

RAY'S PRIMARY ARITHMETIC – LEVEL ONE

UNIT THREE: SUBTRACTION – Lessons 101-170

Overview: This unit introduces subtraction. It shows how mastery of the subtraction facts means we don't have to spend so much time counting. Subtraction is seen as the inverse or reverse of addition.

Suggested Schedule: Minimum of 14 weeks

Background:

We spent quite some time learning and practicing the addition fact families. This is because this first arithmetic operation is the foundation of the other operations. The number bond visuals show how the numbers are connected. Those same number bonds will be used to show how the subtraction facts are simply the reverse of the addition facts. Instead of adding two numbers together, the child now has the answer and one of the component numbers.

The student doesn't have to memorize a whole new set of facts. Once he sees the relationship, he should be able to use what he already knows to solve the subtraction problems. The subtraction signs and vocabulary won't be introduced until the end of the year. This is because the signs and the horizontal and vertical subtraction problems are the last step in moving from the concrete to the abstract. The three main "clue words" for subtraction are *from*, *leaves*, and *less*. This is how a subtraction fact will be worded since the signs have not been introduced: "3 from 5 leaves 2 (same as $5-3=2$). Avoid using the words "minus" and "equal" since those are the abstract words that go along with the abstract signs and symbols.

The major difference between addition and subtraction is that the order matters in subtraction at this level. That is why the order principle introduced in the first unit is called the *Commutative Property of Addition*. Putting the numbers in any order only works with addition. Since we are only working with the **whole numbers** at this stage (0, 1, 2, 3 . . .), we cannot subtract a larger number from a smaller number (such as 10 from 4). You will need to make sure your child recognizes this restriction. [Incidentally, the fact that sometimes we do want to subtract a larger number from a smaller number is why the negative integers were added to the number system.]

The subtraction fact family tables are constructed in such a way to highlight the relationship with addition, which is reinforced with the number bond visuals. The same number bonds are used from addition; the only difference is that now the answer is given as well as one of the component numbers and the missing number is the other component.

We use real-life stories to drill the math facts rather than worksheets full of horizontal and vertical addition problems. The point of understanding our number system is its usefulness in real life. This way the child learns the facts in context rather than a bunch of abstract numbers to memorize.



Where You Are Headed:

Here are the essential arithmetic skills that will be covered in this unit:

1. subtraction facts for 1 through 10 (to $10-10=0$ and $20-10=10$)
2. subtraction clue words used in story problems.
3. subtracting zero.
4. order of operations in subtraction.



Packing List:

Here are the supplies you will need for the unit.

- ✓ chalkboard, whiteboard, or blank sheets of paper with the corresponding writing utensils
- ✓ counters (a set of at least 100 is recommended)
- ✓ drawing paper, scrap paper
- ✓ crayons or colored pencils; markers
- ✓ play money or teaching currency set recommended; pennies, nickels, dimes, quarters, half-dollars, dollar bill
- ✓ standard 12-inch ruler, measuring tape (cloth recommended); yardstick (recommended)

- ✓ game markers
- ✓ light-colored file folder
- ✓ box of round multi-colored labels
- ✓ color spinner (recommended)
- ✓ thermometer
- ✓ bathroom scale; spring scale optional to measure lighter objects
- ✓ teaching clock (recommended); a standard clock with hands that move can be used
- ✓ scissors
- ✓ clear tape
- ✓ glue stick and stapler (optional)
- ✓ minimum of 3 white poster boards
- ✓ clipboard (recommended)
- ✓ grocery bags
- ✓ cups measure, pint measure, gallon jug
- ✓ variety of household items and toys that you have around the house
- ✓ index cards
- ✓ child-sized backpack or tote (optional)



Mile Markers (end of unit)

- Recognizes the subtraction facts for 1 through 10.
- Recognizes how subtraction is the reverse or opposite of addition.
- Recognizes how many of the subtraction facts for larger numbers have already been learned with the lower numbers so there are fewer new facts to be memorized.
- Knows that for now we can only subtract a smaller number from a larger number.
- Recognizes the clue words for subtraction: less, lost, take away, give away, leaves
- Recognizes that subtraction always involves subtracting two numbers at a time
- Can subtract several numbers by subtracting two numbers, getting an answer, and then subtracting the next smaller number from that answer until the final answer is obtained
- Recognizes the numbers involved in a story problem and can use them to find the answer
- Recognizes the importance of units in a story problem and puts them in the answer
- Recognizes the clue words in story problems and can decide whether to add or subtract
- Can add and subtract several numbers
- Recognizes how a number line is constructed
- Recognizes how the Hundred Chart is constructed and can use it to answer questions
- Can measure an object in inches, feet, and yards
- Recognizes that a thermometer is used to measure temperature and that the temperature is usually expressed as Fahrenheit degrees
- Can tell time to the minute
- Can write the time
- Recognizes the parts of a whole
- Recognizes halves, thirds, and fourths and can write these as fractions
- Can use tallies to make a chart and bar graph
- Recognizes the operation signs for addition (+), subtraction (−), equals (=), cents (¢), dollars (\$)



TOURIST ATTRACTIONS

Here are some activities your child can do to extend the learning in this unit. Any extension activities should be done in a separate session, either later in the day or the next day.

- **PRACTICE SUBTRACTION FACTS**
Use any of the games from the lessons to practice the subtraction facts.
- **PRACTICE MEASURING**
Have your child help you in the kitchen or workshop, using the different measuring units taught in the lessons. Even if he hasn't seen the same measures, let him watch you use them to see how useful they are.
- **PRACTICE TELLING TIME AND USING TERMINOLOGY**
Ask your child whether it is AM or PM, whether it is before noon or after noon, and what time it is. Although we do not deal with the amount of time that has elapsed, you can prepare your child for this by asking which chores take less time and which take longer. Decide how long your child can do a certain activity and then together set a timer to get a feel for the amount of time that goes by.
- **POPCORN PRACTICE**
Have your child give you two names and an object. Then make up a subtraction story problem using those nouns for your child to answer. Let's say your child comes up with Cam and Pam for the names and ice cream cones for the object. Your question could be, "Cam made 8 sand castles and Pam's dog jumped through 2 of them, knocking them down. How many castles did Cam have left?" As an added bonus, pop some popcorn and let your child eat some kernels every time he gets the answer correct.



CEMENT MIXERS

(check when done at least one time; these exercises can be used more than once)

For Lessons 101-120, drill the fact family learned that week.

For use with Lessons 121-140

Goal: To practice counting and subtraction facts.

These are oral exercises. (The answers are in parentheses.)

- | | | |
|---|-----------------|-----------------|
| <input type="checkbox"/> How many are 7 less 5? (2) | 9 less 2? (7) | 11 less 4? (7) |
| <input type="checkbox"/> How many are 8 less 6? (2) | 10 less 7? (3) | 11 less 5? (6) |
| <input type="checkbox"/> How many are 17 less 9? (8) | 13 less 4? (9) | 16 less 8? (8) |
| <input type="checkbox"/> How many are 5 less 2? (3) | 10 less 3? (7) | 12 less 2? (10) |
| <input type="checkbox"/> How many are 18 less 8? (10) | 5 less 3? (2) | 6 less 4? (2) |
| <input type="checkbox"/> How many are 6 less 2? (4) | 14 less 6? (8) | 9 less 6? (3) |
| <input type="checkbox"/> How many are 16 less 6? (10) | 14 less 4? (10) | 8 less 2? (6) |
| <input type="checkbox"/> How many are 8 less 4? (4) | 13 less 9? (4) | 9 less 7? (2) |
| <input type="checkbox"/> How many are 10 less 2? (8) | 14 less 5? (9) | 11 less 2? (9) |
| <input type="checkbox"/> How many are 13 less 8? (5) | 10 less 8? (2) | 10 less 5? (5) |

For use with Lessons 141-160

Goal: To provide mixed practice in addition facts and subtraction facts.

These are oral exercises.

- | | |
|---|------------------------------------|
| <input type="checkbox"/> How many are 2 and 5, less 3? (4) | How many are 3 and 3, less 4? (2) |
| <input type="checkbox"/> How many are 8 and 9, less 7? (10) | How many are 9 and 8, less 10? (7) |
| <input type="checkbox"/> How many are 7 and 10, less 8? (9) | How many are 10 and 7, less 9? (8) |
| <input type="checkbox"/> How many are 3 and 4, less 5? (2) | How many are 5 and 2, less 4? (3) |
| <input type="checkbox"/> How many are 2 and 6, less 3? (5) | How many are 5 and 3, less 4? (4) |
| <input type="checkbox"/> How many are 7 and 9, less 6? (10) | How many are 10 and 6, less 8? (8) |
| <input type="checkbox"/> How many are 3 and 5, less 6? (2) | How many are 4 and 4, less 6? (2) |
| <input type="checkbox"/> How many are 6 and 10, less 9? (7) | How many are 10 and 6, less 7? (9) |
| <input type="checkbox"/> How many are 8 and 10, less 9? (9) | How many are 9 and 9, less 10? (8) |

- How many are 3 and 9, less 10? (2)
- How many are 7 and 7, less 5? (9)
- How many are 6 and 3, less 5? (4)
- How many are 5 and 4, less 2? (7)
- How many are 9 and 6, less 7? (8)
- How many are 7 and 4, less 8? (3)
- How many are 5 and 7, less 3? (9)

- How many are 9 and 3, less 7? (5)
- How many are 8 and 5, less 6? (7)
- How many are 8 and 6, less 7? (7)
- How many are 2 and 8, less 5? (5)
- How many are 7 and 6, less 10? (3)
- How many are 10 and 2, less 5? (7)
- How many are 6 and 3, less 7? (2)

For use with Lessons 161-165

Goal: To practice skip-counting and subtraction.

These are oral exercises.

- Begin with 20, and subtract by 2's to 0. (20, 18, 16, 14, 12, 10, 8, 6, 4, 2, 0)
- Begin with 18, and subtract by 3's to 0. (18, 15, 12, 9, 6, 3, 0)
- Begin with 20, and subtract by 4's to 0. (20, 16, 12, 8, 4, 0)
- Begin with 20, and subtract by 5's to 0. (20, 15, 10, 5, 0)
- Begin with 18, and subtract by 6's to 0. (18, 12, 6, 0)

LESSON 101 – Subtraction Story



Packing List:

Here are the supplies you will need for this lesson:

- ✓ drawing paper (or blank paper) and colored pencils or crayons

This lesson draws the child, literally, into the world of subtraction through a story.

- The child (or you) will be asked to draw the elements of the story in a picture.
- He will then use the picture to answer the questions that “just happen” to involve subtraction.
- The lesson reinforces the need for identifying the units we are adding. In this case, owls and bats. We always need to label the numbers we use to show what we are counting. The first blank is for the numeral. The second set of lines is for writing the units (owls/bats).
 - However, if all we are doing is subtracting numbers rather than real objects, then we don't need to include the units.
 - Notice we do not use the subtraction signs yet, which are one more level of abstraction. We want to keep the skill as concrete as possible so that your child can make the connection between counting real objects and using symbolic numerals only.
 - If your child doesn't want to finish the story, that's fine. We used it only to show, once again, how useful numbers are in real life. That is the point of learning arithmetic – to help us solve real-life problems.
 - Be sure to point out the subtraction clue words: FROM and LEAVES. Other clue words that will be pointed out in the story problems in this unit are LESS, LOST, GAVE AWAY, and TOOK AWAY.
 - We will use the picture your child draws in the next lesson, so be sure to keep it safe and handy.

LESSON 102 – Addition and Subtraction Connection



Packing List:

Here are the supplies you will need for this lesson:

- ✓ picture your child drew in the last lesson (of the bats and owls)
- ✓ 7 counters

This lesson draws the child, literally, into the world of subtraction and shows how it relates to addition.

- As with the addition facts, we recommend that you use actual counters your child can see and handle. Even if your child has the addition facts memorized, using the counters helps the child see the relationship between addition and subtraction.

- You can use the counters to play up the story. When the four bats fly away, you can move the four counters as if they are flying away. In the lesson, we show these four counters in outline form only (like phantom bats!) so your child can “see” the preliminary action. Once the bats are long gone, your child should see that he has three “bats” (counters) left.

- The format of the number bond stays the same for addition and subtraction. The total is on top and the two numbers that make that total are below it. In addition, we have the two parts, and we want to know what they are together. In subtraction, we know the total and one of the parts, and we want to know the other part.

- Make sure your child sees how the number bonds shown in the lesson are alike (they have the same numerals) and how they are different (different numerals are highlighted).

LESSON 103 – Subtraction Order of Operation



Packing List:

Here are the supplies you will need for this lesson:

- ✓ drawing paper (or blank paper) and colored pencils or crayons

This lesson draws the child, literally, into the world of subtraction and shows how it is different from addition.

- Have the paper ready as if your child is going to draw another picture. But he will not be able to. We want to drive home the idea that you cannot take away something that is not there.

- Since we are dealing only with whole numbers at this stage, your child must recognize that he cannot subtract a larger number from a smaller number.

- To prove the point, we sneak in the idea of fractional parts without explaining what a fraction is at this point. We simply introduce the idea of parts of a whole—in this case, a half or two parts of the same size.

- Be sure to remind your child that if he sets up a story problem where he is trying to subtract a larger number from a smaller number, something is wrong with the way he set up the problem.

LESSON 104 – Subtraction Facts for One



Packing List:

Here are the supplies you will need for this lesson:

- ✓ 10 counters

This lesson presents the full subtraction fact family for one (1 through 10).

- For the subtraction fact families, the number sentence at the top, in the middle of the columns, will always show that number subtracted from itself, which is always zero.

- To show the counters to be taken away, we will use an outline only and an arrow.

- While it may seem redundant, we recommend having the child use counters to show each fact in the fact family table. As with addition, once your child has done several fact families, there will be fewer “new” facts to see.

LESSON 105 – Subtraction Facts for One – Story Problems



Packing List:

Here are the supplies you will need for this lesson:

- ✓ 10 counters (or coins if preferred in the money story problems)