**Story Problems**

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| In this lesson students use the open number and various strategies to solve two-step story problems.  |

**NC Mathematics Standard(s):**

**Operations and Algebraic Thinking**

**Represent and solve problems.**

**NC.2.OA.1** Represent and solve addition and subtraction word problems, within 100, with unknowns in all positions, by using representations and equations with a symbol for the unknown number to represent the problem, when solving:

* + One-Step problems:
		- Add to/Take from-Start Unknown
		- Compare-Bigger Unknown
		- Compare-Smaller Unknown
	+ Two-Step problems involving single digits:
		- Add to/Take from- Change Unknown
		- Add to/Take From- Result Unknown

**Number and Operations in Base Ten**

**Use place value understanding and properties of operations.**

**NC.2.NBT.7** Add and subtract, within 1,000, relating the strategy to a written method, using:

* Concrete models or drawings
* Strategies based on place value
* Properties of operations
* Relationship between addition and subtraction

**Standards for Mathematical Practice:**

1. Make sense of problems and persevere in solving them.

3. Construct viable arguments and critique the reasoning of others

4. Model with mathematics

7. Look for and make use of structure.

**Student Outcomes:**

* I can apply place value understanding to add and subtract three-digit numbers.
* I can communicate my strategies to add and subtract three-digit numbers.

**Math Language:**

**What words or phrases do I expect students to talk about during this lesson?**

 addition, count, count on, hundreds, ones, subtraction, tens

**Materials:**

* base ten blocks, activity sheets

**Advance Preparation**:

* Gather materials

**Launch:**

Ten Less than a Three-Digit Number (8-10 minutes)

Have students sit in a circle. Choose a number between 300 and 400. Move clockwise. Each student should say the number that is ten less than the last number said. Record the numbers for students to see.

Example: If the start number is 432, the teacher would record 432, 422, 412, 402, 392, 382, 372, 363, 352, 342, 332, 322, 312, 302, 292, etc.

Ask, “What pattern do you see in our list?”

The number of tens decreases by 1 each time. The ones place stays the same. Ask, “What happened after we said 403? Why did that happen?”

This activity can also be done increasing the tens place, counting by hundreds, counting by twenties, etc. The children should see that the ones place never changes and the tens place changes. Talk about why the hundreds place sometimes changes.

Model this counting on a number line by having students tell you what to label.



Ask, “If we were going to solve this problem, how would the number line help us think about the solution? The problem is: My brother had 432 baseball cards. He gave me 50 cards. How many cards does he have now?”

Have the students talk with a partner about solving this problem. Then have them share.

Ask, “Is there a way to solve this problem without using a number line?” Students might share using drawings of 100s, 10s and 1s. They may also use numbers in a series of equations to solve the problem. Examples:

432-10 = 422 432-30 =402

422-10 = 412 402-10 = 392

412-10 = 402 392-10 = 382

402-10 = 392

392-10 = 382

Ask, “How are these strategies alike? How are they different?”

*\*\*Attached to this lesson plan are examples of ways students can record solution strategies.*

**Explore**

Solving Story Problems (15-17 minutes)

Pose story problems to solve. There are options on the attached activity sheets. Explain that they are to write an equation and show how they solved each problem. As students work on the problems the teacher walks around the class observing students and asking questions. As the teacher observes and talks with students, she chooses the strategies from the student work that she wants shared during the lesson discussion.

Possible things to observe:

* Can a student accurately write an equation to represent a problem?
* What strategies do students use to solve the problem?
* What tools, models, or representations do students use to solve the problem? (cubes, drawing 100s, 10s, 1s, number line, numbers in a series of equations, other strategy)
* Can you tell by looking at their work how the problem was solved?

Possible questions to ask:

* Why did you choose to solve it this way?
* Where is your answer in this representation?
* Why did you add (or subtract)?
* Could you solve it using a different strategy?

**Discuss**

Discussion of Strategies Used to Solve Story Problems (10-12 minutes)

After most students have finished the problems gather the students back for a discussion of strategies. It is not necessary to discuss every problem. There are different reasons to choose problems to share. If there was a story problem that many students had difficulty with, discuss the problem.

Ask, “What was the story describing? Who can put the problem in their own words?” Then ask students to share strategies. The teacher should make sure the strategies shared highlight the mathematics she wants highlighted in this lesson. Using place value is a major focus of this lesson. Another reason to choose a problem to share is if there were a variety of strategies used by the students to solve the problem.

After several strategies are on the board, ask, “How are these strategies alike and how are they different?”

After discussing 1-2 problems as a class, ask partners to share one of the other problems with each other. Have each partner share the strategy. Tell students to also discuss how their strategies are alike or different.

**Evaluation of Student Understanding**

Informal: Make a chart (before the lesson) on observations.

Possible topics to place on the chart are:

* + Can a student accurately write an equation to represent a problem?
	+ What strategies do students use to solve the problem?
	+ What tools, models, or representations do students use to solve the problem? (cubes, drawing 100s, 10s, 1s, number line, numbers in a series of equations, other strategy)
	+ Can you tell by looking at their work how the problem was solved? Make notes on the chart as you observe.

Formal: Examine student work for various strategies and correct answers.

**Meeting the Needs of the Range of Learners**

Intervention: Students who have difficulty solving the story problems may need to use smaller

numbers so they can concentrate on the structure of the problem rather than the numbers. You can change the numbers to one-digit numbers or numbers less than 20. Example: There were 5 students on the playground. 3 students joined them. Then 2 students went inside. How many students are now on the playground?

Change the numbers in the story problems for students who need to work with 2-digit numbers.

Extension: Have students write story problems and have classmates solve the problems. Have students solve start unknown problems. An example: *There were some students on the playground. 36 children joined them. In a few minutes 16 students went inside. Now there are 75 students on the playground. How many students were on the playground at the start?* ( \_\_+ 36 – 16 = 75).

Start unknown problems are harder for students to solve.

**Possible Misconceptions/Suggestions:**

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| **Possible Misconceptions** | **Suggestions** |
| Students may struggle adding or subtracting.  | Work with smaller numbers (50 or less) and provide them with base ten blocks or ten frame cards to support their work.  |
| Students may struggle determining whether to add or subtract.  | Students need concrete objects such as base ten blocks or ten strips. Use smaller numbers and have students discuss with classmates and you about the action of the problem to determine whether they should add or subtract.  |

Name \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_

Solve each problem. Show how you solved it. Use numbers, pictures or words. Write an equation for each problem.

1. The parents at Little River School are putting up a fence around the playground. They bought 452 feet of fencing. They have used 328 feet. How many feet of fencing do they have left?
2. The parents are also building a new climbing structure for the playground. They are using bolts to hold the big pieces of wood together. They used some bolts to build the slide. Then they used 125 bolts to build the swings. They had to buy 58 bolts to finish the playground. When they finished they had used 300 bolts. How many bolts did they use?
3. On Monday Carl ran 345 feet. On Tuesday he ran 124 feet, and on Wednesday he ran 316 feet. How many feet did he run in three days?
4. The children were skipping rope. Mary skipped 115 times. Thomas skipped 171 times. How many more times did Thomas skip rope than Mary?

Name \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_

Solve each problem. Show how you solved it. Use numbers, pictures or words. Write an equation for each problem.

1. On Monday the cafeteria sold 322 cartons of milk. On Tuesday 122 cartons were sold. On Wednesday 249 cartons were sold. How many cartons have been sold?
2. Andrew’s book has 128 pages. He read 19 pages on Monday and 20 pages on Tuesday. How many pages does Andrew have left to read?
3. Mrs. Brewer’s class measured the tables in their classroom. They used small paper clips to measure the tables. The science table was 102 paper clips long. The reading table was 175 paper clips long. How much longer was the reading table than the science table?
4. The second grade classes at Central Elementary School were studying the life cycle of butterflies. They had a lot of caterpillars. They had 26 caterpillars spin a chrysalis on Tuesday. On Wednesday 19 caterpillars spun their chrysalises. Then on Thursday 25 spun a chrysalis. How many caterpillars were in a chrysalis? The children couldn’t wait to see the butterflies!

**Strategies for Solving Addition Problems**

**Counting Up**

322 + 249 322 + \_\_\_\_\_\_\_\_\_\_ = 571

322 + 200 = 522 322 + 8 = 330

522 + 40 = 562 330 + 70 = 400 (or the student could count up by 7 tens)

562 + 9 = 571 400 + 100 = 500

500 + 71 = 571



322

**422 522 532 542 552 562 563, 564, 565, …… 571**

**Place Value**

(using the Commutative Property) (using place

value)

322 + 249 322

300 + 200 = 500 +249

20 + 40 = 60 500

2 + 9 = 11 60

500 + 60 + 11 = 571 + 11

571

**Strategies for Solving Subtraction Problems**

261-149

**Keep the first number whole and subtract the second number in parts (place value)**

261-149 261 - 149

261-100 = 161 261 -100 = 161

161- 40 = 121 161- 40 = 121

1. 9 = 112 121 – 1 = 120 (the 9 was broken into 1 and 8. It is easier

120 - 8 = 112 to take away 1 from 121 to get to a multiple of ten and then take away 8.)



**Place Value**

If children try to subtract by breaking apart all the numbers by place value they will encounter a problem for most 2nd graders. Here is an example:

261-149

200-100 = 100

60-40 = 20

1-9 = -8

100 + 20 – 8 = 112 This is where most 2nd graders will encounter misunderstanding. Some will just turn the problem around to 9-1 and not understand why this is not how subtraction works. If a number line is posted in the class have the children start at 1 and hop back 9 jumps. They land on -8. Do not tell students that you cannot take a larger number from a smaller number.

This would lay the foundation for a misunderstanding later in math. Have a class discussion about what is happening. Some students may understand that it is -8 and then use it to solve the problem. Most 2nd graders will not understand. Encourage them to use a different strategy for subtraction.

In this representation the student drew 2 100 blocks, 4 tens, and 1 one. 100 was removed and then 4 tens were removed. To take away the 9 ones, the student took away a one and then

took 8 ones from the ten. The 112 remains.

**Hundreds Board**

