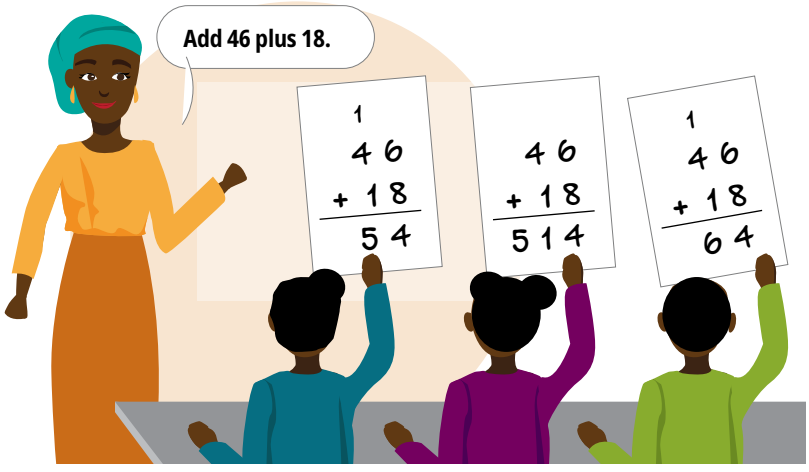
Standard Algorithm for Adding Two-Digit Numbers with Regrouping

Objectives

This mini-module aims to help teachers:

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

Illustration of Teaching

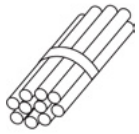


Student A Student B Student C

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
2	1
+ 1	5
3	6

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 C solved the problem correctly. They added the ones, regrouped 10 from the ones' column to the tens' column, and then added the tens. Student A also regrouped correctly, but they did not add all of the tens. It seems like they forgot to add the ten that they regrouped. It looks like Student B added the digits in the ones' column correctly (6 + 8 = 14), but they did not regroup the ten. They simply wrote the sums of the ones and tens in the answer space.

Student B may not understand how to regroup ten. Or they might understand how to regroup ten with place value materials, but they do not yet understand how to regroup in vertical addition. The teacher could demonstrate or ask the students to add 46 + 18 using place value materials, and then using vertical addition. It would be helpful to allow the students to practice with different examples.

ACTIVITY: ADD TWO-DIGIT NUMBERS WITH REGROUPING USING STICKS

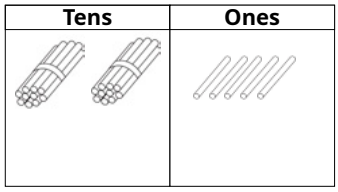
This activity can be completed alone, in pairs, or with a group of teachers. You may prepare groups of ten sticks before the activity to save time. If you have colleagues to work with, take turns showing regrouping with place value materials. Discuss your responses to the questions.

Purpose: Practice adding 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).

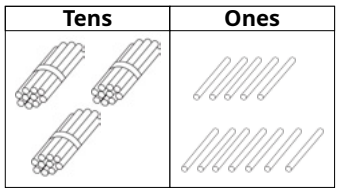
Instructions

- Read a story: ***There were 25 passengers on a bus, and 17 more passengers got on. The bus driver wants to find out how many passengers there are now.***
- ***What math operation should we use for this problem?*** (Addition)
- ***How can we use place value manipulatives to find the total number of passengers?***
- Show the 25 passengers already on the bus in a place value chart:

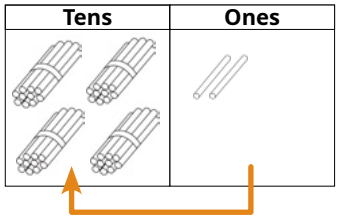


- Count out 17 sticks to represent the passengers who get on:

- Add the 17 sticks to the place value chart:



- ***There are more than 9 sticks in the ones' column. What should we do next?***
- Regroup 10 single sticks into 1 bundle:

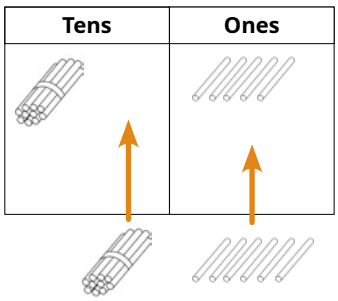
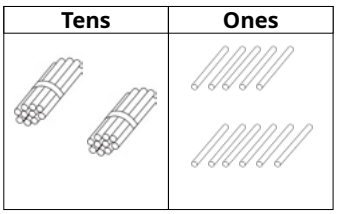
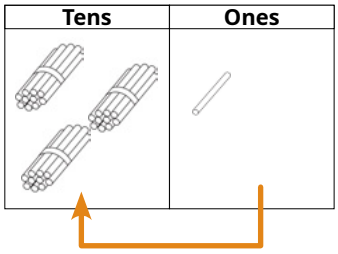


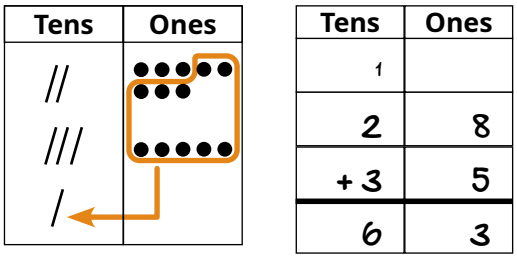
- Count the sticks by tens and ones: "10, 20, 30, 40, 41, 42"
- Note that this means there are 42 passengers on the bus.
- Give each participant a chance to solve the problem by regrouping.
- Solve the same problem using vertical addition. →

$$\begin{array}{r} {\scriptstyle 1} \\ 25 \\ +\ 17 \\ \hline 42 \end{array}$$

What Do Children Learn about Addition with Regrouping?

Children sometimes learn the procedure to regroup (or "carry over") in vertical addition without understanding why they are regrouping or how it works. This can cause them to make mistakes. Children should first learn how regrouping works by using place value materials to add and regroup 10. 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 addition. When they are ready, solving problems with *both* the place value materials and vertical addition can help them understand regrouping better.

Children should be able to . . .	What does this mean?	Example
Add with regrouping using materials	Use place value materials to add two-digit numbers with regrouping.	Q: ***What is 15 + 16 ?*** A: I can place one number in the chart, then the other number. If there are 10 or more in the ones' column, I'll regroup 10 into a bundle. I count out 15 sticks, then add 16:  There are 2 tens and 11 ones:  I regroup 10 ones into 1 bundle of ten  There are 31 sticks in total. 15 + 16 = 31

Children should be able to . . .	What does this mean?	Example
Add numbers up to 99 using a place value chart with regrouping	Use a place value chart to add two-digit numbers written in columns, with regrouping.	
Add with regrouping using the standard algorithm	Write a vertical addition problem with the digits in columns based on place value. Add the ones, and regroup 10 to the tens' column. Then, add the tens.	1 15 + 16 31 1 38 + 9 47

Reflection

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

- Does the above table give you new ideas for activities you would like to try in your classroom? If so, what are they?
- Which row in the table do you think would be most challenging to teach in your classroom? Why?
- What are some ideas you have for overcoming these challenges?

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 ADDITION

Purpose: Add 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.

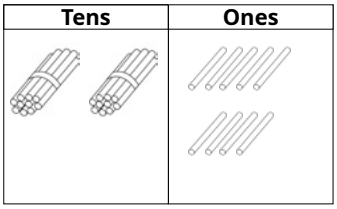
Note: To complete this activity as it is written, children should already have some experience with using place value materials (e.g., sticks). If needed, you may provide more guidance to children by showing addition yourself and asking them to follow the steps.

Instructions

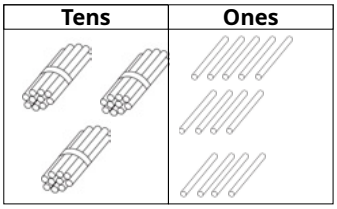
- Ask students to take out their materials.
- Read the story: ***Farmer Musa has 29 chickens and 14 goats. He wants to find out how many animals he has in total.***
- Discuss: ***How can we solve this problem? How do you know?*** (Example: Add because we want to combine the chickens and goats to find the total number of animals.)

- Ask students to show the number of chickens using their sticks.
- Ask them to add the goats. Check for understanding and support children in regrouping as needed.
- Invite a student to demonstrate to the class:

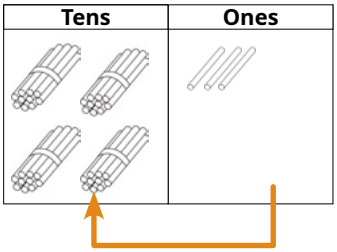
Count 29 chickens:



Add 14 goats:



Regroup 10:



- Ask: ***How many animals does Musa have in total?***
- Say: ***Very good. We have added 29 plus 14 to find 43 animals. We regrouped 10 ones into 1 ten to find the answer.***
- Ask students to write a vertical addition problem for the story on their paper, using place value columns.
- Write the addition 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
2	9
+1	4

- Ask students to solve the addition problem on their paper. You may need to remind them how they solved the problem using materials. Remind them of the steps.

Tens	Ones
1	
2	9
+1	4
4	3

Steps (explain):

- Add the ones: 9 + 4 = 13
- Note that 13 is 1 ten and 3 ones.
- Write the 3 ones in the ones' place of the answer.
- Regroup 10 to the tens' column.
- Add the tens: 10 + 20 + 10 = 40
- Write 4 in the tens' place of the answer.

- Say: ***We used sticks to show that Musa has 43 animals on his farm. Then we used vertical addition to show the same thing.***
- Check students' work. Clarify any misconceptions.