### Objective
To introduce and practice the partial-sums addition algorithm.

### 1. Teaching the Lesson

#### Key Activities
Children are introduced to the partial-sums algorithm using base-10 blocks and paper-and-pencil computation. Children practice adding 2- and 3-digit numbers using the partial-sums algorithm and make ballpark estimates to check their answers.

#### Key Concepts and Skills
- Identify the value of digits in multidigit numbers. [Number and Numeration Goal 2]
- Use base-10 blocks and fact extensions to add two 2-digit whole numbers. [Operations and Computation Goal 2]
- Use ballpark estimates. [Operations and Computation Goal 3]
- Show understanding of addition and subtraction symbols. [Patterns, Functions, and Algebra Goal 2]

#### Key Vocabulary
- **algorithm**

#### Ongoing Assessment: Recognizing Student Achievement
- Use Mental Math and Reflexes. [Operations and Computation Goal 2]

#### Materials
- Math Journal 1, pp. 107 and 108
- Home Link 4-8
- base-10 blocks: 2 flats, 18 longs, 18 cubes
- overhead base-10 blocks (optional): 8 longs, 13 cubes
- slate (optional)

### 2. Ongoing Learning & Practice

Children answer questions about the times before or after a given time of an event. Children practice fact extensions by playing the Fact Extension Game. Children practice and maintain skills through Math Boxes and Home Link activities.

#### Materials
- Math Journal 1, pp. 109 and 110
- My Reference Book, pp. 134 and 135
- Home Link Master (Math Masters, p. 113)
- per partnership: number cards labeled 0–5 (optional: 0–9 number cards)
- 1 die per partnership

### 3. Differentiation Options

<table>
<thead>
<tr>
<th>Readiness</th>
<th>Enrichment</th>
<th>Extra Practice</th>
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<tbody>
<tr>
<td>Children use base-10 blocks to review place-value concepts.</td>
<td>Children explain addition strategies.</td>
<td>Children solve problems using multiples of 10.</td>
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</tbody>
</table>

#### Materials
- Teaching Masters (Math Masters, pp. 114 and 115)
- Teaching Aid Master (Math Masters, p. 428)
- Minute Math®, p. 42

### Additional Information

#### Background Information
The problems in Mental Math and Reflexes give children practice with quickly solving mental addition. This skill is needed for making ballpark estimates and carrying out the partial-sums algorithm.

#### Advance Preparation
Plan to spend three days on this lesson. Decide how you will demonstrate the partial-sums algorithm using base-10 blocks—on a flat surface with children gathered around or with blocks on the overhead projector.

### Technology
- **Assessment Management System**
  - Mental Math and Reflexes
  - See the ITLG.
Getting Started

Math Message Follow-Up

Remind children that one way to make a ballpark estimate is to change the numbers in the problem to close but easier numbers that can be added mentally. For example:

- 37 + 58 is close to 40 + 60, or 100, or 30 + 50, or 80. The exact answer to 37 + 58 should be close to 100.
- 473 + 234 is close to 500 + 200, or 700, or 400 + 200, or 600. The exact answer should be near 700. Or notice that 400 + 200 is 600. That leaves 73 + 34, which is close to 70 + 30, or 100. Thus, 473 + 234 is close to 600 + 100, or 700.

Introducing the Partial-Sums Addition Algorithm Using Base-10 Blocks

Today children will learn and practice a single strategy for addition. (Encourage children to continue using other favorite strategies they may have for adding numbers.)
Write these two problems on the board, in vertical form:

\[
\begin{align*}
45 + 22 &= 67 \\
26 + 57 &= 83
\end{align*}
\]

Ask children to gather around as you demonstrate how to use base-10 blocks. You may wish to use an overhead. Refer to the longs as tens and the cubes as ones. For each problem, model addition as a three-part operation: adding the 10s, adding the 1s, and then adding the partial sums.

**Example 1:** Model \(45 + 22\) with base-10 blocks.

1. Make a ballpark estimate before or after solving the problem. Sample answers: 50 \(+ 20\); 45 \(+ 20\); 40 \(+ 20\)
2. Count out 4 tens and 5 ones to represent 45. Count out 2 tens and 2 ones to represent 22.
3. Arrange the blocks so that they resemble the vertical addition problem. (See the first model in the margin.)
4. Collect the tens into one pile. Collect the ones into a second pile.
5. Count the tens. 6 tens, or 60
6. Count the ones. 7 ones, or 7
7. Add the counts of tens and ones. 60 \(+ 7 = 67\) Record the answer on the board. The ballpark estimates are close to this answer, so the answer is reasonable.

**Example 2:** Model \(26 + 57\) with base-10 blocks.

For the second example, follow the same procedure. When you count the ones, some children may notice that 10 cubes in the ones pile can be replaced by 1 long; you can make this substitution. There are still two piles of blocks: the tens pile (with 8 tens), and the revised ones pile (with 3 ones).

**Summary**

These examples using base-10 blocks illustrate the steps of the partial-sums method for addition:

1. Add the tens.
2. Add the ones.
3. Add the partial sums of tens and ones to obtain the final answer.

Children do several problems at their desk. Have them describe exactly what they are doing at each step.

**Practicing Addition Using Base-10 Blocks**

(Math Journal 1, p. 107)

Partners use base-10 blocks to practice the partial-sums algorithm.
Introducing the Partial-Sums Algorithm as a Paper-and-Pencil Method

Review the partial-sums addition with base-10 blocks using the same two problems: \(45 + 22\) and \(26 + 57\).

Next, on the board or overhead, demonstrate the paper-and-pencil method for solving these problems. As a reminder of place value, write “10s” and “1s” above the columns and use the same language to describe 10s and 1s.

Example: \(45 + 22\)

1. Find a ballpark estimate. \(50 + 20; 45 + 20; 40 + 20\)

2. Add the tens. \(4\ tens + 2\ tens = 6\ tens,\ or\ 60.\) Write 60 below the line.

3. Add the ones. \(5\ ones + 2\ ones = 7\ ones,\ or\ 7.\) Write 7 below 60.

4. Add the partial sums. Draw a second line beneath 60 and 7. Write 67 beneath this line.

In this example, the tens were added first. However, the partial sums may be calculated in either order—it does not matter whether the tens or the ones are added first.

For the second example, follow the same procedure again to find and add the partial sums 70 and 13, checking the answer against a ballpark estimate.

Tell children that the method illustrated by these examples is called an algorithm. An algorithm is a step-by-step set of instructions for doing something. Write algorithm on the board.

Practicing the Partial-Sums Algorithm

Write several multidigit addition problems on the board. Start by adding together a 2-digit and a 1-digit number. Most problems should have 2-digit addends. Using slates or paper, have children describe exactly what they are doing at each step. Correct errors in calculation and in method, making sure the numbers are aligned in columns.

Continuing Practice with the Partial-Sums Algorithm

(Math Journal 1, p. 108)

Review the partial-sums algorithm. Most problems should have 2-digit addends, but include at least one with 3-digit addends. When you discuss the problem with 3-digit addends, write “100s,” “10s,” and “1s” above the columns as a reminder of place value. Most children will realize that the partial-sums method works the same way for 3-digit numbers as for 2-digit numbers.

Links to the Future

This is the first time that children have been exposed to a formal paper-and-pencil addition algorithm. They will have plenty of opportunities to practice the partial-sums algorithm throughout the year. Do not expect all children to be able to perform the algorithm at the conclusion of this lesson.

Student Page

Addition Practice

Write a number model to show your ballpark estimate. Solve the problem. Show your work. Use the ballpark estimate to check whether your exact answer makes sense. Sample estimates:

<p>| | | |</p>
<table>
<thead>
<tr>
<th></th>
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<tbody>
<tr>
<td>(60 + 10 = 70)</td>
<td>(70 + 10 = 80)</td>
<td>(50 + 30 = 80)</td>
</tr>
<tr>
<td>(59)</td>
<td>(67)</td>
<td>(47)</td>
</tr>
<tr>
<td>(57)</td>
<td>(74)</td>
<td>(73)</td>
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<td></td>
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</tr>
<tr>
<td>(60 + 30 = 90)</td>
<td>(120 + 50 = 170)</td>
<td>(160 + 160 = 320)</td>
</tr>
<tr>
<td>(58)</td>
<td>(122)</td>
<td>(136)</td>
</tr>
<tr>
<td>(52)</td>
<td>(175)</td>
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Math Journal 1, p. 108

<table>
<thead>
<tr>
<th>10s</th>
<th>1s</th>
</tr>
</thead>
<tbody>
<tr>
<td>4</td>
<td>5</td>
</tr>
<tr>
<td>+2</td>
<td>+5</td>
</tr>
<tr>
<td>6</td>
<td>7</td>
</tr>
<tr>
<td>+7</td>
<td>+1</td>
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<td>6</td>
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<td></td>
<td>8</td>
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<td>3</td>
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<table>
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<th>100s</th>
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<tr>
<td>4</td>
<td>7</td>
<td>3</td>
</tr>
<tr>
<td>+2</td>
<td>3</td>
<td>4</td>
</tr>
<tr>
<td>6</td>
<td>0</td>
<td>0</td>
</tr>
<tr>
<td>+1</td>
<td>0</td>
<td>0</td>
</tr>
<tr>
<td>7</td>
<td></td>
<td>7</td>
</tr>
</tbody>
</table>

NOTE: Provide base-10 blocks for children to use when working on journal page 108. This concrete experience is essential to prepare children for the transition from concrete to abstract thought.
2 Ongoing Learning & Practice

▶ Reviewing Telling Time
(Math Journal 1, p. 109)

Children answer questions in which they determine the times before or after the given time of an event. This activity is related to the partial-sums algorithm. In adding an initial time and an elapsed time, a common strategy is to add the hours and minutes separately and then trade 60 minutes for an hour if the total number of minutes is 60 or greater.

▶ Playing the Fact Extension Game
(My Reference Book, pp. 134 and 135)

Children practice fact extensions through the Fact Extension Game first introduced on page 292 in Lesson 4-8.

▶ Math Boxes 4-9
(Math Journal 1, p. 110)

Mixed Practice Math Boxes in this lesson are linked with Math Boxes in Lessons 4-5 and 4-7. The skill in Problem 6 previews Unit 5 content.

Writing/Reasoning Have children draw, write, or verbalize their answers to the following: In Problem 4, what time will it be in 12 hours? Explain how you solved this problem. Sample answer: 6:15. I counted up 12 hours. 7:15, 8:15, 9:15, 10:15, and so on.

▶ Home Link 4-9
(Math Masters, p. 113)

Home Connection Children use the partial-sums algorithm to solve multidigit addition problems.

3 Differentiation Options

▶ Reviewing Place-Value Concepts
(Math Masters, pp. 114 and 428)

To provide experience with place value, have children use base-10 blocks to explore a strategy for using the fewest base-10 blocks.
Use base-10 blocks: Partners shuffle number cards, place the deck facedown between them, and draw two cards. They place the first card in the ones column on the Place-Value Mat (Math Masters, page 428) and the second card in the tens column. They use the fewest base-10 blocks possible to build the number. On a sheet of paper, they record the number shown, as well as the number of tens (longs) and the number of ones (cubes).

Then partners switch the two cards on the mat and repeat the procedure. Vary the activity by having children draw three cards to make 3-digit numbers.

Use Math Masters, page 114: For each group of base-10 blocks, children represent the same number using the fewest flats, longs, and cubes possible.

ENRICHMENT

Using Addition Strategies
(Math Masters, p. 115)

To apply children’s understanding of multidigit addition, have them determine the steps of an addition strategy on Math Masters, page 115. Have children explain how the strategies work. Briefly discuss which strategy they thought was easier and why.

EXTRA PRACTICE

Minute Math+

Children practice adding multiples of 10. Model this, using the number grid to find the answer. See the following page in Minute Math+: p. 42.

Teaching Master

Base-10 Blocks

For each problem, draw a new set of base-10 blocks that uses the fewest possible number of flats, longs, and cubes.

1. 

2. 

3. 

4. 

5. 

6. 

Math Masters, p. 114

Teaching Master

Addition Strategies

Look at the two addition strategies below. See if you can figure out how they work.

Louisa’s Strategy
Li’s Strategy
37 + 44 = 7 37 + 44 = 7
37 + 42 = 77 42 + 44 = 86
77 + 4 = 81 84 – 3 = 81
37 + 44 = 81 37 + 44 = 81

Now try to use either Louisa’s Strategy or Li’s Strategy to solve the problems below.

29 + 56 = 7

Sample answers:
Louisa’s Strategy
Li’s Strategy
29 + 50 = 79 65 + 30 = 95
79 + 6 = 85 95 – 3 = 92
29 + 56 = 85 65 + 27 = 92

Which strategy do you think is easier? Explain __________________________.

Sample answer: Louisa’s strategy is easier because she is adding the tens and then adding the ones. She doesn’t have to subtract anything.

Math Masters, p. 115