

**Unit:** Algebraic Reasoning

**Grade:** 3

**Lesson Title:** Organizing the Apple Orchard with Johnny Appleseed

Overview

In this lesson, students will learn about the inverse relationship between multiplication and division. They will use apple seeds, apples, and baskets to create and solve multiplication and division problems.

Objectives

- Students will recall the process of multiplication and of division.
- Students will discover and describe the inverse relationship of multiplication and division.
- Students will create concrete representations of multiplication and division problems.
- Students will create the inverse of a particular problem, whether multiplication or division.

Standards

- NYS Common Core Standards
  - Understand properties of multiplication and the relationship between multiplication and division.
    - 5. Apply properties of operations as strategies to multiply and divide. Examples: If  $6 \times 4 = 24$  is known, then  $4 \times 6 = 24$  is also known. (Commutative property of multiplication.)  $3 \times 5 \times 2$  can be found by  $3 \times 5 = 15$ , then  $15 \times 2 = 30$ , or by  $5 \times 2 = 10$ , then  $3 \times 10 = 30$ . (Associative property of multiplication.) Knowing that  $8 \times 5 = 40$  and  $8 \times 2 = 16$ , one can find  $8 \times 7$  as  $8 \times (5 + 2) = (8 \times 5) + (8 \times 2) = 40 + 16 = 56$ . (Distributive property.)
    - 6. Understand division as an unknown-factor problem. For example, find  $32 \div 8$  by finding the number that makes 32 when multiplied by 8.
- NCTM Standards
  - Model problem situations with objects and use representations such as graphs, tables, and equations to draw conclusions.
  - Express mathematical relationships using equations.

Materials

- The story, *Johnny Appleseed* by Jane Yolen.

- Apple seeds
- State Maps
- “State Seed Sorting” chart
- Seed Sorting scenarios
- Apples
- Baskets
- Easel
- Marker
- “Apple Orchard Organizer” chart
- Apple Sorting scenarios
- Exit Slip, “The Last Apple Slice”
- Apple stickers
- Pencils

### Instructional Plan

- To begin, read the story *Johnny Appleseed* By Jane Yolen.
  - Start a whole class discussion. Ask questions such as “How many seeds do you think Johnny Appleseed started with? Remember, he planted all the way to California!” “How many apples do you think grew on one of Johnny Appleseed’s trees?”
    - Show the students an apple seed. Pass it around.
- Explain to the students that they are now going to use apple seeds to practice their multiplication and division.
  - Separate the students into pairs.
  - Hand each pair a bag of apple seeds (you can decipher how many based on your created problems), a state map, and a “State Seed Sorting” chart.
  - Explain to the students that they are now going to take the place of Johnny Appleseed!
  - They are to plant seeds all throughout the states by listening to the directions given by Johnny himself.
    - For example, project the following scenario on the board:
      - Hi everyone! My name is Johnny Appleseed. Unfortunately, I can’t make my trip across the United States of America this time, so I was hoping you could do it for me! First off, we’re going to start in the tri-state area. This includes the states of New Jersey, Connecticut, and the one you’re in now, New York! I have set aside **15 seeds** for the tri-state area. Can you help me out by planting them **evenly** among the **three states**?
      - Model how to solve the above problem by projecting your state map on the board. List the KNOWN information and the UNKNOWN information.
        - Known:
          - The total amount of seeds is 15.
          - We need to divide them evenly into 3 groups.
        - Unknown:

- How many seeds are in each group?
- Ask student volunteers to come up and help place the correct amount of seeds in each state.
  - 5 seeds in each state.
- Explain that we just **divided** the 15 seeds evenly into 3 groups of 5.
  - Have the rest of the pairs follow along with their seeds and state map.
  - Tell the students to record their planting on the “State Seed Sorting” chart.
- Demonstrate to the students that the equation for this problem is  $15 \div 3 = 5$ .
- Tell the students, “Now it’s time for the tricky part! I am going to switch around the KNOWN and UNKNOWN information and see if you can still solve the problem”
- Project the following scenario on the board:
  - Hi everyone! My name is Johnny Appleseed. Unfortunately, I can’t make my trip across the United States of America this time, so I was hoping you could do it for me! First off, we’re going to start in the tri-state area. This includes the states of New Jersey, Connecticut, and the one you’re in now, New York! I want you to plant **5 seeds in each state**, but I can’t figure out how many seeds I need to give you. Can you help me figure out the total amount of seeds you need?
  - Known:
    - We are to plant 5 seeds in each state.
    - There are 3 states.
  - Unknown:
    - How many seeds do we need in total?
- Ask student volunteers to come up and help solve the problem.
- Explain that we just **multiplied** the 5 seeds 3 times since there are 3 states.
- Demonstrate to the students that the equation for this problem is  $3 \times 5 = 15$ .
- **Stress the inverse relationship between multiplication and division by comparing the two problems, their equations, and the concrete representation of the seeds in each state. The total amount of seeds or the amount of seeds in each state never changed!**
- In pairs, have the students work to plant the rest of the seeds according to Johnny’s directions, one by one.
  - (See attached sheet: Seed Sorting Scenarios).
  - Make sure they place the seeds on the state map and fill out their “State Seed Sorting” chart.
- As a class, go over the remaining word problems. Once again, ask student volunteers for help.
- Explain to the students that a lot of time has passed and the seeds we planted for Johnny Appleseed have now grown into apple trees! However, just yesterday, the apples had fallen from the tree. Therefore, Johnny would like our help **grouping** apples so he can

hand them out to all his family and friends! Remind the students that for this activity they are once again going to need their multiplication and division skills.

- Bring the students outside to the playground. Bring along an easel and marker.
- Have apples and empty baskets pre-set outside.
  - Make sure they are spread out evenly throughout the playground. However, make sure they are within school distance limits. Do not send children anywhere you cannot see them. You may want adult assistance for this activity.
- Ask the students to collect the empty baskets and all the apples. Have them bring the apples and baskets to the center of the playground where you are standing.
- As a class, count the number of total baskets. Record it. Count the total number of apples. Record it.
- Explain to the students, “Now that we have collected all the fallen apples and know the total number of baskets and the total number of apples, we need to figure out how many apples go into each basket and where each basket goes! Phew!”
- Read the following scenario aloud:
  - “Hi everyone! It’s me, Johnny Appleseed, again. You all did a great job of planting my seeds. Look at the amount of apples that grew! Now I need your help grouping the apples so I can pass them out to family and friends all around. Let’s start with the tri-state area again, since that’s where we are! There are 3 states in the tri-state area and I would like each of them to get 7 apples each. How many apples do we need in total?”
  - On the easel, record the KNOWN and UNKNOWN information.
  - Ask student volunteers come up and place the correct number of apples in each of the baskets.
  - Have another student volunteer come up and count the total number of apples.
    - We have 21 apples!
  - Demonstrate to the students that the equation for this problem is  $3 \times 7 = 21$ . Record it on the easel.
  - Just like before, reverse the problem and create the equation  $21 \div 3 = 7$ .
  - **Stress the inverse relationship between the multiplication problem and the division problem. Show using the apples and baskets.**
- Explain to the students that they will now work in 4 small groups to solve a problem provided by Johnny Appleseed. Tell the students to do exactly what we just did as a whole class. Provide them with the corresponding “Apple Orchard Organizer” worksheet and pencils.
  - Provide them the following problem:
    - Hi all! We are now going to give some of the New England states our delicious apples. We are going to give Massachusetts, Rhode Island, New Hampshire, and Vermont some apples. How many baskets do you need? Once you figure it out, go up on to your teacher and ask for them! Next, I want you to get the total amount of apples you need. So go on up and ask your teacher for 20 apples! Lastly, I want you to place an equal amount of apples into each basket. Can you do it? How many apples are in each basket?

- Have the students work out the problem. Find the answer. Record the equation on their “Apple Orchid Organizer” worksheet.
  - (See attached worksheet: Apple Sorting Scenarios)
- Ask them to raise their hand once they are finished. Check their work and see if they can demonstrate the inverse problem. Have them also record this on their worksheet.
- Continue to do the following with several more problems depending on time.
  - (See attached sheet.)
- Head back to the classroom, with the baskets of apples, and ask if the students have any questions.
- Hand out the exit slip.
- Collect, hand the child an apple, and review the exit slip for assessment.

### Assessment

- Observation
- Collection and evaluation of “State Seed Sorting” and “Apple Orchid Organizer” worksheets
- Exit Slip



Name: \_\_\_\_\_

## State Seed Sorting

### Problem One: **The Tri State Area**

What is the total amount of seeds? \_\_\_\_\_

How many seeds are in each state? Write the number or draw the amount!

| New York | New Jersey | Connecticut |
|----------|------------|-------------|
|          |            |             |

Write the equation of the division problem: \_\_\_\_\_

Write the inverse of the problem, creating a multiplication equation: \_\_\_\_\_

### Problem Two: **The Southern States**

What is the total amount of seeds? \_\_\_\_\_

How many seeds are in each state? Write the number or draw the amount!

| Texas | Louisiana | Mississippi | Alabama |
|-------|-----------|-------------|---------|
|       |           |             |         |

Write the equation of the multiplication problem: \_\_\_\_\_

Write the inverse of the problem, creating a division equation: \_\_\_\_\_

### Problem Two: **The West Coast**

What is the total amount of seeds? \_\_\_\_\_

How many seeds are in each state? Write the number or draw the amount!

| Arizona | California | Oregon | Washington |
|---------|------------|--------|------------|
|         |            |        |            |

Write the equation of the division problem: \_\_\_\_\_

Write the inverse of the problem, creating a multiplication equation: \_\_\_\_\_

## Seed Sorting Scenarios

1. Problem One: Hi everyone! My name is Johnny Appleseed. Unfortunately, I can't make my trip across the United States of America this time, so I was hoping you could do it for me! First off, we're going to start in the tri-state area. This includes the states of New Jersey, Connecticut, and the one you're in now, New York! I have set aside **15 seeds** for the tri-state area. Can you help me out by planting them **evenly** among the **three states**?
2. Problem Two: Now we are going to plant seeds in some of the southern states! I want you to plant **3 seeds** in each of the following states: **Texas, Louisiana, Mississippi**, and **Alabama**. Oh no! I'm not sure how many **total seeds** I need to give you. Can you figure it out?
3. Problem Three: Phew! Glad we solved that one! Time to go to the west coast! We need to plant seeds in Arizona, California, Oregon, and Washington. I have **32 seeds** to give you for the west coast states. Once again, I want you to divide them evenly among the four states. How many seeds are to be planted in each state? Can you do it? Get to it!

Name: \_\_\_\_\_

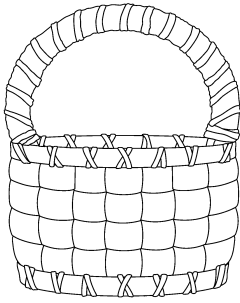
## Apple Orchard Organizer



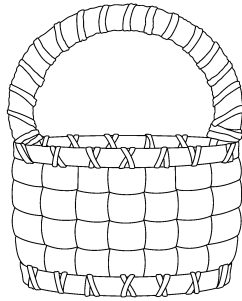
### Problem One: **The New England States**

Number of apples in total: \_\_\_\_\_

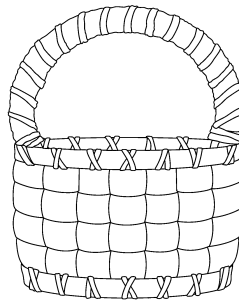
Please draw the amount of apples that should be placed in each basket.



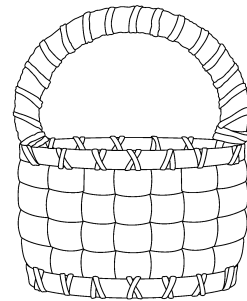
Massachusetts



Rhode Island



New Hampshire



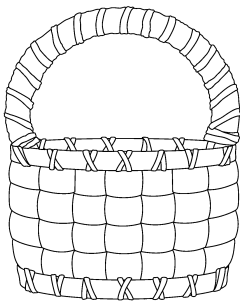
Vermont

Please write the above problem in equation form: \_\_\_\_\_

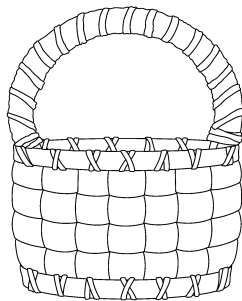
### Problem Two: **The Northern States**

Number of apples in total: \_\_\_\_\_

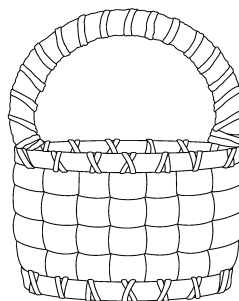
Please draw the amount of apples that should be placed in each basket.



Montana



North Dakota



Minnesota

Please write the above problem in equation form: \_\_\_\_\_



Name: \_\_\_\_\_

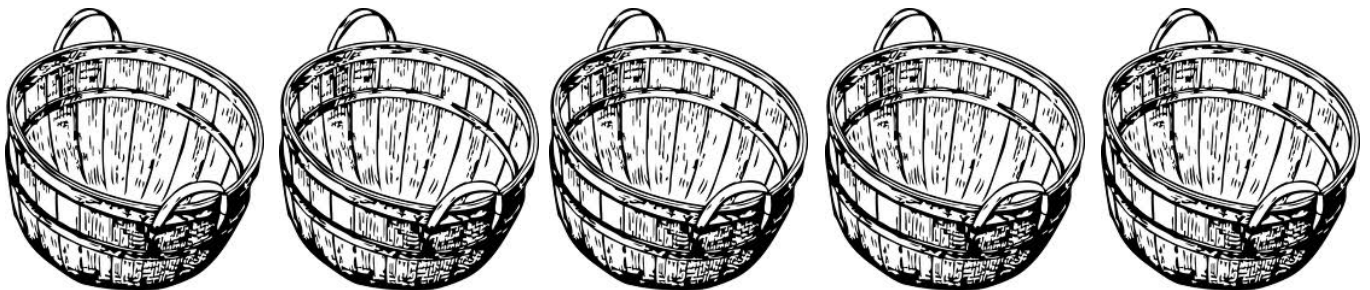


### The Last Apple Slice

1. You have 25 apples. Place them evenly into the following baskets. Use your stickers to do so. How many apples are in each basket?
  - a. \_\_\_\_\_
  - b. Fill in the corresponding equation:  $25 \div \underline{\quad} = \underline{\quad}$



2. I want you to place 5 apples into each of the following baskets. You have 5 baskets to fill. Use your stickers to do so. How many apples are there in total?
  - a. \_\_\_\_\_
  - b. Fill in the corresponding equation:  $5 \times \underline{\quad} = \underline{\quad}$



3. Please explain the how the two problems/equations above are **related**. How are they the **same**? Be specific!

a. \_\_\_\_\_  
\_\_\_\_\_  
\_\_\_\_\_  
\_\_\_\_\_  
\_\_\_\_\_  
\_\_\_\_\_  
\_\_\_\_\_