LETTER HOME

Strategies

Dear Family Member:

In earlier grades, your child developed mental math strategies for solving addition and subtraction facts. In 3rd grade, he or she will continue to revisit these strategies to become more proficient and fluent with the subtraction facts. In this unit, your child will revisit mental math strategies and will begin a systematic review of the subtraction facts in small groups. See Figure 1.

> "Encouraging children to use efficient strategies to derive unknown facts before drill is better than 'premature drill' . . . and doing so increases both initial learning and retention."
>
> C.A. Thornton, "Strategies for the Basic Facts", *Mathematics for the Young Child,* NCTM, 1990.

Subtraction Facts Strategies. There is a body of research that supports students working toward math facts fluency in this manner. Generally, students move through three development stages when acquiring operational understanding and fluency with the math facts.

- Direct modeling in which students re-create the action;
- Counting strategies such as counting on and counting back; and
- Reasoning from known facts in which students work from facts they already know. For example, if a student knows that $13 - 10 = 3$, then he or she has a quick way to access $13 - 9$ (Carpenter, 1999, National Research Council, 2001).

We will encourage your child to invent their own strategies and to share their thinking with one another. However, particular emphasis will be given to the strategies listed below.

Counting Strategies

Counting Up is most efficient when numbers are close together, as in $11 - 8$ or $30 - 28$. To subtract 8 from 11, start at the lower number (8) and keep track of how many you count to get to 11 (9, 10, 11).

Counting Back is most efficient when the number to be subtracted is small, as in $11 - 3$ or $30 - 2$. To subtract 3 from 11, start with the larger number and count backward the amount of the lower number (3), and find the number you stop at (8).

Reasoning from Known Facts

Using Doubles is efficient for doubles (e.g., $6 + 6 = 12$, so $12 - 6 = 6$) and facts close to the doubles (e.g., $13 - 6 = 7$, because $6 + 6 = 12$, so $6 + 7 = 13$, therefore $13 - 6 = 7$).

Making Tens is an efficient way to group numbers (e.g., If you know $6 + 4 = 10$, then $10 - 6 = 4$. These facts can then be used to find close facts such as $11 - 6 = 5$ and $9 - 6 = 3$).

Using Tens is efficient when the number to be subtracted is close to ten (e.g., If you know $17 - 10 = 7$, then $17 - 9 = 8$. Since $17 - 9$ will be one more than $17 - 10$, you can reason that the answer will be $7 + 1$, or 8).

Thinking Addition is an efficient way to use fact families. To find an answer to $15 - 8$, you think, "8 plus what number equals 15? Since $8 + 7 = 15$, then $15 - 8 = 7$."

Use the following activities to help your child at home:

Strategies. As you work with your child on the math facts, ask him or her to describe the strategies used to find the answers.

Making Tens Strategy. Ask your child how to play the *Nine, Ten Game*. Directions, spinners, and game boards are in your child's *Student Activity Book*.

Practice Subtraction and Addition Facts. In this unit, your child will analyze patterns in sums and differences by generating problems from two spinners. Ask your child about these investigations and replicate them using different numbers. Numbers can be randomly generated with two dice, a deck of cards, or different spinners.

Children learn math facts as they play the *Nine, Ten Game*.

Math Facts and Mental Math

This unit begins the systematic review and assessment of the subtraction facts.

Subtraction Facts. Students review the following subtraction facts to maintain and increase fluency and to learn to apply subtraction strategies to larger numbers:

Group 1: $12 - 9$, $12 - 10$, $13 - 9$, $13 - 10$, $13 - 4$, $15 - 9$, $15 - 10$, $15 - 6$, $19 - 10$

Group 2: $14 - 10$, $14 - 9$, $14 - 5$, $17 - 10$, $17 - 9$, $11 - 9$, $16 - 9$, $16 - 7$, $16 - 10$

You can help your child review these facts using the flash cards the teacher sends home or by making a set of flash cards from index cards or scrap paper. Study facts in small groups each night. As your child goes through the flash cards, put the cards in three stacks: Facts I Know Quickly, Facts I Can Figure Out, and Facts I Need to Learn.

For Facts I Need to Learn, work on strategies for figuring them out. Good strategies for the facts in Groups 1 and 2:

> Using Tens. If $14 - 10 = 4$, then $14 - 9$ is one more than 4 because if I subtracted 10, I subtracted one too many.

> Thinking Addition. To find $13 - 4$, think, "What number plus 4 equals 13?" If $10 + 4$ is 14, then $9 + 4$ is 13. So $13 - 4 = 9$.

For Facts I Can Figure Out, use the flash cards to practice the facts for fluency.

For Facts I Know Quickly, help your child use strategies to solve problems like these using mental math:

> Subtracting 10s and 100s: $120 - 90$, $190 - 100$, $160 - 70$

> Two-digit minus one-digit problems: $22 - 9$ (practices $12 - 9$), $37 - 10$ (practices $17 - 10$), $44 - 9$ (practices $14 - 9$)

Grade 3 Math Facts Overview

The goal of the math facts development in *Math Trailblazers* is for students to learn the basic facts efficiently, gain fluency with their use, and retain that fluency over time. A large body of research supports an approach in which students develop strategies for figuring out the facts rather than relying on rote memorization. This not only leads to more effective learning and better retention, but also to the development of mental math skills. In fact, too much drill before conceptual understanding may interfere with a child's ability to understand concepts at a later date. Therefore, the teaching of the basic facts in *Math Trailblazers* is characterized by the following elements:

Use of Strategies. Students first approach the basic facts as problems to be solved rather than as facts to be memorized. In all grades, students are encouraged to use strategies to find facts, so they become confident that they can find answers to facts problems that they do not immediately recall. In this way, students learn that math is more than memorizing facts and rules which "you either get or you don't."

Distributed Facts Practice. Students study small groups of facts that can be found using similar strategies. In third grade, they review mental math strategies for the subtraction facts to gain or maintain proficiency. See Figure 1. Students also work on developing strategies for multiplication facts starting in Unit 3.

Unit	Groups	Subtraction Facts	Strategies Used	Focus
2	1	$12-9, 12-10, 13-9, 13-10, 13-4,$ $15-9, 15-10, 15-6, 19-10,$	Using Tens	Development of mental strategies and number sense
	2	$14-10, 14-9, 14-5, 17-10, 17-9,$ $11-9, 16-9, 16-7, 16-10$	Thinking Addition	
3	3	$10-4, 9-4, 11-4, 10-8, 11-8,$ $9-5, 10-6, 11-6, 11-5,$	Making Tens	
	4	$10-7, 9-7, 11-7, 10-2, 9-2, 9-3,$ $10-3, 11-3, 9-6$	Thinking Addition	
4	5	$7-3, 7-5, 7-2, 11-2, 8-6, 5-3,$ $8-2, 4-2, 5-2,$	Counting Up Counting Back Thinking Addition	
	6	$6-4, 6-2, 13-5, 8-5, 8-3, 13-8,$ $12-8, 12-4, 12-3$		
5	7	$14-7, 14-6, 14-8, 12-6, 12-7,$ $12-5, 10-5, 13-7, 13-6,$	Using Doubles	
	8	$15-7, 16-8, 17-8, 18-9, 18-10,$ $8-4, 7-4, 6-3, 15-8$	Thinking Addition	
6		Review all		Use strategies fluently
7		Review Groups 1–4		
8		Review Groups 5–8		

Figure 1: *Development of Subtraction Facts in Grade 3*

Practice in Context. Students continue to practice all the facts as they use them to solve problems, investigate math concepts, and play math games.

Appropriate Assessment. Students are regularly assessed to see if they can find answers to facts problems quickly and accurately and retain this skill over time. They take a short quiz on each group of facts. Students record their progress on *Subtraction Facts I Know* charts and determine which facts they need to study. An inventory test of all the subtraction facts is given to document student progress.

A Multiyear Approach. In Grades 1 and 2, the curriculum emphasizes the use of strategies that enable students to develop proficient strategies for the addition and subtraction facts by the end of second grade. In Grade 3, students review the subtraction facts and develop proficiency with the multiplication facts. In Grade 4, the addition and subtraction facts are checked, the multiplication facts are reviewed, and students develop fluency with the division facts. In Grade 5, students review the multiplication and division facts.

Facts Will Not Act as Gatekeepers. Use of strategies and calculators allows students to continue to work on interesting problems and experiments while learning the facts. Lacking quick recall of the facts does not prevent students from learning more complex mathematics.

Thank you for taking time to talk with your child about what he or she is doing in math.

Sincerely,

Unit 2: Home Practice

Part 1   Addition and Subtraction Practice

1. A. $18 - 10 =$ _____   **2. A.** $4 - 4 - 8 =$ _____

     B. $13 - 6 =$ _____   **B.** $7 - 9 - 8 =$ _____

     C. $14 - 9 =$ _____   **C.** $15 - 7 - 4 =$ _____

3. Levi received eight new books for his birthday. He now has fifty-two books. How many books did Levi have before his birthday? Show or tell how you found your answer.

Part 2   Find the Missing Number

1. A. $15 + 5 +$ _____ $= 28$ **B.** $20 + 5 +$ _____ $= 28$

     C. $17 +$ _____ $+ 3 = 28$ **D.** $12 +$ _____ $+ 6 = 28$

     E. $5 + 9 +$ _____ $= 28$ **F.** $13 + 8 +$ _____ $= 28$

2. For the food drive, Josh's class collected seventeen cans of vegetables, four cans of fruit, and nine cans of soup.

     A. How many cans did they collect?

     B. How many more cans of vegetables are there than soup?
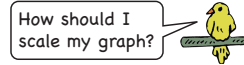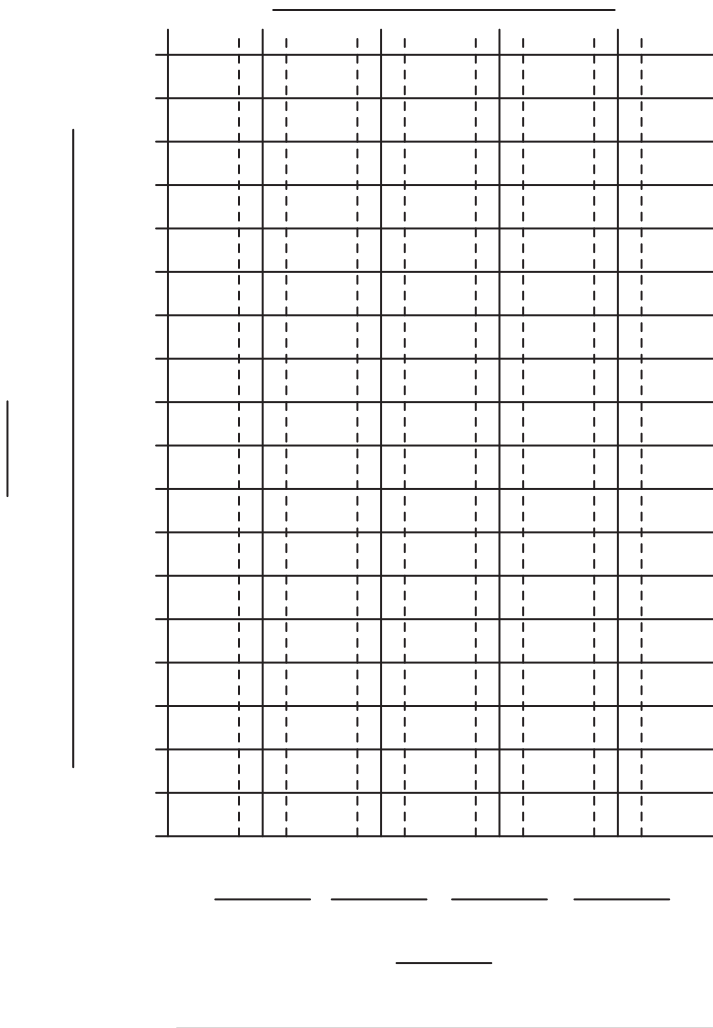
Name _____ Date _____

Part 3 Making a Bar Graph

Julia sorted all the candies in a small bag by color and counted them. She recorded her data in a table.

Candies

C Color	N Number
red	2
brown	24
orange	8
green	10

Graph the data.

How should I scale my graph?

Part 4 ## Using a Bar Graph

Use the data in Part 3 to answer the following questions.

1. **A.** Which color is most common? _____

    B. Which color is least common? _____

2. How many candies are there altogether? _____

3. Julia put all the candies back in the bag, mixed them up, and pulled out one candy without looking. Describe each of the following events by choosing one of the following words: impossible, unlikely, likely, or certain.

    A. Pulling a red candy is _____

    B. Pulling a red, brown, orange, or green candy is _____

    C. Pulling a blue candy is _____

    D. Pulling a brown or green candy is _____

$\begin{array}{r} 12 \\ -\ 9 \\ \hline \end{array}$	$\begin{array}{r} 12 \\ -10 \\ \hline \end{array}$	$\begin{array}{r} 13 \\ -\ 9 \\ \hline \end{array}$
Group 1	Group 1	Group 1
$\begin{array}{r} 13 \\ -10 \\ \hline \end{array}$	$\begin{array}{r} 13 \\ -\ 4 \\ \hline \end{array}$	$\begin{array}{r} 15 \\ -\ 9 \\ \hline \end{array}$
Group 1	Group 1	Group 1
$\begin{array}{r} 15 \\ -10 \\ \hline \end{array}$	$\begin{array}{r} 15 \\ -\ 6 \\ \hline \end{array}$	$\begin{array}{r} 19 \\ -10 \\ \hline \end{array}$
Group 1	Group 1	Group 1

4	2	3
Group 1	Group 1	Group 1
$\underline{6}$	$\underline{9}$	3
Group 1	Group 1	Group 1
$\underline{9}$	$\underline{9}$	5
Group 1	Group 1	Group 1

$\begin{array}{r} 14 \\ -10 \\ \hline \end{array}$	$\begin{array}{r} 14 \\ -9 \\ \hline \end{array}$	$\begin{array}{r} 14 \\ -5 \\ \hline \end{array}$
Group 2	Group 2	Group 2
$\begin{array}{r} 17 \\ -10 \\ \hline \end{array}$	$\begin{array}{r} 17 \\ -9 \\ \hline \end{array}$	$\begin{array}{r} 11 \\ -9 \\ \hline \end{array}$
Group 2	Group 2	Group 2
$\begin{array}{r} 16 \\ -9 \\ \hline \end{array}$	$\begin{array}{r} 16 \\ -7 \\ \hline \end{array}$	$\begin{array}{r} 16 \\ -10 \\ \hline \end{array}$
Group 2	Group 2	Group 2

$\underline{9}$	5	4
Group 2	Group 2	Group 2
2	8	7
Group 2	Group 2	Group 2
$\underline{6}$	$\underline{9}$	7
Group 2	Group 2	Group 2

Name _____ Date _____

Number Lines 0–30

0 1 2 3 4 5 6 7 8 9 10 11 12 13 14 15 16 17 18 19 20 21 22 23 24 25 26 27 28 29 30

0 1 2 3 4 5 6 7 8 9 10 11 12 13 14 15 16 17 18 19 20 21 22 23 24 25 26 27 28 29 30

0 1 2 3 4 5 6 7 8 9 10 11 12 13 14 15 16 17 18 19 20 21 22 23 24 25 26 27 28 29 30
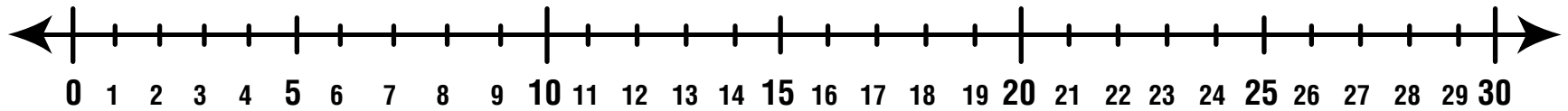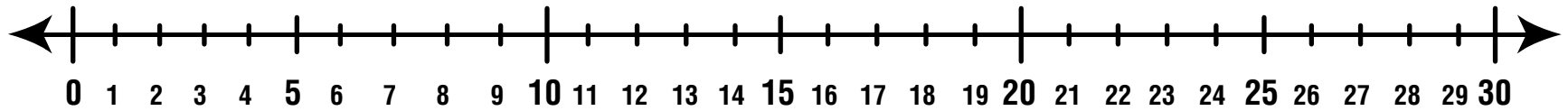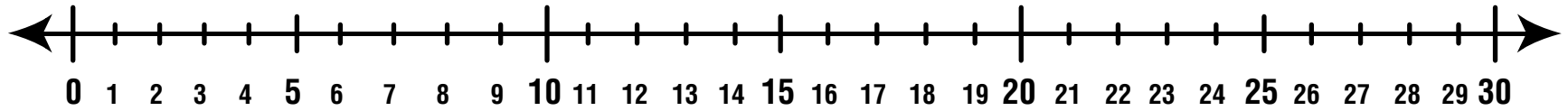
Name _____   Date _____

Addition Strategies Check-in: Questions 13–14 Feedback Box

	Expec-tation	Check In	Comments
Recognize that the equal sign represents the relationship between two equal quantities. [Q# 13]	E4		
Use strategies that apply the properties of addition to solve addition problems (e.g., making tens, using tens, thinking addition, using doubles). [Q# 13]	E5		

	Yes . . .	Yes, but . . .	No, but . . .	No. . .
MPE2. Find a strategy. I choose good tools and an efficient strategy for solving the problem. [Q# 14]				
MPE5. Show my work. I show or tell how I arrived at my answer so someone else can understand my thinking. [Q# 14]				

Making Tens to Add

Solve each problem. Use the switching-numbers or breaking-addends strategies. Show your strategy in the thought bubble.

1. $8 + 5 + 2 =$ _____

2. $7 + 5 + 4 =$ _____

3. $16 + 6 + 8 =$ _____

4. $22 + 7 + 8 =$ _____

For each of the problems below, decide if the number sentences in A and B are true or false. Circle the true number sentences. Then solve C.

5. A. $18 + 7 = 18 + 2 + 5$

B. $18 + 2 + 5 = 20 + 5$

C. $18 + 7 =$ ☐

6. A. $7 + 5 + 3 = 7 + 3 + 5$

B. $7 + 5 + 3 = 10 + 5$

C. $7 + 5 + 3 =$ ☐

7. A. $4 + 9 + 3 = 4 + 3 + 9$

B. $4 + 9 + 1 + 2 = 20 + 6$

C. $4 + 9 + 3 =$ ☐

Name _____   Date _____

Making Tens to Add Feedback Box	Expec-tation	Check In	Comments
Recognize that the equal sign represents the relationship between two equal quantities. [Q# 5–7]	E4		
Use strategies that use the properties of addition to solve addition problems (e.g., making tens, using tens, thinking addition, using doubles). [Q# 1–4]	E5		

	Yes . . .	Yes, but . . .	No, but . . .	No. . .
MPE2. Find a strategy. I choose good tools and an efficient strategy for solving the problem. [Q# 1–4]				
MPE5. Show my work. I show or tell how I arrived at my answer so someone else can understand my thinking. [Q# 1–4]				

Name _____   Date _____

Subtraction Facts Strategies Check-In: Q# 12–13 Feedback Box

	Expec-tation	Check In	Comments
Identify patterns in sums and differences. [Q# 12A and 13A]	**E3**		
Use strategies that apply the properties of addition to solve addition and subtraction problems (e.g., making tens, using tens, and thinking addition). [Q# 12B and 13B]	**E5**		
Determine the unknown number in an addition or subtraction sentence relating three whole numbers for the facts in Groups 1 and 2. [Q# 12A and 13A]	**E7**		

Math Practices	Yes . . .	Yes, but . . .	No, but . . .	No. . .
MPE5. Show my work. I show or tell how I arrived at my answer so someone else can understand my thinking. [Q# 12B and 13B]				