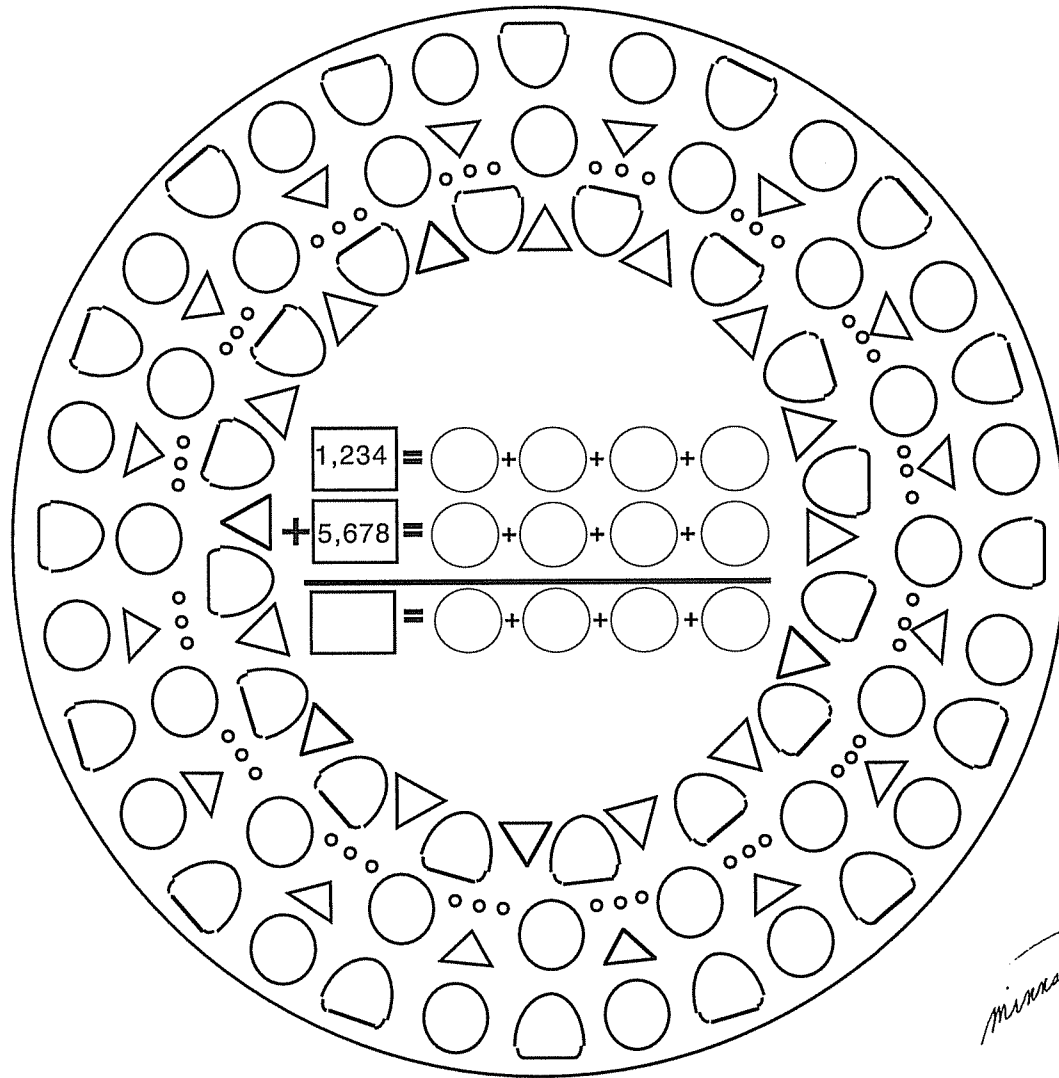


Patterns in Arithmetic
Addition - Booklet 3 PDF
Regrouping into Four Digits
Parent/Teacher Guide



Minns

By Alysia Krafel, Susan Carpenter, and Suki Glenn

Illustrations by Karen Minns and Suki Glenn

Based on methods developed by Prof. Michael Butler at the
UCI Farm Elementary School
University of California, Irvine

Addition: Booklet 3 - PDF - Regrouping into Four Digits

Contents

Circle Math Addition: Review	1	The Assessment for this booklet is in
Circle Math Addition: Three Digits	5	General Organization.
Circle Math Addition: Four Digits	9	
Families of Facts	10	This booklet is dedicated to Tami Pinkas,
Patterns in Sums: Column Addition	11	who taught me this math program and was
Circle Math: Equality	12	my wonderful mentor in the Little Kids'
Picture My Learning	16	House. Pam Reynolds and Anne Hersey
Circle Math Addition Workboards	18	Heryer were also instrumental in develop-
Circle Math Addition - Practice	20	ing Circle Math at the Farm School.
Answer Key	21	Suki Glenn

Acknowledgments

The knowledge, patience, and dedication of Professor Michael Butler made the UCI Farm Elementary School and this mathematics program possible. Special thanks go to Alysia Krafel and Susan Carpenter, who helped develop much of the math materials based on the teachings, ideas, and insights of Professor Butler.

For many years Farm School teachers, students, parents, and staff have shared their unfailing delight in learning. Thank you for your support and dedication.

The books would never have been completed if the students at Chrysalis Charter School in Redding, California, under the guidance of Alysia and Paul Krafel, hadn't needed them. Thank you for your patience through all of the draft copies.

Susan Carpenter edited, added her wise words, useful suggestions, and helped make the Answer Keys a reality. Káran Founds-Benton contributed her meticulous editing skill and knowledge. Diligent and thorough copy editing was done by Jacqueline Logue.

The cover mandala and many delightful illustrations are by Karen Marie Christa Minns. Other illustrations are by Suki Glenn and ClickArt by T/Maker.

To all of the mathematicians, from antiquity to the present, who discovered the principles of mathematics goes our heartfelt appreciation for your dedication.

Patterns in Arithmetic: Addition - Booklet 3 PDF

Parent/Teacher Guide

©2014 Pattern Press

Published by Pattern Press
P.O. Box 2737
Fallbrook, CA 92088
(760)728-3731

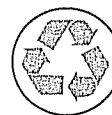
www.patternpress.com

E-mail: Patternpress1@gmail.com

All rights reserved.

Practice worksheets may be duplicated.

Printed on recycled paper.



ISBN 978-1-935559-78-8

Circle Math Addition: Review

Purpose The purpose is to review expanded Circle Math Addition with two and three circles and two digits regrouping. To re-experience that numbers can be broken up into many little problems, the little problems are solved, and then are put back together to solve the larger problem.

Prerequisites Fluency in Circle Math Addition. See *Patterns in Arithmetic: Book 2 - Addition* section.

Materials Circle Math Addition: Three Circles - Worksheet 1, page 5 (in the Student Workbook)
Large erasable Circle Math Addition Board 1, page 18, in this booklet
Manipulatives of any kind

Lesson 1 Start the lesson by reviewing an expanded addition problem.

1. Give the problem $8 + 9$, or one of similar size. Write the numeral eight in the top square and the numeral nine in the middle square.

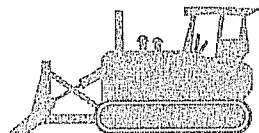
2. Have the student break up the numbers into the circles and then do all of the little addition problems.

3. Have the student prove the answer with blocks. If this is the first time a student has done Circle Math Addition, start with the blocks, and then record the numbers.

$$\begin{array}{r}
 3a. \quad \boxed{8} = \textcircled{3} + \textcircled{2} + \textcircled{3} \\
 + \quad \boxed{9} = \textcircled{1} + \textcircled{4} + \textcircled{4} \\
 \hline
 \boxed{17} = \textcircled{4} + \textcircled{6} + \textcircled{7}
 \end{array}$$

3a. Put on the blocks.

"Claw down, claw down, claw down, bulldoze over" is a chant one student made to remember the procedure. The whole class picked it up.



$$\begin{array}{r}
 1. \quad \boxed{8} = \textcircled{3} + \textcircled{2} + \textcircled{3} \\
 + \quad \boxed{9} = \textcircled{1} + \textcircled{4} + \textcircled{4} \\
 \hline
 \end{array}$$

$$\boxed{} = \textcircled{} + \textcircled{} + \textcircled{}$$

$$\begin{array}{r}
 2. \quad \boxed{8} = \textcircled{3} + \textcircled{2} + \textcircled{3} \\
 + \quad \boxed{9} = \textcircled{1} + \textcircled{4} + \textcircled{4} \\
 \hline
 \end{array}$$

$$\boxed{17} = \textcircled{4} + \textcircled{6} + \textcircled{7}$$

$$\begin{array}{r}
 3b. \quad \boxed{8} = \textcircled{3} + \textcircled{2} + \textcircled{3} \\
 + \quad \boxed{9} = \textcircled{1} + \textcircled{4} + \textcircled{4} \\
 \hline
 \end{array}$$

$$\boxed{17} = \textcircled{4} + \textcircled{6} + \textcircled{7}$$

3b. Add blocks in each circle. Move blocks to the bottom circles.

$$\begin{array}{r}
 3c. \quad \boxed{8} = \textcircled{3} + \textcircled{2} + \textcircled{3} \\
 + \quad \boxed{9} = \textcircled{1} + \textcircled{4} + \textcircled{4} \\
 \hline
 \end{array}$$

$$\boxed{17} = \textcircled{4} + \textcircled{6} + \textcircled{7}$$

3c. Add all blocks together and move them to the square.

Worksheets

Circle Math Addition: Three Circles - Worksheet 2, page 6
 Circle Math Addition: Three Circles - Practice, page 20 in this booklet. Duplicate and write practice problems appropriate to the ability of each student on the following pages

Lesson 2

Use Circle Math Addition Board 2, page 19. Repeat with two circles but give a larger problem and have the student use Base Ten Blocks to prove. Do not give a regrouping problem the first time.

$$\begin{array}{r}
 1. \quad \boxed{24} = \text{circle}(20) + \text{circle}(4) \\
 + \quad \boxed{13} = \text{circle}(10) + \text{circle}(3) \\
 \hline
 \square \quad \text{circle} \quad \text{circle}
 \end{array}$$

$$\begin{array}{r}
 2. \quad \boxed{24} = \text{circle}(20) + \text{circle}(4) \\
 + \quad \boxed{13} = \text{circle}(10) + \text{circle}(3) \\
 \hline
 \square \quad \text{circle}(30) \quad \text{circle}(7)
 \end{array}$$

$$\begin{array}{r}
 3. \quad \boxed{24} = \text{circle}(20) + \text{circle}(4) \\
 + \quad \boxed{13} = \text{circle}(10) + \text{circle}(3) \\
 \hline
 \text{circle}(37) \quad \text{circle}(30) \quad \text{circle}(7)
 \end{array}$$

If the student is successful and doesn't have any problems, give a regrouping problem with two circles.

$$\begin{array}{r}
 1. \quad \begin{array}{l} \text{Put in} \\ \text{tens} \\ \text{place} \end{array} \\
 \begin{array}{r}
 \boxed{27} = \text{circle}(20) + \text{circle}(7) \\
 + \quad \boxed{16} = \text{circle}(10) + \text{circle}(6) \\
 \hline
 \square = \text{circle} + \text{circle}
 \end{array}
 \end{array}$$

Trade single cubes for 1 rod

$$\begin{array}{r}
 2. \quad \begin{array}{l} \text{tens} \\ \text{ones} \end{array} \\
 \begin{array}{r}
 \boxed{27} = \text{circle}(20) + \text{circle}(7) \\
 + \quad \boxed{16} = \text{circle}(10) + \text{circle}(6) \\
 \hline
 \boxed{43} = \text{circle}(40) + \text{circle}(3)
 \end{array}
 \end{array}$$

Worksheets

Circle Math Addition: Two Circles - Worksheet 3, page 7

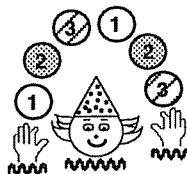
Duplicate and write practice problems appropriate to the ability of each student on the Black Line Masters that are on the following pages: Circle Math Addition: Review - Three Circles - Practice and Circle Math Addition: Review - Two Circles - Practice.

Circle Math Addition: Missing Numbers - Worksheets 1 and 2, pages 8 and 9

Circle Math Addition: Review

Three Circles

Practice - Make multiple copies.



Date _____

$$\begin{array}{r} \square = \bigcirc + \bigcirc + \bigcirc \\ + \square = \bigcirc + \bigcirc + \bigcirc \\ \hline \end{array}$$

$$\begin{array}{r} \square = \bigcirc + \bigcirc + \bigcirc \\ + \square = \bigcirc + \bigcirc + \bigcirc \\ \hline \end{array}$$

$$\square = \bigcirc + \bigcirc + \bigcirc$$

$$\square = \bigcirc + \bigcirc + \bigcirc$$

$$\begin{array}{r} \square = \bigcirc + \bigcirc + \bigcirc \\ + \square = \bigcirc + \bigcirc + \bigcirc \\ \hline \end{array}$$

$$\begin{array}{r} \square = \bigcirc + \bigcirc + \bigcirc \\ + \square = \bigcirc + \bigcirc + \bigcirc \\ \hline \end{array}$$

$$\square = \bigcirc + \bigcirc + \bigcirc$$

$$\square = \bigcirc + \bigcirc + \bigcirc$$

$$\begin{array}{r} \square = \bigcirc + \bigcirc + \bigcirc \\ + \square = \bigcirc + \bigcirc + \bigcirc \\ \hline \end{array}$$

$$\begin{array}{r} \square = \bigcirc + \bigcirc + \bigcirc \\ + \square = \bigcirc + \bigcirc + \bigcirc \\ \hline \end{array}$$

$$\square = \bigcirc + \bigcirc + \bigcirc$$

$$\square = \bigcirc + \bigcirc + \bigcirc$$

Make your own.

$$\begin{array}{r} \square = \bigcirc + \bigcirc + \bigcirc \\ + \square = \bigcirc + \bigcirc + \bigcirc \\ \hline \end{array}$$

$$\begin{array}{r} \square = \bigcirc + \bigcirc + \bigcirc \\ + \square = \bigcirc + \bigcirc + \bigcirc \\ \hline \end{array}$$

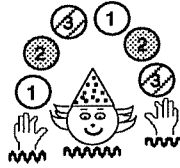
$$\square = \bigcirc + \bigcirc + \bigcirc$$

$$\square = \bigcirc + \bigcirc + \bigcirc$$

Circle Math Addition: Review

Two Circles

Practice - Make multiple copies.



Date _____

$$\begin{array}{r} \square = \bigcirc + \bigcirc \\ + \square = \bigcirc + \bigcirc \\ \hline \square = \bigcirc + \bigcirc \end{array}$$

$$\begin{array}{r} \square = \bigcirc + \bigcirc \\ + \square = \bigcirc + \bigcirc \\ \hline \square = \bigcirc + \bigcirc \end{array}$$

$$\begin{array}{r} \square = \bigcirc + \bigcirc \\ + \square = \bigcirc + \bigcirc \\ \hline \square = \bigcirc + \bigcirc \end{array}$$

$$\begin{array}{r} \square = \bigcirc + \bigcirc \\ + \square = \bigcirc + \bigcirc \\ \hline \square = \bigcirc + \bigcirc \end{array}$$

$$\begin{array}{r} \square = \bigcirc + \bigcirc \\ + \square = \bigcirc + \bigcirc \\ \hline \square = \bigcirc + \bigcirc \end{array}$$

$$\begin{array}{r} \square = \bigcirc + \bigcirc \\ + \square = \bigcirc + \bigcirc \\ \hline \square = \bigcirc + \bigcirc \end{array}$$

$$\begin{array}{r} \square = \bigcirc + \bigcirc \\ \hline \square = \bigcirc + \bigcirc \end{array}$$

$$\begin{array}{r} \square = \bigcirc + \bigcirc \\ \hline \square = \bigcirc + \bigcirc \end{array}$$

Make your own.

$$\begin{array}{r} \square = \bigcirc + \bigcirc \\ + \square = \bigcirc + \bigcirc \\ \hline \square = \bigcirc + \bigcirc \end{array}$$

$$\begin{array}{r} \square = \bigcirc + \bigcirc \\ + \square = \bigcirc + \bigcirc \\ \hline \square = \bigcirc + \bigcirc \end{array}$$

$$\begin{array}{r} \square = \bigcirc + \bigcirc \\ \hline \square = \bigcirc + \bigcirc \end{array}$$

$$\begin{array}{r} \square = \bigcirc + \bigcirc \\ \hline \square = \bigcirc + \bigcirc \end{array}$$

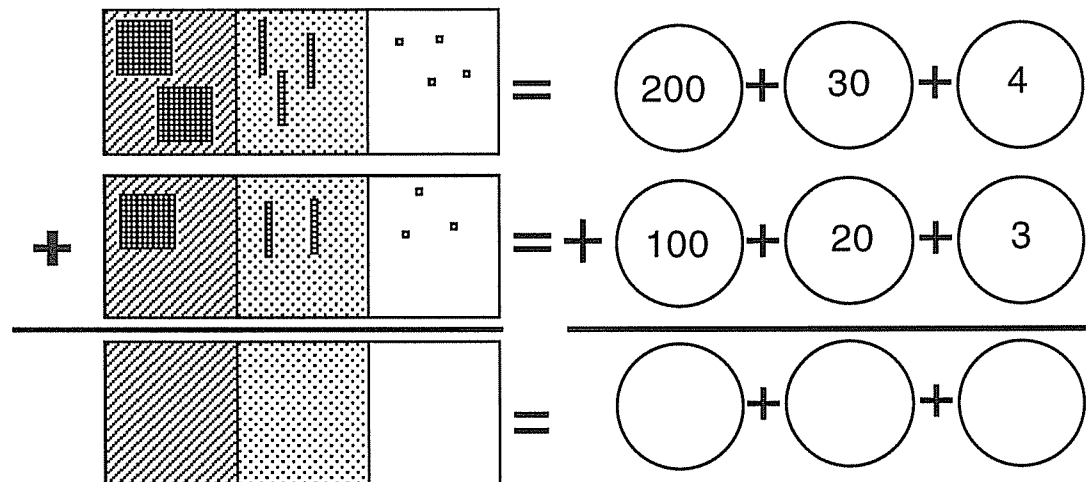
Circle Math Addition: Three Digits

Purpose The purpose is to regroup in addition with Place Value Boards in three and four digits and to prove understanding with a manipulative.

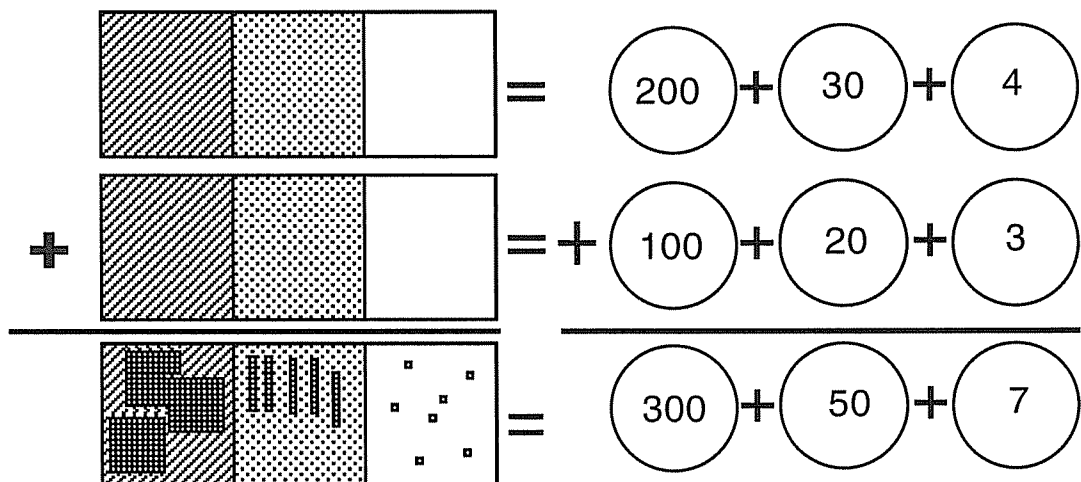
Prerequisites Standard regrouping with proficiency in two digits

Materials Place Value Addition Board, page 11 (enlarge to 11 x 17 inches and laminate)
Break Up into Hundreds, Tens, and Ones Board, page 12 (cover with contact paper or place in a clear sheet cover)
Base Ten Blocks or Cuisenaire Rods
Erasable pen

Lesson Give each student a Place Value Addition Board. **"Build two hundred thirty-four on the top row with the Base Ten Blocks."** The blocks used are two one hundred flats, three tens rods, and four single units. **"Build one hundred twenty-three on the middle row with the Base Ten Blocks."** The blocks used are one one hundred flat, two tens rods, and three singles. **"Record the numbers in the circles on the Break Up into Hundreds, Tens, and Ones Board."**

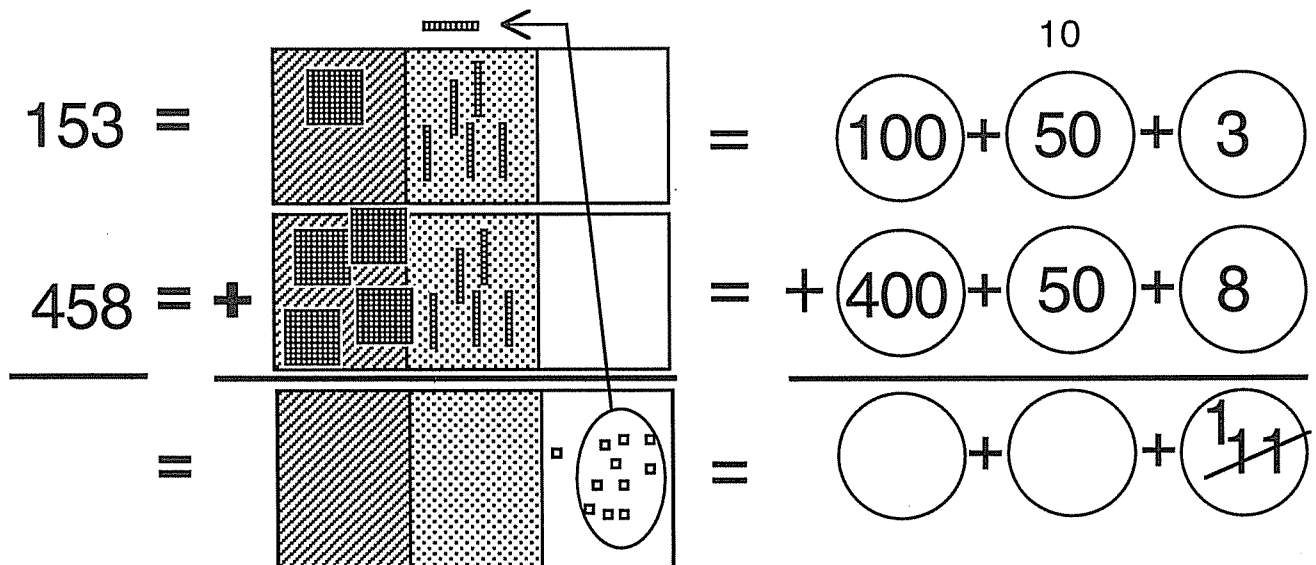
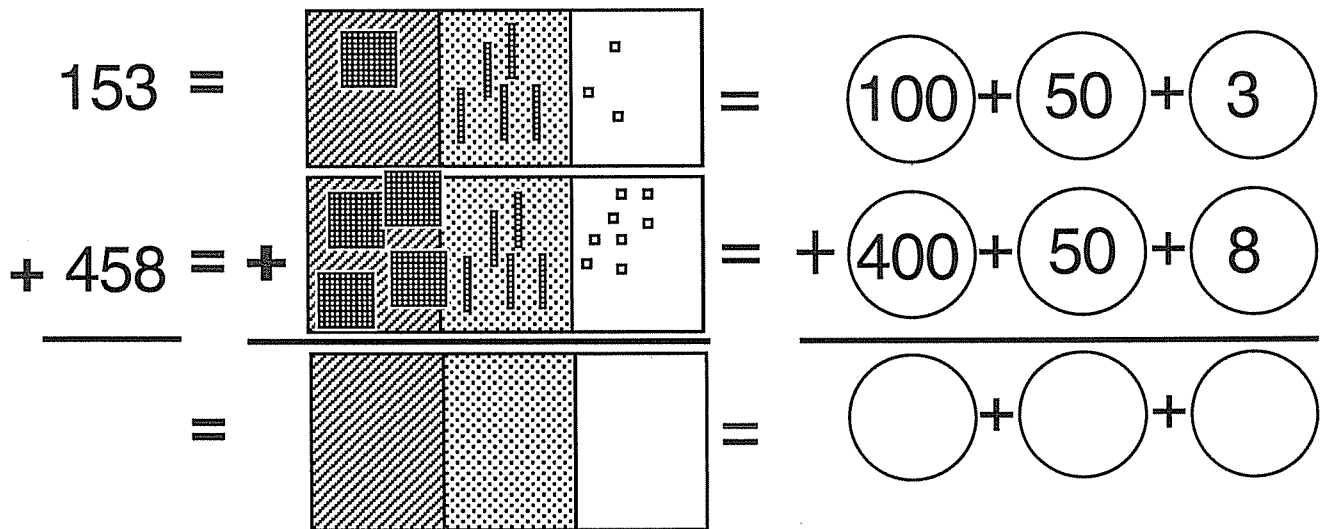


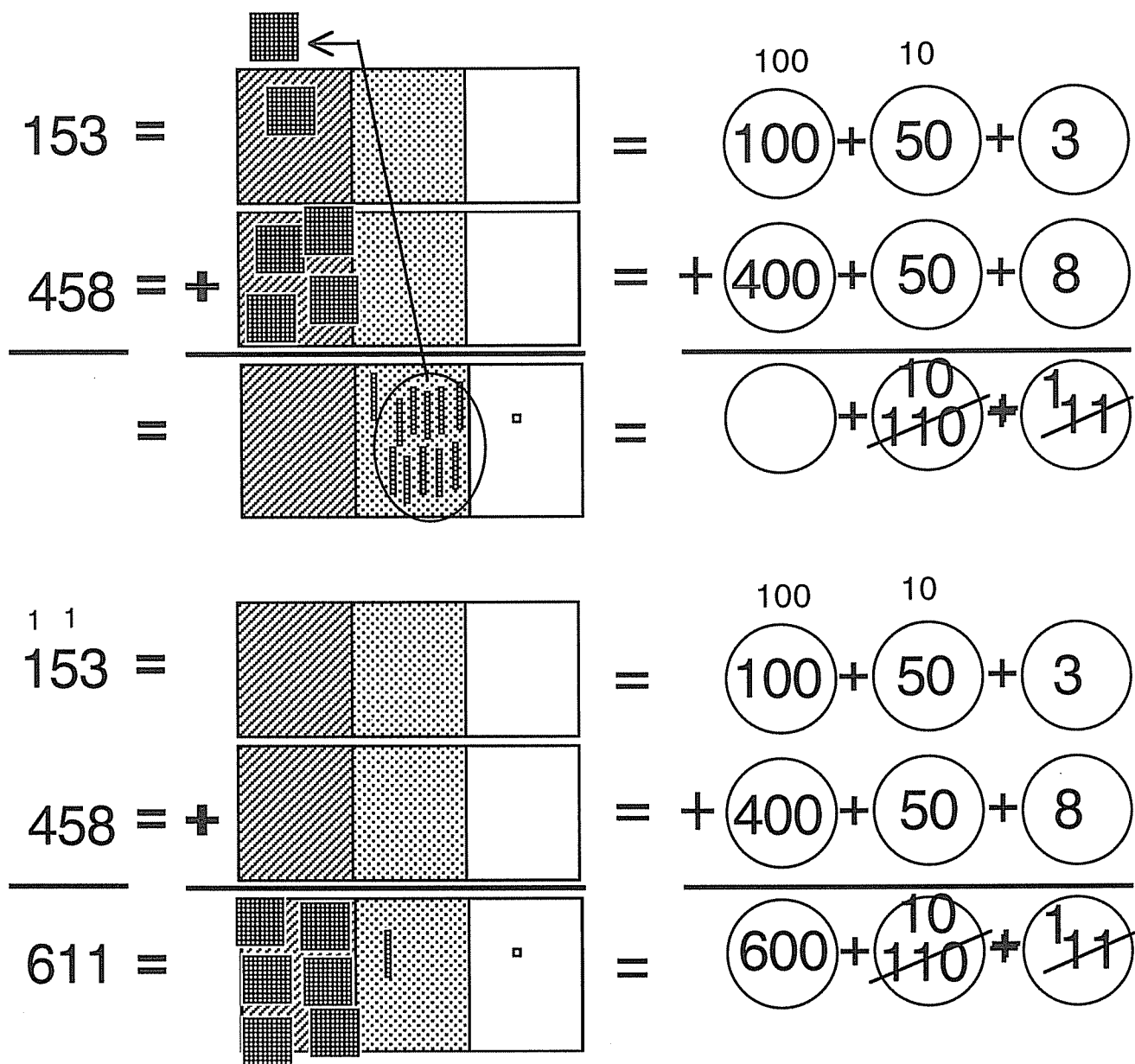
"Add the numbers together. Record in the circles. Draw the blocks on the recording sheet." The completed problem will look like this:



Do another problem or two together. Then give Circle Math Addition: Three Digits - Worksheet 1, page 10. Have the student build the problem with blocks and record in the circles and solve it. Have the student complete the remaining problems on her own. If no difficulties are encountered, give her Circle Math Addition: Three Digits - Worksheets 2 and 3, pages 13 and 14. She will now be regrouping in the tens column. This should be review. Watch how she does the problem. Have her explain what she is doing and why as she manipulates the blocks and records. She should trade in the ten cubes for one ten rod.

Circle Math Addition: Three Digits - Worksheet 4, page 15, has regrouping in both the ones and tens column. Allow her to figure out how to regroup into the hundreds column. Do these problems together so you observe any problems she has. The procedure of trading in ten tens rods for a hundred flat is the same principle as trading in ten ones cubes for a tens rod but often is an "aha" experience for many students. The following is an example of how to manipulate and record.





Worksheets

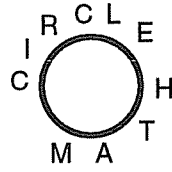
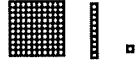
Circle Math Addition: Three Digits, Worksheets 5 and 6, pages 16 and 17. Duplicate and write practice problems appropriate to the ability of each student on page 8 in this booklet: Circle Math Addition: Three Digits - Practice. Also give practice problems from commercial books available that have riddles and other fun ways for students to self-correct and gain proficiency through practice.

Circle Math Addition: Four Digits, Worksheets 1 - 6, pages 20 - 25. Use these for four digit regrouping. Again have the student figure out how to do the trades. Duplicate and write practice problems appropriate to the ability of each student on page 9 in this booklet: Circle Math Addition: Four Digits - Practice.

Circle Math Addition: Three Digits

Practice - Make multiple copies.

Use Base Ten Blocks.

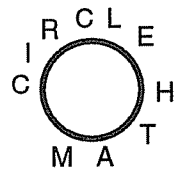


Date _____

	=		=	
+	=	+	=	+
	=	+	=	+
	=		=	
+	=	+	=	+
	=	+	=	+
	=		=	
+	=	+	=	+
	=	+	=	+
	=		=	

Circle Math Addition: Four Digits
Practice - Make multiple copies.

Date _____



$\square = \bigcirc + \bigcirc + \bigcirc + \bigcirc$	$\square = \bigcirc + \bigcirc + \bigcirc + \bigcirc$
$+ \square = \bigcirc + \bigcirc + \bigcirc + \bigcirc$	$+ \square = \bigcirc + \bigcirc + \bigcirc + \bigcirc$
$\square = \bigcirc + \bigcirc + \bigcirc + \bigcirc$	$\square = \bigcirc + \bigcirc + \bigcirc + \bigcirc$

$\square = \bigcirc + \bigcirc + \bigcirc + \bigcirc$	$\square = \bigcirc + \bigcirc + \bigcirc + \bigcirc$
$+ \square = \bigcirc + \bigcirc + \bigcirc + \bigcirc$	$+ \square = \bigcirc + \bigcirc + \bigcirc + \bigcirc$
$\square = \bigcirc + \bigcirc + \bigcirc + \bigcirc$	$\square = \bigcirc + \bigcirc + \bigcirc + \bigcirc$

Make your own.

$\square = \bigcirc + \bigcirc + \bigcirc + \bigcirc$	$\square = \bigcirc + \bigcirc + \bigcirc + \bigcirc$
$+ \square = \bigcirc + \bigcirc + \bigcirc + \bigcirc$	$+ \square = \bigcirc + \bigcirc + \bigcirc + \bigcirc$
$\square = \bigcirc + \bigcirc + \bigcirc + \bigcirc$	$\square = \bigcirc + \bigcirc + \bigcirc + \bigcirc$

Families of Facts

Purpose The purpose of this lesson is to relate addition and subtraction as inverse operations. This program calls them Families of Facts. They are important for many reasons. Students can learn to check their addition by using subtraction and vice versa. Learning these relationships strengthens the notion that there is beauty, pattern, and sense in numbers. Understanding relationships is fundamental to understanding algebra. This will be review for students familiar with the *Patterns in Arithmetic* series.

Prerequisites Basic understanding of addition and subtraction concepts

Materials Any counters
Scratch paper and a pencil

Lesson Ask the student to make any addition problem using any two single-digit numbers, e.g., $6 + 7 = 13$.

Say, using only these three numbers, 6, 7, and 13, make three more number sentences that are true but different. Prove them with counters."

There are many possible incorrect combinations, such as $13 + 6 = 7$, $13 + 6 = 7$, $7 - 6 = 13$, $6 - 7 = 13$, etc. Allow the student to explore and figure out and verify the correct equations.

The possibilities are $7 + 6 = 13$
 $13 - 7 = 6$
 $13 - 6 = 7$

Give the student another set of numbers that makes a Family of Facts, such as 3, 9, and 12. **"Make four number sentences from these numbers that are true."**

$3 + 9 = 12$
 $9 + 3 = 12$
 $12 - 3 = 9$
 $12 - 9 = 3$

After completing several sets of fact families or Families of Facts: Worksheet 1, have the student look for patterns.

Worksheets Families of Facts: Worksheets 1 - 2, pages 26 and 27

Patterns in Sums: Column Addition

Purpose The purpose is to develop pattern play and to facilitate mastery of sums and to "make tens," counting in place value units, as a strategy for efficient adding.

Prerequisites Breaking Up Numbers lessons and experience with column addition

Materials Patterns in Sums: Column Addition - Worksheet 1, page 29
Cuisenaire Rods
Centimeter graph paper or scratch paper

Warm Up Give a few column addition problems such as:

$$\begin{array}{r} 2 \\ 3 \\ 4 \\ 4 \\ + 1 \\ \hline \end{array} \quad \begin{array}{r} 2 \\ 4 \\ 1 \\ + 2 \\ \hline \end{array}$$

Lesson 1 "Make ten as many ways as possible using only two rods. Prove that each is equal to ten. Draw a picture of the rods and record each combination in a number sentence on scratch paper or centimeter graph paper."

"With the combinations you just made, write three column addition problems that would be easy to solve."

Example:

$$\begin{array}{r} 6 \\ + 5 \\ \hline \end{array}$$

Lesson 2 Give a column addition problem such as:

"Is there a way to make this addition easier?"

$$\begin{array}{r} 1 \\ 3 \\ 4 \\ 9 \\ + 3 \\ \hline \end{array}$$

One student drew a looping line between each pair of numbers that added up to ten and wrote ten in the loops.

Example:

$$\begin{array}{r} 6 \\ 1 \\ 3 \\ 4 \\ 9 \\ + 3 \\ \hline \end{array}$$

Diagram showing looping lines between 6 and 4, 1 and 9, and 3 and 3. Each loop contains the number 10.

Take students' suggestions and try them.

"Does the answer come out the same? Why?"

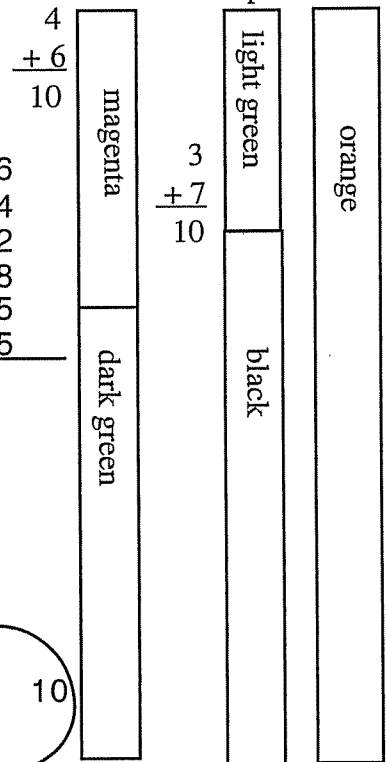
Then the student drew looping lines between the pair of numbers that were doubles and wrote their sum. Finally she added the pairs of numbers: $10 + 10 + 6 = 26$.

"Try this looping method."

$$\begin{array}{r} 6 \\ 1 \\ 3 \\ 4 \\ 9 \\ + 3 \\ \hline 26 \end{array}$$

Diagram showing looping lines between 6 and 4 (loop with 10), 1 and 9 (loop with 10), and 3 and 3 (loop with 6). The final sum is 26.

Two examples:



Worksheets Patterns in Sums: Column Addition, Worksheet 2, page 30

Patterns in Sums: Missing Numbers introduces the concept of a letter replacing one of the numbers. Have the student figure out how to solve this type of problem.

Circle Math: Equality

Purpose The purpose is to practice combinations of numbers that are equal, to increase flexibility in thinking, and to reinforce conservation of number. To practice the commutative property of addition, e.g., $7 + 6 = 6 + 7$.

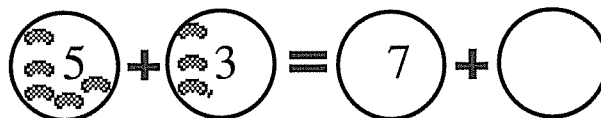
Prerequisites Circle Math Addition and Families of Facts

Materials Circle Math Equality: Two Circles - Worksheet 1, page 31
Any manipulative

Lesson Session 1 The first problem is done for you as an example.
The next problem is:

$$\textcircled{5} + \textcircled{3} = \textcircled{7} + \textcircled{\quad}$$

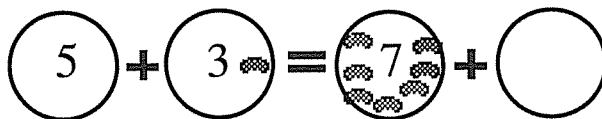
"Place the manipulative (in this example, beans) on the $5 + 3$."



The diagram shows the equation $\textcircled{5} + \textcircled{3} = \textcircled{7} + \textcircled{\quad}$ with beans placed on the circles. The circle with the number 5 contains 5 beans, the circle with the number 3 contains 3 beans, and the circle with the number 7 contains 7 beans. The empty circle on the right is empty.

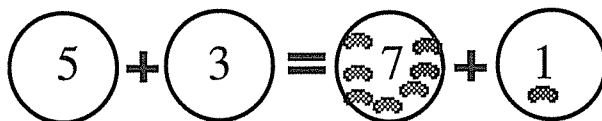
"How many beans will be on the other side of the equal sign?" "Eight."

"How can you break up that number of beans so there is seven in one group?"



The diagram shows the equation $\textcircled{5} + \textcircled{3} = \textcircled{7} + \textcircled{\quad}$ with beans placed on the circles. The circle with the number 5 contains 5 beans, the circle with the number 3 contains 3 beans, and the circle with the number 7 contains 7 beans. One bean has been moved from the 7 circle to the empty circle on the right.

"How many beans will be in the other circle? Record the amounts and read the equation." The last bean is moved to the empty circle and a one is recorded.



The diagram shows the final equation $\textcircled{5} + \textcircled{3} = \textcircled{7} + \textcircled{1}$ with beans placed on the circles. The circle with the number 5 contains 5 beans, the circle with the number 3 contains 3 beans, the circle with the number 7 contains 7 beans, and the circle with the number 1 contains 1 bean.

"If there were two circles with no numbers in them, how else might you solve the equation?" Possible answers: $6 + 2$, $5 + 3$, $4 + 4$, $3 + 5$, $2 + 6$, $1 + 7$, $0 + 8$, or $8 + 0$.

Do the next problem together. "Explain how you solved it." Then have the student complete the worksheet on her own. Some students may be able to do the problems without manipulatives.

Worksheets Circle Math: Equality - Two Circles, Worksheet 2, page 32
Circle Math: Equality - Two Circles, Worksheet 3, page 33

Session 2 "Solve this page of problems using the Commutative Property." The solution to the first example would be $6 + 7 = 7 + 6$. This is the commutative principle of addition. Students have used this principle when doing Families of Facts. Giving part of the answer places a constraint on the solution.

Session 3

Circle Math: Equality - Three Circles - Worksheet 4, page 34

The same method applies with breaking up three or more numbers. These problems are to help a student generalize the procedure. The first problems break up numbers like this:

$$\textcircled{9} + \textcircled{6} + \textcircled{7} = \textcircled{5} + \textcircled{8} + \textcircled{9}$$

The Commutative Property is not being used here because the expansions use different numbers. **"How did you solve the equation? Prove that your answer is correct. How else could you make the two sides equal?"**

Test for Understanding

This is to test to see if the student will find it easier to just change the order of the numbers instead of expanding them with different numbers. The last problem is:

$$\textcircled{8} + \textcircled{9} + \textcircled{5} = \textcircled{5} + \textcircled{\quad} + \textcircled{\quad}$$

If the student has generalized the Commutative Property, then the solution would look like this:

$$\textcircled{8} + \textcircled{9} + \textcircled{5} = \textcircled{5} + \textcircled{8} + \textcircled{9}$$

Or this:

$$\textcircled{8} + \textcircled{9} + \textcircled{5} = \textcircled{5} + \textcircled{9} + \textcircled{8}$$

Worksheet

Circle Math: Equality - Two Circles and Circle Math: Equality - Three Circles Black Line Masters are on the following pages in this booklet. Duplicate and write practice problems appropriate to the ability of each student.

Circle Math: Equality

Date _____

Two Circles

Practice - Make multiple copies.

$$\bigcirc + \bigcirc = \bigcirc + \bigcirc$$

$$\bigcirc + \bigcirc = \bigcirc + \bigcirc$$

$$\bigcirc + \bigcirc = \bigcirc + \bigcirc$$

$$\bigcirc + \bigcirc = \bigcirc + \bigcirc$$

$$\bigcirc + \bigcirc = \bigcirc + \bigcirc$$

$$\bigcirc + \bigcirc = \bigcirc + \bigcirc$$

Make your own.

$$\bigcirc + \bigcirc = \bigcirc + \bigcirc$$

$$\bigcirc + \bigcirc = \bigcirc + \bigcirc$$

Circle Math: Equality

Date _____

Three Circles

Practice - Make multiple copies.

$$\bigcirc + \bigcirc + \bigcirc = \bigcirc + \bigcirc + \bigcirc$$

$$\bigcirc + \bigcirc + \bigcirc = \bigcirc + \bigcirc + \bigcirc$$

$$\bigcirc + \bigcirc + \bigcirc = \bigcirc + \bigcirc + \bigcirc$$

$$\bigcirc + \bigcirc + \bigcirc = \bigcirc + \bigcirc + \bigcirc$$

$$\bigcirc + \bigcirc + \bigcirc = \bigcirc + \bigcirc + \bigcirc$$

$$\bigcirc + \bigcirc + \bigcirc = \bigcirc + \bigcirc + \bigcirc$$

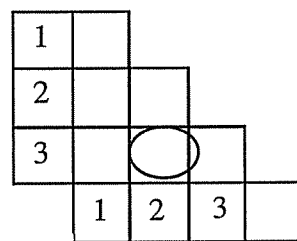
Make your own.

$$\bigcirc + \bigcirc + \bigcirc = \bigcirc + \bigcirc + \bigcirc$$

$$\bigcirc + \bigcirc + \bigcirc = \bigcirc + \bigcirc + \bigcirc$$

Picture My Learning

This picture will help a student visualize what facts she needs to learn. Randomly choose a box, e.g., the one with the circle in it, and say, "3 + 2." Count in your mind and estimate how long it takes the student to give a correct response.



If the correct response comes in three seconds or less, color the square green for "I've got it." In four to six seconds, color the square orange for "I've almost got it." In seven to ten seconds, color the square yellow for "I don't know it but I can figure it out." If it takes over ten seconds, color it red, "I'm still working on it." Do this every couple of weeks until the top is all green and possibly orange in the lower right hand corner. A Black Line Master is on the following page.

1									
2									
3									
4									
5									
6									
7									
8									
9									
+	1	2	3	4	5	6	7	8	9

Color Code

Green - 1 to 3 seconds

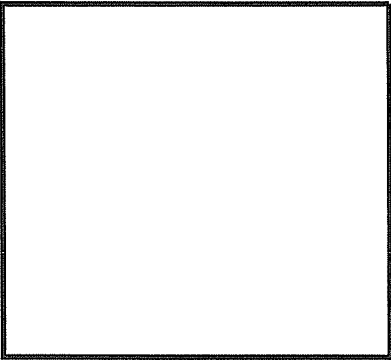
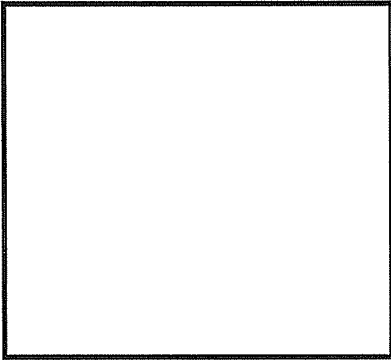
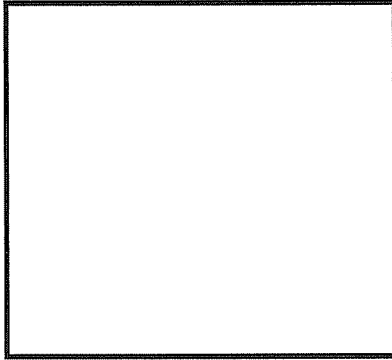
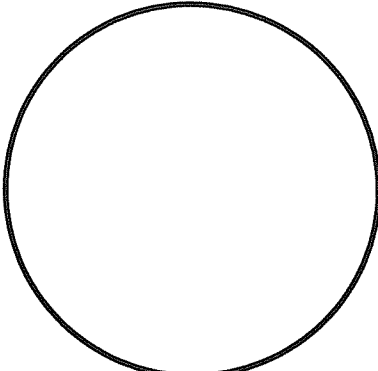
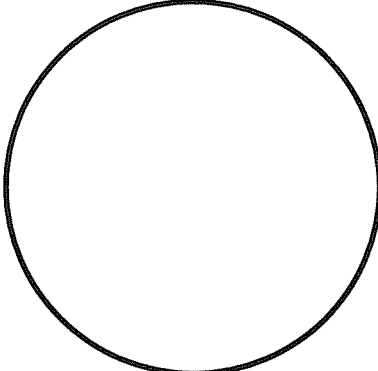
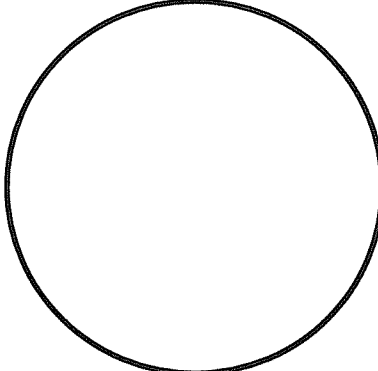
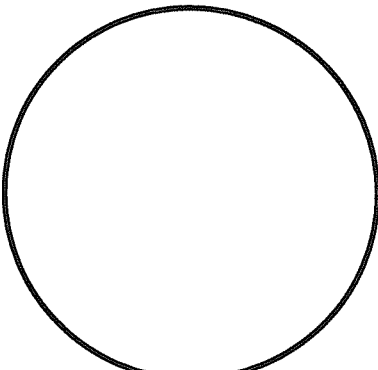
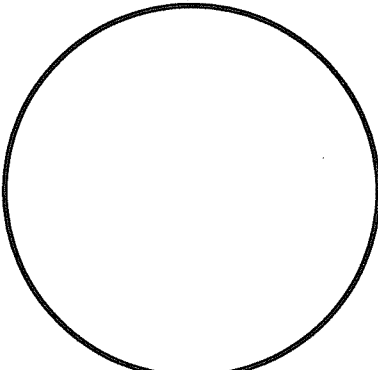
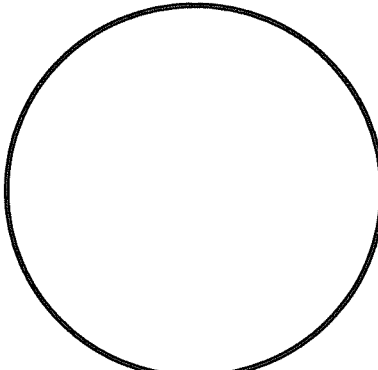
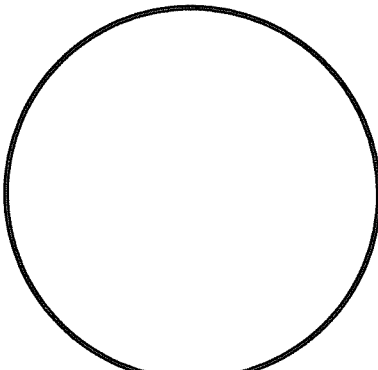
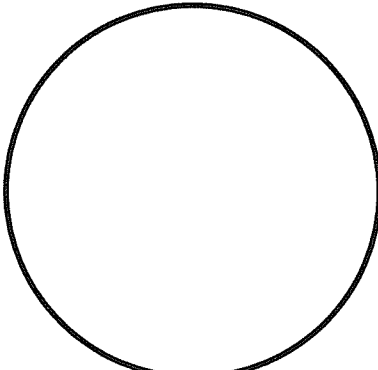
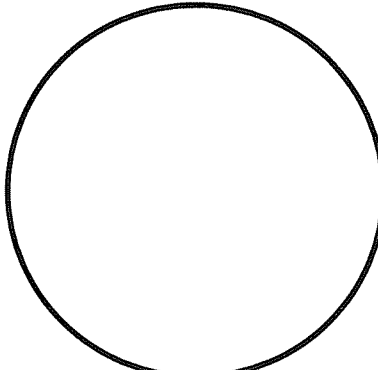
Orange - 4 to 6 seconds

Yellow - 7 to 10 seconds

Red - more than 10 seconds or a wrong answer.

Practice - Make multiple copies.

1									
2									
3									
4									
5									
6									
7									
8									
9									
+	1	2	3	4	5	6	7	8	9

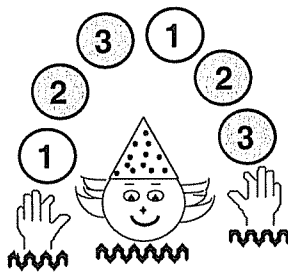
		
		
		
		

Circle Math Addition Board 2

The board is divided into three columns by a vertical line between the second and third columns. Each column contains a sequence of shapes from top to bottom: a circle, a plus sign, a circle, an equals sign, and a rectangle. The plus sign between the second and third rectangles is positioned below the second rectangle.

Circle Math Addition - Practice
Three Circles

Date _____



$$\begin{array}{r}
 \square = \bigcirc + \bigcirc + \bigcirc \\
 + \square = \bigcirc + \bigcirc + \bigcirc \\
 \hline
 \square = \bigcirc + \bigcirc + \bigcirc \\
 \\
 \square = \bigcirc + \bigcirc + \bigcirc \\
 + \square = \bigcirc + \bigcirc + \bigcirc \\
 \hline
 \square = \bigcirc + \bigcirc + \bigcirc
 \end{array}$$

Make your own.

$$\begin{array}{r}
 \square = \bigcirc + \bigcirc + \bigcirc \\
 + \square = \bigcirc + \bigcirc + \bigcirc \\
 \hline
 \square = \bigcirc + \bigcirc + \bigcirc
 \end{array}$$

Patterns in Arithmetic

Addition: Booklet 3

Regrouping into Four Digits

Answer Key

for the

Student Workbook

By Suki Glenn and Susan Carpenter

Answer Key Legend

AWV = answer(s) will vary Cuisenaire Rods

BUWV = break up will vary 1 w = white

OWV = order will vary 2 r = red

Pattern Blocks

r = red trapezoid

g = green triangle

y = yellow hexagon

o = orange square

b = blue parallelogram

t = tan rhombus

3 lg = light green

4 p = purple

5 y = yellow

6 dg = dark green

7 bk = black

8 bn = brown

9 bl = blue

10 o = orange

Note: Some items and pages are left out of the answer key.

1) Some pages in which the answers are open-ended or will vary.

2) Make your own problems. Since students create their own problems and solutions, these sections give valuable information about the level of confidence and competence. It can be a useful source of curriculum for other students.

3) Practice pages.

4) Workboards.

5) The answers are in the Parent/Teacher Guide.

Patterns in Arithmetic: Addition - Booklet 3

Answer Key for the Student Workbook

©2010 Pattern Press

Published by Pattern Press

P.O. Box 2737

Fallbrook, CA 92088

All rights reserved.



Printed on recycled paper.

ISBN 978-1-935559-51-1

Circle Math Addition - Worksheet 1
Missing Numbers

$\begin{array}{r} \boxed{12} = \textcircled{4} + \textcircled{1} + \textcircled{7} \\ + \boxed{13} = \textcircled{1} + \textcircled{7} + \textcircled{5} \\ \hline \boxed{25} = \textcircled{5} + \textcircled{8} + \textcircled{12} \end{array}$	$\begin{array}{r} \boxed{12} = \textcircled{10} + \textcircled{2} \\ + \boxed{12} = \textcircled{10} + \textcircled{2} \\ \hline \boxed{24} = \textcircled{20} + \textcircled{4} \end{array}$
$\begin{array}{r} \boxed{13} = \textcircled{8} + \textcircled{4} + \textcircled{1} \\ + \boxed{19} = \textcircled{11} + \textcircled{2} + \textcircled{6} \\ \hline \boxed{32} = \textcircled{19} + \textcircled{6} + \textcircled{7} \end{array}$	$\begin{array}{r} \text{Buwv} \\ \boxed{16} = \textcircled{\quad} + \textcircled{6} \\ + \boxed{5} = \textcircled{\quad} + \textcircled{\quad} \\ \hline \boxed{21} = \textcircled{10} + \textcircled{11} \end{array}$
$\begin{array}{r} \boxed{19} = \textcircled{15} + \textcircled{2} + \textcircled{2} \\ + \boxed{9} = \textcircled{5} + \textcircled{3} + \textcircled{1} \\ \hline \boxed{23} = \textcircled{20} + \textcircled{5} + \textcircled{3} \end{array}$	$\begin{array}{r} \boxed{19} = \textcircled{10} + \textcircled{9} \\ + \boxed{14} = \textcircled{10} + \textcircled{4} \\ \hline \boxed{33} = \textcircled{20} + \textcircled{13} \end{array}$

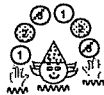
8

9

Circle Math Addition - Worksheet 2
Missing Numbers Buwv

$\begin{array}{r} \boxed{16} = \textcircled{\quad} + \textcircled{\quad} + \textcircled{6} \\ + \boxed{9} = \textcircled{\quad} + \textcircled{\quad} + \textcircled{5} \\ \hline \boxed{25} = \textcircled{\quad} + \textcircled{\quad} + \textcircled{11} \end{array}$	$\begin{array}{r} \boxed{11} = \textcircled{6} + \textcircled{5} \\ + \boxed{15} = \textcircled{10} + \textcircled{5} \\ \hline \boxed{26} = \textcircled{16} + \textcircled{10} \end{array}$
$\begin{array}{r} \boxed{12} = \textcircled{4} + \textcircled{5} + \textcircled{3} \\ + \boxed{8} = \textcircled{0} + \textcircled{4} + \textcircled{4} \\ \hline \boxed{20} = \textcircled{4} + \textcircled{9} + \textcircled{7} \end{array}$	$\begin{array}{r} \boxed{4} = \textcircled{2} + \textcircled{2} \\ + \boxed{14} = \textcircled{12} + \textcircled{2} \\ \hline \boxed{18} = \textcircled{14} + \textcircled{4} \end{array}$
$\begin{array}{r} \boxed{13} = \textcircled{10} + \textcircled{0} + \textcircled{3} \\ + \boxed{18} = \textcircled{2} + \textcircled{7} + \textcircled{9} \\ \hline \boxed{31} = \textcircled{12} + \textcircled{7} + \textcircled{12} \end{array}$	$\begin{array}{r} \boxed{12} = \textcircled{5} + \textcircled{7} \\ + \boxed{2} = \textcircled{2} + \textcircled{0} \\ \hline \boxed{14} = \textcircled{7} + \textcircled{7} \end{array}$

Circle Math Addition: Three Digits
Worksheet 1
Use Base Ten Blocks



Example:

$132 =$		$=$	$\textcircled{100} + \textcircled{30} + \textcircled{2}$
$+235 =$		$+$	$\textcircled{200} + \textcircled{30} + \textcircled{5}$
$367 =$		$=$	$\textcircled{300} + \textcircled{60} + \textcircled{7}$
$136 =$		$=$	$\textcircled{100} + \textcircled{30} + \textcircled{6}$
$+213 =$		$+$	$\textcircled{200} + \textcircled{10} + \textcircled{3}$
$349 =$		$=$	$\textcircled{300} + \textcircled{40} + \textcircled{9}$
$232 =$		$=$	$\textcircled{200} + \textcircled{30} + \textcircled{2}$
$+153 =$		$+$	$\textcircled{100} + \textcircled{50} + \textcircled{3}$
$385 =$		$=$	$\textcircled{300} + \textcircled{80} + \textcircled{5}$

10

Answer Key: Addition - Booklet 3

Circle Math Addition: Three Digits
Worksheet 2

Example

$236 =$		$=$	$\textcircled{200} + \textcircled{30} + \textcircled{6}$
$+127 =$		$+$	$\textcircled{100} + \textcircled{20} + \textcircled{7}$
$363 =$		$=$	$\textcircled{300} + \textcircled{60} + \textcircled{3}$
$246 =$		$=$	$\textcircled{200} + \textcircled{40} + \textcircled{6}$
$+218 =$		$+$	$\textcircled{200} + \textcircled{10} + \textcircled{8}$
$464 =$		$=$	$\textcircled{400} + \textcircled{60} + \textcircled{4}$
$319 =$		$=$	$\textcircled{300} + \textcircled{10} + \textcircled{9}$
$+237 =$		$+$	$\textcircled{200} + \textcircled{30} + \textcircled{7}$
$556 =$		$=$	$\textcircled{500} + \textcircled{50} + \textcircled{6}$

13

Circle Math Addition: Three Digits
Worksheet 3

206 =		=	$(200) + (0) + (6)$
+ 138 = +		= +	$(100) + (30) + (8)$
<hr/>		=	$(300) + (40) + (4)$
236 =		=	$(200) + (30) + (6)$
+ 136 = +		= +	$(100) + (30) + (6)$
<hr/>		=	$(300) + (70) + (2)$
348 =		=	$(300) + (40) + (8)$
+ 237 = +		= +	$(200) + (30) + (7)$
<hr/>		=	$(500) + (80) + (5)$

14

Circle Math Addition: Three Digits
Worksheet 5

Example: $\begin{matrix} B & U & W & V \\ 100 & 20 & 6 \end{matrix}$

$\begin{matrix} 126 \\ + 237 \\ \hline 363 \end{matrix}$	$\begin{matrix} 345 \\ + 128 \\ \hline 473 \end{matrix}$
$\begin{matrix} 129 \\ + 155 \\ \hline 284 \end{matrix}$	$\begin{matrix} 315 \\ + 267 \\ \hline 582 \end{matrix}$
$\begin{matrix} 328 \\ + 137 \\ \hline 465 \end{matrix}$	$\begin{matrix} 244 \\ + 528 \\ \hline 772 \end{matrix}$

16

Circle Math Addition: Three Digits
Worksheet 4

257 =		=	$(200) + (50) + (7)$
+ 169 = +		= +	$(100) + (60) + (9)$
<hr/>		=	$(400) + (20) + (6)$
153 =		=	$(100) + (50) + (3)$
+ 458 = +		= +	$(400) + (50) + (8)$
<hr/>		=	$(600) + (10) + (1)$
332 =		=	$(300) + (30) + (2)$
+ 288 = +		= +	$(200) + (80) + (8)$
<hr/>		=	$(600) + (20) + (0)$

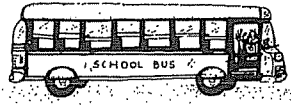
15

Circle Math Addition: Three Digits
Worksheet 6

$\begin{matrix} 156 \\ + 279 \\ \hline 435 \end{matrix}$	$\begin{matrix} 634 \\ + 108 \\ \hline 742 \end{matrix}$
$\begin{matrix} 189 \\ + 255 \\ \hline 444 \end{matrix}$	$\begin{matrix} 167 \\ + 396 \\ \hline 563 \end{matrix}$
$\begin{matrix} 483 \\ + 55 \\ \hline 538 \end{matrix}$	$\begin{matrix} 289 \\ + 78 \\ \hline 367 \end{matrix}$

17

Gus the Bus Driver



Gus, the bus driver, drives groups on field trips during the weekends. In May, he drove senior citizens on tours. One was 186 miles long and one was 118 miles. How many miles did they travel? 304
Show your work.

$$\begin{array}{r} 186 \\ + 118 \\ \hline 304 \end{array}$$

In June, his trip odometer showed trips of 76 miles, 420, and 73 miles. What was his total for June? 569 Round off about how many more miles did he travel in June than May? 300
Show your work.

$$\begin{array}{r} 76 \\ 420 \\ + 73 \\ \hline 569 \end{array}$$

$$\begin{array}{r} 569 \\ - 304 \\ \hline 265 \rightarrow 300 \end{array}$$

In July, he drove a bus of special Olympians to their tournament, a 472 miles round trip. He also drove a chartered bus of legislators to four pollution problem sites 248 miles. How many miles did he drive in July? 720
Show your work.

$$\begin{array}{r} 472 \\ + 248 \\ \hline 720 \end{array}$$

How many miles did he drive in May, June, and July? 1,593
Show your work.

$$\begin{array}{r} 304 \\ 569 \\ + 720 \\ \hline 1,593 \end{array}$$

18

Circle Math Addition: Four Digits - Worksheet 1

3,143 = = (3,000) + (100) + (40) + (3)

+ 1,235 = = + (1,000) + (200) + (30) + (5)

4,378 = = (4,000) + (300) + (70) + (8)

1,237 = = (1,000) + (200) + (30) + (7)

+ 2,530 = = + (2,000) + (500) + (30) + (0)

3,767 = = (3,000) + (700) + (60) + (7)

3,127 = = (3,000) + (100) + (20) + (7)

+ 4,254 = = + (4,000) + (200) + (50) + (4)

7,381 = = (7,000) + (300) + (80) + (1)

20

Expanded Addition

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

$$\begin{array}{r} 20 \\ + 20 \\ \hline 40 \end{array}$$

$$\begin{array}{r} 200 \\ + 200 \\ \hline 400 \end{array}$$

$$\begin{array}{r} 2,000 \\ + 2,000 \\ \hline 4,000 \end{array}$$

$$\begin{array}{r} 2,222 \\ + 2,222 \\ \hline 4,444 \end{array}$$

$$\begin{array}{r} 3 \\ + 3 \\ \hline 6 \end{array}$$

$$\begin{array}{r} 30 \\ + 30 \\ \hline 60 \end{array}$$

$$\begin{array}{r} 300 \\ + 300 \\ \hline 600 \end{array}$$

$$\begin{array}{r} 3,000 \\ + 30 \\ \hline 3,030 \end{array}$$

$$\begin{array}{r} 3,333 \\ + 3,333 \\ \hline 6,666 \end{array}$$

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

$$\begin{array}{r} 40 \\ + 40 \\ \hline 80 \end{array}$$

$$\begin{array}{r} 400 \\ + 400 \\ \hline 800 \end{array}$$

$$\begin{array}{r} 4,000 \\ + 4,400 \\ \hline 8,400 \end{array}$$

$$\begin{array}{r} 4,444 \\ + 4,444 \\ \hline 8,888 \end{array}$$

$$5 + 5 = 10$$

$$500 + 50 = 550$$

$$5 + 5,055 = 5,060$$

$$50 + 50 = 100$$

$$500 + 505 = 1,005$$

19

Circle Math Addition: Four Digits - Worksheet 2

3,155 = = (3,000) + (100) + (50) + (5)

+ 1,269 = = + (1,000) + (200) + (60) + (9)

4,424 = = (4,000) + (400) + (20) + (4)

1,353 = = (1,000) + (300) + (50) + (3)

+ 1,269 = = + (1,000) + (200) + (60) + (9)

2,622 = = (2,000) + (600) + (20) + (2)

21

Circle Math Addition: Four Digits - Worksheet 3

1,576 = = (1,000) + (500) + (70) + (6)

2,768 = = + (2,000) + (700) + (60) + (8)

3,344 = = (3,000) + (300) + (40) + (4)

3,597 = = (3,000) + (500) + (90) + (7)

+ 4,648 = = + (4,000) + (600) + (40) + (8)

8,245 = = (8,000) + (200) + (40) + (5)

22

Circle Math Addition: Four Digits - Worksheet 4

B U W V

$\begin{array}{r} 1,236 \\ + 2,142 \\ \hline 3,378 \end{array}$	$\begin{array}{r} 2,316 \\ + 1,352 \\ \hline 3,668 \end{array}$
$\begin{array}{r} 1,433 \\ + 1,464 \\ \hline 2,897 \end{array}$	$\begin{array}{r} 1,232 \\ + 2,042 \\ \hline 3,274 \end{array}$
$\begin{array}{r} 2,035 \\ + 2,142 \\ \hline 2,177 \end{array}$	$\begin{array}{r} 1,340 \\ + 3,241 \\ \hline 4,581 \end{array}$

Circle Math Addition: Four Digits - Worksheet 6

$\begin{array}{r} 3,136 \\ + 1,797 \\ \hline 4,933 \end{array}$	$\begin{array}{r} 4,638 \\ + 1,362 \\ \hline 6,000 \end{array}$	$\begin{array}{r} 6,563 \\ + 1,565 \\ \hline 8,128 \end{array}$	$\begin{array}{r} 8,613 \\ + 1,249 \\ \hline 9,862 \end{array}$
$\begin{array}{r} 2,867 \\ + 3,586 \\ \hline 6,453 \end{array}$	$\begin{array}{r} 3,842 \\ + 3,479 \\ \hline 7,321 \end{array}$	$\begin{array}{r} 2,724 \\ + 6,578 \\ \hline 9,302 \end{array}$	$\begin{array}{r} 3,086 \\ + 2,349 \\ \hline 5,435 \end{array}$
$\begin{array}{r} 1,447 \\ + 3,567 \\ \hline 5,014 \end{array}$	$\begin{array}{r} 3,179 \\ + 2,341 \\ \hline 5,520 \end{array}$	$\begin{array}{r} 7,207 \\ + 2,496 \\ \hline 9,703 \end{array}$	$\begin{array}{r} 2,753 \\ + 6,768 \\ \hline 9,521 \end{array}$
$\begin{array}{r} 3,982 \\ + 1,383 \\ \hline 5,365 \end{array}$	$\begin{array}{r} 2,274 \\ + 7,395 \\ \hline 9,669 \end{array}$	$\begin{array}{r} 5,468 \\ + 1,851 \\ \hline 7,319 \end{array}$	$\begin{array}{r} 1,457 \\ + 5,657 \\ \hline 7,114 \end{array}$
$\begin{array}{r} 2,769 \\ + 5,035 \\ \hline 7,804 \end{array}$	$\begin{array}{r} 8,247 \\ + 1,084 \\ \hline 9,331 \end{array}$	$\begin{array}{r} 5,352 \\ + 2,648 \\ \hline 8,010 \end{array}$	$\begin{array}{r} 5,346 \\ + 6,889 \\ \hline 12,235 \end{array}$

$$\begin{array}{r} 100\ 10 \\ 1\ 3\ 2 \\ + 2\ 4\ 8 \\ \hline 10,370 \end{array}$$

What's wrong with this problem? Ten ones were carried into the tens column and written as 10 tens instead of 1 ten. Then, the incorrect 10 tens were carried into the hundreds column and written as 100 hundreds.

Please correct it and explain how you fixed it.

Circle Math Addition: Four Digits - Worksheet 5

$\begin{array}{r} 2,346 \\ + 1,367 \\ \hline 3,713 \end{array}$	$\begin{array}{r} \text{Expanded} \\ 2,346 = 2,000 + 300 + 40 + 6 \\ + 1,367 = 1,000 + 300 + 60 + 7 \\ \hline 3,713 \end{array}$
$\begin{array}{r} 4,386 \\ + 3,578 \\ \hline 7,964 \end{array}$	$\begin{array}{r} \text{Expanded} \\ 4,386 = 4,000 + 300 + 80 + 6 \\ + 3,578 = 3,000 + 500 + 70 + 8 \\ \hline 7,964 \end{array}$
$\begin{array}{r} 4,753 \\ + 2,698 \\ \hline 7,451 \end{array}$	$\begin{array}{r} \text{Expanded} \\ 4,753 = 4,000 + 700 + 50 + 3 \\ + 2,698 = 2,000 + 600 + 90 + 8 \\ \hline 7,451 \end{array}$
$\begin{array}{r} 2,547 \\ + 1,482 \\ \hline 4,029 \end{array}$	$\begin{array}{r} \text{Expanded} \\ 2,547 = 2,000 + 500 + 40 + 7 \\ + 1,482 = 1,000 + 400 + 80 + 2 \\ \hline 4,029 \end{array}$
$\begin{array}{r} 5,378 \\ + 2,284 \\ \hline 7,662 \end{array}$	$\begin{array}{r} \text{Expanded} \\ 5,378 = 5,000 + 300 + 70 + 8 \\ + 2,284 = 2,000 + 200 + 80 + 4 \\ \hline 7,662 \end{array}$

Families of Facts - Worksheet 1

~~4 2 6~~ ~~7 8 5~~ ~~6 4 2~~

Use only the three numbers in the box to make four number sentences.

$\begin{array}{c} \text{7 4 11} \\ (7) + (4) = (11) \\ (4) + (7) = (11) \\ (11) - (7) = (4) \\ (11) - (4) = (7) \end{array}$	$\begin{array}{c} \text{6 10 4} \\ (6) + (4) = (10) \\ (4) + (6) = (10) \\ (10) - (6) = (4) \\ (10) - (4) = (6) \end{array}$	$\begin{array}{c} \text{18 11 7} \\ (11) + (7) = (18) \\ (7) + (11) = (18) \\ (18) - (11) = (7) \\ (18) - (7) = (11) \end{array}$
$\begin{array}{c} \text{9 12 A} \\ (A) + (9) = (12) \\ (9) + (A) = (12) \\ (12) - (A) = (9) \\ (12) - (9) = (A) \end{array}$	$\begin{array}{c} \text{7 8 F} \\ (7) + (8) = (F) \\ (8) + (7) = (F) \\ (F) - (7) = (8) \\ (F) - (8) = (7) \end{array}$	$\begin{array}{c} \text{24 13 11} \\ (11) + (13) = (24) \\ (13) + (11) = (24) \\ (24) - (11) = (13) \\ (24) - (13) = (11) \end{array}$

Make your own. Challenge!

$\begin{array}{c} \text{A W V} \\ \square + \square = \square \\ \square + \square = \square \\ \square - \square = \square \\ \square - \square = \square \end{array}$	$\begin{array}{c} \square \\ \square + \square = \square \\ \square + \square = \square \\ \square - \square = \square \\ \square - \square = \square \end{array}$	$\begin{array}{c} \text{A B C} \\ (A) + (B) = (C) \\ (B) + (A) = (C) \\ (C) - (A) = (B) \\ (C) - (B) = (A) \end{array}$
---	--	---

Families of Facts - Worksheet 2



Use only the three numbers in the box to make four number sentences.

20 30 50	24 28 52	700 500 200
$20 + 30 = 50$	$24 + 28 = 52$	$200 + 500 = 700$
$30 + 20 = 50$	$28 + 24 = 52$	$500 + 200 = 700$
$50 - 20 = 30$	$52 - 24 = 28$	$700 - 200 = 500$
$50 - 30 = 20$	$52 - 28 = 24$	$700 - 500 = 200$

500 100	150 400 550	275 650 925
$100 + 400 = 500$	$150 + 400 = 550$	$275 + 650 = 925$
$400 + 100 = 500$	$400 + 150 = 550$	$650 + 275 = 925$
$500 - 100 = 400$	$550 - 150 = 400$	$925 - 275 = 650$
$500 - 400 = 100$	$550 - 400 = 150$	$925 - 650 = 275$

or
 $500 + 100 = 600$

or
 $250 + 150 = 400$

or
 $375 + 275 = 650$

27

Missing Numbers

③ Ⓐ + ⑤ — 10	Ⓑ ③ + ⑧ — 14	⑥ ⑤ + ① — 15	② ⓧ + ⑨ — 16
A = 2	B = 3	C = 4	X = 5

⑧ Ⓐ + ⑦ — 20	Ⓒ ③ + ⑥ — 17	⑥ ④ + ⑧ — 19	Ⓙ ④ + ⑧ — 21
N = 5	G = 8	T = 5	J = 9

⑦ Ⓐ + ⑨ — 24	Ⓜ ② + ⑥ — 14	⑤ ③ + ⑤ — 18	Ⓨ ② + ⑧ — 22
P = 8	M = 6	S = 8	Y = 12

28

Patterns in Sums: Column Addition - Worksheet 1

3 2 + 5 — 10	4 3 + 8 — 15	3 5 + 7 — 15	2 6 + 9 — 17
4 3 2 + 8 — 17	8 6 3 + 2 — 19	7 4 3 + 4 — 18	3 9 0 + 6 — 18
3 5 4 9 + 5 — 26	5 9 1 2 + 3 — 20	2 3 5 9 + 7 — 26	2 3 4 7 + 8 — 24
23 32 86 23 44 + 28 — 236	22 45 23 32 24 + 13 — 159	30 10 34 20 44 + 24 — 162	13 34 32 23 18 + 34 — 154

29

Patterns in Sums: Column Addition - Worksheet 2

$\begin{array}{r} 27 \\ 34 \\ 86 \\ 43 \\ 61 \\ + 79 \\ \hline 330 \end{array}$	$\begin{array}{r} 84 \\ 28 \\ 17 \\ 72 \\ 33 \\ + 96 \\ \hline 330 \end{array}$	$\begin{array}{r} 75 \\ 19 \\ 65 \\ 43 \\ 81 \\ + 27 \\ \hline 310 \end{array}$
$\begin{array}{r} 27 \\ 69 \\ 76 \\ 83 \\ + 31 \\ \hline 286 \end{array}$	$\begin{array}{r} 38 \\ 76 \\ 52 \\ 44 \\ + 55 \\ \hline 265 \end{array}$	$\begin{array}{r} 29 \\ 83 \\ 27 \\ 23 \\ + 81 \\ \hline 243 \end{array}$
$\begin{array}{r} 29 \\ 86 \\ 61 \\ + 64 \\ \hline 140 \end{array}$	$\begin{array}{r} 38 \\ 46 \\ 72 \\ + 66 \\ \hline 222 \end{array}$	$\begin{array}{r} 33 \\ 46 \\ 84 \\ + 63 \\ \hline 226 \end{array}$
$\begin{array}{r} 77 \\ 99 \\ 66 \\ 31 \\ 13 \\ + 55 \\ \hline 341 \end{array}$	$\begin{array}{r} 80 \\ 69 \\ 23 \\ 38 \\ 62 \\ + 97 \\ \hline 289 \end{array}$	$\begin{array}{r} 73 \\ 47 \\ 16 \\ 76 \\ 86 \\ + 94 \\ \hline 392 \end{array}$

30

Circle Math: Equality - Worksheet 1

Two Circles

$$\begin{aligned} (3) + (2) &= (4) + (1) \\ (5) + (3) &= (4) + (4) \\ (2) + (7) &= (3) + (6) \\ (1) + (9) &= (8) + (2) \\ (2) + (10) &= (AwV) + (\quad) \\ (12) + (5) &= (8) + (9) \end{aligned}$$

31

Circle Math: Equality - Worksheet 3

Two Circles Solve using the easiest way you found.

$$\begin{aligned} (6) + (7) &= (7) + (6) \\ (5) + (4) &= (4) + (5) \\ (9) + (6) &= (6) + (9) \\ (10) + (7) &= (7) + (10) \\ (7) + (8) &= (8) + (7) \\ (4) + (9) &= (4) + (9) \end{aligned}$$

The easiest way is called the Commutative Property. Write a definition of the Commutative Property.

Changing the order of the addends does not change the sum.

33

Circle Math: Equality - Worksheet 2

Two Circles

$$\begin{aligned} (1) + (10) &= (AwV) + (\quad) \\ (3) + (6) &= (AwV) + (\quad) \\ (7) + (4) &= (4) + (7) \\ (4) + (9) &= (AwV) + (\quad) \\ (2) + (6) &= (2) + (6) \\ (3) + (AwV) &= (\quad) + (3) \end{aligned}$$

Which ones were the easiest? Why?

$7+4=4+7$ $2+6=2+6$

32

Circle Math: Equality - Worksheet 4

Three Circles

AWV

Example:

$$\begin{aligned} (10) + (12) + (7) &= (12) + (7) + (10) \\ (5) + (13) + (6) &= (\quad) + (\quad) + (\quad) \\ (13) + (6) + (7) &= (\quad) + (\quad) + (\quad) \\ (12) + (9) + (8) &= (\quad) + (\quad) + (\quad) \\ (15) + (7) + (6) &= (\quad) + (\quad) + (\quad) \\ (10) + (35) + (20) &= (\quad) + (\quad) + (\quad) \end{aligned}$$

34

Practice - Worksheet 1

Solve these problems.

If the answer begins with:

Color the space:

- 6 →
- 7 →
- 8 →
- 9 →

Correct answers make a design.



$\begin{array}{r} 528 \\ + 144 \\ \hline 682 \end{array}$	$\begin{array}{r} 370 \\ + 559 \\ \hline 929 \end{array}$	$\begin{array}{r} 531 \\ + 176 \\ \hline 707 \end{array}$	$\begin{array}{r} 312 \\ + 586 \\ \hline 898 \end{array}$
$\begin{array}{r} 533 \\ + 386 \\ \hline 919 \end{array}$	$\begin{array}{r} 277 \\ + 339 \\ \hline 616 \end{array}$	$\begin{array}{r} 539 \\ + 269 \\ \hline 808 \end{array}$	$\begin{array}{r} 252 \\ + 485 \\ \hline 737 \end{array}$
$\begin{array}{r} 2,379 \\ + 2,749 \\ \hline 6,128 \end{array}$	$\begin{array}{r} 2,474 \\ + 6,565 \\ \hline 9,039 \end{array}$	$\begin{array}{r} 3,369 \\ + 3,768 \\ \hline 7,137 \end{array}$	$\begin{array}{r} 2,962 \\ + 5,846 \\ \hline 8,808 \end{array}$
$\begin{array}{r} 3,828 \\ + 5,449 \\ \hline 9,277 \end{array}$	$\begin{array}{r} 4,284 \\ + 2,434 \\ \hline 6,718 \end{array}$	$\begin{array}{r} 6,739 \\ + 1,347 \\ \hline 8,086 \end{array}$	$\begin{array}{r} 4,952 \\ + 2,347 \\ \hline 7,299 \end{array}$

35

Practice - Worksheet 2

$$\begin{array}{r} 2,106 \\ + 4,792 \\ \hline 6,898 \end{array}$$

$$\begin{array}{r} 7,608 \\ + 1,202 \\ \hline 8,810 \end{array}$$

$$\begin{array}{r} 3,365 \\ + 1,765 \\ \hline 5,130 \end{array}$$

$$\begin{array}{r} 7,753 \\ + 1,562 \\ \hline 9,315 \end{array}$$

$$\begin{array}{r} 2,247 \\ + 4,886 \\ \hline 7,133 \end{array}$$

$$\begin{array}{r} 4,842 \\ + 3,429 \\ \hline 8,271 \end{array}$$

$$\begin{array}{r} 2,174 \\ + 6,378 \\ \hline 8,552 \end{array}$$

$$\begin{array}{r} 2,358 \\ + 3,449 \\ \hline 5,807 \end{array}$$

$$\begin{array}{r} 2,447 \\ + 6,553 \\ \hline 9,000 \end{array}$$

$$\begin{array}{r} 1,359 \\ + 8,341 \\ \hline 9,700 \end{array}$$

$$\begin{array}{r} 5,204 \\ + 2,892 \\ \hline 8,096 \end{array}$$

$$\begin{array}{r} 4,743 \\ + 3,208 \\ \hline 7,951 \end{array}$$

$$\begin{array}{r} 3,942 \\ + 7,383 \\ \hline 11,325 \end{array}$$

$$\begin{array}{r} 2,244 \\ + 7,325 \\ \hline 9,569 \end{array}$$

$$\begin{array}{r} 5,369 \\ + 1,831 \\ \hline 7,200 \end{array}$$

$$\begin{array}{r} 2,447 \\ + 5,557 \\ \hline 8,004 \end{array}$$

$$\begin{array}{r} 2,519 \\ + 5,005 \\ \hline 7,524 \end{array}$$

$$\begin{array}{r} 2,547 \\ + 1,074 \\ \hline 3,621 \end{array}$$

$$\begin{array}{r} 5,562 \\ + 2,688 \\ \hline 8,250 \end{array}$$

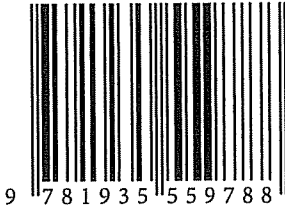
$$\begin{array}{r} 5,443 \\ + 6,859 \\ \hline 12,302 \end{array}$$

36

Patterns in Arithmetic: Addition - Booklet 3 PDF
Regrouping into Four Digits
Parent/Teacher Guide

ISBN 978-1-935559-78-8

ISBN 978-1-935559-78-8



9 7 8 1 9 3 5 1 5 5 9 7 8 8