

RAY'S PRIMARY ARITHMETIC — LEVEL 2

UNIT TWO: MULTIPLICATION — Lessons 16- 70

Overview: This unit introduces the multiplication facts.

Suggested Schedule: minimum of 11 weeks

Background:

In Level 1 of *Ray's for Today*, your child saw the value of learning the addition and subtraction facts to make adding and subtracting numbers faster and easier. Subtraction was seen as the reverse of addition. Skip-counting showed how the same number could be added repeatedly. The rhythm of skip-counting can make it easier to count, but after a while the numbers become so big and the process becomes so tedious that it isn't much help.

Just as learning the addition and subtraction facts made doing arithmetic easier, learning the facts involved in repeated addition can make doing arithmetic easier. Repeated addition has another name: multiplication. Students will learn that the prefix *multi* means *many*, so it is the same as adding a number many times.

It's important that students see how the arithmetic operations (so far addition, subtraction, and multiplication) are just short-cuts for using numbers in special ways. Each time we introduce another operation or type of number, it's because it allows us to use numbers in another way. Numbers are useful!

With multiplication, we can rapidly work with larger numbers. This means that students will shortly need to be able to count beyond 100. We opted to introduce the multiplication fact families first, building upon the addition facts through ten that they already know. Hooking a new skill to something that is already known helps students see how and why math works, rather than just memorizing a set of steps or formulas.

Once the multiplication facts are seen as extensions of repeated addition, students will be ready to learn larger numbers and see how those numbers are expanded in groups of ten. This will prepare them for place value.



Where You Are Headed:

ESSENTIALS — The student will:

- be introduced to multiplication as repeated addition.
- see how the repeated addition facts can be summarized into the multiplication facts.
- practice the multiplication fact families for 1 through 10, using both charts and story problems.

SUPPLEMENTARY

- review telling time, circle graphs, shapes and measurement

ADDITIONAL SKILLS

- introduced to more fractions



Packing List:

Here are the supplies you will need for this unit:

- ✓ chalkboard, whiteboard, or blank sheets of paper with the corresponding writing utensils
- ✓ a copy of the Hundred Chart in the back of the Instructor's Manual
- ✓ two copies of the Multiplication Chart in the back of the Instructor's Manual, one for teaching purposes and one that the student will color in
- ✓ at least 20 copies of the multiplication number bonds sheet
- ✓ drawing paper and crayons or colored pencils
- ✓ 200 counters
- ✓ copies of the game boards in the back of the Instructor's Manual
- ✓ game marker (player piece)
- ✓ dice or game spinner

- ✓ play money – coins and bills (or real money)
- ✓ teaching clock or standard clock with hands that can be moved
- ✓ outdoor thermometer
- ✓ various-shaped objects (round, square, rectangular, triangular)
- ✓ ruler, yardstick, and measuring tape
- ✓ spring scale (recommended, a food scale can be used)
- ✓ bathroom scale
- ✓ light and heavy objects for measuring
- ✓ cup measures, pint measure (larger measuring cup)
- ✓ quart measure (or pitcher that holds several quarts)
- ✓ empty gallon jug



Mile Markers

- Your child will be learning the multiplication facts by using the counters to see the repeated addition. The process will start out slowly since it is a new concept, but as more fact families are covered, you child should see how it works and should be able to catch on to newer facts faster.
- Going through the entire fact family, along with the opposite fact, offers built-in review, so make sure you go through the whole list in each lesson even if your child seems to know some of the facts. Repetition is absolutely crucial for cementing learning and moving the skill into Long-Term Memory.
- Because of the amount of repetition in the lessons based on the tangible, concrete counters, not a lot workbook exercises are included. Most children’s attention will stay focused longer when doing something with their hands than doing passive worksheets.
- The other topics covered in this unit, such as telling time and measurement, are designed to build on previous introductions in Level 1. These lessons expand that introduction and offer a limited amount of practice. While these are useful skills, it is more essential that students learn the multiplication facts.



CEMENT MIXERS

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

For Lessons 16-35, drill the multiplication fact family learned that week.

For use with Lessons 36-50

Goal: To practice the multiplication facts.

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

- | | | |
|--|------------------|-----------------|
| <input type="checkbox"/> How many are 2 times 5? (10) | 3 times 4? (12) | 2 times 9? (18) |
| <input type="checkbox"/> How many are 2 times 10? (20) | 3 times 3? (9) | 4 times 2? (8) |
| <input type="checkbox"/> How many are 5 times 4? (20) | 2 times 8? (16) | 2 times 2? (4) |
| <input type="checkbox"/> How many are 3 times 10? (30) | 5 times 6? (30) | 2 times 6? (12) |
| <input type="checkbox"/> How many are 3 times 8? (24) | 4 times 10? (40) | 3 times 7? (21) |
| <input type="checkbox"/> How many are 4 times 7? (27) | 5 times 5? (25) | 3 times 5? (15) |
| <input type="checkbox"/> How many are 3 times 6? (18) | 4 times 9? (36) | 4 times 6? (24) |
| <input type="checkbox"/> How many are 3 times 9? (27) | 4 times 8? (32) | 4 times 4? (8) |
| <input type="checkbox"/> How many are 5 times 7? (35) | 2 times 3? (6) | 4 times 3? (12) |
| <input type="checkbox"/> How many are 4 times 5? (20) | 5 times 2? (10) | 5 times 3? (15) |

For use with Lessons 51-60

Goal: To practice the multiplication facts.

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

- | | | | |
|--------------------------|-------------------------------|--------------------|------------------|
| <input type="checkbox"/> | How many are 8 times 10? (80) | 8 times 6? (48) | 7 times 10? (70) |
| <input type="checkbox"/> | How many are 6 times 6? (36) | 8 times 8? (64) | 7 times 9? (63) |
| <input type="checkbox"/> | How many are 6 times 9? (54) | 8 times 5? (40) | 7 times 7? (49) |
| <input type="checkbox"/> | How many are 10 times 5? (50) | 6 times 10? (60) | 6 times 7? (42) |
| <input type="checkbox"/> | How many are 9 times 10? (90) | 8 times 7? (56) | 9 times 9? (81) |
| <input type="checkbox"/> | How many are 8 times 9? (72) | 10 times 10? (100) | 7 times 2? (14) |
| <input type="checkbox"/> | How many are 9 times 7? (63) | 8 times 3? (24) | 9 times 6? (54) |
| <input type="checkbox"/> | How many are 8 times 4? (32) | 7 times 6? (42) | 10 times 9? (90) |
| <input type="checkbox"/> | How many are 9 times 8? (72) | 9 times 5? (45) | 9 times 4? (36) |

For use with Lessons 61-70

Goal: To practice the multiplication facts.

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

- | | |
|--------------------------|--|
| <input type="checkbox"/> | How many are 2 times 3 times 3? (18) |
| <input type="checkbox"/> | How many are 4 times 2 times 2? (16) |
| <input type="checkbox"/> | How many are 2 times 3 times 4? (24) |
| <input type="checkbox"/> | How many are 2 times 2 times 5? (20) |
| <input type="checkbox"/> | How many are 5 times 2 times 3? (30) |
| <input type="checkbox"/> | How many are 3 times 2 times 6? (36) |
| <input type="checkbox"/> | How many are 2 times 2 times 6? (24) |
| <input type="checkbox"/> | How many are 2 times 3 times 7? (42) |
| <input type="checkbox"/> | How many are 2 times 2 times 7? (28) |
| <input type="checkbox"/> | How many are 4 times 2 times 8? (64) |
| <input type="checkbox"/> | How many are 3 times 3 times 4? (36) |
| <input type="checkbox"/> | How many are 2 times 4 times 6? (48) |
| <input type="checkbox"/> | How many are 2 times 2 times 10? (40) |
| <input type="checkbox"/> | How many are 3 times 2 times 10? (60) |
| <input type="checkbox"/> | How many are 4 times 2 times 5? (40) |
| <input type="checkbox"/> | How many are 4 times 2 times 4? (32) |
| <input type="checkbox"/> | How many are 3 times 2 times 8? (48) |
| <input type="checkbox"/> | How many are 4 times 2 times 10? (80) |
| <input type="checkbox"/> | How many are 2 times 5 times 7? (70) |
| <input type="checkbox"/> | How many are 3 times 3 times 10? (90) |
| <input type="checkbox"/> | How many are 5 times 2 times 8? (80) |
| <input type="checkbox"/> | How many are 2 times 5 times 9? (90) |
| <input type="checkbox"/> | How many are 5 times 2 times 6? (60) |
| <input type="checkbox"/> | How many are 2 times 3 times 9? (54) |
| <input type="checkbox"/> | How many are 2 times 2 times 9? (36) |
| <input type="checkbox"/> | How many are 3 times 3 times 5? (45) |
| <input type="checkbox"/> | How many are 3 times 3 times 6? (54) |
| <input type="checkbox"/> | How many are 2 times 5 times 10? (100) |

- How many are 4 times 2 times 9? (72)
- How many are 3 times 3 times 7? (63)
- How many are 3 times 3 times 8? (72)

LESSON 16 – Multiplication Chart



Packing List:

Here are the supplies you will need for this lesson:

- ✓ Multiplication Chart from the back of the Instructor’s Manual.
- ✓ Hundred Chart from the back of the Instructor’s Manual

The lesson shows how the Multiplication Chart is constructed.

- The lesson covers how the chart shows all the results of skip-counting using the counting numbers (one through ten).

- This helps students make the connection between addition and multiplication.

- The lesson explains that the chart compiles all the skip-counting charts that we made in Lessons 6 - 14. You may need to flip back to each lesson so your child can see how the first row of each skip-counting chart is the same as the top row of the Multiplication Chart. Then make sure your child sees how the second row of each skip-counting chart corresponds to the row on the Multiplication Chart for the skip-counting number. The lesson shows these for the TWOS and the THREES.

- To drive the point home, have your child find each skip-counting numbered row (e.g. the FOURS, FIVES, SIXES, and so on) in the lesson and then on the Multiplication Chart. Have him run his finger across each row as we did with the TWOS in the lesson, to see how the numbers increase.

- Let your child compare the Hundred Chart and the Multiplication Chart. Some children will need to skip-count on the Hundred Chart again to see the relationships.

- The point of showing the Multiplication Chart first before introducing the multiplication fact families is so students see how we are building upon known math skills (repeated addition) and how our number system expands to allow us to use more math skills. Rather than having to refer back to the Chart, students will see that learning the multiplication facts is an even faster way to add repeatedly.

LESSON 17– Picturing Multiplication



Packing List:

Here are the supplies you will need for this lesson:

- ✓ drawing paper and crayons or colored pencils
- ✓ 20 counters (optional)

The lesson draws the child, literally, into the world of multiplication through a story.

- The child (or you) will be asked to draw the basic elements of a story in a simple picture.

- He will then use the picture to answer the questions that “just happen” to involve repeated addition—otherwise known as multiplication.

- The lesson reinforces the need for identifying the units we are adding repeatedly. In this case, birds, eggs, and wings. We always need to label the numbers we use to show what we are counting.

- But if all we are doing is adding the numbers repeatedly (multiplying) rather than real objects, then we don’t need to include the units.

- Notice we do not use the multiplication sign yet, which is one more level of abstraction. We want to keep the skill of repeated addition/multiplication as concrete as possible so that your child can make the connection between counting the same number repeatedly and using the symbolic numerals only.

- When your child is done with the lesson, he can color the picture. We used it only to show, once again, how useful numbers are in real life. That is the point of learning new skills in arithmetic—to help us solve real-life problems faster and easier.

LESSON 18 – Multiplication and Repeated Addition



Packing List:

Here are the supplies you will need for this lesson:

- ✓ Multiplication Chart from the back of the Instructor’s Manual.

The lesson shows how skip-counting, repeated addition, and multiplication are related.

- The point of this lesson is to see how much easier it is to work with the multiplication facts than with repeated addition and skip-counting.
- To do this, we make the student write out the skip-counting fact for each number to ten. We put ten blanks for the number sentence for the TWOS to guide your student, and then give the final answer.
- Your child’s answers for the rest of the counting numbers should follow the same format as the number sentence for the ONES given in the lesson.
- Those “answers” are listed again in the lesson, with the shortened way of saying the same fact.
- Once the concrete multiplication facts have been introduced and practiced, we will show another short-cut using the more abstract multiplication symbol.

LESSON 19 – Multiplication Fact Family – Ones



Packing List:

Here are the supplies you will need for this lesson:

- ✓ Multiplication Chart from the back of the Instructor’s Manual.
- ✓ 20 counters

The lesson shows the full multiplication fact family for the ones (1 through 10).

- Each time we introduce a multiplication fact family, we will compare it to the Multiplication Chart so that it is hooked to the skip-counting and repeated addition facts.
- The ONES fact family isn’t shown on the Multiplication Chart in the same way that the rest of the counting numbers are shown. The Multiplication Chart doesn’t show the results of 1 times a number since it would simply repeat the top row: 1 times any number is that number.
- The lesson shows the Commutative Property of Multiplication without stating it as such. As with the Commutative Property of Addition, this property means that the order of the numbers being multiplied does not matter; you get the same answer no matter what order you use. In the lesson we call these “opposite” facts; the numbers are in the opposite order. For example, 1 times 3 is 3; 3 times 1 is 3.
- As with addition and subtraction, we want your child to use the counters to show the facts. We want to make sure your child has a visual of how the facts work. To cement the idea of the Commutative Property, keep the counters for each fact on the table when you show the opposite fact; use additional counters to show the flip side. This way your child can indeed see that the facts yield the same answer.
- Every time your child shows a fact with the counters, make sure he says the fact out loud. The more senses that are used, the more the fact is cemented into long-term memory. This is also why we want your child to show every fact with the counters, even if he thinks he can “see it” already. After a while, your child may think the counters are tedious. Keep doing them because we are imprinting the pictures of the counters onto your child’s memory.