiplication cluster are the square numbers (2 x 2, 3 x 3, 4 x 4, etc.). These are the numbers that make squares. For example,



If your child knows these facts and knows that you can "flip" the known facts to get the same product (Commutative Property: if you know 2 x 3 = 6 then you know 3 x 2 = 6), then your child knows all but 3 facts. We have not listed learning the 3s, 6s, or 7s in this sequence. The only 3 facts that we are missing are 3 x 6 and 3 x 7. 3 x 6 is double 3 x 3. We are missing 6 x 3 and 6 x 7. If your child knows 3 x 6 is 18 then he or she knows 6 x 3 is 18. 6 x 7 is double 3 x 7. If your child knows 3 x 7 is 21 then 6 x 7 is double that or 42. We are missing 7 x 3 and 7 x 6 but we've already addressed those facts. Technically the one fact to memorize is 3 x 7.

## Multiplication and Division Games

There are 3 sets of concentration game cards that we used in grade 3 to help your child develop their understanding and fluency with multiplication and division:

- *Equal Grouping* Cards
- *Division as Separating Concentration* Cards
- *Multiplication 8s, 9s, 10s Facts Concentration* Cards

**You can do Activities 1-4 using any of these card sets. Activity 5 uses the first 2 sets.**

**Activity 1—Find the Match**

- Shuffle the cards well.
- Place cards face up in 4 rows with 6 cards in each row.
- Take turns finding matches.
- Each player must share how he or she knows it is a match before taking the cards.

**Activity 2—Multiplication/Division Concentration**

- Shuffle the cards well.
- Place cards face down in 4 rows with 6 cards in each row.
- Take turns turning over 2 cards and placing face up in the exact same spaces.
- If the cards match, the player must share how he or she knows it is a match before taking the cards. (The defense must make sense.)
- If the cards do not match, the player must share how he or she knows the cards do not match before turning them back over. (The defense must make sense.)
- See who can find the most matches.

**Activity 3—Who has more?**

- Shuffle the cards well.
- Deal the cards so that each player has the same number of cards.
- Each player places their cards in a stack, face down.
- Each player turns over the top card on the stack.
- The player with the greater number states how they know it is greater. If the explanation makes sense, he or she then takes the cards and places on the bottom of the stack.
- See who can capture all of the cards.

**Activity 4—Who has fewer? Who has less?**

- Shuffle the cards well.
- Deal the cards so that each player has the same number of cards.
- Each player places their cards in a stack (face-down).
- Each player turns over the top card on the stack.
- The player with the smaller number states how they know it is smaller. If the explanation makes sense, he or she then takes the cards and places on the bottom of the stack.
- See who can capture all of the cards.

**Activity 5—Multiplication and Division Stories—*Equal Grouping* Cards & *Division as Separating* Cards**

Sample stories are included within these 2 card decks. Use one of the decks at a time. Have your child remove the story cards from one of the decks.

- Shuffle the remaining cards well.
- Place the cards in a stack (face-down).
- Have your child select the top card and tell a story problem to go with the fact or the drawing.
- Complete 4 to 6 stories.
- Repeat for the same deck on a different day or do the same activity for the other deck.

# Measurement Activities

## Money

In 4th grade your child is expected to be able to:

- name each of the coins regardless of the image on the head or tail,
- name the value of each coin,
- find and name other information available on the coins (date, United States of America, In God We Trust, value, etc.),
- name the total when given a collection of mixed coins and bills,
- show multiple ways to make the same value,
- correctly write money values using $ and ¢ symbols, and
- solve money story problems.

**Note:** Remember that when using the ¢ symbol we do not use a decimal point. Think of ¢ as representing the value of a penny. We have 50¢ but not **.**50¢. The latter is the equivalent of half a penny. That is not part of US currency. We can also show 50 cents as a part of a dollar. A dollar is the equivalent of 100 cents. 50 cents is the equivalent of fifty hundredths of a dollar, or $**.**50. So to record 50 cents we can write it as 50¢ or $**.**50. We would write 25 cents as either 25¢ or $**.**25, 10 cents as 10¢ or $**.**10, 5 cents as 5¢ or $**.**05, and 1 cent as 1¢ or $**.**01 (one-hundredth of a dollar).

**Activity 1—Count the change**

In grade 4 we focus on writing decimal numbers to hundredths. Money activities provide a wonderful opportunity for students to work with decimal numbers.

- If you have a coin jar, give your child a handful of coins.
- Have him or her count the coins and record the value using $ and ¢ signs correctly.
- Repeat 4 or 5 times with a different handful of coins each time.

**Other Money Activities**

- At the store have your child check that the correct change has been given.
- Have your child look at store fliers from the mail or newspaper. Have them pick an item and then make that value with coins and bills. (They can make fake money to use for this activity).
- Have your child look at store fliers to see if the amounts using the ¢ symbol have been written correctly.

# Angles

## Activity 1—What's Your Angle?

**Materials:** A sheet of paper to use as a measurement tool, paper and pen or pencil.

- Each corner of a sheet of paper is a right angle (90°).
- Have your child find at least 6-10 items that have right angles around your house or in the neighborhood (e.g., corner of a room, corner of a book, corner of a shelf, corner of a brick, etc.)
- Have your child record their findings on a sheet of paper (they may choose to draw a picture to show).

On a different day…

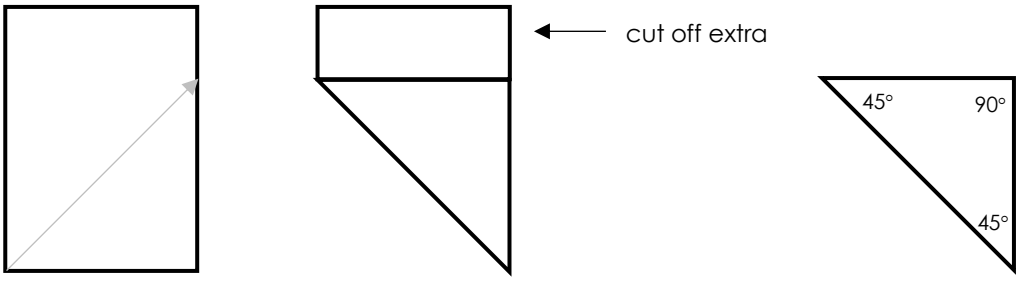
- Have your child find at least 5 or 6 items that have angles smaller than a right angle (< 90°) around your house or in the neighborhood. These are acute angles.
- Have your child record their findings on a sheet of paper (they may choose to draw a picture to show).

On a different day…

- Have your child find at least 5 or 6 items that have angles larger than a right angle (> 90°) around your house or in the neighborhood. These are obtuse angles.
- Have your child record their findings on a sheet of paper (they may choose to draw a picture to show).

On a different day…

- Have your child fold a sheet of paper to make a square (can also use a square sticky note if one is available).




- Leave the square folded in half as shown.
- Your child now has two 45° and one 90° angle that her or she can measure with.
- Have your child find at least 5 or 6 items that have 45° angles around your house or in the neighborhood.
- Have your child record his or her findings on a sheet of paper (he or she may choose to draw a picture to show).
- See if your child can find angles that are less than 45° around your house or in the neighborhood.
- Have your child record her or his findings on a sheet of paper.

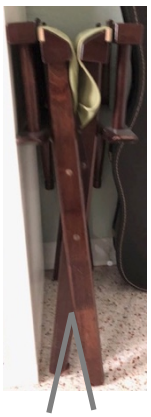
## Geometry Activities

**Activity 1—Shape Hunt (shapes with parallel and/or perpendicular lines, acute, obtuse, and/or right angles, etc.)**

In grade 4 your child is expected to recognize and name parallel lines (don't intersect), perpendicular lines (intersect to make right angles), acute angles (less than 90°), obtuse angles (more than 90°), and right angles (equal to 90°). He or she should be able to identify shapes in the world around him or her.

- Have your child look for shapes in your home and in the neighborhood.
- Have your child take photos or draw pictures of what he or she finds. (**Note:** The shapes your child will find are all 3D shapes.) Have them highlight and name attributes within the shape.

For example,

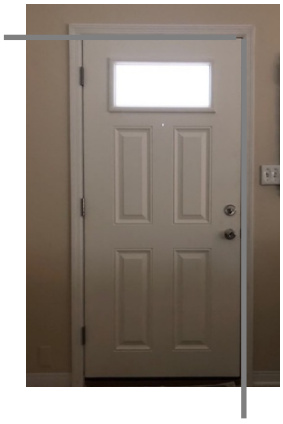


The chair legs form an acute angle.

The slots in the lamp have sides that are parallel.

The opposite sides of the drum practice pad are parallel.

The grid pattern in the outdoor chair is formed by parallel lines.



The corners of the door and the panels in the door are formed by perpendicular lines.

The adjacent sides of the drum practice pad form an obtuse angle.

**Activity 2—Symmetrical Shapes**

In grade 4 your child is expected to identify symmetrical shapes and name lines of symmetry. A line of symmetry is the line on which we can "fold" the shape and each half of the shape will overlap exactly. This type of symmetry is called bilateral symmetry. Some shapes also have rotational symmetry. Rotational symmetry is a wonderful concept for your child to research.

- Have your child look for symmetrical shapes in your home and in the neighborhood.
- Have your child take photos or draw pictures of what he or she finds. (**Note:** The shapes your child will find are all 3D shapes.) Have them highlight the lines of symmetry within the shape.

For example,

The shapes on the binding of the old photo albums are symmetrical.

The lamp shade is symmetrical.

The hexagonally shaped drum practice pad has many lines of symmetry.