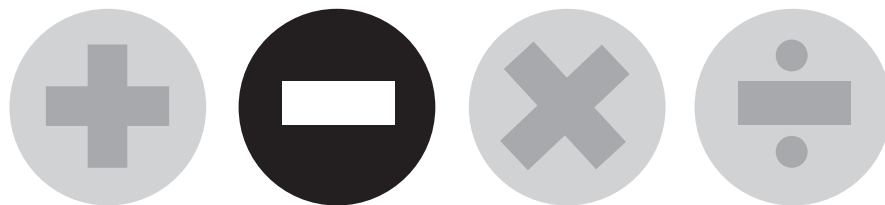


THINKING STRATEGIES: SUBTRACTION

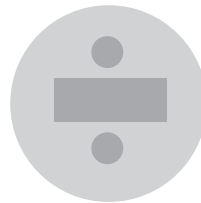
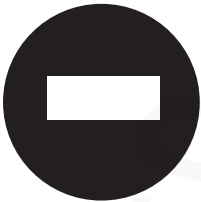
BUILDING MASTERY OF SUBTRACTION FACTS



CELIA BARON

MathImagine

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INTRODUCTION

PROGRAM GOAL

Thinking Strategies: Subtraction is a program designed to help students master the basic subtraction facts. The program accomplishes this goal by introducing the facts in logical rather than numerical order. The program uses the mathematical processes of communication, connections, reasoning, representation, and problem solving to encourage learning. Teachers can use *Thinking Strategies: Subtraction* with an entire class, small groups, or individual students.

WHAT ARE THE BASIC SUBTRACTION FACTS?

The basic subtraction facts are combinations, like $6 - 2$ or $15 - 9$, in which the subtrahends (numbers being subtracted) and differences (answers) are less than 10. Because our number system is a base-ten number system however, the program also includes subtraction facts in which the subtrahends and differences are 10, as well as the numbers that are less than 10.

INTRODUCING TERMS

The program levels use the terms minuend, subtrahend, and difference to identify facts. Consider the subtraction sentence $6 - 2 = 4$. The number 6 is called the *minuend*, the number 2 is called the *subtrahend*, and the answer, 4, is called the *difference*. The terms *minuend* and *subtrahend* are not easy terms. In this program, the minuend is referred to as the *sum*. The operation of subtraction is related to the operation of addition. For example, the subtraction sentence $6 - 2 = 4$ has the related addition sentence $4 + 2 = 6$. The minuend, 6, in the fact $6 - 2 = 4$ is the sum of its related addition fact $4 + 2 = 6$. The term *subtrahend* is only used in the teacher lessons to identify facts. It is not used on the student activity sheets.

When the subtraction fact $6 - 2$ is written vertically, the sum (*minuend*) is the top number and the subtrahend is the bottom number. One way to remember the term *subtrahend* is by thinking of a submarine under the water. The *subtrahend* is the number on the bottom.

WHAT IS MASTERY OF THE BASIC FACTS?

In his book, *Elementary and Middle School Mathematics*, John Van de Walle (2001) defines mastery of a basic fact as a quick response time of less than three seconds. When a student is able to correctly respond to a fact automatically and without thinking, he/she has mastered that fact.

Building mastery of the basic facts involves the following four stages:

- Stage 1: incorrect response/an inappropriate thinking strategy
- Stage 2: correct response in more than three seconds using an appropriate thinking strategy

- Stage 3: correct response within three seconds using an appropriate thinking strategy
- Stage 4: correct response that is automatic and occurs without thinking

Mastery develops with practice (reviewing a variety of facts or procedures). Student activity sheets such as Power Facts, Partner Bingos, Card Games, Number Cube Games, and Challenge Facts provide practice throughout the program.

Mastering the Basic Facts: The Latest Research

Van de Walle states that all students are able to master the basic facts if they follow three steps:

1. develop a strong understanding of the operations and number relationships
2. develop efficient thinking strategies for fact retrieval
3. practice the use and selection of those strategies

WHAT IS A “THINKING STRATEGY”?

A thinking strategy is a way of thinking that helps complete a fact *quickly*. For a strategy to be a thinking strategy, it must be done *mentally*, and it must be efficient.

The more senses you can involve when introducing the facts, the greater the likelihood students will remember how to complete the facts. Different strategies work for different students. By providing a variety of strategies, students can choose what works best for them. Some strategies are visual – for example, as picturing facts on ten-frames. Many of the strategies involve patterns and connecting facts that students have yet to learn with facts they already know how to complete.

PROGRAM LEVELS

The *Thinking Strategies: Subtraction* program is divided into six levels. The first three levels consider subtraction facts with sums less than or equal to 10; the last three levels consider the basic subtraction facts with sums greater than 10. Each level begins by having the students model the facts introduced in that level. These models are visual representations of the facts and help students understand why a fact is completed the way it is. Once the students have developed and understand the strategies of that level of the program, they practice them. The facts are then incorporated with the facts introduced in previous levels. At the end of each level, a Level Challenge activity helps students identify and apply thinking strategies to the facts introduced to that point of the program.

Level 1: The first level examines the basic subtraction facts with a subtrahend of 0, 1, 2, or 3. It introduces the concept of subtraction, and most of the models used in the program. Students first interpret the operation of subtraction

as “taking away,” and the first strategy they use to complete subtraction facts is a counting back strategy. This level introduces the count-back thinking strategy for completing facts with a subtrahend of 1, 2, or 3.

The first level of the program also connects the operation of subtraction to that of addition. Students are asked to broaden their interpretation of subtraction from “taking away,” to finding the missing part in a part-part-all relationship. In Level 1, students are asked to check their answers to subtraction facts with related addition facts.

Level 2: The second level examines the basic subtraction facts with a sum of 10. These facts can be used as helping facts to complete other subtraction facts. Facts with a sum of 10 can be modelled on ten-frames and completed by the think-addition strategy. Completing these facts with the think-addition strategy encourages the students to connect the operation of subtraction to that of addition.

Level 3: The third level examines the remaining subtraction facts with sums less than or equal to 10. This level introduces the count-up thinking strategy for completing facts with a difference (answer) of 1, 2, or 3. Students are again encouraged to connect the operation of subtraction to that of addition. The think-addition strategy is listed as the first thinking strategy in completing subtraction facts from this level onwards.

Level 4: The fourth level examines subtraction facts with a subtrahend or a difference of either 9 or 10. This is the first group of facts with sums greater than 10 introduced in the program. There are patterns for these facts that make them easier to complete. This level introduces the 10-between fact strategy. This thinking strategy can be used to complete not only the facts introduced in this level but all the basic subtraction facts with sums greater than 10.

Level 5: The fifth level examines the subtraction facts that have related addition facts that are either double or near-double facts. This level introduces the helping double strategy to complete subtraction facts.

Level 6: The sixth level examines the remaining basic subtraction facts. By this level there are only twelve subtraction facts that have not been introduced. A variety of thinking strategies are developed for these facts.

PROGRAM COMPONENTS

Teacher Lessons

The lessons give clear directions for working through the program and provide instructions that teachers can use to help students master the subtraction facts. The lessons involve working with models and developing a strong understanding of the operation of subtraction and number relationships. Students are encouraged to find as many strategies as possible for completing the facts. With many strategies to choose from, students soon find the strategies that work best for them.

Class Discussion

Class discussions are an integral part of the program. The following are some statements and questions that can be used to encourage student participation in class discussions:

- Explain and justify your answer.
- Explain your answer in another way.
- Can someone else explain the answer in another way?
- As a group, describe a different way to find the answer.
- If you did not know how to complete this fact, what thinking strategy would you use?
- What is another fact that you can complete this way?
- How can you model this fact with a picture?
- How can you model this fact with another picture?
- How does this model explain the fact?
- Make up a story problem for this fact.
- How does your story problem illustrate the fact?
- Explain how the two facts are related.
- Explain how the two operations are related.

Practice for Students

The student activity sheets support understanding of number relationships and give students practice with the basic subtraction facts. The activity sheets, which consist mainly of secret messages, line designs, and number designs are intended to be fun and engaging. They have the added advantage of being mainly self-correcting.

The program makes it easy to monitor the progress of students. A level challenge activity is provided at the end of each level. The Level Mystery Number Challenge checks each student's ability to identify and apply the appropriate thinking strategies to the facts introduced to that point in the program. Teachers can keep track of students' progress in other ways. As the students complete each level of the program, have them make a list of the facts they have yet to master. Have the students practice these facts both at school with a classmate and at home with a parent. When the student is able to complete these facts, check them off on the student's progress report (page 154). Teachers can also check which facts their students can complete while they are working on the activity sheet that accompanies each lesson.

At the completion of a level, teachers will find suggestions for more practice. Students who have not yet mastered the facts introduced in that level can still continue to the next level of the program. They will have more opportunities to practice these facts in the levels that follow.

Addition/Subtraction Grid

At the beginning of the program, hand out a copy of the Addition/Subtraction grid to each student (page 242). In each level of the program, students are asked to fill in the grid for the facts they have been introduced to. Teachers may also want to keep a master grid.

Power Facts

There are six sets of Power Facts (pages 146-153) – one set for each level in the program. Each set has 20 facts. The facts consist of those that are introduced in each level plus some of the more difficult facts from previous levels. The Power Facts are asked only after the thinking strategies for those facts have been fully developed.

The Power Facts are intended to support the learning of the subtraction facts. Ask these facts in class each day. Allow students no more than three seconds to complete each fact on their answer sheets, and then read out the subtraction fact and its difference (answer). If the students have been unable to complete the fact in three seconds, or if they have completed it incorrectly, have them write the completed fact on their answer sheet. Wait 5-7 seconds between facts to give the students time to process the fact. Students can measure their improvement each day, as they are able to complete more facts correctly.

Each set of Power Facts is given in rows and columns. It is important to change the order in which the facts are asked. One day ask them vertically, the next day horizontally, then from top to bottom, and another day from bottom to top.

Partner Bingo

Partner Bingo (page 163) is a two-player game. Students can play it in class or at home with parents and siblings. Players have a bingo card and 16 facts that they take turns completing. As they complete each fact in order, they shade in one square on their bingo card. The same number might appear in more than one box on the bingo card, and the students must choose which to fill in. The first player to complete a row, column, or diagonal is the winner.

Partner Bingo provides practice with the basic subtraction facts in a fun game setting. The games are a positive way for parents to determine which subtraction facts their children are able to complete and which facts need more practice. There are Partner Bingo games in each level of the program.

Playing Cards

Playing cards (pages 228-237), are provided for levels 1, 2, 4, 5, and 6 of the program. A “deck” of playing cards consists of forty cards, ten sets of four cards each. Each set consists of four different ways to represent a fact. The cards can be laminated. The students can play various card games with these decks, including War, Fish, Snap, and Concentration.

Number Cube Games

Designs for number cubes for Levels 2, 3, and 6 are provided in the program (pages 238-239). Each cube design consists of 6 numbers that can be placed on the six faces of a blank cube. The numbers on the opposite faces of each cube all have the same sum. Students can play various games with the cubes. For example, have students write the number from each of the six sides of the cube twice on a piece of paper. They then take turns rolling the cube and crossing off the numbers that, together with the one rolled, add to the sum of that cube. The first student to cross off all his/her numbers wins.

Challenge Facts

The Challenge Facts (page 195) consist of subtraction facts for each level of the program. Recent research does not support using timed tests to help students master the facts. Some students become very anxious when faced with timed tests, and this can affect their sense of their ability to do mathematics.

The Challenge Facts are included in the program as a diagnostic tool. Teachers can use these sheets to find out which facts the students have mastered and which facts they have not mastered.

Students can circle the facts on the Challenge Facts sheets that require more practice. There are no time limits for completing the Challenge Facts. Discourage students from guessing. Completing a fact incorrectly reinforces the incorrect answer.

There are two types of Challenge Facts, *A* and *B*, in all levels except Level 1. Type *A* Challenge Facts consist of the facts introduced in a particular level. These also include addition facts with missing addends. Type *B* Challenge Facts contain all of the facts introduced in the program up to that level. Students can use the Level *A* Challenge Facts to practice the facts developed in that level. Students can use the Level *B* Challenge Facts to practice all the facts introduced to that point. Students can also use the Challenge Facts to practice identifying facts. To do this, students can draw shapes or use coloured pencils to identify facts that are completed with the same strategies.

Teacher Assessment

The intent of the program is not only to have the students master the basic facts, but also to have them do so in a positive manner. The evaluation and assessment should reflect this. Continuous assessment and evaluation allow recognition of student achievement. When students are successful in mastering the facts, they feel good about themselves and about their ability to learn. A powerful assessment tool is to have the students keep track of the facts that they have mastered. Doing so allows the students to see how much they are learning and gives them a sense of accomplishment.

The National Council of Teachers of Mathematics recommends the integration of assessment and instruction. The program *Thinking Strategies: Subtraction* supports this integration. The student activity sheet that accompanies each lesson allows teachers to assess whether or not the students are following the program. As well, many of the activities are self-correcting and allow the students to know if they have understood the lessons.

Teachers can also use the Power Facts to assess the progress of students. Students can hand in their Power Facts answer sheets each day, or they can track their own progress. With either method, the teacher can use the results to complete the students' progress reports. A student progress report for each level is included in the program (page 154).

Student Self-Assessment

In this program, students can track which facts they have mastered and which facts they have yet to master. As they complete each level of the program, have students write about the facts they are learning in their journals. Ask them to indicate whether or not the facts in the level that they are working on are easy for them to complete. Have them explain why or why not. They may want to list both the facts they have mastered and the ones they have yet to master. Have them describe thinking strategies for the facts they have yet to master. If students need help in identifying thinking strategies, work with them to find the strategies. A student self-assessment progress report for each level is included in the program (pages 155-160).

Using Individual Response Boards

Student response boards can be either a chalkboard or a dry-erase board made of laminated sheets of cardboard. In classrooms where each student has a response board, the students can write the differences of the facts on their boards. Teachers can check off the students' progress reports as the students show the answers on their boards.

Teachers in classes with no response boards can have students mouth the answer. This method of response provides students with opportunities to answer a question, and it allows the teacher to monitor the progress of his/her students.

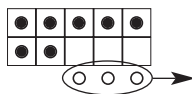
Parental Guidance

Teachers might want to involve parents in the learning process. Power Facts and thinking strategies can be sent home with students so that they can practice the facts with their parents as they are being taught the facts in class. Parents can also help their children by playing Partner Bingo with them.

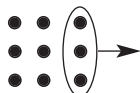
MODELS USED IN THE PROGRAM

The following models are used in the program:

- **Ten-Frames:** A ten-frame is an array of 2 rows and 5 columns in which counters or dots represent numbers. The top row is filled in first, beginning on the left. Once the top row is full, the second row is filled in, again beginning on the left. For example, the fact $10 - 3$ can be illustrated by the following ten-frame.



- **Dot Patterns:** The dot pattern modelling the fact $9 - 3$ consists of 9 dots in which 3 dots are being separated from the other 6 dots.



- **Number Lines:** The fact $8 - 6$ can be modelled on the number line model with 1 hop of length two from the number 6 to the number 8.



Addition/Subtraction buddies appear on each student activity sheet. The buddies illustrate a fact introduced in that lesson of the program. The fact is usually the first fact of the activity sheet.

LANGUAGES IN SUBTRACTION

Van de Walle explains that it is useful to think of number sentences, models, and word problems as three separate languages. For example, the fact $10 - 2$ can be expressed in the following ways:

- A number sentence would be $10 - 2 = 8$.
- A model could be a ten-frame containing 10 counters from which 2 counters are removed, leaving 8 counters.
- A word problem could be a story problem involving separating 10 pencils into two sets, one set containing 2 pencils, and asking how many pencils are in the other set.

When students complete a fact, having them translate from one language to another helps them develop operation meaning. Many facts at each level are introduced with story problems. As well, students are encouraged to create their own story problems throughout the program.

DIFFERENT CLASSES OF STRUCTURES FOR SUBTRACTION

Van de Walle explains that most researchers identify four categories of subtraction problems. These categories, based on the kind of relationships involved, are the following: join problems, change and initial unknown; separate problems, result and change unknown; part-part-all problems, part unknown; compare problems, difference and smaller unknown.

Join Problems

- **Change Unknown**

Amy has 5 erasers. Her sister gives her some more erasers. Now Amy has 9 erasers. How many erasers did her sister give her?

- **Initial Unknown**

Adam has some scribbles. His mother bought him 4 more. Now Adam has 7 scribbles. How many scribbles did Adam have to begin with?

Separate Problems

- **Result Unknown**

Leah has 5 pencils. She gives her friend Cathy 2 pencils. How many pencils does Leah have now?

- Change Unknown

Brian had 10 marbles. He gave some to Garrett. Now Brian has 7 marbles. How many marbles did Brian give Garrett?

Part-Part-All Problem

- Part Unknown

Aisha has 5 pets. Three of her pets are turtles and the rest are goldfish. How many goldfish does Aisha have?

Compare Problems

- Difference Unknown

Danny has 9 markers and Callie has 7 markers. How many more markers does Danny have than Callie?

- Smaller Unknown

Danica has 3 fewer books than her sister Candace. If Candace has 8 books, how many books does Danica have?

Thinking Strategies: Subtraction encourages the use of story problems. Teachers are encouraged to include situations with humour to make the story problems more relevant and engaging for students.

LEVEL 1: FACTS WITH SUBTRAHENDS OF 0, 1, 2, AND 3

LEVEL 1 OVERVIEW

In Level 1, students are introduced to all the basic subtraction facts with a subtrahend of 0, 1, 2, or 3, and to number relationships they can and should develop with numbers 1 through 10. These number relationships are the basis of building an understanding of the operation of subtraction and of the thinking strategies introduced in this program. The importance of these relationships cannot be overstated.

Number Relationships 1 Through 10

Van de Walle, in his book *Elementary and Middle School Mathematics*, lists four relationships that students can and should develop with numbers 1 through 10.

- spatial relationships
- one- and two-more-than, one- and two-less-than relationships
- anchors or benchmarks of 5 and 10
- part-part-all relationships (part-part whole relationships)

These relationships are considered in more detail in the program *Thinking Strategies: Addition*. If your students need more practice with these relationships, consider the activities suggested in the first level of that program.

Spatial Relationships

Spatial relationships refer to the student's ability to recognize how many objects there are in sets of 1 to 10 patterned arrangements, without having to count the objects. Students who can recognize dots in patterns have developed this relationship. The program *Thinking Strategies: Subtraction* models subtraction facts with dot patterns.

The One- and Two-More-Than, One- and Two-Less-Than Relationships

Other relationships that students should develop for the numbers 1 through 10 are the one- and two-more-than, and one- and two-less-than relationships (Van de Walle 2001). These relationships involve more than just the ability to count one or two more or count back one or two less. The relationships involve the understanding that, for example, the number 7 is one less than the number 8, and two less than the number 9. Completing subtraction facts with a subtrahend of 1 or 2 involves the one-less-than and two-less-than relationships.

Before students are able to develop these relationships, they must first be able to count up from 1 to 10 and count back from 10 to 1. To check that students can do this, start with a number less than 10. For example, start with the number 4, and have the students count up to 9. Or start with number 8, and have the students count back to 5.

IMPORTANT! Check to make sure your students are able to count back from a number less than or equal to 10.

Anchoring Numbers to 5 and 10

Our number system is a base ten number system. Because two fives make ten, the numbers 5 and 10 can serve as anchors for number relationships.

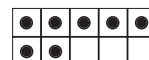
- Students can anchor the numbers 6 and 7 to the number 5. They can think of the number 6 as 5 and 1, and the number 7 as 5 and 2. Students can anchor the number 4 to the number 5. They can think of 4 as 5 less 1.
- Students can anchor the numbers 8 and 9 to the number 10. They can think of 9 as 10 less 1, and 8 as 10 less 2.

These relationships are very important and will help the students in completing their subtraction facts.

Introducing the Ten-Frame

The most powerful model for anchoring the numbers to 5 and 10 is the ten-frame. The ten-frame is an array of 2 rows and 5 columns in which counters or dots are placed to illustrate numbers.

Give each student a ten-frame mat and counters (page 243). Ask the students to use the counters to display the number 7 on their ten-frame. Have them fill the top row first, beginning on the left. Once the first row is full, have them place the remaining counters in the second row, again beginning on the left. Have the students note that 7 is displayed as 5 and 2.



The ten-frame is a powerful model because it allows the students to visually anchor numbers from 1 to 10 to the numbers 5 and 10. Students can picture the subtraction facts they are completing. The more senses involved in learning, the more effective the learning will be. The ten-frame is used throughout the program.

Part-Part-All Relationships

Conceptualizing a number as being made up of two or more parts is the most important relationship a child can develop about numbers (Van de Walle 2001). The part-part-all relationship is fundamental to understanding subtraction. Van de Walle states that the concept of subtraction as a "taking away" is a narrow definition. He suggests interpreting subtraction as finding the missing part of a part-part-all relationship.

Note: This part-part-all relationship can also be referred to as a part-part-whole relationship.

This interpretation of subtraction is introduced in Level 1. Developing students' understanding of the operation of subtraction from one of "taking away," to one of connecting it to addition is stressed throughout the program. In the first level, students are asked to check their subtraction facts with

related addition facts. In the next level, they will complete subtraction facts by thinking of their related addition facts.

The thinking strategies introduced in this level are:

The Count-Back Strategy

The count-back strategy is an efficient strategy for a fact in which 1, 2, or 3 is being subtracted. Consider the fact $9 - 2$. It can be completed using the count-back strategy.

Have the students say 9, pause, and then count back 8, 7. Have them emphasize both the 9 and the 7. Have them count back with rhythm. You can clap your hands on the 8 and 7 as they count back. Have the students note that when they count back 2 from 9, they do not include the 9 in the count.

Thinking Strategy: Subtract-1 Fact

Most students do not have to count back to complete subtract-1 facts. They can use the one-less-than relationship to complete these facts. For example, consider the subtraction fact $9 - 1$.

$9 - 1$

- Number Relationship:

One less than 9 is 8.
SO, $9 - 1 = 8$

Note: Since most students do not have to count back to complete subtract-1 facts, counting-back is not listed as a strategy for this fact. If students need to count back to complete this fact, check that they are able to count back correctly.

Addition Check

Have the students check the subtraction facts they have completed by naming their related addition facts. For example, consider the fact $9 - 1 = 8$. A related addition fact is $8 + 1 = 9$.

Thinking Strategies: Subtract-2 Fact

Many students can use the two-less-than relationship to complete subtract-2 facts. Others may still have to count-back to complete these facts.

Consider, for example, the fact $9 - 2$.

$9 - 2$

- Number Relationship:

Two less than 9 is 7.
SO, $9 - 2 = 7$

- Count-Back Fact:

Count back 2 from 9.
 $9 \rightarrow 8, 7$
SO, $9 - 2 = 7$

Note: Check that students are able to count back correctly.

Thinking Strategy: Subtract-3 Fact

Subtraction facts with a subtrahend of 3 can be completed with the count-back strategy.

Consider, for example, the fact $9 - 3$.

$9 - 3$

- Count-Back Fact:

Count back 3 from 9.
 $9 \rightarrow 8, 7, 6$
SO, $9 - 3 = 6$

Note: Check that students are able to count back correctly.

Thinking Strategy: Subtract-0 Fact

The thinking strategy for a subtract-0 fact with a subtrahend of 0 is the following.

$9 - 0$

- Number Relationship:

The difference between a number and 0 is the number.
SO, $9 - 0 = 9$

Level 1 consists of the following lessons:

Lesson 1A: Dot Pattern Rally with Subtrahends of 1, 2, and 3

This lesson introduces the operation of subtraction and the spatial relationships for the numbers 1 through 10.

Lesson 1B: Secret Message with Subtrahends of 1, 2, and 3

In this lesson, students practice counting back from 10 to 1. This lesson also introduces the one-less-than and two-less-than relationships.

Lesson 1C: Match-Ups with Subtrahends of 1, 2, and 3

This lesson introduces thinking strategies for facts with subtrahends of 1, 2, and 3. The count-back strategy is introduced for completing these facts.

Lesson 1D: Dot-to-Dot with Subtrahends of 1, 2, and 3

This lesson connects the operation of subtraction to the operation of addition. The part-part-all relationship is introduced.

Lesson 1E: Zany Table with Subtrahends of 1, 2, and 3

This lesson introduces the ten-frame model.

Lesson 1F: Jellybean Jumble with Subtrahends of 0, 1, 2, and 3

This lesson introduces subtraction facts with a subtrahend of 0.

Lesson 1G: Secret Message with Subtrahends of 0, 1, 2, and 3

In this lesson, students complete facts with a subtrahend of 0, 1, 2, or 3 by identifying and applying the appropriate thinking strategies.

Lesson 1H: Number Design with Subtrahends of 0, 1, 2, and 3

In this lesson, students continue to complete facts with a subtrahend of 0, 1, 2, or 3 by identifying and applying the appropriate thinking strategies. Students are also introduced to even and odd numbers.

Lesson 1I: The Level 1 Mystery Number Challenge

This challenge assesses the students' ability to identify and apply appropriate thinking strategies to the facts introduced in Level 1. Students also review models and vocabulary introduced so far in the program.

ADDITION/SUBTRACTION GRID

The addition/subtraction grid for the facts introduced in this level is the following:

–	0	1	2	3	4	5	6	7	8	9	10
0	0	1	2	3							
1	1	2	3	4							
2	2	3	4	5							
3	3	4	5	6							
4	4	5	6	7							
5	5	6	7	8							
6	6	7	8	9							
7	7	8	9	10							
8	8	9	10								
9	9	10									
10	10										

LESSON 1A: DOT PATTERN RALLY WITH SUBTRAHENDS OF 1, 2, AND 3

TEACHER LESSON

In this lesson, students are introduced to the operation of subtraction. They are also introduced to spatial relationships for the numbers 1 to 10.

Introducing the Operation of Subtraction

Present the following story problem to the students.

- Travis has 6 video games. He gives his best friend, Adam, 2 of them. How many video games does Travis have now?

Have the students draw a picture illustrating the story problem and then have them solve the story problem.

Note: This story problem illustrates the structure of separating (result unknown). Other structures for subtraction are possible and are discussed in the Introduction to the program.

- Travis has 4 video games now.

Ask the students to represent this story problem as a subtraction sentence.

- $6 - 2 = 4$ (6 minus 2 is 4)

Interpreting the Operation of Subtraction

Students first interpret the operation of subtraction as “taking away.” The above story problem can be interpreted as follows: “Take 2 videos away from 6 videos. That leaves 4 videos.”

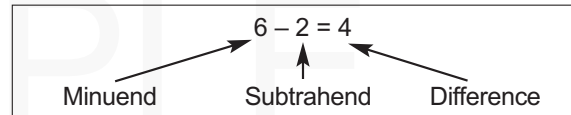
As students develop their understanding of the operation of subtraction, they relate it to the operation of addition. The relationship between the operations of addition and subtraction is an important one and will be developed as students work through the program.

Students are first introduced to the relationship between the operations of addition and subtraction in Lesson 1D. In Lesson 1E, they are asked to check their subtraction sentences with a related addition sentence. In the next levels, they are encouraged to use related addition facts to complete subtraction facts. Some students will use this relationship as their primary thinking strategy for completing subtraction facts. Encourage them to do so.

Introductory Terms

Tell the students that in the subtraction sentence, $6 - 2 = 4$, the answer is called the *difference*.

The number 6 is called the *minuend*, while the number 2 is called the *subtrahend*. The terms minuend and subtrahend are not easy terms and are only used in the teacher lessons to identify facts. They are not used in the student activity sheets.



When the subtraction fact $6 - 2$ is written vertically, the minuend is the top number and the subtrahend is the bottom number. You may prefer to use the terms *top number* and *bottom number* with the students.

Note: One way to remember the term *subtrahend* is by thinking of a submarine under the water. The subtrahend is the number on the bottom. The minuend, the number representing the quantity becoming less, is the number on the top.

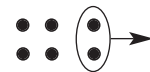
Spatial Relationships

Spatial relationships refer to the ability to recognize how many objects there are in sets of 1 to 10 patterned arrangements, without having to count the objects. It is one of the important number relationships students should develop for the numbers 1 through 10.

Note: Refer to the program *Thinking Strategies: Addition*. Activities and a “deck” of playing cards that support the development of this relationship are provided in Level 1 of the program.

Modelling Facts

- Dot Patterns: The dot pattern model for the subtraction fact $6 - 2$ is the following:



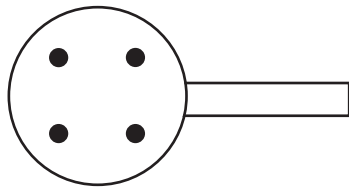
Addition/Subtraction Buddies: The buddies show the subtraction fact $6 - 2$.

Encouraging Class Discussion

Engaging students in whole-class discussions is an integral part of the program. Prompts for encouraging class discussions can be found on page 2 of the Introduction.

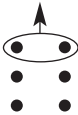
INTRODUCING THE STUDENT ACTIVITY SHEET

Distribute a copy of the sheet, Dot Pattern Rally, to each student. Read the instructions aloud as a class, and have the students complete the activity.

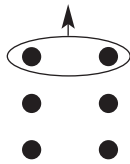


Dot Pattern Rally

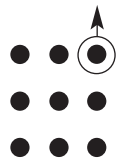
You can show the subtraction fact $6 - 2$ with the following dot pattern:

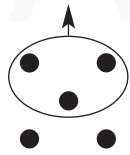


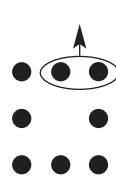
The answer to the subtraction fact is 4, and is called the *difference*. Below, name the subtraction sentence each dot pattern shows, or draw a dot pattern showing the subtraction fact, and complete the sentence. Do what the sentence at the bottom of the page asks.

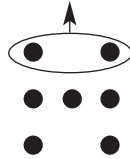


$$6 - 2 = 4$$



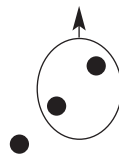




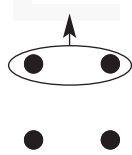


$$4 - 1 = \underline{\hspace{2cm}}$$

$$10 - 2 = \underline{\hspace{2cm}}$$



$$7 - 1 = \underline{\hspace{2cm}}$$



$$9 - 3 = \underline{\hspace{2cm}}$$

Name three subtraction sentences with a difference of 7. Show these sentences with dot patterns.

LESSON 1B: SECRET MESSAGE WITH SUBTRAHENDS OF 1, 2, AND 3

TEACHER LESSON

In this lesson, students practice counting back from 10 to 1. The lesson also introduces the one-less-than and two-less-than relationships for the numbers 1 through 10.

Counting Back From 10 to 1

Check whether the students can count back from 10 to 1. Next, check that students can count back to a specified number when they are given a number less than or equal to 10. For example, have them count back from 8 to 4 or from 9 to 3. Continue to have them do this until they can do it confidently.

Note: If students have difficulty counting back from 10 to 1, check to see if they can count up from 1 to 10.

The One-Less-Than and Two-Less-Than Relationships

Both the one-less-than and two-less-than relationships are important relationships students should develop for the numbers 1 through 10.

Present the subtraction fact $6 - 1$ to the students. Ask them to explain what this fact means to them, and ask them to complete it. Ask them to explain how they completed it. If students say they just know that one less than 6 is 5, they have developed the one-less-than relationship for numbers less than or equal to 10.

Next, present the subtraction fact $8 - 2$ to the students. Ask them to explain what this fact means to them, and then ask them to complete it. Have the students explain how they completed it. If they say they just know that two less than the number 8 is 6, they have developed the two-less-than relationship for numbers less than or equal to 10.

Counting Back 1, 2, or 3 from a Number Less Than or Equal to 10

If students need to count back to complete the fact $8 - 2$, suggest they count back as follows: Have them say 8, pause, then count back 7, 6. Have them emphasize both the 8 and the 6. Have them count back with rhythm. You can also clap your hands on the 7 and 6 as they count back.

Demonstrate how to count back a few times, and then have them count back aloud as a class. Have the students note that when they count back 2 from 8, they *do not* include the 8 in the count.

Next, present other numbers from 3 to 10, and have the students count back as you clap your hands.

Continue to do this throughout the first level until students can count back 2 successfully from any number less than or equal to 10.

When students can easily count back 2, present subtraction facts like $7 - 3$, in which the number 3 is being subtracted. Suggest the students complete the fact by counting back 3 in a similar fashion: Have them say the number 7, pause and then say 6, 5, 4. Have them emphasize the number 7, say 6, 5, 4 with rhythm, and emphasize 4 at the end of the count. Have the students note that when they count back 3 from 7, they *do not* include the 7 in the count.

Note: Check that students can recognize one to three claps.

Note: If students are using their fingers to complete subtraction facts, encourage them to try to complete the facts without using their fingers.

Note: For students who can complete the fact $7 - 3$ by thinking of a related addition fact or another subtraction fact, encourage them to do so. These strategies will be developed later in the program.

Encouraging Class Discussion

Engaging students in whole-class discussions is an integral part of the program. Prompts for encouraging class discussions can be found on page 2 of the Introduction

INTRODUCING THE STUDENT ACTIVITY SHEET

Distribute a copy of the sheet, Secret Message, to each student. Read the instructions aloud as a class, and have the students complete the activity.

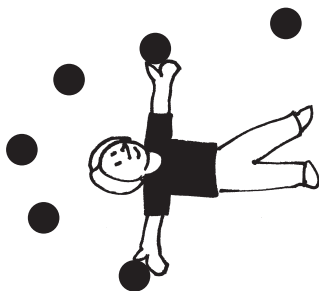
Note: Take time to explain how the blanks are completed in this Secret Message. All the Secret Messages in the program are completed in the same way. If students have difficulty completing the code, have them write the letter that matches each difference beside each fact. Then have them place these letters in the blanks, one after the other. Some students keep a finger on the fact; others check off each fact as they place its matching letter in the Secret Message.

Secret Message

Complete the facts. The first completed fact is $6 - 1 = 5$. In the Code Key, find the number 5. The letter above 5 is *W*. The letter *W* is written in the first blank.

The second completed fact is $7 - 3 = 4$. In the Code Key, find the number 4. The letter above 4 is *H*. Write the letter *H* in the second blank.

Complete the remaining facts, and fill in the rest of the blanks to find the secret message.



When are people like the wheels of a car?

W $\frac{1}{1}$ $\frac{2}{2}$ $\frac{3}{3}$ $\frac{4}{4}$ $\frac{5}{5}$ $\frac{6}{6}$ $\frac{7}{7}$ $\frac{8}{8}$ $\frac{9}{9}$ $\frac{10}{10}$ $\frac{11}{11}$ $\frac{12}{12}$ $\frac{13}{13}$ $\frac{14}{14}$ $\frac{15}{15}$ $\frac{16}{16}$

Code Key	Y	A	D	T	H	W	R	E	I	N
	0	1	2	3	4	5	6	7	8	9

① $\frac{6}{-1} - \frac{7}{-3} = \frac{8}{-4}$ ② $\frac{7}{-3} - \frac{9}{-2} = \frac{10}{-4}$ ③ $\frac{9}{-2} - \frac{10}{-1} = \frac{10}{-1}$ ④ $\frac{10}{-1} - \frac{10}{-1} = \frac{6}{-3}$ ⑤ $\frac{6}{-3} - \frac{6}{-3} = \frac{5}{-1}$ ⑥ $\frac{5}{-1} - \frac{6}{-3} = \frac{10}{-3}$ ⑦ $\frac{10}{-3} - \frac{5}{-1} = \frac{8}{-2}$

⑧ $\frac{3}{-2} - \frac{9}{-3} = \frac{10}{-2}$ ⑨ $\frac{9}{-3} - \frac{9}{-2} = \frac{10}{-2}$ ⑩ $\frac{9}{-3} - \frac{9}{-2} = \frac{10}{-2}$ ⑪ $\frac{9}{-2} - \frac{9}{-2} = \frac{10}{-2}$ ⑫ $\frac{5}{-2} - \frac{5}{-2} = \frac{10}{-2}$ ⑬ $\frac{10}{-2} - \frac{10}{-2} = \frac{9}{-3}$ ⑭ $\frac{9}{-3} - \frac{9}{-3} = \frac{8}{-1}$ ⑮ $\frac{8}{-1} - \frac{9}{-3} = \frac{16}{-3}$ ⑯ $\frac{16}{-3} - \frac{9}{-3} = \frac{5}{-3}$

LESSON 1C: MATCH-UPS WITH SUBTRAHENDS OF 1, 2, AND 3

TEACHER LESSON

In this lesson, students use the count-back thinking strategy to complete facts with a subtrahend of 1, 2, and 3.

Note: Although all subtraction facts can be completed with this strategy, it is not an efficient strategy if the counting back involves more than 3 counts. In this program, the count-back strategy will only be listed for facts with a subtrahend of 1, 2, or 3.

Practicing Counting Back

Continue to present numbers between 3 and 10, and have the students count back 1, 2, or 3 from the number presented.

Introducing the Thinking Strategy for Subtract-1 Facts

Present the fact $9 - 1$ to the students. Ask them to explain what the fact means to them, and ask them to complete it. Most students do not have to count back to complete subtract-1 facts. They can use the one-less-than relationship to complete these facts as follows:

9 – 1

- Number Relationship:

One less than 9 is 8.

$$\text{SO, } 9 - 1 = 8$$

Note: Since most students do not have to count back to complete subtract-1 facts, counting-back is not listed as a strategy for this fact. If students need to count back to complete this fact, check they are able to count back correctly.

Introducing the Thinking Strategies for Subtract-2 Facts

Present the fact $9 - 2$ to the students. Ask them to explain what the fact means to them, and have them complete the fact. Many students do not have to count back to complete subtract-2 facts. They can use the two-less-than relationship to complete these facts.

9 – 2

- Number Relationship:

Two less than 9 is 7.

$$\text{SO, } 9 - 2 = 7$$

- Count-Back Fact:

Count back 2 from 9.

$$9 \rightarrow 8, 7$$

$$\text{SO, } 9 - 2 = 7$$

Note: Encourage students to count back 2 as follows. Have them emphasize 9, pause, then count back 8, 7. Check they are able to count back correctly.

Introducing the Thinking Strategy for Subtract-3 Facts

Present the fact $9 - 3$ to the students. Ask them to explain what the fact means to them, and ask them to complete the fact. The students can complete the fact using the count-back strategy as follows:

9 – 3

- Count-Back Fact:

$$9 \rightarrow 8, 7, 6$$

$$\text{SO, } 9 - 3 = 6$$

Note: Encourage the students to complete this fact by counting back 3. Have them emphasize 9, pause, then count back 8, 7, 6. Check that students are able to count back correctly.

Note: For students who can complete this fact by thinking of a related addition fact or another subtraction fact, encourage them to do so. These strategies will be developed later in the program.

Creating Story Problems

Ask the students to create a story problem involving the fact $9 - 3$. You might suggest the story problem involves pencils. Have the students solve their own story problems and illustrate them. When students interpret subtraction facts as story problems, it reinforces their concept of the operation of subtraction.

Encouraging Class Discussion

Engaging students in whole-class discussions is an integral part of the program. Prompts for encouraging class discussions can be found on page 2 of the Introduction.

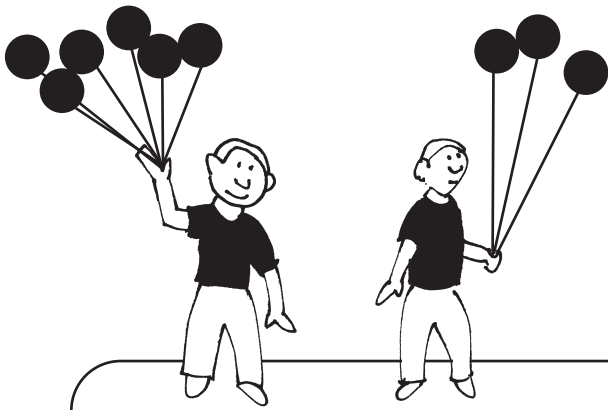
INTRODUCING THE STUDENT ACTIVITY SHEET

Distribute a copy of the sheet, Match-Ups, to each student. Read the instructions aloud as a class, and have the students complete the activity.

Note: Students will find that the connecting lines of each set of subtraction facts form a pattern. They can use the patterns to check their work. Some students enjoy connecting the lines with different coloured pencils.

COMPLETING THE GRID

Have the students shade in their addition/subtraction grid for facts with a subtrahend of 1, 2, and 3. These facts are in three columns of the grid.



Match-Ups

Complete each subtraction fact by connecting the dot beside the fact to the dot beside its difference. Use a ruler to keep the lines straight. When you have completed the “match-ups,” do what the sentences at the bottom of the page ask you to do.

$9 - 3 \cdot$

$\cdot 9$

$8 - 2 \cdot$

$\cdot 4$

$5 - 3 \cdot$

$\cdot 6$

$7 - 3 \cdot$

$\cdot 7$

$6 - 2 \cdot$

$\cdot 2$

$10 - 3 \cdot$

$\cdot 8$

$10 - 1 \cdot$

$\cdot 4$

$9 - 1 \cdot$

$\cdot 6$

$8 - 3 \cdot$

$\cdot 5$

$6 - 3 \cdot$

$\cdot 3$

$9 - 2 \cdot$

$\cdot 8$

$4 - 2 \cdot$

$\cdot 9$

$4 - 3 \cdot$

$\cdot 7$

$10 - 1 \cdot$

$\cdot 5$

$5 - 2 \cdot$

$\cdot 1$

$7 - 2 \cdot$

$\cdot 1$

$10 - 2 \cdot$

$\cdot 3$

$2 - 1 \cdot$

$\cdot 2$

What thinking strategy did you use for completing the fact $9 - 3$? Explain in words and with a picture.

LESSON 1D: DOT-TO-DOT WITH SUBTRAHENDS OF 1, 2, AND 3

TEACHER LESSON

In this lesson, students are introduced to the part-part-all relationship and the relationship between the operations of addition and subtraction.

Interpreting the Operation of Subtraction

Present the following story problem to the students:

- Chantal has 6 balloons she brought back from her friend Katya's birthday party. She gives 3 of these balloons to her younger sister. How many balloons does Chantal now have?

Have the students draw a picture illustrating the story problem. Have them solve the story problem and represent it as a number sentence.

- $6 - 3 = 3$
Chantal now has 3 balloons.

Continue the story problem as follows:

- Later that day, her sister decides to give the balloons back to Chantal. How many balloons does Chantal have now?

Have the students draw a picture illustrating the story problem. Have them solve the story problem and represent it as a number sentence.

- $3 + 3 = 6$ (3 and 3 makes 6)
Chantal now has 6 balloons.

Part-Part-All Relationship

It is most important for students to be able to conceptualize a number as being made up of two or more parts. The part-part-all relationship is fundamental to understanding both addition and subtraction. The models used in the program reinforce the part-part-all relationship. This relationship can also be referred to as the part-part-whole relationship.

Van de Walle (2001) believes the "take away" definition of subtraction is a narrow one and suggests broadening it with the part-part-all relationship as follows: In a part-part-all relationship, when the *all* and *one of the parts* are known, subtraction names the other part.

This definition is in agreement with the definition of "take away." Consider, for example, the story problem involving balloons presented in this lesson. If the *all* is a set of 6 balloons and you take away a set of 3 balloons, you are left with a set of 3 balloons. The two sets of 3 balloons are the *parts*, and the set of 6 balloons is the *all*.

Relating the Operations of Addition and Subtraction

Have students consider the number sentences $3 + 3 = 6$ and $6 - 3 = 3$.



Have students note that the answer to the addition fact is the first number (on the left) in the subtraction fact.

Students will be encouraged to connect the operations of addition and subtraction as they work through the program. In the next lesson, they will be asked to check their completed subtraction facts with a related addition fact. In Level 2, they will complete subtraction facts by thinking of a related addition fact.

Introducing Terms for Addition

Tell the students that in an addition sentence, the parts are called *addends* and the all is called the *sum*. In the addition sentence $3 + 3 = 6$, the numbers 3 and 3 are called the *addends*, and the answer, 6, is called the *sum*.

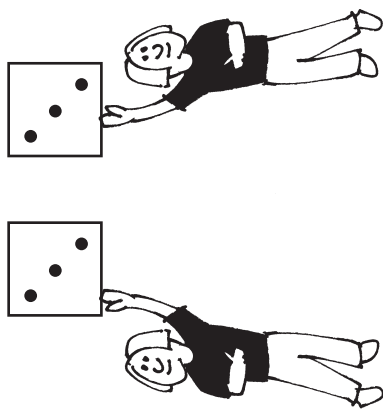
Encouraging Class Discussion

Engaging students in whole-class discussions is an integral part of the program. Prompts for encouraging class discussions can be found on page 2 of the Introduction.

INTRODUCING THE STUDENT ACTIVITY SHEET

Distribute a copy of the sheet, Dot-to-Dot, to each student. Read the instructions aloud as a class, and have the students complete the activity.

Note: The connecting lines form a pattern that students can use to check their work.



Dot-to-Dot

Complete the facts below. Connect the dot beside each subtraction fact to the dot beside its related addition fact. Use a ruler to keep the lines straight. Then do what the sentence at the bottom of the page asks.

$\begin{array}{r} 6 \\ -3 \\ \hline \end{array}$	$\begin{array}{r} 9 \\ -2 \\ \hline \end{array}$	$\begin{array}{r} 7 \\ -1 \\ \hline \end{array}$	$\begin{array}{r} 5 \\ -3 \\ \hline \end{array}$	$\begin{array}{r} 10 \\ -1 \\ \hline \end{array}$	$\begin{array}{r} 4 \\ -2 \\ \hline \end{array}$	$\begin{array}{r} 8 \\ -3 \\ \hline \end{array}$	$\begin{array}{r} 6 \\ -1 \\ \hline \end{array}$	$\begin{array}{r} 7 \\ -2 \\ \hline \end{array}$	$\begin{array}{r} 10 \\ -3 \\ \hline \end{array}$	$\begin{array}{r} 3 \\ -2 \\ \hline \end{array}$	$\begin{array}{r} 9 \\ -3 \\ \hline \end{array}$
--	--	--	--	---	--	--	--	--	---	--	--

• • • • • • • • • • • • • • • •

$\begin{array}{r} 2 \\ +2 \\ \hline \end{array}$	$\begin{array}{r} 9 \\ +1 \\ \hline \end{array}$	$\begin{array}{r} 2 \\ +3 \\ \hline \end{array}$	$\begin{array}{r} 6 \\ +1 \\ \hline \end{array}$	$\begin{array}{r} 7 \\ +2 \\ \hline \end{array}$	$\begin{array}{r} 3 \\ +3 \\ \hline \end{array}$	$\begin{array}{r} 6 \\ +3 \\ \hline \end{array}$	$\begin{array}{r} 1 \\ +2 \\ \hline \end{array}$	$\begin{array}{r} 7 \\ +3 \\ \hline \end{array}$	$\begin{array}{r} 5 \\ +2 \\ \hline \end{array}$	$\begin{array}{r} 5 \\ +1 \\ \hline \end{array}$	$\begin{array}{r} 5 \\ +3 \\ \hline \end{array}$
--	--	--	--	--	--	--	--	--	--	--	--

Explain how the subtraction fact $6 - 3$ and the addition fact $3 + 3$ are related.

LESSON 1E: ZANY TABLE WITH SUBTRAHENDS OF 1, 2, AND 3

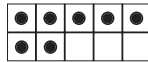
TEACHER LESSON

In this lesson, students are introduced to the ten-frame model. The ten-frame is a powerful visual model that not only helps students complete subtraction facts, but also helps them understand the base-ten number system. The ten-frame model is emphasized throughout the program.

Introducing the Ten-Frame

Our number system is a base-ten number system. Because two fives make ten, the numbers 5 and 10 can serve as anchors in our number system.

A powerful model for anchoring the numbers to 5 and 10 is the ten-frame. The ten-frame is an array of 2 rows and 5 columns in which counters or dots are placed to illustrate numbers. The top row is filled in first, beginning on the left. Once the top row is full, the second row is filled in, again beginning on the left. For example, the number 7 is modelled as follows.



Notice that the ten-frame displays 7 as 5 and 2.

The Ten-Frame Train

To reinforce the ten-frame, draw a train car with a ten-frame as the window. Have the students place passengers on the train in the same order as they place counters on a ten-frame.

Note: Illustrations of ten-frame trains and passengers are on page 248.

Ten-Frame Flash

Refer to the pages of ten-frames (pages 244-246). Flash one of the ten-frames on the overhead for a few seconds. Have students write the number of dots they saw on the ten-frame on their response boards. When students have finished writing the number on their response boards, show them the ten-frame to check they have answered correctly.

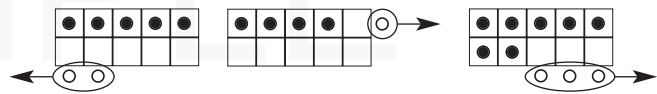
Note: Continue to play ten-frame flash with the students until they can recognize the number of dots on the ten-frames without counting. When they are able to do this successfully, ask them for the number that is one less than and then two less than the numbers shown on the ten-frames.

Using Ten-Frames to Model Subtraction Facts

Give each student a ten-frame mat and some counters. Present the following subtraction facts to the students.

$$\begin{array}{r} 7 - 2 \\ 5 - 1 \\ 10 - 3 \end{array}$$

Have them model these facts on their ten-frame mats. Have them complete the facts and check their answers with a related addition sentence.



$$\begin{array}{r} 7 - 2 = 5 \\ 5 + 2 = 7 \end{array} \quad \begin{array}{r} 5 - 1 = 4 \\ 4 + 1 = 5 \end{array} \quad \begin{array}{r} 10 - 3 = 7 \\ 7 + 3 = 10 \end{array}$$

The facts $2 + 5 = 7$, $1 + 4 = 5$, and $3 + 7 = 10$ are also related addition sentences.

Note: The first level of the program introduces students to the relationship between subtraction and addition by having them check their answers to subtraction facts with related addition facts. In the next level, they will complete subtraction facts by thinking of their related addition facts.

Subtraction Facts with Ten-Frames

The facts of Level 1 can all be modelled on one ten-frame mat. Refer to the blank ten-frames (page 244). Students can use these ten-frames to model the facts of this level.

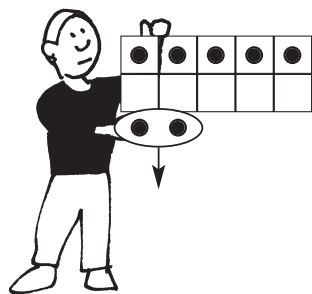
Encouraging Class Discussion

Engaging students in whole-class discussions is an integral part of the program. Prompts for encouraging class discussions can be found on page 2 of the Introduction.

INTRODUCING THE STUDENT ACTIVITY SHEET

Distribute a copy of the sheet, Zany Table, to each student. Read the instructions aloud as a class, and have the students complete the activity.

Zany Table



A ten-frame has 10 boxes, 5 in each row.

You fill in a ten-frame starting with the first box in the top row. You fill the boxes in the first row in order, from left to right. Then, you fill in the boxes in the second row, in order, again starting with the box on the left.

Complete the following table row by row, and then do what the sentences at the bottom of the page ask.

Number	Ten-Frame	Subtraction Sentence	Ten-Frame	Related Addition Sentence
7		$7 - 2 = 5$		$5 + 2 = 7$
10		$10 - 2 =$		
6		$6 - 1 =$		

Show the fact $10 - 3$ with a ten-frame. Complete the fact, and name its related addition sentence.

LESSON 1F: JELLYBEAN JUMBLE WITH SUBTRAHENDS OF 0, 1, 2, AND 3

TEACHER LESSON

In this lesson, students are introduced to subtraction facts with a subtrahend of 0.

Practicing Counting Back

Continue to present numbers between 3 and 10 to the students, and have them name the number that is 2 or 3 less than the number presented.

Interpreting the Operation of Subtraction

Present the following story problem to the students:

- Ryan has 3 erasers. Jason asks Ryan to give him some of his erasers. Ryan does not give Jason any of his erasers. How many erasers does Ryan have?

Ask the students to represent this story problem as a subtraction fact and complete it.

- $3 - 0 = 3$
Ryan still has 3 erasers.

Ask the students to explain their answer.

- Since Ryan did not give Jason any erasers, he still has the same number of erasers.

Make sure students understand that when they subtract 0 from a number, the *difference* is that number. Students who understand this find subtract-0 facts easy and answer them quickly. Students who do not understand may believe the difference has to be less than the number they are subtracting from.

One way to help students who need more practice with these facts is to present everyday situations involving subtract-0 facts. Have them use dominoes or other manipulatives. Have them also model subtract-0 facts on blank ten-frames (page 244).

Introducing the Thinking Strategy for Subtract-0 Facts

Have the students complete the fact $3 - 0$ as follows:

$3 - 0$

- Number Relationship:

The difference between a number and 0 is the number.
SO, $3 - 0 = 3$

Addition Check

Have the students check the subtraction sentence $3 - 0 = 3$ by naming its related addition fact, $3 + 0 = 3$.

Note: The fact $0 + 3 = 3$ is also a related addition fact.

Encouraging Class Discussion

Engaging students in whole-class discussions is an integral part of the program. Prompts for encouraging class discussions can be found on page 2 of the Introduction.

INTRODUCING THE STUDENT ACTIVITY SHEET

Distribute a copy of the sheet, Jellybean Jumble, to each student. Read the instructions aloud as a class, and have the students complete the activity

Note: The coloured jellybeans form a pattern that students can use to check their work. Some students like to colour the three jellybeans with the same answer with one colour, and the jellybeans with the different answer with a different colour.

Note: If students are still having difficulty completing the facts of this lesson, have them model the facts on the blank ten-frames found on page (244).

COMPLETING THE GRID

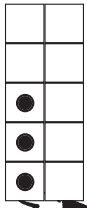
Have the students shade in their addition/subtraction grid for facts with a subtrahend of 0. They will shade in the first column of the grid.

POWER FACTS

Now that the students have developed the thinking strategies for the facts of this level, hand out the Power Facts, Level 1 (page 146), and the letter to parents (page 161) for students to take home. Have the students practice the first set of Power Facts at least once a day. Students can practice in class or at home.

STUDENT JOURNAL

Have students choose four subtraction facts: one with a subtrahend of 0, one with a subtrahend of 1, one with a subtrahend of 2, one with a subtrahend of 3. Have the students explain their thinking strategies for completing these facts.



Jellybean Jumble

Complete the subtraction facts below. Three of the subtraction facts in each group of four jellybeans have the same answer. Colour the jellybean in each group that has the subtraction fact with the different answer.

$3 - 0 =$
 $4 - 0 =$
 $5 - 2 =$
 $6 - 3 =$

$9 - 1 =$
 $10 - 2 =$
 $10 - 3 =$
 $8 - 0 =$

$10 - 3 =$
 $8 - 1 =$
 $9 - 2 =$
 $9 - 3 =$

$3 - 1 =$
 $6 - 3 =$
 $5 - 3 =$
 $2 - 0 =$

$6 - 2 =$
 $7 - 3 =$
 $8 - 3 =$
 $5 - 1 =$

$8 - 3 =$
 $6 - 2 =$
 $7 - 2 =$
 $5 - 0 =$

$1 - 0 =$
 $0 - 0 =$
 $2 - 2 =$
 $1 - 1 =$

$6 - 0 =$
 $9 - 3 =$
 $9 - 2 =$
 $8 - 2 =$

LESSON 1G: SECRET MESSAGE WITH SUBTRAHENDS OF 0, 1, 2, AND 3

TEACHER LESSON

In this lesson, students practice completing subtraction facts in which the subtrahends are 0, 1, 2, or 3 by identifying and applying the appropriate thinking strategies.

CHALLENGE FACTS

Use the Challenge Facts, Level 1 (pages 196-197) to help the students identify subtraction facts with a subtrahend of 0, 1, 2, and 3. Have them use coloured pencils and circle all the facts with a subtrahend of 0 with one coloured pencil. Then have them complete these facts. Next, have them circle all the facts with a subtrahend of 1 with a different coloured pencil, and complete them. Have the students continue using a different coloured pencil to circle the facts with a subtrahend of 2, and have them complete the facts. The remaining facts will all have a subtrahend of 3. The students can circle these facts with different colours and then complete them.

Practicing Thinking Strategies

Present the following subtraction facts to the students:

$$\begin{array}{l} 9 - 1 \\ 8 - 3 \\ 1 - 0 \\ 5 - 2 \end{array}$$

Have students complete each fact and explain the thinking strategy they used for each.

(a) $9 - 1$

- Number Relationship:
One less than 9 is 8.
SO, $9 - 1 = 8$

Note: If students need to count back to complete this fact, check they are able to count back correctly.

(b) $8 - 3$

- Count-Back Fact:
Count back 3 from 8.
 $8 \rightarrow 7, 6, 5$
SO, $8 - 3 = 5$

Note: Check students are able to count back correctly.

Note: For students who can complete this fact using a related addition fact or another subtraction fact, encourage them to do so.

(c) $1 - 0$

- Number Relationship:
The difference between a number and 0 is the number.
SO, $1 - 0 = 1$

(d) $5 - 2$

- Number Relationship:
Two less than 5 is 3.
SO, $5 - 2 = 3$
- Count-Back Fact:
Count back 2 from 5.
 $5 \rightarrow 4, 3$
SO, $5 - 2 = 3$

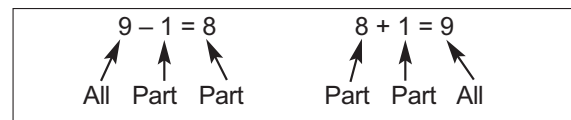
Note: Check students are able to count back correctly.

Addition Check

Have the students check the subtraction facts they have completed by naming the related addition facts. For example, consider the fact $9 - 1 = 8$. A related addition fact is $8 + 1 = 9$.

Note: The addition fact $1 + 8$ is also a related addition fact

Point out to the students that the answer in an addition fact, the sum, represents all, while the addends represent the parts.



Ten-Frame Flash

Continue to play ten-frame flash with the students. When they are able to recognize the number shown on the ten-frame, ask them for the number that is one less than, two less than, or three less than the number shown on the ten-frame.

Encouraging Class Discussion

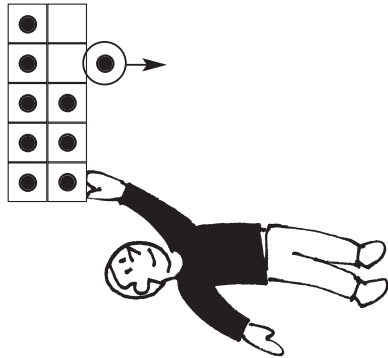
Engaging students in whole-class discussions is an integral part of the program. Prompts for encouraging class discussions can be found on page 2 of the Introduction.

INTRODUCING THE STUDENT ACTIVITY SHEET

Distribute a copy of the sheet, Secret Message, to each student. Read the instructions aloud as a class, and have the students complete the activity.

Note: If students have difficulty completing the code, refer to Lesson 1B for suggestions.

Note: If students are still having difficulty completing the facts of this lesson, have them model the facts on the blank ten-frames found on page 244.



Secret Message

Complete the facts. In the Code Key, find the number that matches the answer of the first fact. Write the letter that is above that number in the first blank. Now, find the number in the Code Key that matches the answer of the second fact. Write the letter that is above it in the second blank. Continue with each subtraction fact until you have filled in the remaining blanks with a letter from the Code Key. When you are finished, you will find the secret message.

What did one cactus plant say to the other cactus plant?

- ① $\overline{\quad}$ ② $\overline{\quad}$ ③ $\overline{\quad}$ ④ $\overline{\quad}$ ⑤ $\overline{\quad}$ ⑥ $\overline{\quad}$ ⑦ $\overline{\quad}$ ⑧ $\overline{\quad}$ ⑨ $\overline{\quad}$ ⑩ $\overline{\quad}$ ⑪ $\overline{\quad}$ ⑫ $\overline{\quad}$ ⑬ $\overline{\quad}$ ⑭ $\overline{\quad}$ ⑮ $\overline{\quad}$ ⑯ $\overline{\quad}$ ⑰ $\overline{\quad}$ ⑱ $\overline{\quad}$

Code Key	H	P	S	U	R	L	A	O	Y	K	E
	0	1	2	3	4	5	6	7	8	9	10

① $\begin{array}{r} 9 \\ -1 \\ \hline \end{array}$ ② $\begin{array}{r} 10 \\ -3 \\ \hline \end{array}$ ③ $\begin{array}{r} 4 \\ -1 \\ \hline \end{array}$ ④ $\begin{array}{r} 6 \\ -2 \\ \hline \end{array}$ ⑤ $\begin{array}{r} 10 \\ -0 \\ \hline \end{array}$ ⑥ $\begin{array}{r} 9 \\ -3 \\ \hline \end{array}$

⑦ $\begin{array}{r} 8 \\ -3 \\ \hline \end{array}$ ⑧ $\begin{array}{r} 5 \\ -0 \\ \hline \end{array}$ ⑨ $\begin{array}{r} 10 \\ -2 \\ \hline \end{array}$ ⑩ $\begin{array}{r} 7 \\ -2 \\ \hline \end{array}$ ⑪ $\begin{array}{r} 8 \\ -1 \\ \hline \end{array}$ ⑫ $\begin{array}{r} 9 \\ -2 \\ \hline \end{array}$

⑬ $\begin{array}{r} 10 \\ -1 \\ \hline \end{array}$ ⑭ $\begin{array}{r} 5 \\ -3 \\ \hline \end{array}$ ⑮ $\begin{array}{r} 0 \\ -0 \\ \hline \end{array}$ ⑯ $\begin{array}{r} 8 \\ -2 \\ \hline \end{array}$ ⑰ $\begin{array}{r} 7 \\ -3 \\ \hline \end{array}$ ⑱ $\begin{array}{r} 4 \\ -3 \\ \hline \end{array}$

LESSON 1H: NUMBER DESIGN WITH SUBTRAHENDS OF 0, 1, 2, AND 3

TEACHER LESSON

In this lesson, students are introduced to even and odd numbers.

Preparing for the Level 1 Mystery Number Challenge

Continue to present students with subtraction facts with a subtrahend of 0, 1, 2, or 3. Have students complete each fact and explain their thinking strategies.

Encourage the students to practice the first set of Power Facts. Students can also play Partner Bingo, Level 1; Card Games, Level 1; or practice the Challenge Facts, Level 1, to prepare for the Level 1 Mystery Level Challenge.

Even Numbers

Hand out interlocking cubes to the students. Ask them to build a cube train that is 8 cubes in length. Ask the students to divide the cube train into two cube trains of the same length.

- The cube train can be divided into two cube trains, each of length 4.

Tell the students that because a cube train of length 8 can be divided into two cube trains of equal length, the number 8 is considered to be an *even* number.

Have the students use cube trains to find other even numbers less than or equal to 10. Have them name these numbers.

- The numbers 2, 4, 6, 8, and 10 are even numbers.

The number 0 is also considered to be an even number.

Odd Numbers

Explain to the students that the numbers that are not even are called *odd* numbers.

Have the students name the *odd* numbers less than or equal to 10.

- The numbers 1, 3, 5, 7, and 9 are odd numbers.

Even and Odd Numbers

Have the students write the numbers from 1 to 10.

Have them circle all the even numbers.

- 1, (2), 3, (4), 5, (6), 7, (8), 9, (10)

Have them note that every second number is an even number.

Have the students examine the number sentences $8 - 1 = 7$, $8 - 2 = 6$, and $8 - 3 = 5$. Have them note the following:

- The number 8 is even, and the number that is one less than 8, the number 7, is odd.
- The number 8 is even, and the number two less than 8, the number 6, is also even.
- The number 8 is even, and the number that is three less than 8, the number 5, is odd.

Note: Students can use even and odd numbers to help them complete subtraction facts.

Note: Further discussion of even and odd numbers and rules for even and odd differences can be found in Lesson 6F. This lesson serves as an introduction to even and odd numbers.

Encouraging Class Discussion

Engaging students in whole-class discussions is an integral part of the program. Prompts for encouraging class discussions can be found on page 2 of the Introduction.

INTRODUCING THE STUDENT ACTIVITY SHEET

Distribute a copy of the sheet, Number Design, to each student. Read the instructions aloud as a class, and have the students complete the activity.

Note: The coloured areas form a pattern that students can use to check their work.

PARTNER BINGO

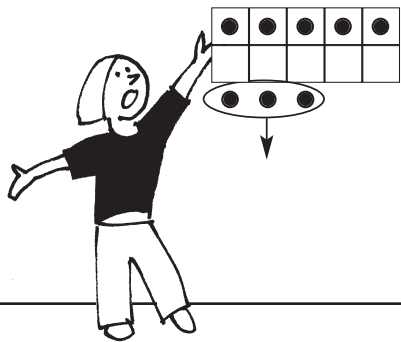
Students can practice the subtraction facts of this level by playing Partner Bingo, Level 1 (pages 164-166). Have the students complete the facts in order and cross out only one square on their cards for each fact. Partner Bingo can be played in class or at home.

CARD GAMES

Card Games, Level 1, provide more practice for the facts of this level (pages 228-229). Card Games can be played either in class or at home.

CHALLENGE FACTS

Challenge Facts, Level 1, provide more practice for the facts of this level (pages 196-197).



Number Design

Complete the subtraction facts below. Then, use the colour key, and colour the design.

The numbers 0, 2, 4, 6, 8, and 10 are **EVEN**.
The numbers 1, 3, 5, 7, and 9 are **ODD**.

SAMPLE

		$\begin{array}{r} 8 \\ -3 \\ \hline \end{array}$		$\begin{array}{r} 9 \\ -1 \\ \hline \end{array}$			
$\begin{array}{r} 10 \\ -0 \\ \hline \end{array}$	$\begin{array}{r} 3 \\ -2 \\ \hline \end{array}$	$\begin{array}{r} 2 \\ -1 \\ \hline \end{array}$	$\begin{array}{r} 6 \\ -0 \\ \hline \end{array}$	$\begin{array}{r} 7 \\ -2 \\ \hline \end{array}$	$\begin{array}{r} 4 \\ -0 \\ \hline \end{array}$	$\begin{array}{r} 6 \\ -3 \\ \hline \end{array}$	$\begin{array}{r} 10 \\ -2 \\ \hline \end{array}$
	$\begin{array}{r} 5 \\ -3 \\ \hline \end{array}$					$\begin{array}{r} 8 \\ -1 \\ \hline \end{array}$	
$\begin{array}{r} 2 \\ -0 \\ \hline \end{array}$	$\begin{array}{r} 9 \\ -2 \\ \hline \end{array}$					$\begin{array}{r} 9 \\ -3 \\ \hline \end{array}$	$\begin{array}{r} 1 \\ -0 \\ \hline \end{array}$
$\begin{array}{r} 6 \\ -1 \\ \hline \end{array}$	$\begin{array}{r} 3 \\ -3 \\ \hline \end{array}$					$\begin{array}{r} 5 \\ -2 \\ \hline \end{array}$	$\begin{array}{r} 7 \\ -1 \\ \hline \end{array}$
	$\begin{array}{r} 4 \\ -1 \\ \hline \end{array}$					$\begin{array}{r} 7 \\ -3 \\ \hline \end{array}$	
$\begin{array}{r} 0 \\ -0 \\ \hline \end{array}$	$\begin{array}{r} 8 \\ -3 \\ \hline \end{array}$	$\begin{array}{r} 6 \\ -2 \\ \hline \end{array}$	$\begin{array}{r} 10 \\ -3 \\ \hline \end{array}$	$\begin{array}{r} 8 \\ -2 \\ \hline \end{array}$	$\begin{array}{r} 10 \\ -1 \\ \hline \end{array}$	$\begin{array}{r} 4 \\ -2 \\ \hline \end{array}$	$\begin{array}{r} 3 \\ -0 \\ \hline \end{array}$
			$\begin{array}{r} 8 \\ -0 \\ \hline \end{array}$				$\begin{array}{r} 2 \\ -1 \\ \hline \end{array}$

COLOUR KEY

Even Differences: yellow

Odd Differences: orange

LESSON 11: THE LEVEL 1 MYSTERY NUMBER CHALLENGE

The Level 1 Mystery Number Challenge involves the subtraction facts introduced in Level 1.

Before students take the Level 1 Mystery Number Challenge, have them complete subtraction facts with a subtrahend of 0, 1, 2, or 3. Choose facts that the students find most challenging. The following are often challenging for students to complete:

9 – 3
10 – 2
7 – 3
1 – 0
8 – 3
9 – 2
10 – 1

Have the students discuss the thinking strategies they can use with these subtraction facts.

INSTRUCTIONS FOR THE LEVEL 1 CHALLENGE

Distribute a copy of the challenge sheet to each student. Explain the challenge: There are nine facts at the top of the page. Below, there are nine boxes with a clue in each box. Complete the facts, then match each completed fact with one of the clues, and place it in that box. After each of the facts has been placed in the box with its matching clue, add the differences of the three facts in each row and the differences of the three facts in each column to find the mystery number. Cross out each fact after it has been placed in its box.

SUGGESTIONS FOR MORE PRACTICE

Students will have many more opportunities to practice the subtraction facts of this level as they work through the rest of the program. However, if the students need more practice, consider the following suggestions.

- Check whether students have developed the relationships for the numbers 1 through 10, explained in the overview of the level. These relationships are prerequisites to building mastery of the subtraction facts. They are the following:
 1. Spatial Relationships
 2. One-Less-Than and Two-Less-Than
 3. Anchors or benchmarks of 5 and 10
 4. Part-Part-All

Continue to provide the students with experiences that develop these relationships. Refer to the program *Thinking Strategies: Addition* for activities to develop these relationships.

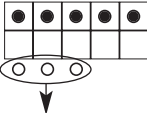
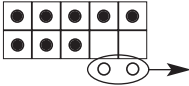
- Check that students understand the concept of subtraction.

- Check that students can count back from 10.
- Check that students can count back from a number less than 10.
- Check that students can identify 1 to 3 claps.
- Check that students understand the thinking strategy for facts with a subtrahend of 0.
- Identify the facts that students find difficult. Help them develop thinking strategies for these facts. Have them list the facts they find difficult, and encourage them to practice these facts with a classmate in school and a parent at home.
- Have students practice the first set of Power Facts.
- Have students play Partner Bingo in class or at home. There are 3 Partner Bingos for this level of the program.

Level 1 Mystery Number Challenge

Complete the facts. Then, read the clue in each box, and find the fact that matches it. Place each completed fact into the box with its matching clue. To find the MYSTERY NUMBER, add the three answers in each row and the three answers in each column. Remember, rows go across the page, and columns go down the page.

$\begin{array}{r} 8 \\ -2 \\ \hline \end{array}$	$\begin{array}{r} 5 \\ -3 \\ \hline \end{array}$	$\begin{array}{r} 9 \\ -0 \\ \hline \end{array}$	$\begin{array}{r} 10 \\ -2 \\ \hline \end{array}$	$\begin{array}{r} 4 \\ -1 \\ \hline \end{array}$	$\begin{array}{r} 8 \\ -3 \\ \hline \end{array}$	$\begin{array}{r} 6 \\ -2 \\ \hline \end{array}$	$\begin{array}{r} 1 \\ -0 \\ \hline \end{array}$	$\begin{array}{r} 9 \\ -2 \\ \hline \end{array}$
--	--	--	---	--	--	--	--	--

<p>This fact has a difference of 4.</p>	<p>This fact has the greatest difference.</p>	<p>This fact is shown with the following picture:</p> <p style="text-align: center;">$** * \textcircled{***} \rightarrow$</p>	<p>= _____</p>
<p>In this fact, the number being subtracted is 1.</p>	<p>This fact is shown with the following picture:</p> 	<p>This fact has the related addition sentence, $7 + 2 = 9$.</p>	<p>= _____</p>
<p>This fact is shown with the following picture:</p> 	<p>This fact has the least difference.</p>	<p>The difference of this fact is 2 less than 8.</p>	<p>= _____</p>

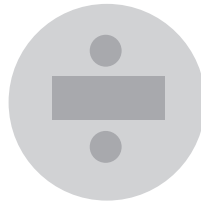
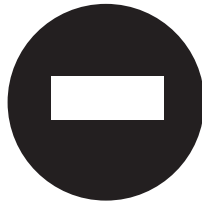
= _____

= _____

= _____

APPENDIX A

TEACHER RESOURCES



POWER FACTS: LEVEL 1

$9 - 1 = 8$	$6 - 3 = 3$	$5 - 2 = 3$	$1 - 1 = 0$	$10 - 2 = 8$
$8 - 3 = 5$	$5 - 1 = 4$	$7 - 3 = 4$	$6 - 2 = 4$	$0 - 0 = 0$
$5 - 3 = 2$	$8 - 2 = 6$	$10 - 1 = 9$	$9 - 2 = 7$	$4 - 2 = 2$
$7 - 2 = 5$	$9 - 0 = 9$	$4 - 3 = 1$	$8 - 1 = 7$	$9 - 3 = 6$

THINKING STRATEGIES

Level 1 introduces subtract-0, subtract-1, subtract-2, and subtract-3 facts. Although any fact in which the number subtracted is 1, 2, or 3 can be completed with the count-back strategy, many students will complete subtract-1 facts using the one-less-than relationship and subtract-2 facts using the two-less-than relationship.

THINKING STRATEGY: SUBTRACT-1 FACT

Consider, for example, the fact $9 - 1$.

9 - 1

- Number Relationship:
One less than 9 is 8.
SO, $9 - 1 = 8$

Note: Since most students do not have to count back to complete subtract-1 facts, counting back is not listed as a strategy for this fact. If students need to count back to complete this fact, check they are able to count back correctly.

Addition Check

Have the students check the subtraction facts they complete by naming their related addition facts. For example a related addition sentence of $9 - 1 = 8$ is $8 + 1 = 9$.

THINKING STRATEGIES: SUBTRACT-2 FACT

Consider, for example, the fact $9 - 2$.

9 - 2

- Number Relationship:
Two less than 9 is 7.
SO, $9 - 2 = 7$

If students need to count back to complete this fact, they can complete it as follows:

- Count-Back Fact:
Count back 2 from 9.
 $9 \rightarrow 8, 7$
SO, $9 - 2 = 7$

THINKING STRATEGY: SUBTRACT-3 FACT

Subtract-3 facts with a subtrahend of 3 can be completed with the count-back strategy.

Consider, for example, the fact $9 - 3$.

9 - 3

- Count-Back Fact:
Count back 3 from 9.
 $9 \rightarrow 8, 7, 6$
SO, $9 - 3 = 6$

Note: Check that students are able to count back correctly.

Note: Encourage students who can complete this fact using a related addition fact or a subtraction fact they know to do so. These strategies will be introduced in the next levels of the program.

THINKING STRATEGY: SUBTRACT-0 FACT

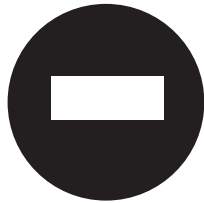
Consider, for example, the fact $9 - 0$.

9 - 0

- Number Relationship:
The difference between a number and 0 is the number.
SO, $9 - 0 = 9$

APPENDIX B

PARTNER BINGO





PARTNER BINGO 1

Find a partner.

Answer question 1, and cross out one of the answers on your card (Partner #1).

Have your partner answer question 1, and cross out one of the answers on his/her card (Partner #2).

Take turns answering questions and crossing out one answer each time.

The winner is the first one who has a row, column, or diagonal crossed out.

Partner #1

- ① $8 - 3 =$ _____ ⑨ $6 - 3 =$ _____
 ② $9 - 2 =$ _____ ⑩ $10 - 0 =$ _____
 ③ $1 - 0 =$ _____ ⑪ $7 - 2 =$ _____
 ④ $7 - 3 =$ _____ ⑫ $8 - 1 =$ _____
 ⑤ $5 - 2 =$ _____ ⑬ $9 - 3 =$ _____
 ⑥ $10 - 3 =$ _____ ⑭ $5 - 0 =$ _____
 ⑦ $8 - 2 =$ _____ ⑮ $10 - 2 =$ _____
 ⑧ $5 - 1 =$ _____ ⑯ $5 - 3 =$ _____

Partner #2

- ① $6 - 2 =$ _____ ⑨ $10 - 3 =$ _____
 ② $3 - 3 =$ _____ ⑩ $6 - 1 =$ _____
 ③ $10 - 2 =$ _____ ⑪ $9 - 2 =$ _____
 ④ $4 - 1 =$ _____ ⑫ $6 - 0 =$ _____
 ⑤ $8 - 3 =$ _____ ⑬ $5 - 3 =$ _____
 ⑥ $3 - 0 =$ _____ ⑭ $4 - 2 =$ _____
 ⑦ $9 - 3 =$ _____ ⑮ $8 - 2 =$ _____
 ⑧ $7 - 3 =$ _____ ⑯ $10 - 1 =$ _____

Partner #1

9	5	4	3	10
7	8	3	0	7
10	6	-	1	9
6	0	2	4	5
1	5	9	8	7

Partner #2

1	0	5	3	10
4	6	2	9	6
5	10	-	5	3
2	0	4	10	7
8	7	1	6	8



PARTNER BINGO 2

Find a partner.

Answer question 1, and cross out one of the answers on your card (Partner #1).

Have your partner answer question 1, and cross out one of the answers on his/her card (Partner #2).

Take turns answering questions and crossing out one answer each time.

The winner is the first one who has a row, column, or diagonal crossed out.

Partner #1

- ① $9 - 3 = \underline{\quad}$ ⑨ $8 - 3 = \underline{\quad}$
 ② $5 - 1 = \underline{\quad}$ ⑩ $10 - 1 = \underline{\quad}$
 ③ $8 - 2 = \underline{\quad}$ ⑪ $0 - 0 = \underline{\quad}$
 ④ $6 - 3 = \underline{\quad}$ ⑫ $9 - 2 = \underline{\quad}$
 ⑤ $4 - 0 = \underline{\quad}$ ⑬ $5 - 5 = \underline{\quad}$
 ⑥ $10 - 3 = \underline{\quad}$ ⑭ $9 - 0 = \underline{\quad}$
 ⑦ $9 - 1 = \underline{\quad}$ ⑮ $7 - 3 = \underline{\quad}$
 ⑧ $6 - 2 = \underline{\quad}$ ⑯ $3 - 2 = \underline{\quad}$

Partner #2

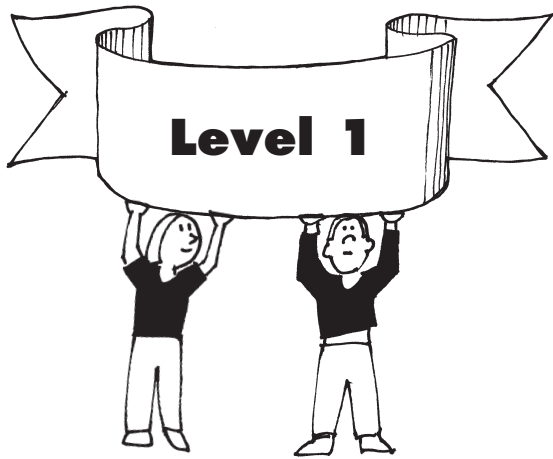
- ① $10 - 3 = \underline{\quad}$ ⑨ $7 - 2 = \underline{\quad}$
 ② $7 - 3 = \underline{\quad}$ ⑩ $8 - 0 = \underline{\quad}$
 ③ $3 - 1 = \underline{\quad}$ ⑪ $9 - 3 = \underline{\quad}$
 ④ $9 - 2 = \underline{\quad}$ ⑫ $10 - 0 = \underline{\quad}$
 ⑤ $8 - 3 = \underline{\quad}$ ⑬ $7 - 1 = \underline{\quad}$
 ⑥ $7 - 0 = \underline{\quad}$ ⑭ $8 - 2 = \underline{\quad}$
 ⑦ $9 - 3 = \underline{\quad}$ ⑮ $1 - 1 = \underline{\quad}$
 ⑧ $4 - 2 = \underline{\quad}$ ⑯ $6 - 3 = \underline{\quad}$

Partner #1

4	3	9	2	5
2	6	7	4	0
0	8	-	5	10
4	10	9	0	6
7	3	1	4	2

Partner #2

8	7	9	8	6
4	5	6	1	4
9	0	-	7	5
6	1	8	2	6
2	3	7	10	9



PARTNER BINGO 3

Find a partner.

Answer question 1, and cross out one of the answers on your card (Partner #1).

Have your partner answer question 1, and cross out one of the answers on his/her card (Partner #2).

Take turns answering questions and crossing out one answer each time.

The winner is the first one who has a row, column, or diagonal crossed out.

Partner #1

- ① $7 - 2 = \underline{\quad}$ ⑨ $9 - 1 = \underline{\quad}$
 ② $10 - 3 = \underline{\quad}$ ⑩ $7 - 3 = \underline{\quad}$
 ③ $4 - 0 = \underline{\quad}$ ⑪ $3 - 3 = \underline{\quad}$
 ④ $1 - 1 = \underline{\quad}$ ⑫ $10 - 0 = \underline{\quad}$
 ⑤ $9 - 2 = \underline{\quad}$ ⑬ $8 - 2 = \underline{\quad}$
 ⑥ $8 - 3 = \underline{\quad}$ ⑭ $5 - 5 = \underline{\quad}$
 ⑦ $6 - 2 = \underline{\quad}$ ⑮ $9 - 3 = \underline{\quad}$
 ⑧ $9 - 0 = \underline{\quad}$ ⑯ $5 - 2 = \underline{\quad}$

Partner #2

- ① $8 - 3 = \underline{\quad}$ ⑨ $4 - 3 = \underline{\quad}$
 ② $1 - 0 = \underline{\quad}$ ⑩ $2 - 0 = \underline{\quad}$
 ③ $9 - 1 = \underline{\quad}$ ⑪ $6 - 2 = \underline{\quad}$
 ④ $6 - 3 = \underline{\quad}$ ⑫ $10 - 1 = \underline{\quad}$
 ⑤ $7 - 2 = \underline{\quad}$ ⑬ $4 - 2 = \underline{\quad}$
 ⑥ $10 - 2 = \underline{\quad}$ ⑭ $9 - 0 = \underline{\quad}$
 ⑦ $9 - 3 = \underline{\quad}$ ⑮ $7 - 3 = \underline{\quad}$
 ⑧ $8 - 2 = \underline{\quad}$ ⑯ $9 - 2 = \underline{\quad}$

Partner #1

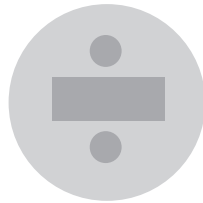
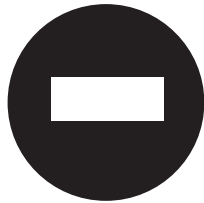
7	10	1	8	2
0	2	5	0	4
10	6	-	1	8
1	0	4	5	10
3	7	6	9	4

Partner #2

6	9	10	3	2
4	5	7	0	8
10	2	-	4	9
1	0	2	5	1
8	4	6	3	10

APPENDIX C

CHALLENGE FACTS



Challenge Facts 1

Complete these facts as fast as you can.

$$\begin{array}{r} 6 \\ -2 \\ \hline \end{array}$$

$$\begin{array}{r} 9 \\ -1 \\ \hline \end{array}$$

$$\begin{array}{r} 5 \\ -3 \\ \hline \end{array}$$

$$\begin{array}{r} 2 \\ -1 \\ \hline \end{array}$$

$$\begin{array}{r} 8 \\ -0 \\ \hline \end{array}$$

$$\begin{array}{r} 3 \\ -3 \\ \hline \end{array}$$

SAMPLE

$$\begin{array}{r} 8 \\ -3 \\ \hline \end{array}$$

$$\begin{array}{r} 7 \\ -2 \\ \hline \end{array}$$

$$\begin{array}{r} 10 \\ -0 \\ \hline \end{array}$$

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

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

$$\begin{array}{r} 5 \\ -1 \\ \hline \end{array}$$

$$\begin{array}{r} 7 \\ -1 \\ \hline \end{array}$$

$$\begin{array}{r} 6 \\ -0 \\ \hline \end{array}$$

$$\begin{array}{r} 2 \\ -2 \\ \hline \end{array}$$

$$\begin{array}{r} 7 \\ -3 \\ \hline \end{array}$$

$$\begin{array}{r} 9 \\ -2 \\ \hline \end{array}$$

$$\begin{array}{r} 10 \\ -1 \\ \hline \end{array}$$

$$\begin{array}{r} 1 \\ -0 \\ \hline \end{array}$$

$$\begin{array}{r} 10 \\ -3 \\ \hline \end{array}$$

$$\begin{array}{r} 6 \\ -1 \\ \hline \end{array}$$

$$\begin{array}{r} 8 \\ -2 \\ \hline \end{array}$$

$$\begin{array}{r} 4 \\ -1 \\ \hline \end{array}$$

$$\begin{array}{r} 3 \\ -2 \\ \hline \end{array}$$

$$\begin{array}{r} 4 \\ -3 \\ \hline \end{array}$$

$$\begin{array}{r} 1 \\ -1 \\ \hline \end{array}$$

$$\begin{array}{r} 9 \\ -3 \\ \hline \end{array}$$

$$\begin{array}{r} 5 \\ -0 \\ \hline \end{array}$$

$$\begin{array}{r} 10 \\ -2 \\ \hline \end{array}$$

$$\begin{array}{r} 8 \\ -1 \\ \hline \end{array}$$

Challenge Facts 2

Complete these facts as fast as you can.

$$\begin{array}{r} 8 \\ -1 \\ \hline \end{array}$$

$$\begin{array}{r} 4 \\ -3 \\ \hline \end{array}$$

$$\begin{array}{r} 5 \\ -2 \\ \hline \end{array}$$

$$\begin{array}{r} 9 \\ -0 \\ \hline \end{array}$$

$$\begin{array}{r} 8 \\ -2 \\ \hline \end{array}$$

$$\begin{array}{r} 2 \\ -1 \\ \hline \end{array}$$

SAMPLE

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

$$\begin{array}{r} 9 \\ -2 \\ \hline \end{array}$$

$$\begin{array}{r} 7 \\ -1 \\ \hline \end{array}$$

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

$$\begin{array}{r} 0 \\ -0 \\ \hline \end{array}$$

$$\begin{array}{r} 10 \\ -3 \\ \hline \end{array}$$

$$\begin{array}{r} 7 \\ -2 \\ \hline \end{array}$$

$$\begin{array}{r} 3 \\ -1 \\ \hline \end{array}$$

$$\begin{array}{r} 10 \\ -0 \\ \hline \end{array}$$

$$\begin{array}{r} 6 \\ -1 \\ \hline \end{array}$$

$$\begin{array}{r} 9 \\ -3 \\ \hline \end{array}$$

$$\begin{array}{r} 4 \\ -1 \\ \hline \end{array}$$

$$\begin{array}{r} 2 \\ -0 \\ \hline \end{array}$$

$$\begin{array}{r} 8 \\ -3 \\ \hline \end{array}$$

$$\begin{array}{r} 9 \\ -1 \\ \hline \end{array}$$

$$\begin{array}{r} 10 \\ -2 \\ \hline \end{array}$$

$$\begin{array}{r} 5 \\ -1 \\ \hline \end{array}$$

$$\begin{array}{r} 8 \\ -0 \\ \hline \end{array}$$

$$\begin{array}{r} 10 \\ -1 \\ \hline \end{array}$$

$$\begin{array}{r} 6 \\ -0 \\ \hline \end{array}$$

$$\begin{array}{r} 7 \\ -3 \\ \hline \end{array}$$

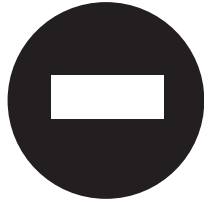
$$\begin{array}{r} 1 \\ -1 \\ \hline \end{array}$$

$$\begin{array}{r} 6 \\ -2 \\ \hline \end{array}$$

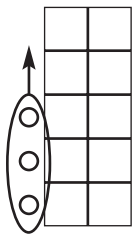
$$\begin{array}{r} 5 \\ -3 \\ \hline \end{array}$$

APPENDIX D

GAMES

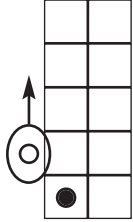


Level 1

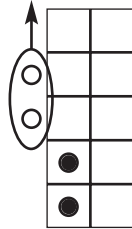
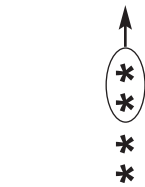


$$\begin{array}{r} 3 \\ -3 \\ \hline \end{array}$$

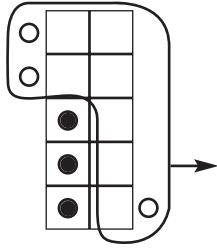
0



$$\begin{array}{r} 2 \\ -1 \\ \hline \end{array}$$



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

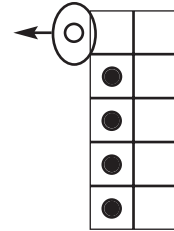


1

2

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

3



$$\begin{array}{r} 5 \\ -1 \\ \hline \end{array}$$

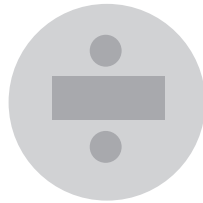
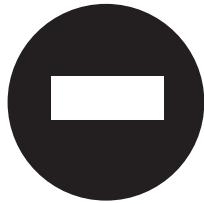
4

Level 1

		<p>8</p> $\begin{array}{r} 3 \\ \hline \end{array}$	<p>5</p>			<p>7</p> $\begin{array}{r} 1 \\ \hline \end{array}$
<p>6</p>		<p>9</p> $\begin{array}{r} 2 \\ \hline \end{array}$	<p>7</p>			
<p>10</p> $\begin{array}{r} 2 \\ \hline \end{array}$	<p>8</p>			<p>10</p> $\begin{array}{r} 1 \\ \hline \end{array}$	<p>9</p>	

APPENDIX F

ANSWER KEYS



$6-2=4$ $9-1=8$ $5-3=2$ $8-2=6$
 $3-2=1$ $4-1=3$ $7-2=5$ $9-3=6$
 $8-1=7$ $9-2=7$ $10-2=8$ $10-3=7$

Name three subtraction sentences with a difference of 7. Show these sentences with dot patterns.

Lesson 1A, page 11

$9-3$ $8-2$
 $5-3$ $7-3$
 $6-2$ $10-3$
 $10-1$ $9-1$
 $8-3$ $6-3$
 $9-2$ $4-2$
 $4-3$ $10-1$
 $5-2$ $7-2$
 $10-2$ $2-1$

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

What thinking strategy did you use for completing the fact $9-3$? Explain in words and with a picture.
 Answers will vary.

Lesson 1C, page 15

When are people like the wheels of a car?

W	H	E	N	T	H	E	Y	A	R	E	T	I	R	E	D
1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16

Code	Y	A	D	T	H	W	R	E	I	N
Key	0	1	2	3	4	5	6	7	8	9

$6-1=5$ $7-3=4$ $9-2=7$ $10-9=1$ $2-2=0$
 $3-2=1$ $9-9=0$ $10-2=8$ $5-3=2$ $8-8=0$
 $9-3=6$ $11-2=9$ $12-3=9$ $14-3=11$ $16-3=13$

Lesson 1B, page 13

$6-3$ 9
 $9-2$ 3
 $7-1$ 10
 $5-3$ 7
 $10-1$ 6
 $8-3$ 8
 $4-2$ 4
 $10-1$ 10
 $5-2$ 5
 $7-1$ 7
 $6-1$ 6
 $9-2$ 9
 $10-3$ 10

$9-3=6$ $3-2=1$
 $10-3=7$ $7-5=2$
 $9-2=7$ $6-1=5$
 $8-3=5$ $4-2=2$
 $10-1=9$ $10-9=1$
 $5-2=3$ $5-3=2$
 $7-1=6$ $7-3=4$
 $6-1=5$ $6-3=3$
 $9-2=7$ $4-2=2$
 $10-3=7$ $10-2=8$

Explain how the subtraction fact $6-3$ and the addition fact $3+3$ are related.
 Answers will vary.

Lesson 1D, page 17

Number	Ten-Frame	Subtraction Sentence	Ten-Frame	Related Addition Sentence
7		$7 - 2 = 5$		$5 + 2 = 7$
5		$5 - 1 = 4$		$4 + 1 = 5$
10		$10 - 2 = 8$		$8 + 2 = 10$
8		$8 - 3 = 5$		$5 + 3 = 8$
6		$6 - 1 = 5$		$5 + 1 = 6$

Show the fact $10 - 3$ with a ten-frame. Complete the fact, and name its related addition sentence.
 The related addition sentence is $7 + 3 = 10$.

Lesson 1E, page 19

Lesson 1F, page 21

What did one cactus plant say to the other cactus plant?




Code Key	U	R	E	A	L	L	Y	L	O	O	K	S	H	A	R	P
1	9	2	10	3	4	5	6	7	8	9	10	11	12	13	14	15
2	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16
3	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16
4	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16
5	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16
6	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16
7	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16
8	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16
9	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16
10	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16
11	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16
12	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16
13	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16
14	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16
15	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16
16	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16

Lesson 1G, page 23

COLOUR KEY
 Even Differences: yellow
 Odd Differences: orange

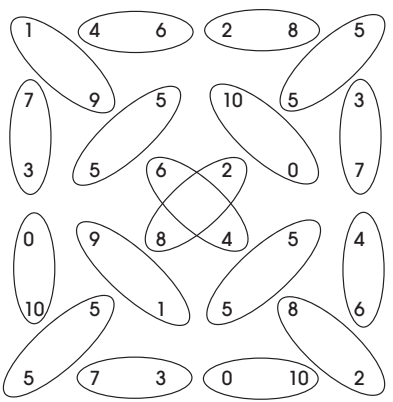
Lesson 1H, page 25

$\frac{-2}{6}$ $\frac{-3}{2}$ $\frac{-0}{9}$ $\frac{10}{8}$ $\frac{4}{3}$ $\frac{8}{5}$ $\frac{6}{4}$ $\frac{1}{1}$ $\frac{9}{7}$

This fact has a difference of 4. $\begin{array}{r} 6 \\ -2 \\ \hline 4 \end{array}$	This fact has the greatest difference. $\begin{array}{r} 9 \\ -0 \\ \hline 9 \end{array}$	This fact is shown with the following picture:  $\begin{array}{r} 5 \\ -3 \\ \hline 2 \end{array}$	= 15	
In this fact, the number being subtracted is 1. $\begin{array}{r} 4 \\ -1 \\ \hline 3 \end{array}$	This fact is shown with the following picture:  $\begin{array}{r} 8 \\ -3 \\ \hline 5 \end{array}$	This fact has the related addition sentence, $7 + 2 = 9$. $\begin{array}{r} 9 \\ -2 \\ \hline 7 \end{array}$		= 15
This fact is shown with the following picture:  $\begin{array}{r} 10 \\ -2 \\ \hline 8 \end{array}$	This fact has the least difference. $\begin{array}{r} 1 \\ -0 \\ \hline 1 \end{array}$	The difference of this fact is 2 less than 8. $\begin{array}{r} 8 \\ -6 \\ \hline 2 \end{array}$		

= 15 = 15 = 15

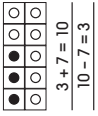
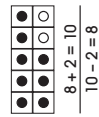
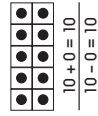
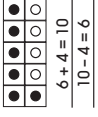
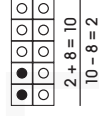
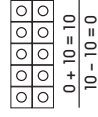
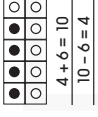
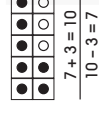
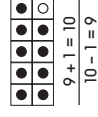
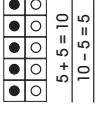

Lesson 11, page 27



Name the pairs of numbers with a sum of 10.

0 and 10 10 and 0
 1 and 9 9 and 1
 2 and 8 8 and 2
 3 and 7 7 and 3
 4 and 6 6 and 4
 5 and 5

Lesson 2B, page 35

 $\begin{array}{r} 3 + 7 = 10 \\ 10 - 7 = 3 \end{array}$	 $\begin{array}{r} 8 + 2 = 10 \\ 10 - 2 = 8 \end{array}$	 $\begin{array}{r} 10 + 0 = 10 \\ 10 - 0 = 10 \end{array}$
 $\begin{array}{r} 6 + 4 = 10 \\ 10 - 4 = 6 \end{array}$	 $\begin{array}{r} 2 + 8 = 10 \\ 10 - 8 = 2 \end{array}$	 $\begin{array}{r} 0 + 10 = 10 \\ 10 - 10 = 0 \end{array}$
 $\begin{array}{r} 4 + 6 = 10 \\ 10 - 6 = 4 \end{array}$	 $\begin{array}{r} 7 + 3 = 10 \\ 10 - 3 = 7 \end{array}$	 $\begin{array}{r} 9 + 1 = 10 \\ 10 - 1 = 9 \end{array}$
 $\begin{array}{r} 5 + 5 = 10 \\ 10 - 5 = 5 \end{array}$	 $\begin{array}{r} 1 + 9 = 10 \\ 10 - 9 = 1 \end{array}$	

Lesson 2A, page 33

Did you hear what happened when some skunks wrote books?

O	N	E	W	A	S	A	B	E	S	T	S	M	E	L	L	E	R
1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18

Code key: M 0, B 1, O 2, S 3, L 4, N 5, A 6, E 7, W 8, T 9, R 10

1 $8 + 2 = 10$ 2 $5 + 5 = 10$ 3 $3 + 7 = 10$ 4 $2 + 8 = 10$ 5 $4 + 6 = 10$ 6 $7 + 3 = 10$
 7 $6 + 4 = 10$ 8 $1 + 9 = 10$ 9 $7 + 3 = 10$ 10 $3 + 7 = 10$ 11 $9 + 1 = 10$ 12 $3 + 7 = 10$
 13 $0 + 10 = 10$ 14 $3 + 7 = 10$ 15 $4 + 6 = 10$ 16 $6 + 4 = 10$ 17 $7 + 3 = 10$ 18 $0 + 10 = 10$

Lesson 2C, page 37