

Predict and Use Algorithms to Add

Lesson Goal

To record addition using numbers and to develop an addition algorithm

Materials

- Teacher: a place value mat, digit cards, blocks and holders of each size, and a copy of the activity sheet (game board)
- Per Group: one activity page, a paper clip, access to markers (chips, pennies, pieces of paper) to mark spaces on a game board, 4 blocks-of-100, a place value mat, and digit cards
- Per Student: blank paper and one practice page for Lesson 9

Overview

In the previous lessons, students learned to model addition with the blocks and with drawings of the blocks. Through your questions and their recordings, they began to reflect on this process and to predict what would happen when they combined the blocks.

In this lesson, students look at a problem and predict its solution by visualizing what will happen with the blocks. They use a record keeping system to write and keep track of the numbers. In effect, students begin to make an algorithm. The algorithm they make may be very similar to the standard algorithm. Later in the lesson, students compare their algorithm to the standard one. Students model each step in the traditional U.S. algorithm for addition.

In this lesson, students also use the blocks to check their work. However, some students may need more opportunities to combine the blocks before they can predict sums and develop an algorithm. If so, you may want to spend more time on Lessons 7 and 8.

Introduction

Have students record numbers to predict the sum of an addition problem:

Display the problem:

$$\begin{array}{r} 256 \\ + 39 \\ \hline \end{array}$$

Ask students to discuss how they would solve the problem using the

blocks. However, they will not use the blocks at this time to solve the problem.

Distribute blank paper. Have students work on their own or in small groups to predict how many blocks there will be if they are combined. Encourage students to try to record only numbers if possible. However do not stop them from making drawings if they need to.

When students finish, have them share their predictions and recording methods.

- Make sure students explain their recording methods thoroughly, including how they recorded their thought processes.
- Let students try to explain each other's methods. Also have them talk about what they like about the different methods.
- Encourage students to discuss how they show regrouping (packing) in their recordings.
- Ask students to explain how knowing the facts for single digit numbers (developed in Lesson 6) helps them to predict answers.

Following are two examples of students' different recordings for this problem. The first is from a student who uses lined paper turned on edge and records the sum in each column, working right to left, and then regroupes in a second step. The second example is from a student who works left to right, self-correcting as she discovers the need to regroup.

$$\begin{array}{r|l|l} 2 & 5 & 6 \\ + & 3 & 9 \\ \hline 2 & 8 & 15 \\ 2 & 9 & 5 \end{array} \qquad \begin{array}{r} 2 \ 5 \ 6 \\ + \ 3 \ 9 \\ \hline 2 \ 8 \ 5 \\ 2 \ 9 \ 5 \end{array}$$

As a class, use blocks to check predictions for this problem:

Ask a volunteer to model the problem for the class with blocks on the place value mat.

- Ask students why they need to pack and move (regroup) the single blocks to make another block-of-10.
- Ask students why they do *not* need to pack and move (regroup) the blocks-of-10 to make another block-of-100.
- Have students look at their own recordings to see why they did or did not predict accurately.

Present the standard algorithm for addition:

You may wish to present how the standard algorithm could be used to solve $256 + 39$. As you explain, use blocks to show how the algorithm relates to the combining of the blocks. Encourage students to compare their method for adding with numbers to this algorithm:

$$\begin{array}{r} 1 \\ 2 \ 1 \ 6 \\ + \ 4 \ 8 \\ \hline 2 \ 6 \ 4 \end{array}$$

Repeat with several more problems:

Make sure you mix up problems by including some problems that have no regrouping, some that regroup in only one place, and some that regroup in two or more places.

- Have students predict the answer to these problems by visualizing and using their records to keep track of what they are thinking.
- Tell them they can use their old recording method, another student's method, or a new method.

Here are some problems to present:

$$\begin{array}{r} 146 \\ + 387 \\ \hline \end{array} \quad \begin{array}{r} 872 \\ + 519 \\ \hline \end{array} \quad \begin{array}{r} 485 \\ + 213 \\ \hline \end{array} \quad \begin{array}{r} 1613 \\ + 548 \\ \hline \end{array}$$

While students are working, circulate and look at their records. Ask them to explain how their methods work. Also, ask them to explain how their methods relate to combining the blocks. For example, if students write down 3 ones for the first problem ask them to show you with the blocks what they think happened.

Again let students discuss their results and methods. As a class, use blocks on the place value mat to check the sum for each problem.

Activity

“Four in a Row”

Have students work in groups of 2 or 4. Groups of 4 should be divided into two teams. Each team takes turns finding the sum of two addends and marks their prediction on a game board. The opposing team checks the prediction with blocks. The team who marks 4 sums in a row on the game board wins the game.

Distribute the materials, including activity sheets and blank paper. Model how to use the spinner by placing a pencil tip in the center of the circle and gently spinning the paper clip around the pencil.

Explain how the game is played and have student volunteers model how to play a round of the game.

- Team A spins the spinner two times to name addends, predicts the sum of the numbers, and places a marker on the game board space that shows the predicted sum. (Note: Students are encouraged to solve the problem on paper to “predict” the answer.)
- Team B uses the blocks to check the prediction. Once Team B is convinced that the prediction is correct, the marker remains on the game board and it is Team B's turn.
- If the prediction is incorrect, the marker must be removed and Team B proceeds.
- Students continue playing until one team has 4 markers arranged in a row.



Quick Check

Present the problem $135 + 273$. Ask students to solve the problem using their recording methods. Collect students' recordings. Make three piles: accurate solution methods, nearly accurate (only minor counting errors), and needs work (major errors present). Use these categories to determine which students need additional practice with blocks, which students need practice with algorithms, and which students are ready to move on.

Closure

Ask students to share their results from the activity with the class. Discuss strategies they may have developed for predicting sums.

Practice

Have students do the practice page for Lesson 9. If students are having difficulty solving addition problems, give them more time to combine collections of blocks before continuing work with algorithms.

Extension

Have students make new game boards and spinners on their own. Try them out in class.

Explain a new activity, "What's Missing." Present vertical addition problems with the sum given but one of the addends missing. Have students first predict the missing number and then use blocks to check. Here are some problems to try:

$$\begin{array}{r} 225 \\ + \square \\ \hline 317 \end{array}$$

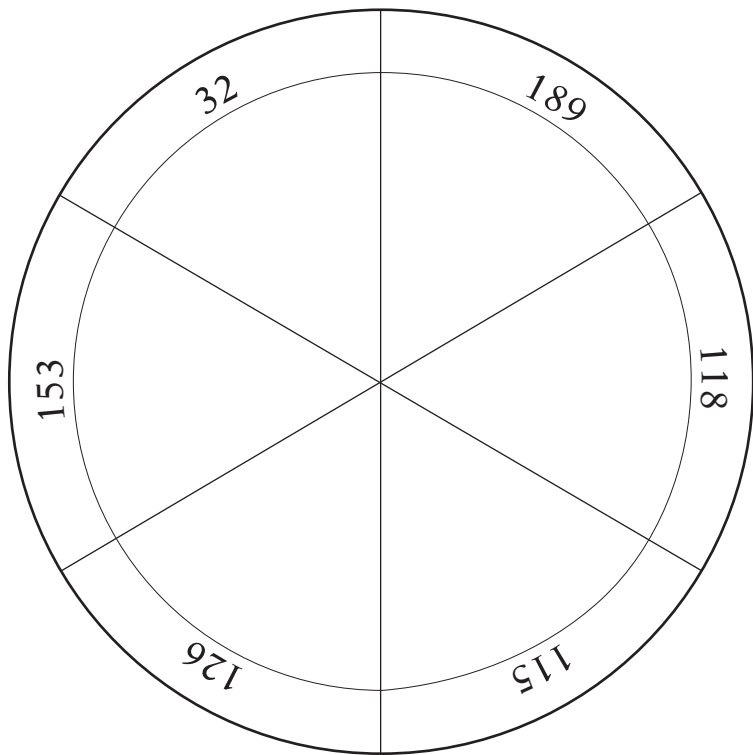
$$\begin{array}{r} 217 \\ + \square \\ \hline 293 \end{array}$$

$$\begin{array}{r} 77 \\ + \square \\ \hline 154 \end{array}$$

LESSON 9 ACTIVITY: FOUR IN A ROW

Name: _____

Directions: Use a paper clip and pencil to complete the spinner.



Team A Game Board

252	315	306	271	221	378	236
279	244	185	241	150	307	230
158	233	342	64	147	304	268

Team B Game Board

233	306	244	342	150	158	268
279	241	221	304	307	236	64
315	230	185	271	252	378	147

LESSON 9 PRACTICE

Name: _____

Use your method to predict each sum. Check your answers with blocks.

1.
$$\begin{array}{r} 121 \\ +205 \\ \hline \end{array}$$

2.
$$\begin{array}{r} 156 \\ +175 \\ \hline \end{array}$$

3.
$$\begin{array}{r} 75 \\ +208 \\ \hline \end{array}$$

4.
$$\begin{array}{r} 127 \\ +192 \\ \hline \end{array}$$

5.
$$\begin{array}{r} 199 \\ +199 \\ \hline \end{array}$$

6.
$$\begin{array}{r} 249 \\ +321 \\ \hline \end{array}$$

Fill in the blanks with the numbers shown.

373

586

243

641

7. _____ and _____ have a sum of 829.

8. _____ and _____ have a sum of 1014.

9. While at camp, Taylor collected 294 shells. Tran collected 312 shells. They estimated they would have more than 500 when they combined their collections. Were they correct? Check to see. Altogether, how many shells do they have?

10. Lucia and Cheryl went bowling at camp. Lucia scored 83 and Cheryl scored 121. What was their combined score?