

Introduction to *Squared Away* Units

“Squared away” was originally a nautical term used to announce that the sails of a square-rigger sailing ship were correctly set. The navy came to use the phrase to describe sailors who completed a task with competency, as in, “He was right squared away!” We have adopted the term to describe students who demonstrate competency in specific content and skills.

Each *Squared Away* unit allows both teachers and students to concentrate on basic concepts that can be mastered in a relatively short period of time. The basic subconcepts are taught in four instructional blocks. The daily activities are interactive, exploratory, and reflective—all best practices to maximize student learning. By the end of each block, students must demonstrate mastery of the subconcepts. After completing four blocks, students may be considered Squared Away. However, to earn a Golden Square, students must go beyond the basic level indicating that they achieved an exemplary score on a final test/project or mastered a final task requiring higher-level thinking skills.

Developing
student competency
is the major goal of all
Squared Away units.

Levels: The units are designed as complete, stand-alone lessons. Although written for either grades 2–4 or 5–8, the content may be used for instruction, enrichment, or remediation.

Differentiation: Teachers are encouraged to reteach and scaffold the learning so that all students master the concepts. Investigations take place in cooperative group settings that allow for peer teaching and support for students with learning difficulties. An extensive list of optional extra activities follows each Instructional Square and provides opportunities for independent or group investigations. The “Golden Square” tasks and an extensive list of optional extra activities will provide opportunities for group investigations or independent challenges for your more talented students.

Student grouping: Students may work in *Squared Away* units as individuals, in pairs, or in heterogeneous teams of three or four. When working in groups, students are responsible for their own learning and for supporting the learning of their teammates. All units provide Cooperative Group Work Rubrics.

Lessons: The lessons begin with a list of concepts to be taught, materials needed, and a lesson-plan schedule. Each lesson is combines whole class instruction, group work, and independent tasks designed to build understanding. Each lesson includes Stop/Think/Draw/Write activities that cause students to synthesize their learning and to share what they know.

Assessments and Rubrics: All units include a pretest/posttest to be administered before starting and after completing the unit. You also assess students daily to check mastery of content and to determine points of confusion. Part of the assessments requires students to explain orally or in writing what they understand. Students may retake assessments until they achieve mastery. The units provide quizzes, tests, and rubrics. There are many opportunities in the daily lessons, optional activities, and assessments for students to demonstrate Gardner's Multiple Intelligences.

Timeline: The lesson plans address four basic instruction blocks and one block to achieve a Golden Square. These may take five or more days depending on the instructional time available and/or your students' grade level and prior knowledge.

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Instruction Block Two

Ratios and Proportions

Instruction Block Two

Ratios and Proportions

Square Two Concepts—Students will:

- Understand that ratios are descriptions comparing two items or measures.
- Understand that a ratio can be written three ways: $\frac{x}{y}$ ___ to ___, or ___ : ___.
- Understand that the order of a ratio is important and ratios must be written as a sentence or with labels so that the description is clear.
Example: The ratio of red to blue is 4 to 3.
- Understand that a proportion is an equation stating that two ratios are equal.
- Write ratios from a given statement.
- Write proportions from a given statement.
- Simplify ratios.
- Solve problems involving ratio and proportion by applying skills learned with equivalent fractions.
- Understand how to interpret the whole group from a ratio. *Example: 5 : 1 means there are 6 in the whole group.*

Materials

- Calculators—*one per student*

Duplicate

- Ratios and Proportion—*one pack per student*
- Writing Ratios—*one per student*
- Worksheet to Reinforce Square Two concepts—*one per student*
- (Optional) How to Create Word Problems—*one per student or team*
- Practice and More Practice—*one per student*
- Quick Team Quiz Two—*one per student*
- Square Test Two—*one per student*

Lesson plan schedule

- Award squares for Instruction Block One
- Ratios and Proportions
 - Writing ratios
 - Simplifying ratios
 - What's a proportion?
 - Solving problems with equivalent ratios and proportion
 - Stop/Think/Draw/Write 5
 - Finding the ratio
 - Finding the "whole"
 - Stop/Think/Draw/Write 6
 - Keeping track of the labels in the question
- (Optional) Worksheet to Reinforce Square Two Concepts
- (Optional) Practice
- (Optional) More Practice
- Quick Team Quiz Two
- Square Two Test

Instruction Block Two

Ratios and Proportions



Small group

Teaching tip

Explain to students who have not yet mastered the first concepts that they will shortly and you will award them their squares as soon as they do. Consider awarding parts of squares to recognize content these students have mastered.



Teaching tip

Student may be reluctant to write labels saying *they* know what they are saying/doing, but when they work with calculators, they tend to “forget” where they were and what they have entered in the calculator. Insist that they write at least some label (ex. *c-cow*, *ck=chicken*)



Lesson Plan

Ratios and Proportions

Awarding squares

Arrange the room and send students into teams. Students will rotate their roles today. If you have not already done so, announce/award the First Squares (blue) to students who have mastered the first concepts in Instruction Block One.

1. Writing ratios

- Give enough packs of **Ratios and Proportions** to each team Manager for every member of his/her team. Because this square is the basis for the rest of the unit, you should probably review the handouts as a whole class, rather than team activity.
- Introduce #1 **Writing Ratios** and introduce the three different ways to write a ratio. Practice how to read a ratio. If needed, have students create ratio sentences so they become familiar with the format:

“The ratio of x to y is ___ to ___.”

Have students note that ratios always have two different labels. Allow students time to draw the clock and write the ratio of 60 to 1 (minutes to hours). Encourage them to offer the correct labels for the ratio of 1:60.

- **Writing Ratios** handout (page two of **Rates and Proportions**). Have students count the figures in each box and write the appropriate ratio. Reinforce the idea that these ratios can be written three different ways. Note that when a ratio is written as a fraction, that they can put either part in the numerator or denominator as long as it is labeled correctly.

2. Simplifying ratios

- Remind students that they already know how to simplify ratios because they already know about simplifying fractions. For this unit, the fractions have easily recognizable GCFs. If want your students to review simplifying more rigorously, choose problems from other texts. Go back to the **Practice** sheet for writing ratios and have students simplify the ratios they wrote after counting.

3. What is a proportion?

- Introduce proportions. Go over the definition comparing it to the definition of a ratio. Stress that working with proportions is not really new material, but something they already know how to do from their

work with equivalent fractions. Unlike fraction worksheets, proportions have actual application in word problems.

4. Solving problems with ratios and proportions

- For parts 4a, b, and c, quickly review the skills for equivalent fractions as they apply to a proportion. The big difference is the need for *labels*. Show students that for their computations, they often need only initial letters. Keep an eye on students who have not yet passed the **Square One Test**. They may need more instruction.
- **Stop/Think/Draw/Write 5**
Have students work individually to complete the prompt. This prompt will show them what can happen if they don't keep track of labels. Walk around and check that students who have finished "early" have included all they know. Tell students to check their spelling and work neatly. Be certain that they have written a label on their final answer.
- After 2–3 minutes, have students first share what they wrote or drew with their team. Then ask teams to choose one teammate's explanations and drawings to share with the whole class.

5. Finding the ratio

- Sometimes students just grab numbers and force them into a proportion. It's important, however, for students to realize that a ratio of 5 to 2 implies a total of 7 items, and that when they see a fraction of $\frac{2}{3}$, this implies a ratio of 2 to 1. If they confuse the ratio with the fraction, they will set up incorrect proportions. Drawings help students to see the difference.

6. Finding the "whole"

- This skill is very important to setting up proper proportions. Adding the numbers of a proportion will reveal the "whole." If the statement is already given as a fraction, the denominator is the "whole."
- **Stop/Think/Draw/Write 6**
Have students work individually to complete the prompt. Walk around and check that students who have finished "early" have included all they know. Tell students to check their spelling and work neatly.
- After 2–3 minutes, have students first share what they wrote or drew with their team. Then ask teams to choose one teammate's explanations and drawings to share with the whole class. Correct responses should note that the sum of the two numbers in the ratio equal the total number. When writing the fraction, the total number is always in the denominator.



Whole class



Individual



Small group



Teaching tip

This is a **very** important concept.

If you feel your students need more concrete practice, use math manipulatives or pieces of black and white paper on their desks to show finding the ratio and determining the "whole."



Teaching tip

Students may not have thought about what "out of" means. Take a moment to discuss concrete examples within the classroom. For example: 5 out of 6 windows are open, 3 out of 25 students are absent, 15 out of 28 students are males, etc. Also point out that the second number in an "out of" statement represents the "whole."



Small group

Square Two Answer Key

Ratios and Proportions:

1. 2 to 15 left-handers to right-handers, 2 : 4 cups fruit to cups of juice,
 $\frac{\text{sparrows } 14}{\text{robins } 3}$

The ratio of minutes to hours is 60 to 1

- a. 5 to 13 b. 8 : 6 c. 8 to 12 d. $\frac{10 \text{ white}}{15 \text{ black}}$
2. a. $\frac{1}{2}$ $\frac{3}{4}$ $\frac{2}{3}$ b. Answers will vary
c. Answers will vary and 4 to 5
4. a. \$16 b. 42 blue marbles c. 24 cups of tea
d. 12 Canadian stamps.

Stop/Think/Draw/Write 5

Sandra set up her ratio wrong, putting the cinnamon on the sugar line. The correct answer is 9 tsp of cinnamon. Sandra would not have made this mistake if she had labeled her lines.

5. The ratio of black to white marbles is 2 to 5.
 $\frac{\text{black marbles } 2}{\text{marbles } 7}$
6. a. 5 to 1. 40 players rode the bus. b. 3 to 2, whole = 5, 105 diners

Stop/Think/Draw/Write 6

8 to 2, whole = 10 (They say it was given in the statement, but remind them that they should add the numbers in the ratio.) 560 bought tickets online.

7. a. 12 French stamps b. 14 Spanish stamps

Worksheet to Reinforce Square Two Concepts:

1. a. 7 to 4 b. 4 to 7
2. a. 4 : 5 b. 2 to 5 c. $\frac{2}{9}$
3. a. 125 to 25 b. 5 to 1
4. a. 2,400 to 1,800 b. 4 to 3
5. Yellow 8, 16, 24, 32; blue 3, 6, 9, 12
Answer: 12 blue
6. 54 cats

Instruction Block Two

Ratios and Proportions

7. 56 spoons
8. 2 cows
9. 24 ducks
10. 5 to 2, 60 cats
11. 12 red ants

Practice:

1. a. high schoolers and students b. 9 HS to 5 MS, 14

$$\frac{9 \text{ high schoolers}}{14 \text{ students}} = \frac{n}{560}$$
 c. 360 HS students were at the game.
2. a. $\frac{T}{J} = \frac{7}{3}$
 b. $\frac{T}{J} = \frac{1,015}{n}$ $7 \times n = 3 \times 1,015$ $n = 435$ voted for Jon
3. 3366 voters

More Practice:

3. a. 14 to 2 b. $\frac{\text{apples } 14}{\text{pears } 2} = \frac{588}{n}$ c. 84 pear trees
4. a. $\frac{\text{cherries } 6}{\text{peach } 4}$ simplify to $\frac{3}{2}$ b. $\frac{3}{5}$ or $\frac{6}{10}$ trees are cherry
- c. $\frac{3}{5} = \frac{936}{n}$ d. 1,560 trees
5. 1,080 cucumber plants
6. 240 drivers forgot

Challenge: Answers will vary.

