

# Problems with Start Unknown

## Math Focus Points

- ◆ Visualizing, retelling, and modeling the action of addition and subtraction situations with an unknown start
- ◆ Developing strategies for solving addition and subtraction problems with an unknown start and recording work
- ◆ Using standard notation (+, −, =) to represent addition and subtraction situations with an unknown start
- ◆ Considering the relationship between addition and subtraction

Today's Plan		Materials
<b>1</b> <small>ACTIVITY</small> <b>Introducing Problems with an Unknown Start</b>	 20 MIN  CLASS	<ul style="list-style-type: none"> <li>• Chart paper; Write the two balloon problems found in the activity on separate chart pages.</li> <li>• Connecting cubes (20 per student)</li> </ul>
<b>2</b> <small>ACTIVITY</small> <b>Solving Problems with an Unknown Start</b>	 20 MIN  INDIVIDUALS	<ul style="list-style-type: none"> <li>• <i>Student Activity Book</i>, pp. 32A–32B or <b>C29–C30, Birds, Fish, and Marbles</b> Make copies. (as needed)</li> <li>• Connecting cubes (35 per student)</li> </ul>
<b>3</b> <small>DISCUSSION</small> <b>Problems with an Unknown Start</b>	 20 MIN  CLASS	<ul style="list-style-type: none"> <li>• Materials from Activity 2</li> </ul>
<b>4</b> <small>SESSION FOLLOW-UP</small> <b>Daily Practice</b>		<ul style="list-style-type: none"> <li>• <i>Student Activity Book</i>, p. 32C or <b>C31, Solve the Equation</b> Make copies. (as needed)</li> </ul>

## Classroom Routines

**Today's Number: 12 with Missing Parts** Show C28, *Today's Number: 12 with Missing Parts*. This page presents several equations with one part missing. The class works together to solve problems such as:

$$\underline{\quad} + 6 = 12 \quad 8 + \underline{\quad} = 12 \quad 20 - \underline{\quad} = 12 \quad 12 = 10 + \underline{\quad}$$

### Teaching Notes

- 1 **Size of Numbers** Note that the numbers are intentionally small so that students can focus on the *situation*. Later students will work on similar problems with larger numbers.
- 2 **Problems with an Unknown Start** Because this type of problem cannot be modeled directly—one must first visualize Kira holding some balloons and then perform the action of Sally giving Kira 4 more balloons—students may be unsure of exactly what is happening or how to solve it. Therefore, it is particularly important that students visualize both the action and the sequence of the story to make sense of what is happening.

### Professional Development

- 3 **Teacher Note: Adapting Story Problems** See Curriculum Unit 3 p. 212 for information about Unknown Change Problems.

Name _____ Date _____	
316, Number Strings, and Story Problems	
<b>Today's Number: 12 with Missing Parts</b>	
$15 - \underline{\quad} = 12$	$8 + \underline{\quad} = 12$
$20 - \underline{\quad} = 12$	$\underline{\quad} + 5 = 12$
$\underline{\quad} - 2 = 12$	$12 = 10 + \underline{\quad}$
$\underline{\quad} + 6 = 12$	$\underline{\quad} - 4 = 12$
$2 + \underline{\quad} = 12$	$12 = \underline{\quad} + 7$

Unit 3 Session 2.5A **C28** © Pearson Education, Inc., or its affiliates. All Rights Reserved. 2

▲ Resource Masters, C28; T41 



### ACTIVITY

## Introducing Problems with an Unknown Start



Distribute 20 cubes to each student. Display the following story on chart paper. 1

*Kira had a bunch of balloons. Sally gave her 4 more balloons. Now Kira has 14 balloons. How many balloons did Kira have at the start?*

I would like everyone to think about this story problem for a minute. I don't want you to solve it yet. Close your eyes and imagine what is happening. Who can explain what you see? 2 3

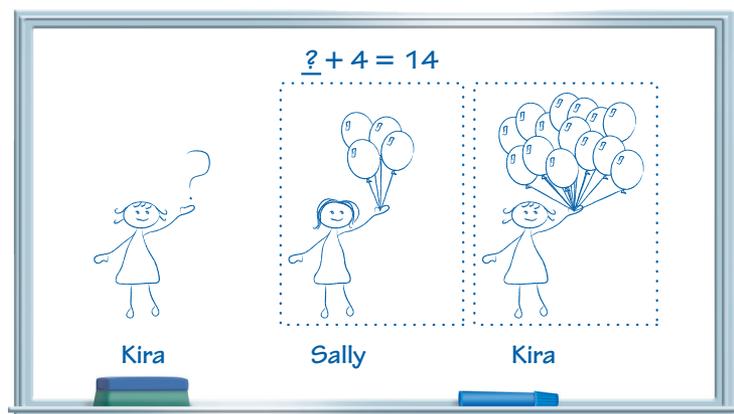
After a couple of volunteers have shared, talk through what is happening in the problem and model how to record an equation that represents the situation.

What information do we know? We know that Kira was holding a bunch of balloons. Do we know how many? Not yet, so let's draw a line with a question mark. ?

Then what happens? [Mark] says that Sally gave Kira 4 more balloons. How can we show that? [Record + 4.] What else do we know? We know from the problem that Kira is now holding 14 balloons.

Record = 14 so that the following equation is on the board.

$$\underline{\quad} + 4 = 14$$



Review the problem with students, pointing out which information in the written problem connects with the information in the equation.

In this problem, what are we trying to find out? (*The number of balloons Kira was first holding.*) Do you think the answer to this problem will be more than 14 balloons or fewer than 14? Why?

Next, ask the class to solve the problem and to think about how they could model the situation with cubes. 4

Briefly discuss their solutions, asking a few students to show how they modeled the action of the problem with cubes.

As students offer equations, write them on the board. Refer back to the information about what is known and unknown. Point out that some students used an addition strategy to solve the problem and others used a subtraction strategy; both are correct. 5

Next, display a similar story that involves removal instead of combining.

*Sally had a bunch of balloons. 10 balloons flew away. Then, she had 8 balloons left. How many balloons did Sally have at the start?*

Follow the same procedure as you did with the first problem.

*I would like everyone to think about this story problem for a minute. I don't want you to solve it yet. Close your eyes and imagine what is happening. Who can explain what you see?*

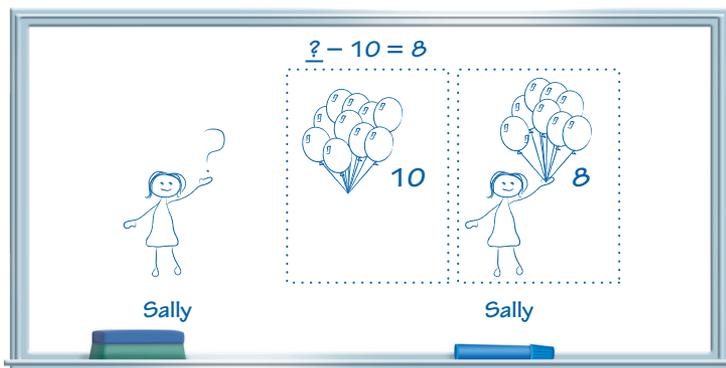
After a couple of volunteers have shared, discuss what is happening in the problem and model how to record an equation that represents the situation.

*What information do we know? We know that Sally was holding a bunch of balloons. Do we know how many? Not yet, so let's draw a line with a question mark. ?*

*Then what happens? [Jacy] says that 10 balloons flew away. How can we show that? [Record - 10.] What else do we know? We know from the problem that Sally was left holding 8 balloons.*

Record  $= 8$  so that the following equation is on the board.

$$\underline{\quad} - 10 = 8$$



### Teaching Notes

- 4 **Modeling with Cubes** Even though many students do not need cubes to *solve* the problem, it is important that everyone understand how to *model* the situation with cubes.

### Math Note

- 5 **Solving Unknown Start Problems** While the equation  $\underline{\quad} + 4 = 14$  represents the action of the problem, solution methods for unknown start problems may vary. Some students will count out the known part, or the number of balloons Sally gave Kira (4) and then add on more cubes (10) until they have 14, the number Kira ended with. The equation  $4 + \underline{10} = 14$  represents this strategy. Other students may begin with the total known amount, 14 cubes, and then remove cubes as they count back to four ( $14 - \underline{10} = 4$ ). Or students might count 14 cubes, separate 4 cubes, and count what remains ( $14 - 4 = \underline{10}$ ).

### Math Note

**6 Equations** While the equation  $\underline{\quad} - 10 = 8$  best represents the action of the problem as written, solution methods for unknown start subtraction problems will vary, as they did for the previous problem. Some students may begin with the known amount that was left, 8 balloons, and then add on the 10 balloons that flew away. The equation  $10 + 8 = 18$  would represent this strategy.

Review the problem with students, pointing out which information in the written problem connects with the information in the equation.

**What are we trying to find out in this problem?** (*The number of balloons Sally was first holding.*) **How is this problem similar to the first problem? How is it different?** 6

Ask the class to solve the problem and to model the situation with cubes. Briefly discuss their solutions, asking a few students to show how they modeled the action of the problem with cubes. Record equations for each strategy. As with the previous problem, students may use an addition or subtraction strategy.

#### Students might say:



“I know she was holding 8 balloons and 10 flew away. So I added  $8 + 10$  and got 18. Then I checked if I was right. If she had 18 balloons and 10 flew away, she would have 8 left. So she started with 18.”



“I first tried 20 but  $20 - 10$  isn't 8. Then I realized  $18 - 10$  is 8, so that's how I knew it.”

Name \_\_\_\_\_ Date \_\_\_\_\_  
 Stickers, Number Sentences, and Story Problems

**Birds, Fish, and Marbles** (page 1 of 2)  
 Solve each problem. Show your work. Write an equation.

1. Jake had some marbles in a bag. He won 20 more marbles in a game. Now Jake has 29 marbles in his bag. How many marbles did Jake start with?

2. There were some birds sitting on a wire. 15 more birds joined them. Now there are 35 birds on the wire. How many birds were on the wire to begin with?

32A Unit 3 Session 2.5A

▲ Student Activity Book, Unit 3, p. 32A; Resource Masters, C29

Name \_\_\_\_\_ Date \_\_\_\_\_  
 Stickers, Number Sentences, and Story Problems

**Birds, Fish, and Marbles** (page 2 of 2)

3. Kira has a collection of marbles. She gave 12 marbles to Jake. Now Kira has 20 marbles left in her collection. How many marbles did Kira start with?

4. The pet store has a tank of goldfish. On Friday the store sold 10 goldfish. There are 20 goldfish left in the tank. How many goldfish were in the tank to begin with?

Unit 3 32B Session 2.5A

▲ Student Activity Book, Unit 3, p. 32B; Resource Masters, C30

## 2

### ACTIVITY

## Solving Problems with an Unknown Start



20 MIN



INDIVIDUALS

Students work individually to solve the problems on *Student Activity Book* pages 32A–32B or C29–C30. Explain that for each problem students should write an equation, solve the problem, and show their work. Encourage students to use cubes to model each problem. In preparation for the discussion at the end of this session, students should begin working on problems 1 and 3 and then work on 2 and 4, if time permits. Students can continue to work on these problems during Math Workshop in Session 2.5.

### ONGOING ASSESSMENT: Observing Students at Work



Students solve addition and subtraction story problems in which the starting amount is unknown (i.e., unknown start).

- **Can students visualize the situation?** Can they use numbers and notation to write an equation that shows what the problem is asking?
- **How do students solve the problems?** Do they model with cubes or pictures? Do they count on or back? Do they use knowledge of number combinations?
- **Can students explain and record their strategies?**

### DIFFERENTIATION: Supporting the Range of Learners



**Intervention** If students are having difficulty, talk through each part of the problem with them, modeling how to record an equation. Discuss what information is known and unknown and what the problem is asking them to find. In addition, adapting the problems to use smaller numbers may make unknown start problems more accessible. 7

## 3 DISCUSSION Problems with an Unknown Start



### Math Focus Points for Discussion

- ◆ Developing strategies for solving addition and subtraction problems with an unknown start and recording work
- ◆ Using standard notation (+, −, =) to represent addition and subtraction situations with an unknown start

Discuss problems 1 and 3, following the same format as Activity 1. Ask students to help you write an equation, and then discuss students' strategies and solutions.

## 4 SESSION FOLLOW-UP Daily Practice

**Daily Practice:** For reinforcement of this unit's content, have students complete *Student Activity Book* page 32C or C31.

### Differentiation

- 7 **English Language Learners** Underline each part of the problem and connect the written text to the equation that represents the action of the problem.

Name \_\_\_\_\_ Date \_\_\_\_\_

Slicker, Number Sentences, and Story Problems Daily Practice

### Solve the Equation

NOTE: Students solve addition and subtraction problems when one part is missing.

Solve each equation.

___ + 6 = 10	___ + 8 = 16	___ + 7 = 9
___ + 10 = 20	___ + 5 = 10	___ + 10 = 14
___ - 6 = 6	___ - 5 = 1	14 - ___ = 7
10 - ___ = 3	___ - 10 = 8	18 - ___ = 9

32C Unit 3 Session 2.5A

▲ Student Activity Book, Unit 3, p. 32C; Resource Masters, C31

## Today's Number: 12 with Missing Parts

$15 - \underline{\quad} = 12$	$8 + \underline{\quad} = 12$
$20 - \underline{\quad} = 12$	$\underline{\quad} + 5 = 12$
$\underline{\quad} - 2 = 12$	$12 = 10 + \underline{\quad}$
$\underline{\quad} + 6 = 12$	$\underline{\quad} - 4 = 12$
$2 + \underline{\quad} = 12$	$12 = \underline{\quad} + 7$



# Birds, Fish, and Marbles (page 2 of 2)

- 3.** Kira has a collection of marbles. She gave 12 marbles to Jake. Now Kira has 20 marbles left in her collection. How many marbles did Kira start with?
- 4.** The pet store has a tank of goldfish. On Friday the store sold 10 goldfish. There are 20 goldfish left in the tank. How many goldfish were in the tank to begin with?

Name \_\_\_\_\_

Date \_\_\_\_\_

Stickers, Number Strings, and Story Problems

Daily Practice



# Solve the Equation

**NOTE** Students solve addition and subtraction problems when one part is missing.

Solve each equation.

$\underline{\quad} + 6 = 10$	$\underline{\quad} + 8 = 16$	$\underline{\quad} + 7 = 9$
$\underline{\quad} + 10 = 20$	$\underline{\quad} + 5 = 10$	$\underline{\quad} + 10 = 14$
$\underline{\quad} - 6 = 6$	$\underline{\quad} - 5 = 1$	$14 - \underline{\quad} = 7$
$10 - \underline{\quad} = 3$	$\underline{\quad} - 10 = 8$	$18 - \underline{\quad} = 9$