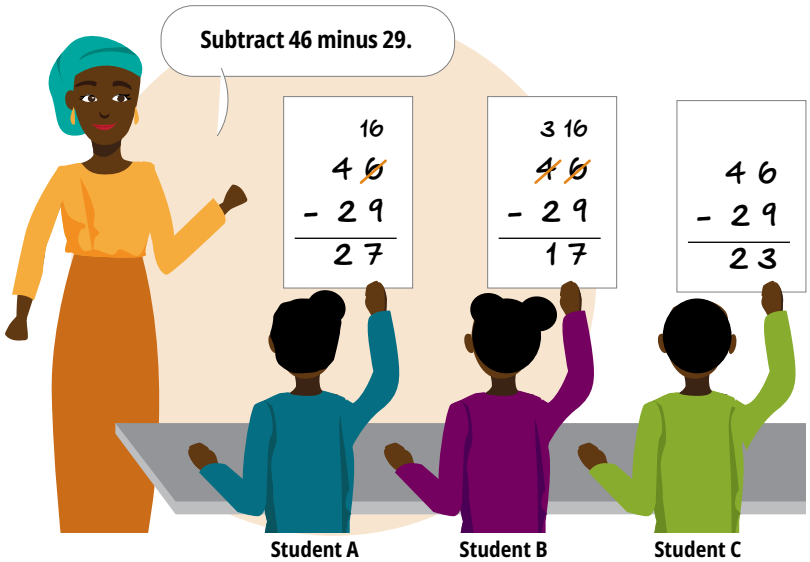
Standard Algorithm for Subtracting Two-Digit Numbers with Regrouping

Objectives

This mini-module aims to help teachers:

- Demonstrate regrouping in subtraction using place value materials and the standard algorithm.
- Teach the standard algorithm for subtraction with regrouping using materials and writing.
- Practice a new teaching activity.

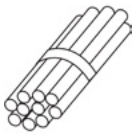
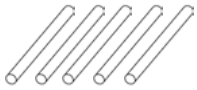
Illustration of Teaching



REFLECT:

- Which student found the correct answer?
- What mistakes did the other students make?
- Why do you think the other students made these mistakes?
- How could you address these mistakes?

Recommended Materials

Tens	Ones
	

Tens	Ones
4	7
- 2	3
2	4

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
31	32	33	34	35	36	37	38	39	40
41	42	43	44	45	46	47	48	49	50
51	52	53	54	55	56	57	58	59	60
61	62	63	64	65	66	67	68	69	70
71	72	73	74	75	76	77	78	79	80
81	82	83	84	85	86	87	88	89	90
91	92	93	94	95	96	97	98	99	100

Ideas to Consider

Student B subtracted correctly by regrouping 10 from the tens' column to the ones' column. Student A added 10 to the ones' column, but they did not change the digit in the tens' column. They may understand regrouping as "adding on 10." Regrouping is actually "moving 10" from one place value to another without changing the value of the number. It might help to demonstrate and practice regrouping using place value materials like sticks.

Student C subtracted the ones' digits backward. They should have subtracted 6 – 9, but they subtracted 9 – 6. The teacher could ask them to compare the numbers 46 and 29 to identify which is greater. Then the teacher could remind them that the smaller number is being subtracted from the larger number.

ACTIVITY: SUBTRACT TWO-DIGIT NUMBERS WITH REGROUPING USING STICKS

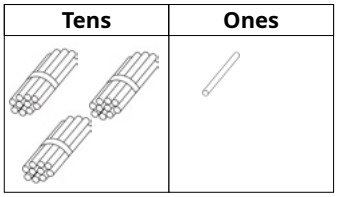
This activity can be completed alone, in pairs, or with a group of teachers. You may prepare groups of ten sticks before the activity to save time. If you have colleagues to work with, take turns showing regrouping with place value materials. Discuss your responses to the questions.

Purpose: Practice subtracting two-digit numbers with regrouping using place value materials.

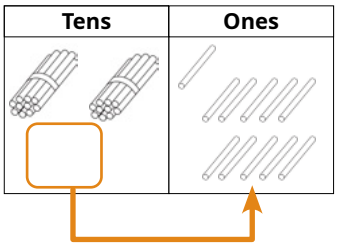
Materials needed: Place value manipulatives (e.g., sticks with rubber bands or strings to group them; base 10 blocks).

Instructions

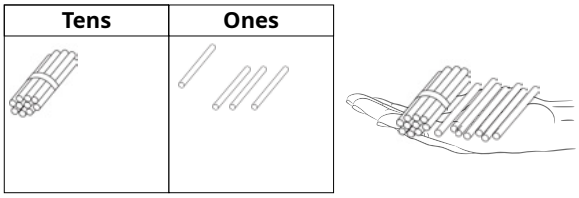
- Read a story: ***Michael had 31 pencils in his shop. He sold 17 of them to students, and he wants to find out how many pencils he has left.***
- ***What math operation should we use for this problem?*** (Subtraction)
- ***How can we use place value manipulatives to find the number of pencils left?***
- Show the 31 pencils that Michael started with in a place value chart:



- Ask: ***How can we remove the 17 pencils that were sold?***
- Regroup 1 bundle of 10 into 10 single sticks:



- Remove 17 sticks (1 ten and 7 ones) to represent the pencils that were sold:

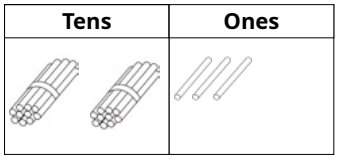
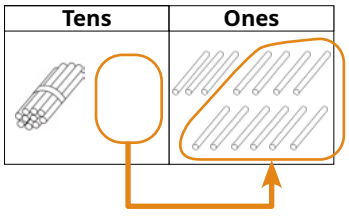
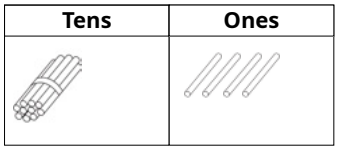


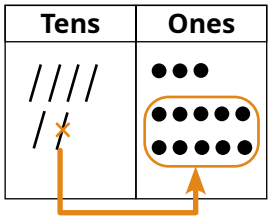
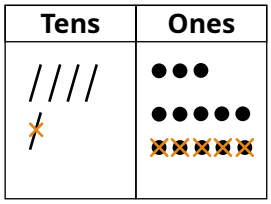
- Count the remaining sticks by tens and ones: "10, 11, 12, 13, 14"
- Note that this means that Michael has 14 pencils left in his shop.
- Write a subtraction sentence for the problem: 31 – 17 = 14
- Give each participant a chance to solve the problem by regrouping.

What Do Children Learn about Subtraction with Regrouping?

As with addition, children should first learn how regrouping works by using place value materials to regroup 10 and then subtract. This can be done using manipulatives in a place value chart, and then using written numbers in a place value chart. Once they understand regrouping through practice, they will be prepared to learn how to regroup in vertical subtraction. When they are ready, solving problems with *both* the place value materials and vertical subtraction can help them understand regrouping better.

Understanding addition and subtraction as inverse operations will support children as they work with numbers that need regrouping. This understanding helps them have clarity on the changes they have made when they "borrow" or "carry over" numbers.

Children should be able to . . .	What does this mean?	Example
Subtract with regrouping using materials	Use place value materials to subtract two-digit numbers with regrouping.	Q: ***What is 23 – 9?*** A: I can place the first number in the chart, then remove the second number. If there are not enough ones, I'll regroup a bundle into 10 ones. First I count out 23:  Then, I regroup 1 bundle of ten into 10 ones:  I remove 9:  There are 14 sticks left. 23 – 9 = 14

Children should be able to . . .	What does this mean?	Example
Subtract numbers up to 99 using a place value chart with regrouping	Use a place value chart to subtract two-digit numbers written in columns, with regrouping.	63 – 15 = **SUBTRACT WITH SYMBOLS** Regroup 10:  Subtract 15:  **SUBTRACT WITH NUMBERS** Tens: 5, 6, – 1, 4 Ones: 13, 3, 5, 8
Subtract with regrouping using the standard algorithm	Write a vertical subtraction problem with the digits in columns based on place value. Subtract the ones, regrouping 10 from the tens' column if needed. Then, subtract the tens.	3 12 4 2 – 1 7 2 5 4 15 5 5 – 8 4 7

Reflection

Write your responses down or discuss your ideas with your colleagues:

- What are some common mistakes students make in vertical subtraction?
- How does practicing with place value manipulatives help students with vertical subtraction?

Teaching Practice

This practice activity may be completed by teachers with their own class or with a smaller group of students.

ACTIVITY: SHOW REGROUPING IN VERTICAL SUBTRACTION

Purpose: Subtract two-digit numbers with regrouping.

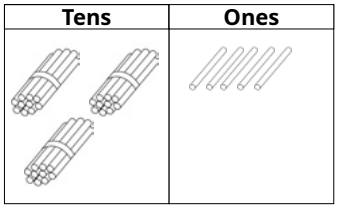
Materials needed: Writing materials for all students, a place value chart, and place value manipulatives (e.g., sticks with rubber bands or strings to group them) for students to use in pairs.

Note: To complete this activity as it is written, children should already have some experience with using place value materials (e.g., sticks). If needed, you may provide more guidance to children by demonstrating the subtraction yourself and asking them to follow the steps.

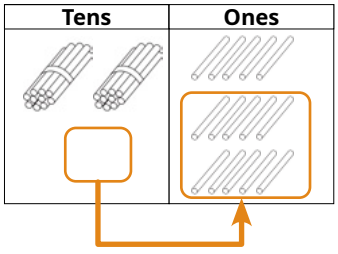
Instructions

- Ask students to take out their materials.
- Discuss: ***There are 35 children in a classroom, and 18 of them are girls. The teacher wants to find out how many boys there are.***
- Discuss: ***How can we solve this problem? Which operation should we use? How do you know?*** (Example: **Subtract** the number of girls from the total number of children, because the others must be boys.)
- Ask students to show the total number of children using their sticks.
- Ask them to take away the girls. Check for understanding and support children to regroup as needed.
- Invite a student to demonstrate to the class:

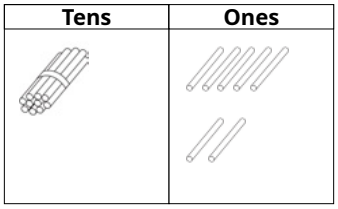
Count 35 children:



Regroup 10:



Subtract 18 girls:



- Ask: ***How many boys are there in the classroom?***
- Say: ***Very good. There are 17 boys in the class. We regrouped 1 ten into 10 ones so that we could subtract and find this answer.***
- Ask students to write a vertical subtraction problem for the story on their paper using place value columns.
- Write the subtraction problem on the board with place value columns, and ask students to check their work. Make sure students have put the digits in the correct columns.

Tens	Ones
3	5
−1	8

- Ask students to solve the subtraction problem on their paper. You may need to remind them how they solved the problem using materials. Remind them of the steps.
- Invite a student to solve the problem on the board:

Tens	Ones
2	15
~~3~~	~~5~~
–1	8
1	7

Steps (explain):

- Note that we cannot subtract the ones: 5 – 8 =
- Regroup 10 to the ones' column. In the tens' column, 30 becomes 20. In the ones' column, 5 becomes 15.
- Subtract the ones: 15 – 8 = 7
- Subtract the tens: 20 – 10 = 10. Write 1 in the tens' place of the answer.

- Say: ***We used sticks to find that there are 17 boys in the classroom. Then we used vertical subtraction to show the same thing.***
- Check students' work. Clarify any misconceptions.

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