Fractions, Decimals and Percent:

A Squared Away Unit

About the author

Fran Lyons Sammons completed her undergraduate and graduate work at the University of Rhode Island. After 30 years as a classroom teacher in Jamestown, RI, she is now a freelance writer and consultant to school districts helping them implement standards-based curricula. She has written, co-authored, and contributed to several Interact titles including *Election*, *House Design*, *Personal Finance*, and *Branches of Government*. When she's not busy promoting active learning, she can be found sailing with her husband Jim, who is a science writer and retired science teacher.

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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.

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

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.

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. The Golden Square activities provide challenges for all student levels.

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 team mates. 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 divided into parts that specifically list an objective followed by the teaching plans to achieve the objective.

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 Gardiner'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 the instructional time available and/or your students' grade level and prior knowledge.

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Fractions, Decimals, and Percent

A Squared Away Unit

Purpose

Textbooks often teach one chapter on fractions, another on decimals, and finally a third on percent. Students perceive these as three unrelated topics. This unit presents the basic concepts of fractions, decimals, and percent together and in a relatively short period of time. Students will see how the three topics are closely related and will develop a better number sense about fractions, decimals, and percent.

> "By studying fractions, decimals, and percents simultaneously, students can learn to move among equivalent forms, choosing and using an appropriate and convenient form to solve problems and express quantities." *Principles and Standards for School Mathematics*. ©2000 NCTM, p. 151.

Educational standards

This unit addresses National Council of Teachers of Math Principles and Standards.

NCTM Number and Operations Standard for Grades 3–5

- Understand numbers, ways of representing numbers, relationships among numbers, and number systems
- Develop an understanding of fractions as parts of unit wholes, as parts of a collection…and as divisions of whole numbers
- Recognize and generate equivalent forms of commonly used fractions, decimals, and percents
- Develop and use strategies to estimate computations involving fractions and decimals in situations relevant to students' experience

NCTM Number and Operations Standard for Grades 6-8

- Work flexibly with fractions, decimals, and percents to solve problems
- Compare and order fractions, decimals, and percents efficiently
- Select appropriate methods and tools for computing with fractions and decimals from among mental computation, estimation, calculators or computers, and paper and pencil, depending on the situation, and apply the selected methods

NCTM Problem Solving Standards for Grades 3–5 and Grades 6–8

- Build new mathematical knowledge through problem solving
- Solve problems that arise in mathematics and in other contexts
- Apply and adapt a variety of appropriate strategies to solve problems
- Monitor and reflect on the process of mathematical problem solving

NCTM Representation Standards for Grades 3–5 and Grades 6–8

- Create and use representations to organize, record, and communicate mathematical ideas
- Select, apply, and translate among mathematical representations to solve problems
- Use representations to model and interpret physical, social, and mathematical phenomena

NCTM Communication Standards for Grades 3–5 and Grades 6–8

- Communicate their mathematical thinking coherently and clearly to peers, teachers, and others
- Analyze and evaluate the mathematical thinking and strategies of others
- Use the language of mathematics to express mathematical ideas precisely

NCTM Technology Principles

- Technology is essential in teaching and learning mathematics; it influences the mathematics that is taught and enhances students' learning
- Calculators and computers are reshaping the mathematical landscape, and school mathematics should reflect those changes. Students can learn more mathematics more deeply with the appropriate and responsible use of technology. They can make and test conjectures. They can work at higher levels of generalization or abstraction.
- Technology also offers options for students with special needs. Some students may benefit from the more constrained and engaging task situations possible with computers. Students with physical challenges can become much more engaged in mathematics using special technologies.

Knowledge, skills, and attitudes:

Knowledge—*Your students will:*

- Understand that fractions are numbers that can be written as a/b (b cannot be zero)
- Understand that a fraction can describe a part of a whole or a part of a collection
- Understand that the bottom number of a fraction (called the "denominator") equals the total count of parts of a whole or of a collection
- Understand that the top number of a fraction (called the "numerator") describes the number of parts identified
- Understand that when the numerator and the denominator are equal, then the fraction describes a whole or all of a collection
- Understand that when a percent = 100%, then it describes a whole or all of the collection
- Understand when there is a zero in the numerator of a fraction, it represents 0%
- Understand that every fraction can be renamed as a decimal or a percent
- Recognize that the symbol for division (÷) displays the form of a fraction
- Recognize that the symbol for percent (%) also displays the form of a fraction
- Recognize that fractions describe division problems in which the numerator is the dividend and the denominator is the divisor
- Know the equivalent forms of decimals and percents for commonly used fractions (e.g., $\frac{0}{n}, \frac{1}{10}, \frac{1}{8}, \frac{1}{5}, \frac{1}{4}, \frac{1}{3}, \frac{1}{2}, \frac{2}{3}, \frac{3}{4}, \frac{n}{n}$)
- Understand that some fractions can be described as terminating decimals, but others only as repeating decimals
- Understand that repeating decimals are generally rounded in percents
- Understand that many different fractions are equivalent to common percents of 0%, 10%, 12.5%, 20%, 25%, 33%, 50%, 67%, 75%, 100%

Skills—*Your students will learn how to:*

- Write a fraction to describe a divided whole or parts of a collection
- Read a fraction and a decimal to the thousandths place
- Generate a decimal equivalent to a fraction
- Generate a percent equivalent to a decimal or fraction
- Interpret a fraction, decimal, and/or percent in a context
- Solve word problems involving fractions, decimals, and percent by using mental math and/or a calculator

Attitudes—*Your students will appreciate that:*

- Fractions, decimals, and percents are related topics
- Knowing equivalent forms of fractions, decimals, and percents makes solving math problems easier
- Knowing equivalent forms of fractions, decimals, and percents allows them to solve many math problems experienced in real life by using only mental math

Content overview

This *Squared Away* math unit is designed to be concept-specific and is, therefore, grade-level independent. It will be very effective as a concept introduction/reinforcement unit for grades 5–6, but it can also serve as an efficient remediation unit through grade 7. Although students may work individually, the lesson plans direct students to work in trios as they complete math activities. These investigations will cause students to not only discover math concepts, but to communicate their understanding to their teammates and classmates.

Square One concepts (blue square)—Students will review or learn the parts of a fraction (numerator and denominator) and how to read fractions. Through math activities, students will demonstrate that a fraction shows parts of a whole or parts of a collection. They will write a fraction to describe a math situation. They will discover when the numerator and denominator are equal, the fraction described is a whole or all of a collection.

Square Two concepts (red square)—Students will learn that the symbol for division (÷) shows a fraction. Using calculators, students will generate decimal equivalents by dividing the numerator by the denominator (N ÷ D). Students will write/read decimals as fractions: 0.5 = $\frac{5}{10}$ = 5 tenths; 0.25 = $\frac{25}{100}$ = 25 hundredths).

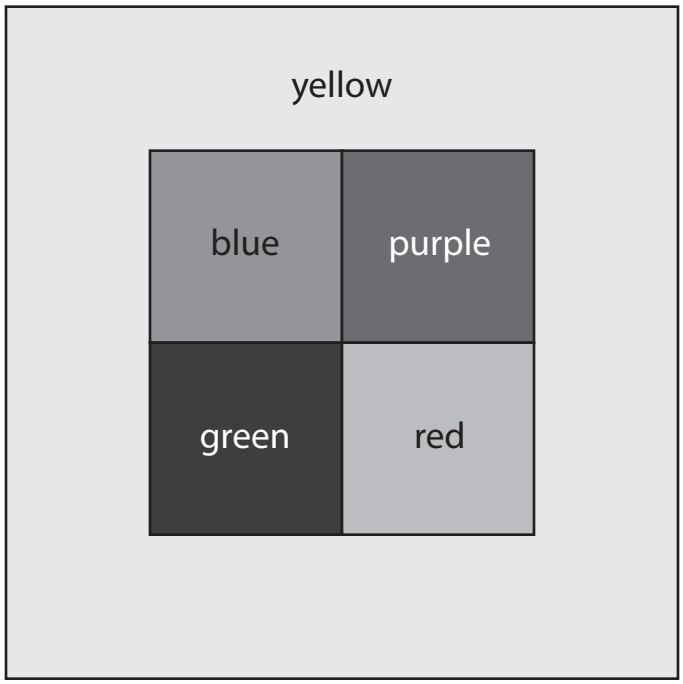
Square Three concepts (green square)—Students use Hundred Blocks to understand how percent relates to fractions. Then students will use calculators to convert fractions into decimals and decimals into percents by multiplying by 100. Students will learn that the symbol for percent (%) also shows a fraction.

Square Four concepts (purple square)—Students will discover that percents can describe many different equivalent fractions. They will learn to use the percent key on the calculator. Students will memorize commonly used fractions, decimals, and percents.

Golden Square concepts—Students will use mental math and/or a calculator to solve more difficult word problems involving fractions, decimals, and percent.

Making the individual award squares

Award squares can be created from four different colored pieces of construction paper. Cut the paper first into one-inch strips, and then cut those strips into one-inch squares. The four colors are only suggestions; however, use yellow paper only for the Golden Square. Cut a $2\frac{1}{4}$-inch, plain white square to form the backing. Students will paste their earned squares on the backing as they complete each instruction block. Make a $3\frac{1}{2}$-inch yellow square for each Golden Square. (You may choose to trim the backing before affixing the four-square to the Golden Square.)



Unit time chart

Depending on students' ages, prior knowledge, and the length of the math period, you may complete one group of concepts per instruction block. Block lesson plans are designed for a math period of 60 to 90 minutes. If a class is made up of younger students, disabled students, or the assessments indicate students need more instruction, then the block lessons will take more time. Students with stronger math skills may complete an instruction block in 40 minutes. At the end of each instruction block is a list of optional activities.

Instruction Block One

- Pretest
- **Square One concepts** (blue)
- (Optional activities)
- Quick Team Quiz 1
- Individual Square One Test

Instruction Block Two

- **Square Two concepts** (red)
- (Optional activities)
- Quick Team Quiz 2
- Individual Square Two Test

Instruction Block Three

- **Square Three concepts** (green)
- (Optional activities)
- Quick Team Quiz 3
- Individual Square Three Test

Instruction Block Four

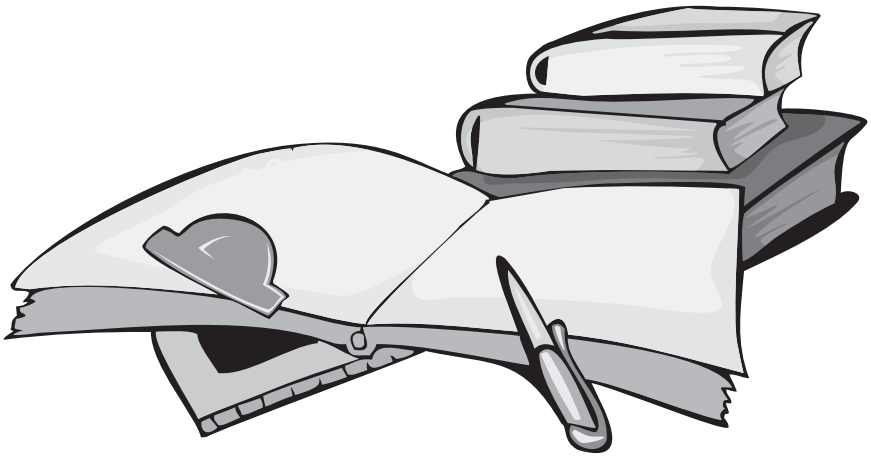
- **Square Four concepts** (purple)
- (Optional activities)
- Quick Team Quiz 4
- Individual Square Four Test

Instruction Block Five

- **Golden Square concepts** (yellow)
- (Optional activities)
- Team Golden Activity
- Individual Golden Square Challenges

Assessment Block

- Final review
- Posttest (one week later)
- Awards ceremony for Four Square and Golden Squares



General Directions

Fractions, Decimals, and Percent

Instruction blocks

This unit is divided into four instruction blocks that address specific instructional objectives related to fractions, decimals, and percent. Each block is sequential and builds on the knowledge and skills learned in the block before it. Always evaluate the tests of one block before going on to the next.

Important!
Class set of calculators needed!

Student grouping

Students may work in *Squared Away* units as individuals, in pairs, or in trios. Create your teams before the first lesson. Generally the most successful teams are mixed by gender, math sense, and study skills.

Student roles rotate daily. (When working in pairs, combine the roles of Leader-Manager and Recorder-Reader.)

Leader: organizes the team and directs team members as needed. He/she checks that the day's assignments are complete, and makes sure that teammates submit all assignments. The Leader also keeps the team motivated and on task.

Reader-Recorder: reads handouts and/or activity directions. The Reader clarifies and repeats as necessary, and writes the team's responses.

Manager: collects and returns supplies, handouts, and materials needed for the team's daily work. The Manager maintains the team folder and hands it in to the teacher at the end of each day.

Teaching tip
Make a class chart of the role assignments for each team and post it. Review the duties for each role before beginning the lesson.

Classroom arrangement

Organize student desks into pairs or trios, with the Reader-Recorder in the center seat. Allow as much space as possible between groups so that students can converse among their teammates without distractions.

Supplies and duplicated materials

Create a folder for each team, listing the names of team members on the front and attaching a Cooperative Group Work Rubric. Each lesson includes a list of the supplies and pages you need to duplicate and assemble for the day.

Individual calculators are essential to this unit. If necessary, consider asking your PTA to purchase inexpensive five-function calculators (+ , - , × , ÷ , and %) that are now available from an office supply company for less than $5 each.

Lesson plans and timeline

Squared Away lessons plans begin with a concepts list and materials. There is a lesson schedule that matches the headings within the numbered lesson steps. Also each part of the lesson lists specific objectives. Always read through the day's lesson ahead of time to familiarize yourself with how the lesson should proceed and how the concepts are developed. Specific concepts are introduced in a special order to minimize confusion. The lessons are arranged in instruction blocks that take 60–90 minutes, depending on your students' prior knowledge.

Assessments

Teaching tip
Students will need calculators for the Pretest/Posttest.

The Pretest and Posttest are identical and are administered at the beginning and at the end of the unit. Administer the Pretest before Instruction Block One. The Pretest will reveal student prior knowledge so that you can be more confident working about the pace of your lessons. The Posttest will let you know how competent your students have become with the content and skills presented in the unit. Give the Posttest at least one week after you complete the unit.

Cooperative group work assessment is ongoing and important to the success of this unit. Students need to work together being responsible for their own learning and helping their team members to succeed. Post the *Cooperative Group Work Rubric* and staple one copy to the outside of each team folder. During the instruction block, occasionally refer to the rubric and comment on how the teams are working. Praise good work, and if necessary, point out where teams could improve. At the end of the block or at the end of a teaching day, assess each team member using the Cooperative Group Work Rubric as your guide. At the end of the unit, give each student a copy of the rubric with an overall assessment of his/her group work.

Teaching tip
Sometimes students "hide" during group work, allowing the more vocal students to answer all the questions and make all the comments. Create a team seating chart for each day of instruction. When you call on a student, make a check mark near his/her name. If the student seems confused, circle the check mark.

Informal assessments are also ongoing and important. At different times during the lesson, take a moment to ask students individually or as teams to explain what they understand or to demonstrate something they have just learned. You can ask them to respond orally, or ask them to quickly write an explanation to share. If you detect confusion in one student, it may indicate general confusion. Use the available checksheets daily to keep track of skills students have learned or still need to learn. (See pp. 67–68)

Quick team quizzes take about five minutes to administer, but they allow you to make a final check before distributing the individual tests. Each team

member gets his own paper to complete, but when all the team members have finished, they compare answers. If there is a discrepancy among the answers, the team discusses the answers and what the team members were thinking. You may also pair teams to compare answers. Always remind students of the *Cooperative Group Work Rubric* and their responsibility to be kind and supportive. After 3–5 minutes, go over the correct answers with the whole class, addressing any questions students may still have.

Individual square tests are given at the end of each instruction block. You may administer them at the end of an instruction class period or at a later time. The second, third, and fourth individual tests contain questions from the previous instructional blocks so that the fourth test may be considered a final exam for the four blocks. Separate the desks and insist that students work individually on these assessments. Before beginning a new instruction block, evaluate student answers for the square test to determine the need to reteach some concepts. Generally only a few students are confused about one or two test questions. Create ad hoc groups, review, and retest. The retest should be a new copy of the same test with those items he/she must redo circled or highlighted. Follow this procedure for each square test.

The Golden Square Challenge is a fifth assessment that stretches students to solve more difficult word problems. Not all students are expected to earn the fifth, golden square. However, it is not necessary for students to have perfect scores. See the suggested criteria on page 62.

Reinforcing and reteaching concepts

The timeline of this unit depends on your students' prior knowledge and the length of your class period. If you have more time available, assign the extra activities suggested at the end of each instruction block. It is also often difficult to find time to reteach students who do not grasp concepts on the first round. However, working with struggling students before they are overwhelmed is essential. Consider stopping after Instruction Block Two and again after Block Three to work with students who still need help. Consider allowing the more able students to work on the Optional Activities while you work with those who need more instruction.

Awarding squares

Although the lesson plans suggest awarding squares at the beginning of an instructional period, you may choose a different time so that you have more available time for instruction. If possible, notify students ahead of time why they are not going to earn a square that day. Stress, though, that they will eventually earn their squares and arrange a time to reteach and retest them.

Bright Idea
You may consider giving students a portion of a square to indicate that they have mastered some of the content.

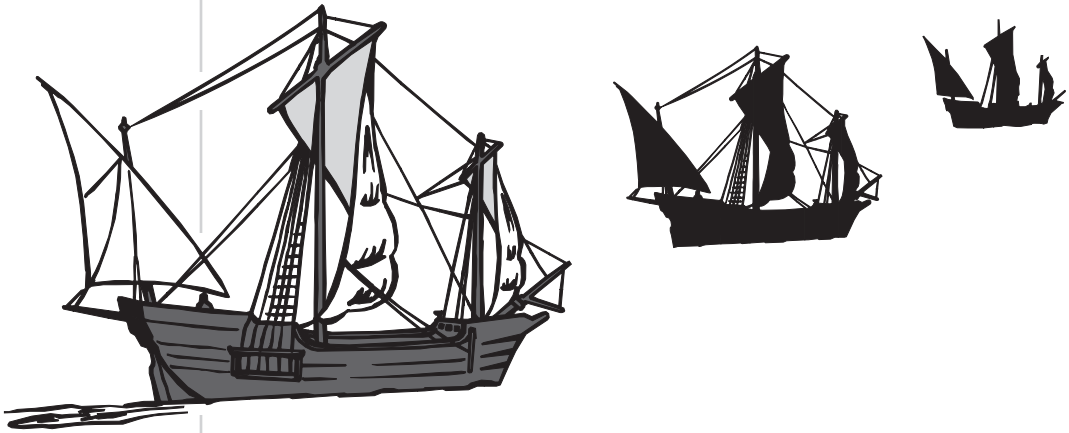
Even after the unit is over, keep working with those who have not finished

their squares. The content and skills in this unit are important to the math curriculum and, more importantly, practical for real-life math situations.

Your classes may be too "grown-up" to respond well to collecting squares. In that case, you may choose to acknowledge achievement in other ways. Consider posting a wall chart with check marks, offering class privileges (free time, prizes, etc.) or whatever else might help motivate your students.

Final award celebration

Although with the successful completion of the Square Four Test, students are considered Squared Away, consider waiting until you run the Golden Square Activities to celebrate. This will give you more time to work with those students who are close to finishing the four squares. It would be best if all your students could successfully complete the four instruction blocks. The Golden Square Challenges are just that—challenges, and not essential to be considered Squared Away. However, give special recognition to all those who do achieve a Golden Square. Design a celebration appropriate to your students' age, and your available time and resources. Give Special Award Certificates to acknowledge each student's achievement.



Instruction Block One

Intro Fractions

Square One concepts*—Students will:*

- Recognize that fractions describe parts of a whole or parts of a collection
- Review/learn the parts of a fraction (*numerator* and *denominator*)
- Read a fraction correctly
- Recognize when the numerator and denominator are equal, then the fraction describes a *whole* or *all* of a collection
- Recognize when there is a zero in the numerator, the fraction describes none or no part
- Write a fraction to describe a divided whole or parts of a collection in a math situation
- Interpret a fraction in a context

Materials

Blank paper, crayons, and paperclip

Duplicate

Pretest/Posttest—*two per student*

Introduction—*one per student*

Cooperative Group Work Rubric—*one class copy to post and one per team folder*

Square One Math Situation Strips—*one per team*

Worksheets to Reinforce Square One Concepts—*optional, one per student*

Quick Team Quiz 1—*one per student*

Square One Test—*one per student*

Lesson plan schedule

- Pretest
- Introduction
- Situation Strips: collection vs parts of a whole
- Determining denominators, identifying numerators, and labels
- Reading fractions: -th and exceptions
- Changing numerators
- Determining all and none
- Optional activities
- Quick Team Quiz 1
- Square One Test

Answer Key for *Pretest/Post*

1. circle 12
2. $\frac{3}{8}$
3. $\frac{1}{4}$
4. a. $\frac{4}{5}$ b. $\frac{19}{100}$ c. $\frac{160}{1000}$
5. a. 0.7 b. 0.14 c. 0.855
6. $\frac{0}{3}$
7. a. 25% b. 20% c. 100% d. 75%
8. $\frac{3}{4}$ $\frac{12}{16}$
9. 150 students
10. $54
11. $\frac{21}{28}$ because it equals 75%. The other equals only 67%.

Lesson Plan

Pretest

Individual

1. Be certain you have administered the Pretest to all students individually before starting this unit.

Small group

2. Arrange the room, announce the teams, and go over the Introduction with the class. Assign student roles. Review the duties of each role and the Cooperative Group Work Rubric.

Situation strips

3. *Objective 1: To show students that fractions are used to describe real-life situations and that fractions describe parts of a whole, or parts of a collection*

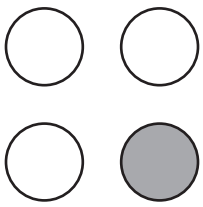
   a. Give Managers folders and markers or crayons, and one **Square One Math Situation Strip** per team

   b. Model how students will use the Situation Strips:
   First model: On the chalkboard write: *Mom gave Kate and Greg a candy bar. Make a drawing to show how they shared the candy bar. Color Kate's piece.* The labeled drawing should be representative of this math situation. This is a *parts of a whole* situation.

Candy Bar

   c. **Second model:** On the chalkboard write: *Four buttons were on the counter. One was red, and the rest were white. Make a labeled drawing to show the buttons.* The labeled drawing should be representative of this math situation. This is a *collection* situation. (Students may label buttons "R" and "W.")

Buttons



   d. Allow teams 3–5 minutes to work together to make drawings to represent the situations on their strips. Ask students to make

Teaching tip
Tell the story of how Mom tells one child he/she may cut the candy bar, but the second child can choose his/her piece first. This reinforces the concept that when dividing a whole into parts, all fractional parts must be equal.

Teaching tip
Remind students that when asked to "draw," they should work quickly, using stick figures and sketching simple objects. People's names in the situations begin with different letters so that they may refer to a person as "E," instead of Edward.

big drawings so you can post them.

e. When they finish, have each team read their Situation Strip and present their drawings and post their representation drawings on the board.

Determining denominators, identifying numerators, and labels

4. *Objective 2: To have students understand that:*

   - *The denominator describes the total number in a collection OR the total number of pieces in a whole*
   - *The numerator describes the part or parts identified*
   - *The label refers to the whole or the collection*

   a. When all the teams have reported, tell students that each of their situations can be described as a fraction. Write the appropriate fraction and label next to each drawing. Introduce the denominator first and then the numerator. (Remind students that in their representations they created the denominator first, and then identified the numerator by coloring a part.)

   b. They may have trouble with labels. Ask them what label would the whole or collection have? Here are correct answers for labeled fractions:

1. $\frac{1}{4}$ pizza is Maria's share
2. $\frac{1}{6}$ lasagna is Teddy's share
3. $\frac{1}{7}$ books are nonfiction
4. $\frac{1}{8}$ brownie mix is one serving
5. $\frac{1}{15}$ circles are colored
6. $\frac{1}{3}$ sandwich is Trudy's share
7. $\frac{1}{5}$ plums are rotten
8. $\frac{1}{12}$ clockface is one hour

Teaching tip

Tell students that they might better remember that the **D**enominator is "**D**own" below the fraction line.

Reading fractions

5. *Objective 3: To have students read all fractions*

   - *Those ending in* -th
   - *Those that have changed spellings, including one-half, one-third, and the changed spelling for one-fifth, one-ninth, and one-twelfth*

   a. Write different fractions on the board and have students read them correctly

   b. Students will see that once they know how to read $\frac{1}{3}$ they can now read $\frac{1}{23}$, $\frac{1}{43}$, and $\frac{1}{563}$. Also introduce $\frac{1}{21}$ and $\frac{1}{22}$, which have special fractional endings (twenty-firsts and twenty-seconds). Once they can read these, they can also read $\frac{1}{41}$ and $\frac{1}{52}$.

Changing numerators

6. *Objective 4: To have students understand that as we identify more or less of the collection or parts of the whole, the numerator changes*

   a. Go back to drawing for Situation 1 on the board and ask, "What if the directions said to color both Maria's and Lola's pieces together?" Color the piece and ask, "How did the fraction change?" $\frac{1}{4} \rightarrow \frac{2}{4}$. This reinforces the fact that the denominator does not change because the pizza is still in four pieces. The numerator changes because you asked them to identify two pieces.

   b. Go through all the drawings, asking students to identify more parts of the whole or pieces in the collection. Color the pieces. Do not ask them to identify a whole ($\frac{4}{4}$) yet. Ask them to generate the new fractions (e.g., $\frac{4}{6}$, $\frac{3}{7}$, etc.). Do not reduce or rename these fractions. Go back and ask the questions requiring students to give fraction and label.

   c. Ask students how they know that if $\frac{3}{8}$ are shaded, then $\frac{5}{8}$ are not shaded

Teaching tip
This is not the time to talk about equivalencies ($\frac{2}{4} = \frac{1}{2}$) that do change the denominator.

Determining whole or all, or none

7. *Objective 5: To have students understand that when the numerator and the denominator are the same, then the fraction describes a* whole *or all of a collection. And that when there is a zero in the numerator, then the fraction describes* none *of the collection, or*

no part *of the whole.*

a. Go back through the drawings one final time, coloring or marking all the pieces. What is the fraction that describes the drawing? ($\frac{4}{4}$, $\frac{6}{6}$, etc.) Ask what does the drawing now represent? Use the word "whole" for situations that described parts of a whole, and use the word "all" for situations that described a collection. (For example, say, "The *whole* pizza," and "*All* the circles.")

b. Ask teams to make up two rules: one that explains when a fraction describes a *whole* or *all* of a collection and one to describe *no part* of a whole or *none* of a collection. *Answers: When the numerator and the denominator are the same, then the fraction describes a* whole *or* all *of a collection (*$\frac{n}{n}$*). When there is a zero in the numerator, the fraction describes* none *or* no part *(*$\frac{0}{n}$*).*

8. If you have more time, look at page 70 for optional activities that will help reinforce your students' learning.

Quick Team Quiz One

Teaching tip

Students will have trouble with labels. They may want to say $\frac{1}{3}$ piece of candy. (This actually means $\frac{1}{3}$ of $\frac{1}{3}$, or $\frac{1}{9}$). Remind them to look at the label for the whole or the collection. The answers are $\frac{1}{3}$ candy bar or $\frac{3}{5}$ roses (not $\frac{3}{5}$ red).

9. Ask the Managers to come to you for the Quick Team Quiz One. (See page 8 in this guide for directions under Quick Team Quizzes.) While students are working in teams, walk around the room, clarifying and instructing.

10. Ask the Manager to put all the team's papers neatly in the team folder and give them to you.

Quick Team Quiz One Answer Key

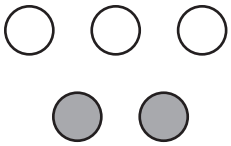
1. 

2. Parts of a whole

3. $\frac{1}{3}$ candy bar

4. $\frac{2}{3}$ candy bar

5. $\frac{3}{3}$ candy bar

6. 

7. Collection

8. $\frac{3}{5}$ roses

9. $\frac{2}{5}$ roses

10. $\frac{0}{5}$ roses

Square One Test


Individual

11. When you are satisfied that your students are ready, administer the Square One Test to them as individuals, not teams. Separate their desks for privacy.

12. Using the Cooperative Group Work Rubric as your guide, assess each student and assign a number from 1 to 4 to describe their cooperative behavior. Let students know how well they are meeting your expectations and, if necessary, what specifically they can do to improve.

13. Correct the individual tests and evaluate your students' mastery of concepts in Instruction Block One before starting Instruction Block Two. Reteach and retest if necessary. Make a list of those students who have earned a square.

Square One Test Answer Key

1. $\frac{10}{18}$ circles are shaded, collection

2. $\frac{5}{6}$ circle is shaded, parts of a whole

3. $\frac{5}{16}$ squares are shaded, parts of a whole

4. $\frac{6}{11}$ small triangles are shaded, collection

5. A cake divided into 8 pieces, one shaded and labeled B

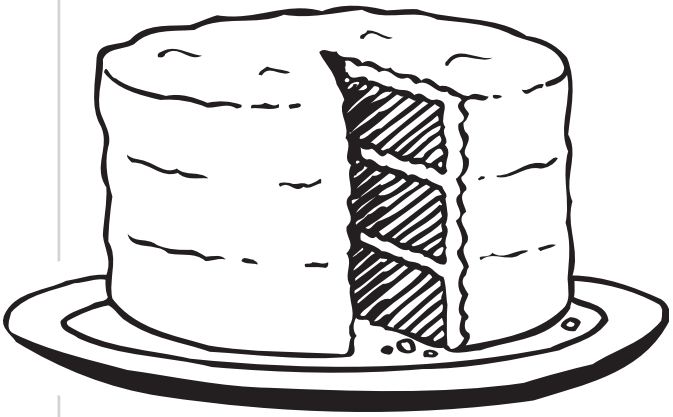
6. Parts of a whole

7. $\frac{1}{8}$ cake

8. $\frac{7}{8}$ cake

9. $\frac{8}{8}$ cake

10. $\frac{0}{8}$ cake



Optional Activities One


Individual

or


Small group

or


Whole class

1. Worksheet to Reinforce Square One Concepts (p. 70)

- Assign this as a homework assignment, a team assignment, or as a whole-class assignment. Correct in teams or as a whole class. Consider giving recognition to teams in which all students completed the assignment on time.
- Use every opportunity to show the fractions in real life: For example, $\frac{20}{25}$ students completed the homework, $\frac{5}{25}$ earned a perfect score, $\frac{3}{25}$ had only one error, etc.
- Ask students to write explanations for their answers or to make a list of instructions that another student can use to solve the problem
- Allow teams to rewrite worksheet questions 1, 3, and 4, making new math questions to quiz one another
- Spend time going over labels. Students say $\frac{1}{4}$ piece when referring to a pizza. The true answer is $\frac{1}{4}$ pizza is a piece. ($\frac{1}{4}$ piece is actually $\frac{1}{4}$ of $\frac{1}{4}$, or $\frac{1}{16}$.)

Worksheet to Reinforce Square One Concepts Answer Key

1. a. $\frac{8}{19}$ dogs b. $\frac{3}{23}$ cards c. $\frac{6}{15}$ cars d. $\frac{5}{8}$ cake
   e. $\frac{1}{5}$ pizza f. $\frac{1}{4}$ candy bar g. $\frac{2}{10}$ bar h. $\frac{7}{8}$ circle
2. a. D b. N. c. D d. N e. D
3. a. $\frac{3}{12}$ b. $\frac{14}{21}$ c. $\frac{6}{52}$ d. $\frac{9}{463}$
4. a. 3-eighths b. 1-sixth c. 4-thirteenths
5. Answers may vary


Individual

or


Small group

or


Whole class

2. Journal writing is always an excellent way for students to reinforce their own learning. Below is a list of prompts you can give individual students, teams, or the whole class. Choose one or two for each Instruction Block or give one prompt per team.

Allow students to write for at least three minutes. Direct them to first share

what they wrote with their team. Ask for volunteers to share with the whole class. Look for common comments and strategies that students write.

- Objective 1 prompt: What is the difference between a collection and a whole?
- Objective 2 prompt: How do you keep track of the terms *denominator* and *numerator*?
- Objective 3 prompt: What are some of the fraction labels that are not formed by adding *-th*? How will you remember them?
- Objective 4 prompt: When a fraction changes from $\frac{1}{4}$ to $\frac{3}{4}$, what has changed in the real-life situation described by that fraction? How is that different from what happens when a fraction changes from $\frac{1}{4}$ to $\frac{3}{4}$?
- Objective 5 prompt: What must be true of the numerator and the denominator in order for a fraction to describe the WHOLE or ALL of the collection?

Individual

3. Real-life situations

- For homework, ask students to write three original situation strips to describe something in their lives. Suggest looking at soup cans in the pantry and noting those that contain tomatoes, or at fruit in the refrigerator and noting which have spots. The lists are endless.
- Distribute a newspaper and ask students to look for situations that can be described in fractions

Instruction Block Two

Fractions to Decimals

Square Two concepts*—Students will:*

- Understand that fractions are numbers that can be written as $\frac{a}{b}$ (but b cannot be zero)
- Recognize that the symbol for division (÷) displays the form of a fraction
- Recognize that fractions describe division problems in which the numerator is the dividend and the denominator is the divisor (N ÷ D)
- Understand that every fraction can be renamed as a decimal
- Read a fraction and a decimal to the one-thousandths place
- Generate a decimal equivalent to a fraction
- Recognize the equivalent forms of decimals for commonly used fractions ($\frac{1}{10}$, $\frac{1}{8}$, $\frac{1}{5}$, $\frac{1}{4}$, $\frac{1}{3}$, $\frac{1}{2}$, $\frac{2}{3}$, $\frac{3}{4}$,)

Materials

$2\frac{1}{4}$"-square background-pattern piece—*one per student*

1" blue square—*one per student*

Glue or tape—*one per team*

Simple calculators with the following functions: + , - , × , ÷ , and % — *one per student*

Duplicate

Fractions and Decimals Worksheet—*one per team*

Worksheets to Reinforce Square Two Concepts—*optional, one per student*

Quick Team Quiz 2—*one per student*

Square Two Test—*one per student*

Lesson-plan schedule

- Award squares
- Reviewing fractions with tenths, hundredths, and thousandths in the denominator
- Using fractions to read and write decimals
- Translating decimals to fractions
- Fractions and division
- Fractions other than tenths, hundredths, and thousandths
- No zeros in the denominator
- Optional activities
- Quick Team Quiz 2
- Square Two Test

Lesson Plan

Awarding squares

1. Arrange the room and send students into their teams. If you have not already done so, award the First Squares (blue) to students who have mastered the first concepts in Instruction Block One.
2. Assign new student roles, reviewing the duties of each role and the Cooperative Group Work Rubric. Ask managers to come to you for folders and supplies.

Small group

Teaching tip
Whenever awarding squares, allow students two minutes to attach squares to the background piece

Reviewing fractions with tenths, hundredths, and thousandths in the denominator

Fractions to Decimals		
Fraction	**How it is said**	**Equivalent Decimal**
$\frac{3}{10}$	3 tenths	
$\frac{12}{100}$	12 hundredths	
$\frac{135}{1000}$	135 thousandths	
$\frac{8}{10}$	8 tenths	
$\frac{65}{100}$	65 hundredths	
$\frac{403}{1000}$	403 thousandths	
$\frac{9}{10}$	9 tenths	
$\frac{99}{100}$	99 hundredths	
$\frac{999}{1000}$	999 thousandths	

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. Students learn at different rates, but eventually they will all be Squared Away.

3. *Objective 1: To review reading fractions with tenths, hundredths, and thousandths in the denominator (second column of the chart)*
   a. Write examples on the board: $\frac{2}{10}$ is read as "two tenths," $\frac{66}{100}$ is read as "66 hundredths," and $\frac{139}{1000}$ is read as "139 thousandths."
   b. Ask Managers to come to you for the Fractions and Decimals

Teaching tip
Students do not have to write words for the numerators, just the denominators.

Worksheet. Ask students to work together as a team to complete only the second column of the top part and stop.

c. Ask teams to share with the whole class what they wrote in the second column.

Using fractions to read and write decimals

4. *Objective 2: To have students realize they can use fractions to help them read, write, and understand decimals*

ONES		Tenths	Hundredths	Thousandths
0	•	1	3	5

a. Draw a decimal place-value chart like the one to the left, on the board. Use it to explain how to read the decimals.

b. In the third column of the Fractions to Decimals Worksheet, in the row with $\frac{3}{10}$, write "0.3." Explain that this decimal reads exactly the same as the $\frac{3}{10}$ fraction: three tenths and not zero point three.

Fractions to Decimals		
Fraction	**How it is said**	**Equivalent Decimal**
$\frac{3}{10}$	3 tenths	0.3
$\frac{12}{100}$	12 hundredths	0.12
$\frac{135}{1000}$	135 thousandths	0.135
$\frac{8}{10}$	8 tenths	0.8
$\frac{65}{100}$	65 hundredths	0.65
$\frac{403}{1000}$	403 thousandths	0.403
$\frac{9}{10}$	9 tenths	0.9
$\frac{99}{100}$	99 hundredths	0.99
$\frac{999}{1000}$	999 thousandths	0.999

- $\frac{3}{10}$ and 0.3 are equal
- When decimals describe parts of a whole, mathematicians and calculators put a zero before the decimal point to

show that the number is less than one whole

- If the fraction is $\frac{12}{100}$, then the decimal ends in the second place (0.12). With $\frac{135}{1000}$, it ends in the third place (0.135).
- Use a place-value chart to help students visualize each place

d. Ask teams to work together to complete column three of the top half of the worksheet. Correct as a class.


Whole class

Translating decimals to fractions

Decimals to Fractions		
Decimal	**How it is said**	**Equivalent Fraction**
0.7	7 tenths	$\frac{7}{10}$
0.2	2 tenths	$\frac{2}{10}$
0.14	14 hundredths	$\frac{14}{100}$
0.58	58 hundredths	$\frac{58}{100}$
0.783	783 thousandths	$\frac{783}{1000}$

5. Work with 0.7 and 0.14 on the second part of the worksheet. Remind students of the place value. Have the teams finish the second part of the chart.


Teaching tip
Some students take note of the number of zeros: 10ths has one zero and therefore one place; 100ths has two zeros and two places; and 1000ths has three zeros and three places.

Fractions and division

6. *Objective 3: To realize that the symbol for division is a fraction and that all fractions are division problems*

   a. Draw the symbol for division (÷) on the board and ask students to describe what they see. One or more of them will notice that the division symbol (÷) shows a fraction. Ask them to speculate why a model of a fraction symbolizes division.

   b. Present this math situation to the teams: *Sally ordered ten cupcakes—three were plain chocolate, and seven had frosting. Write a fraction to show the three plain cupcakes.* They will agree that the answer is $\frac{3}{10}$ cupcakes.


Teaching tip
You can ask question 6a of the whole class, or if time allows, direct it to teams to discuss and come up with a team answer.

c. If time allows, give them a moment to experiment with the calculators, using the ÷ key so that they derive the decimal answer of 0.3 in the calculator display

- If pressed for time, tell them to enter the numerator and then divide by the denominator
- Once they know how to use the calculator to change $\frac{3}{10}$ into 0.3, have them repeat their process for the $\frac{7}{10}$ cupcakes that were frosted.

d. Ask them to write the procedure (rule) using the words *numerator* and *denominator* to change a fraction into a decimal at the bottom of their worksheets.

Rule
To change a fraction into a decimal, divide the numerator by the denominator (N ÷ D). For example $\frac{3}{10}$ = 3 divided by 10.

Fractions other than tenths, hundredths, and thousandths

7. *Objective 4: To show students how to use division to change any fraction into a decimal*

a. Remind students of the first situation: *Barbara, Sara, Lola, and Maria bought one pizza. Make a drawing to show how they will share it equally. Color Maria's piece.* Write 1/4 on the board, and ask, "How is this a division problem?" (You are dividing the pizza into four pieces—one pizza divided into four equal pieces. No one will get the whole thing.)

b. Tell students to use the rule they have derived and determine the decimal equivalent of $\frac{1}{4}$ (0.25)

c. Write $\frac{1}{2}$, $\frac{3}{4}$, and $\frac{1}{8}$ on the board. Ask the teams to determine their decimal equivalents. (0.5, 0.75, and 0.125.) Have them share their answers by reading the decimals aloud.

d. Congratulate your students! They now know how to find decimal equivalents for ALL fractions. Use calculators to apply the rule: *numerator ÷ denominator*. Have them practice with $\frac{1}{5}$, $\frac{3}{8}$, and $\frac{4}{5}$.

Teaching tip
Sometimes students enter the denominator first, instead of the numerator. These errors are obvious, since students get answers that are whole numbers. Take a moment to help them recognize when their answers don't make sense.

No zeros in the denominator

8. *Objective 5: To have students understand that zero can never be in a denominator, but can be in a numerator*

Teaching tip
Do not try other fractions at this time. You may run into repeating decimals and decimals longer than thousandths place.

a. Ask students to try using their calculator for $\frac{8}{0}$. What happens? (Answer = 0)

a. Give teams 1–2 minutes to think about and report why there is never zero in a denominator. (Some may explain using situations. If you have nothing, how can you divide nothing into parts or identify one of a collection of nothing?)

b. Now ask them if 0 can be in the numerator. (Yes it can. You can have 5 plums, but none are rotten. Therefore $\frac{5}{5}$ plums are ripe; $\frac{0}{5}$ plums are rotten.)

9. If you have more time, look at pages 74–75 for optional activities that will help reinforce your students' learning.

Quick Team Quiz Two

10. Ask the Managers to come to you for the Quick Team Quiz Two. (See directions under Quick Team Quizzes, page 8 in this guide.) When students are working in teams, walk around the room, clarifying and instructing.

11. Ask the Manager to put all the team's papers neatly in the team folder and give them to you. Look them over to see if all the students are completing the worksheets with understanding.

Quick Team Quiz Two Answer Key

1.

How it is said	Fraction	Decimal
6 tenths	$\frac{6}{10}$	0.6
98 hundredths	$\frac{98}{100}$	0.98
47 hundredths	$\frac{47}{100}$	0.47
455 thousandths	$\frac{455}{1000}$	0.455
2 tenths	$\frac{2}{10}$	0.2
24 hundredths	$\frac{24}{100}$	0.24
127 thousandths	$\frac{127}{1000}$	0.127

2. $\frac{7}{10}$ games, 0.7 games

3. $\frac{34}{100}$ days, 0.34 days

4. 0.8

5. Divide numerator by denominator

6. Put an X over $\frac{3}{0}$

7. $\frac{4}{16}$ students wore hats, 0.25 students wore hats

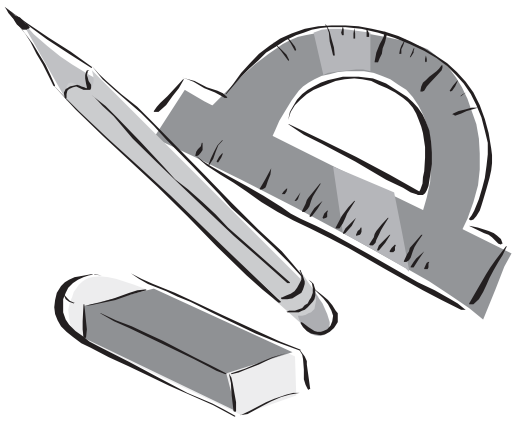
Square Two Test

Individual

12. When you are satisfied that your students are ready, administer the Square Two Test as individuals, not teams. Separate their desks for privacy.

13. Using the Cooperative Group Work Rubric as your guide, assess each student and assign a number from 1 to 4 to describe their cooperative behavior. Let students know how well they are meeting your expectations and, if necessary, what specifically they can do to improve.

14. Correct the individual tests and evaluate your students' mastery of concepts in Instruction Block Two before starting Instruction Block Three. Reteach and retest if necessary. Make a list of students who have earned a square or squares.



Square Two Test Answer Key

1.

How it is said	Fraction	Decimal
4 tenths	$\frac{4}{10}$	0.4
57 hundredths	$\frac{57}{100}$	0.57
83 hundredths	$\frac{83}{100}$	0.83
995 thousandths	$\frac{995}{1000}$	0.995
3 tenths	$\frac{3}{10}$	0.3
66 hundredths	$\frac{66}{100}$	0.66
703 thousandths	$\frac{703}{1000}$	0.703

2. $\frac{25}{100}$ customers, 0.25 customers

3. 0.25

4. To change a fraction into a decimal, divide the numerator by the denominator (N ÷ D)

5. $\frac{14}{28}$ class, 0.5 class

6. 5 pizzas

Optional Activities Two


Individual

or


Small group

or


Whole class

1. Worksheet to Reinforce Square Two Concepts (p. 74–75)

- Assign this as a homework assignment, a team assignment, or as a whole-class assignment. Correct in teams or as a class. Consider giving recognition to teams in which all students completed the assignment on time.
- Use every opportunity to show fractions and decimals in real life. Remind students that they use decimals every day when they work with money. Show them how to write a check that shows \$0.25 as $\frac{25}{100}$ dollars.
- Ask students to make a list of instructions for changing a fraction to a decimal so that another student can follow them
- Allow teams to rewrite worksheet questions 1, 4, and 8, making new math questions to quiz one another
- Continue to spend time going over labels. Remind students that they can use decimals to describe situations, too. 0.5 of the students are males and 0.25 of the faculty teach math or science.

Worksheet to Reinforce Square Two Concepts Answer Key

1.

How it is said	Fraction	Decimal
6 tenths	$\frac{6}{10}$	0.6
37 hundredths	$\frac{37}{100}$	0.37
59 hundredths	$\frac{59}{100}$	0.59
239 thousandths	$\frac{239}{1000}$	0.239
5 tenths	$\frac{5}{10}$	0.5
2 tenths	$\frac{2}{10}$	0.2
41 hundredths	$\frac{41}{100}$	0.41
816 thousandths	$\frac{816}{1000}$	0.816

2. Numerator, denominator

3.

5	÷	8	=	0.625

4. a. $\frac{7}{10}$ and 0.7 cars b. $\frac{14}{100}$ and 0.14 members

   c. $\frac{55}{100}$ and 0.55 horses d. $\frac{368}{1000}$ and 0.368 new songs

5. Any fraction in which the numerator and denominator are equal

6. Any fraction where the numerator equals zero

7. Zero

8. a. $\frac{13}{130}$ cars were SUVs; 0.1 cars were SUVs

   b. $\frac{590}{2950}$ books were nonfiction; 0.2 books were nonfiction

   c. $\frac{6700}{10000}$ voters voted for Mr. Alvares; 0.67 voters voted for Mr. Alvares

2. Journal writing is always an excellent way for students to reinforce their own learning. Below is a list of prompts you can give individual students, teams, or the whole class. Choose one or two for each Instruction Block, or give one prompt per team. Allow students to write for at least three minutes. Direct them to first share what they wrote with their team. Ask for volunteers to share with the whole class. Look for common comments and strategies that students write.


Individual

or


Small group

or


Whole class

- Objective 1 prompt: Explain your process for changing fractions that have denominators of tenths, hundredths, and thousandths, into decimals
- Objective 2 prompt: Why do mathematicians put a zero BEFORE the decimal point when writing decimals that are less than one?
- Objective 3 prompt: How does the division symbol (÷) relate to fractions?
- Objective 4 prompt: How do you change any fraction into a decimal?
- Objective 5 prompt: Why can there never be a zero in the denominator?

Individual

3. Real-life situations

- As homework ask students to search for decimals in their life. Obviously, our money system involves decimals. Tell them that sports statistics like batting averages are often given in decimals. Ask them to explain what it means to "bat .400."
- Distribute newspapers and ask students to look for decimal or situations that can be described in decimals.

Instruction Block Three

Decimals to Percent

Square Three Concepts—*Students will:*

- Understand when there is a zero in the numerator of a fraction, it represents 0%
- Understand that 0% means none of a collection or no part of a whole
- Understand that when a percent equals 100%, then it describes a whole or all of a collection
- Recognize that the symbol for percent (%) also displays the form of a fraction
- Understand that every fraction can be renamed as a decimal or a percent
- Understand that some fractions can be described as terminating percents, but others only as repeating percents
- Generate a percent equivalent to a decimal or fraction
- Know the equivalent forms of decimals and percents for commonly used fractions ($\frac{0}{n}$, $\frac{1}{10}$, $\frac{1}{8}$, $\frac{1}{5}$, $\frac{1}{4}$, $\frac{1}{3}$, $\frac{1}{2}$, $\frac{2}{3}$, $\frac{3}{4}$, $\frac{n}{n}$)
- Understand that repeating decimals are generally rounded as percents
- Interpret a fraction, decimal, and/or percent in a context
- Solve word problems involving fractions, decimals, or percent by using mental math and/or a calculator

Materials

Red square—*one per student*

Glue or tape—*one per team*

Simple calculators with the following functions: + , - , × , ÷ , and % — *one per student*

Crayon or marker—*one per student*

Plain paper—*one per student*

Index cards—*one per student*

Duplicate

Hundred Blocks paper—*one per student*

Changing Fractions Into Percent— *one per student*

Equivalencies to Memorize—*one per team, or class poster*

Worksheets to Reinforce Square Three concepts—*optional, one per student*

Quick Team Quiz 3—*one per student*

Square Three Test—*one per student*

Lesson-plan schedule

- Award squares
- Hundreds block and percent
- Figuring percent from fraction values
- Using calculators to change fractions into percent
- Repeating decimals, rounding, and percent
- Using the calculator percent key
- Memorizing common fractions, decimals, and percent
- Optional activities
- Quick Team Quiz 3
- Square Three Test

Lesson Plan

Awarding squares


Small group

1. Arrange the room and send students into teams. If you have not already done so, announce/award the Second Squares (red) to students who have mastered the concepts in Instruction Block Two. Also award First Squares to the students who have caught up and mastered Instruction Block One concepts.
2. Assign new student roles, reviewing the duties of each role and the Cooperative Group Work Rubric

Hundreds Block and percent

3. *Objective 1: To have students understand that "percent" means "per 100"*
   a. Have team Managers come to you for one Hundreds Blocks worksheet
   b. Explain that "percent" means *per one hundred*
   c. Introduce the % symbol, which also looks like another way to write a fraction. Remind them that the percent symbol always follows the number. (e.g., 5%)
4. Hundreds block A: Have students shade the ten squares in the first column.
   a. Ask the teams what fraction describes the shaded part ($\frac{10}{100}$ squares)
   b. Ask the team what fraction describes the part that is not shaded ($\frac{90}{100}$ squares)
   c. Make the connection—since this situation describes a block of 100, we can easily translate the fractions into equivalent percents: $\frac{10}{100}$ = 10% squares (10 per 100) and $\frac{90}{100}$ = 90% squares (90 per 100)
5. Hundreds block B: Tell each student to shade a different number of squares (11–99) in hundreds block B on their paper.
   a. When they finish, they should pass their paper to the teammate on their right and have him/her determine the percent of squares shaded. The teammate should write a percent with a label. (e.g., 14% of the squares are shaded).


Teaching tip
Remind students that they already know that "cent" means 100. A century is 100 years, and cents are the 100 pennies in a dollar.


Teaching tip
Students may want to be fancy and shade blocks randomly or in a design. Ask that they shade in columns in order to save time by making it easier to count.

b. Pass the paper to the next teammate. He/she should count and write the percentages of squares that are not shaded and write a percent and label. The teams should agree on the counts and the percent.

c. Monitor the teams to determine they understand when the denominator is 100, the fraction converts directly into percent

d. Also make sure they understand that the sum of the shaded and unshaded in these instances should equal 100

Figuring percent from fraction values

6. *Objective 2: To have students understand the percent value of common fractions, including $\frac{1}{2}$, $\frac{1}{4}$, and $\frac{3}{4}$*

   a. Hundreds block C: Have team members divide hundreds block C by shading one-half. Have them count the squares to determine the percent ($\frac{50}{100}$ = 50% squares).

   b. Hundreds block D: Have teams divide hundreds block D into quarters and shade one-quarter. Ask them to determine the percent of squares that is colored ($\frac{1}{4} = \frac{25}{100}$ = 25% squares) and the percent of squares that is not shaded $\frac{3}{4} = \frac{75}{100}$ = 75% squares)

Using calculators to change fractions into percent

7. *Objective 3: To teach students how to use calculators to find percents*

   a. Point out that the percent equivalencies they discovered for the hundred blocks are true whether there are 100 items or not. They can prove it with their calculators if they follow this rule. Have students write this rule on the back of their papers: *To find the percent, first convert the fraction into a decimal and then multiply by 100. For example, convert $\frac{1}{2}$ into a decimal (0.5) and multiply by 100 to find the percent (50%).*

   b. Have teams practice with $\frac{1}{4}$. You might want to ask them to write down the numbers and keys as they push them: 1 ÷ 4 = 0.25 x 100 = 25%

   c. Have Managers come to you for the Changing Fractions Into Percents Worksheet.

8. Part 1: Draw a chart on the board that matches Part 1, leaving columns two and three blank. Model the first line. Tell students to complete part 1 and stop.

Important!
Many simple calculators translate fractions directly into percent. (n ÷ d % key) However, not all do. Teaching students to multiply by 100 reinforces the concept of percent and this method works on all calculators.

Changing Fractions Into Percents Answer Key		
Part 1 fraction	**Divide to find the decimal**	**Multiply by 100 to find the percent**
$\frac{3}{5}$	0.6	60%
$\frac{3}{12}$	0.25	25%
$\frac{3}{6}$	0.5	50%
$\frac{4}{8}$	0.5	50%
$\frac{9}{12}$	0.75	75%
$\frac{6}{8}$	0.75	75%

9. Part 2: Model the first example in Part 2

Changing Fractions Into Percents Answer Key		
Part 2 fraction	**Decimal and percent**	**The rest of the whole or collection?**
$\frac{10}{20}$ students were late	0.5 or 50% of students were late	How many were on time? $\frac{10}{20}$ or 50% of students were on time
$\frac{4}{16}$ students with hats	0.25 or 25% of students with hats	How many without hats? $\frac{12}{16}$ or 75% of students without hats
$\frac{3}{15}$ boys	0.2 or 20% of students were boys	How many girls? $\frac{12}{15}$ or 0.8 or 80% of students were girls

   a. Stress that the total of the percents should be 100% (Exception: revisit this point after you have explained repeating decimal/percents.)

   b. After the teams have completed part 2 of the chart, share answers with the whole class and ask individual team members to explain how they calculated their answers


Whole class

10. Part 3: You may work this part of the chart as a whole class. Spend time on $\frac{9}{9} = 100\%$ and $\frac{0}{8} = 0\%$. Help students to generalize for $\frac{4}{4}$, $\frac{18}{18}$,

etc. for 100% and for $\frac{0}{16}$, $\frac{0}{47}$, etc. for 0%

Changing Fractions Into Percents Answer Key		
Part 3 fraction	**Decimal and percent**	**Interpretation**
$\frac{9}{9}$ students bought tickets	1.0 or 100%	100% bought tickets
$\frac{0}{8}$ students rode the bus	0.0 or 0%	0% rode the bus

Repeating decimals, rounding, and percent

11. *Objective 4: To have students understand repeating decimals and the need for rounding*

Small group

a. Ask teams to find the decimal equivalent for $\frac{1}{3}$. The students will find that their calculators have lots of 3s. Tell them that these decimals are called "repeating decimals" because they, in fact, never end. ($\frac{1}{6}$, $\frac{1}{7}$, and $\frac{1}{9}$ are also repeating decimals.) Decimals like 0.25 and 0.5 are called "terminating decimals" because they end.

b. Show them that mathematicians put a line over numbers to indicate repeating decimals, as in $\frac{1}{3} = 0.\overline{333}$

c. Have them multiply by 100, and they will find that the percent also repeats. It is necessary to round to the nearest whole percent.

Bright Idea

Ask your students to prove why the $\frac{1}{3}$ division problem never ends. (After making a division into 1.0, there is always a remainder of 1.)

d. Always have students find the percent first before trying to round. The decimal for $\frac{1}{7}$ equals 0.1428571, but the percent value is 14.28571, which students can more easily round to the whole number of 14%.

e. Have them experiment with $\frac{2}{3}$, $\frac{1}{7}$, and $\frac{1}{9}$. Remind students how to round. We usually round repeating decimals: $\frac{2}{3}$ (67%), $\frac{1}{7}$ (14%), $\frac{1}{9}$ (11%).

Using the calculator percent key

12. *Objective 5: To teach students how to use a percent key on a calculator*

a. In problems like those on the worksheet, students can check

their answers using the percent key on the calculator

a. If $\frac{4}{16}$ students had hats, then 25% of the students had hats. The denominator describes the total group (16 students).

b. Have students key in the following: 16 x 25%. The answer (4) appears as soon as the [%] key is pushed. There is no need to push the [=] key.

c. If someone pushes the = key, the answer will be nonsensical (64).

- Students should always enter the total number in the group (the denominator) FIRST, and then multiply by the percent. The [%] key should be pushed LAST.

13. Ask students to go back through the examples in the worksheet and multiply the denominator times the percent. Their answers should equal the numerator in the problems.

Teaching tip
Actually, the order of numbers doesn't matter, but the % key must be pushed last.

Memorizing common fractions, decimals, and percent

Equivalencies to Memorize		
Fraction	**Decimal**	**Percent**
$\frac{0}{n}$	0.0	0%
$\frac{1}{10}$	0.1	10%
$\frac{1}{8}$	0.125	12.5%
$\frac{1}{5}$	0.2	20%
$\frac{1}{4}$	0.25	25%
$\frac{1}{3}$	$0.\overline{333}$	33%
$\frac{1}{2}$	0.5	50%
$\frac{2}{3}$	$0.\overline{666}$	67%
$\frac{3}{4}$	0.75	75%
$\frac{n}{n}$	1.0	100%

14. *Objective 6: To have students make an index card to study*

    a. Make copies for team folders of the Equivalencies to Memorize chart, or make a large chart to post at the front of the class

    b. Give Team Managers index cards for their teams—*one per student*

    c. Tell students to make three columns and label them "Fractions," "Decimals," and "Percent." Explain that n = any number.

    d. For homework or during the school day, students should begin to memorize this list

    e. Suggest that students quiz each other when they have free time until every team member has memorized his/her card

15. If you have more time, look at page 81 for optional activities that will help reinforce your students' learning

Teaching tip

You can use this chart to give quick recall quizzes by folding the paper to hide two of the three columns.

Teaching tip

The fractions are listed in size order, smallest to largest. Learning them in this order can be helpful in many math situations.

Quick Team Quiz Three

16. Give a quick assessment to review the concepts taught today. Directions for the quizzes are on page 8 in this guide. When students are working in teams, walk around the room, clarifying and instructing.

    a. Ask the Manager to put all the team's papers neatly in the team folder and give them to you

    a. If you intend to give Test Three on another day, be certain that team members keep their index card with the fraction/decimal/equivalents to study overnight

Quick Team Quiz Three Answer Key

1. 0.34 blocks, 34% blocks
2. 0.66 blocks, 66% blocks
3. 0.88 blocks, 88% blocks
4. 0.12 blocks, 12% blocks
5. 100

6.

Fraction	Decimal	Percent
$\frac{3}{12}$	0.25	25%
$\frac{2}{3}$	$0.\overline{666}$	67%
$\frac{13}{26}$	0.5	50%
$\frac{56}{56}$	1 or 1.0	100%

7. 80% students, 20% students

Square Three Test


Individual

17. When you are satisfied that your students are ready, administer the Square Three Test as individuals, not teams. Separate their desks for privacy.

18 Assess each team member using the Cooperative Group Work Rubric

19. Correct the Square Three Test and evaluate your students' mastery of the concepts before starting Instruction Block Four. Reteach and retest, if necessary. Make a list of those students who have earned squares.

Square Three Test Answer Key

1. 0.68 blocks, 68% blocks
2. 0.32 blocks, 32% blocks
3. 100
4.

Fraction	Decimal	Percent
$\frac{6}{24}$	0.25	25%
$\frac{3}{9}$	$0.\overline{333}$	33%
$\frac{16}{20}$	0.8	80%
$\frac{0}{56}$	0.0	0%

5. 75%, 25%

6. 25%
7. 6 tenths
8. 18 hundredths
9. $\frac{6}{n}$
10. It's a repeating decimal

Optional Activities Three


Individual

or


Small group

or


Whole class

1. Worksheet to Reinforce Square Three Concepts (p. 81)

- Assign this worksheet as a homework assignment, a team assignment, or as a whole-class assignment. Correct in teams or as a whole class. Consider giving recognition to teams where all students completed the assignment on time.
- Allow teams to rewrite worksheet questions 1, 3, and 6, making new math questions to quiz one another
- Continue to spend time going over labels. Remind students that they can use percents to describe situations, but all percents are followed by the word "of" in the label. (Ex., 50% of the students were males, or 25% of the faculty taught math or science.)

Worksheet to Reinforce Square Three Concepts Answer Key

1. b, d, and f

2. 100

3. a. $\frac{25}{100}$ b. 0.25 c. 25%

4. a. $\frac{44}{100}$ b. 0.44 c. 44%

5.

3	÷	5	=	0.6	×	100	=	60%

6. a. 0.8, 80% b. 0.5, 50% c. 0.75, 75%
   d. 1.0, 100% e. $0.\overline{333}$, 33% f. 0, 0%

7. a. 0.33 b. 0.67

8.

20	×	25	%

9. a. 70 b.18 c. 60

10. a. 280 votes b. 72 boats c. 180 apples

Individual

or

Small group

or

Whole class

2. Journal writing is always an excellent way for students to reinforce their own learning. Below is a list of prompts you can give individual students, teams, or the whole class. Choose one or two for each instruction block, or give one prompt per team.

Allow students to write for at least three minutes. Direct them to first share what they wrote with their team. Ask for volunteers to share with the whole class. Look for common comments and strategies that students write.

- Objective 1 prompt: Explain the background meaning of the term "percent"
- Objective 2 prompt: Explain how to use a calculator to change a fraction into a percent. You may make a numbered list.
- Objective 3 prompt: What is a repeating decimal? Show why the decimal and percent for $\frac{1}{3}$ are repeating.
- Objective 4 prompt: If you wanted to find 20% of 60, describe which calculator keys you would push, and in what order
- Objective 5 prompt: Describe in detail your plan to learn the list of fractions, decimals, and percent that are on the index card. Include a time table.

3. Real-life situations

Individual

- For homework, ask students to search for percents in their life. All food labels include percent information. If a food provides 30% of the recommended daily allowance, then they have to eat more food to get the other 70% for the total % Daily Value. Advertizing often contains percents, such as "10% down" or "6% APY." Polls are reported in percents, too.
- Distribute newspapers to ask students to look for percents or situations that are or can be described in percent

Multi-Grain wheat crackers

Nutrition Facts

Serving Size 17 crackers (30g)
Servings Per Container About 9

Amount Per Serving

Calories 130 Calories from Fat 35

	% Daily Value*
Total Fat 4g	**6%**
Saturated Fat	**2%**
Polyunsaturated Fat 0g	
Monounsaturated Fat 0g	
Cholesterol 0mg	**0%**
Sodium 290 mg	**10%**
Total Carbohydrate 21g	**6%**
Dietary Fiber 2g	**8%**
Sugar 4g	
Protein 2g	

Vitamin A 0% • Vitamin C 0%
Calcium 4% • Iron 8%
Phosporous 15%

*Percent Daily Values are based on a 2,000 calorie diet. Your daily values may be higher or lower, depending on your calorie needs.

	Calories: 2,000	2,500
Total Fat	Less than 65g	80g
Sat Fat	Less than 20g	25g
Cholesterol	Less than 300mg	300mg
Sodium	Less than 2400g	2400mg
Total Carbohydrate	300g	375g
Dietary Fiber	25g	30g

Calories per gram:
Fat 9 • Carbohydrate 4 • Protein 4

Instruction Block Four

Percents/Decimals and Equivalent Fractions

Square Four concepts—*Students will:*

- Interpret a fraction, decimal, and/or percent in a context
- Understand that many different fractions are equivalent to common percents of 0%, 10%, 20%, 25%, 33%, 50%, 67%, 75%, and 100%
- Solve word problems using fractions, decimals, and percent by using mental math or a calculator
- Know the equivalent decimals and percents for common fractions $(\frac{0}{n}, \frac{1}{10}, \frac{1}{5}, \frac{1}{4}, \frac{1}{3}, \frac{1}{2}, \frac{2}{3}, \frac{3}{4}, \frac{n}{n})$
- Appreciate that knowing equivalent forms of fractions, decimals, and percents makes solving math problems easier
- Appreciate that knowing equivalent forms of fractions, decimals, and percents allows them to solve math problems experienced in real life by using only mental math

Materials

Green Square—*one per student*

Glue or tape—*one per team*

Simple calculators with the following functions: + , - , × , ÷ , and % — *one per student*

Blank paper—*four or more sheets per team*

Crayons or large markers—*one per team*

Duplicate

Fraction–Decimal Equivalencies, pages 1 and 2—*one per student*

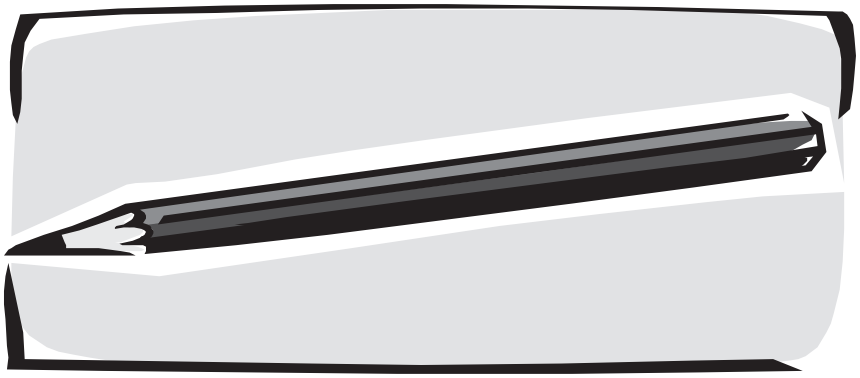
Worksheet to Reinforce Square Four Concepts—*optional, one per student*

Quick Team Quiz 4—*one per student*

Square Four Test—*one per student*

Lesson-plan schedule

- Award squares
- Review
- Finding equivalencies
- Using percents to compare fractions
- Percent activities in real life
- Optional activities
- Quick Team Quiz 4
- Square Four Test



Lesson Plan

Awarding squares

Small group

1. Arrange the room and send students into teams. If you have not already done so, announce/award the Third Squares (green) to students who have mastered the concepts in Instruction Block Three.
2. Assign new student roles, reviewing the duties of each role and the Cooperative Group Work Rubric.

Teaching tip
Award other squares to those students who have since earned them. Encourage students to continue to strive to be Squared Away.

Review

3. Take a moment to review what students have learned so far. Congratulate them for their ongoing achievement.

   Parts of a fraction (numerator and denominator) and what each means

   - Collections vs. parts of a whole
   - How fractions describe situations in real life
   - How to change a fraction into a decimal
   - How to change a decimal into a percent
   - What "100%" means and what "0%" means
   - Why there are no zeros in a denominator

4. Give a quick quiz on scrap paper to see that the students have memorized the common fraction/decimal/percent equivalences with quick recall.

Finding equivalencies

5. *Objective 1: To have students discover that there are many fractions that equal common percents, such as 50%, 25%, etc.*

   a. Put the following four fractions on the board: $\frac{4}{8}$, $\frac{14}{26}$, $\frac{27}{54}$, and $\frac{82}{164}$

   b. Ask teams to discover which fraction does not belong in the set and why ($\frac{14}{26}$ is the only one that does not equal 0.5 or 50%)

6. Give each Team Manager three copies of the Fraction–Decimal Equivalencies Worksheet. Read these directions to the whole class. Each team must complete <u>one</u> worksheet, the one held by the Reader Recorder.

Teaching tip
Suggest that students create a system to record equivalencies and to mark those numbers they have already looked at

7. Walk around the room as students work. Give help and encouragement where needed. After 10–15 minutes, pair teams to share/compare answers. If there are any discrepancies between what the two teams wrote , have students recalculate to determine the correct answer.

Fraction–Percent Equivalencies Worksheet Answer Key										
0%	**10%**	**12.5%**	**25%**	**33%**	**50%**	**67%**	**75%**	**100%**	**Not equivalent**	
$\frac{0}{8}$	$\frac{1}{10}$	$\frac{1}{8}$	$\frac{1}{4}$	$\frac{1}{3}$	$\frac{1}{2}$	$\frac{2}{3}$	$\frac{3}{4}$	$\frac{13}{13}$	$\frac{16}{17}$	$\frac{110}{1000}$
$\frac{0}{29}$	$\frac{10}{100}$	$\frac{3}{24}$	$\frac{3}{12}$	$\frac{5}{15}$	$\frac{5}{10}$	$\frac{8}{12}$	$\frac{15}{20}$	$\frac{42}{42}$	$\frac{30}{100}$	$\frac{180}{18000}$
$\frac{0}{35}$	$\frac{30}{300}$	$\frac{5}{40}$	$\frac{6}{24}$	$\frac{10}{30}$	$\frac{16}{32}$	$\frac{12}{18}$	$\frac{21}{28}$	$\frac{162}{162}$	$\frac{51}{0}$	$\frac{90}{3000}$
$\frac{0}{467}$	$\frac{600}{6000}$	$\frac{12}{96}$	$\frac{12}{48}$	$\frac{12}{36}$	$\frac{120}{240}$	$\frac{20}{30}$	$\frac{30}{40}$	$\frac{75}{75}$	$\frac{75}{125}$	$\frac{70}{0}$
	$\frac{120}{1200}$	$\frac{100}{800}$	$\frac{200}{800}$		$\frac{70}{210}$	$\frac{28}{42}$	$\frac{36}{48}$	$\frac{200}{200}$		

8. After five minutes of team sharing, reconvene the whole class and discuss the worksheet and answers in the Fraction–Percent Equivalencies Worksheet answer key. Discuss any errors or confusion.

Using percents to compare fractions

9. *Objective 2: To have students realize they can easily compare fractions by converting them to percent and comparing percent*

   a. Ask students if they would get a bigger piece of pizza if they shared one with two people or with three people. If they shared with two, they would get $\frac{1}{3}$ pizza, and with three people they would get $\frac{1}{4}$ pizza.

   b. Ask how knowing the percent value of the two fractions would help you answer the question. (33% is bigger than 25%.)

   c. How might this knowledge help them when comparing fractions that are unfamiliar, such as $\frac{16}{48}$ and $\frac{20}{80}$?

   d. Point to all the fractions on the Fraction–Decimal Equivalencies Worksheet. The smaller the percent, the smaller the fraction.

Teaching tip

Point out when comparing fractions or decimals, context is everything. Although 50% may be bigger than 25%, 50% of a rowboat is much smaller than 25% of an oil tanker.

Percent activities in real life

10. Choose between two activities (A or B) to have your students apply their understanding of fractions, decimals, and percent in real life

11. In **Activity A**, student teams conduct quick polls and report the poll results in percent values:

Have teams design a question to ask fellow classmates. The questions must have at least three possible responses. For example: *What is your favorite sport to watch? A. basketball, B. football, C. swimming, D. none of the above.* (Make sure that they include an option for "none.")

a. One team at a time runs its poll

b. The teams go back to their desks to compute the fractions, decimals, and percent values

c. Using the crayon or marker, teams write four statements having to do with their poll results. For example: *20% of responders like basketball, etc.*

d. Post the results

12. In **Activity B**, assign each team two or more larger-numbered fractions from the Fraction–Decimal Equivalencies Worksheet. Tell students to use a crayon or marker when they present and post their work. Have them write an original situation that is described by the fraction. Their situations can describe parts of a whole or parts of a collection. Ask them to write three correct statements related to the situation, using percents. The third statement will be a 0% statement. Post the results.

a. Model this example for $\frac{20}{25}$: There were 25 kittens in the animal shelter; 20 were all white, but 5 kittens had spots.

$\frac{20}{25} = 80\%$ $\frac{5}{25} = 20\%$

b. 80% of the kittens were white.
20% of the kittens had spots.
0% of the kittens had stripes.

13. If you have more time, look at p. 86 for optional activities that will help reinforce your students' learning

Teaching tip
Students need to first count the number of students in the room to determine the denominator. At the end of each poll, teams should check totals to be certain everyone has voted, but only once.

Quick Team Quiz 4

14. Give a quick assessment to review the concepts taught today.

Small group

Directions for the quizzes are on p. 8 in this guide. When students are working in teams, walk around the room, clarifying and instructing.

15. Ask the Manager to put all the team's papers neatly in the team folder and give them to you

Quick Team Quiz Four Answer Key

1.

12.5%	33%	50%	75%	100%
$\frac{4}{32}$	$\frac{12}{36}$	$\frac{5}{10}$	$\frac{27}{36}$	$\frac{14}{14}$
$\frac{8}{64}$	$\frac{6}{18}$	$\frac{8}{16}$	$\frac{15}{20}$	$\frac{26}{26}$

2. $\frac{48}{120}$ = They lost 40% of the games

   $\frac{72}{120}$ = They won 60% of the games

3. 16 x 75% = 12 fiction books

4. 14 tourists bought tickets at the door

5. $\frac{1}{8}$, because the larger the denominator, the smaller the piece

6. $\frac{12}{48}$ is larger; $\frac{12}{48}$ = 25%, whereas $\frac{9}{45}$ = 20%

Square Four Test

Individual

16. When you are satisfied that your students are ready, administer the Square Four Test to individuals, not teams. Separate their desks for privacy.

17. Give students a quiz orally (like a spelling test) to check that they have been memorizing common fractions, decimals, and percents.

    a. NO calculators for this part!

    a. Be certain to allow team members to keep their index card with the fraction/decimal/percent equivalents if they still need to study

18 Assess each team member using the Cooperative Group

Work Rubric

19. Correct the Square Four Test and evaluate your students' mastery of the concepts before starting Instruction Block Five

20. One week after you finish the unit, give students the Posttest

Square Four Test Answer Key

1.

12.5%	33%	50%	75%	100%
$\frac{7}{56}$	$\frac{5}{15}$	$\frac{4}{8}$	$\frac{18}{24}$	$\frac{27}{27}$
$\frac{6}{48}$	$\frac{4}{12}$	$\frac{10}{20}$	$\frac{36}{48}$	$\frac{11}{11}$

2. Martin missed 25% of his free-throw shots; he made 75% of his free-throw shots

3. 45% of the students did not go on the trip

4. 0 cats

5. 8 cats

6. $\frac{n}{5}$

7. It's a repeating decimal

8. 357 cans, 119 bottles

9. $\frac{36}{45} = 80\%$, whereas $\frac{27}{36} = 75\%$

Optional Activities Four


Individual

or


Small group

or


Whole class

1. Worksheet to Reinforce Square Four Concepts (p. 86)

- Assign this as a homework assignment, a team assignment, or as a whole-class assignment. Correct in teams or as a whole class. Consider giving recognition to teams in which all students completed the assignment on time.
- Many of the problems on this sheet are word problems. Have students write out the steps they followed to solve each problem. Each step should be numbered.
- Allow teams to rewrite worksheet questions 3, 4, 5, and 6 by doubling or tripling the number that describes the whole or all of the collection, making new math questions to quiz one another.
- Allow teams to rewrite worksheet question 2 with different fractions and determine which is the larger of a pair by comparing their percent values.

Worksheet to Reinforce Square Four Concepts Answer Key

1.

0%	10%	12.5%	20%	25%	33%	50%	67%	75%	100%	NONE
$\frac{0}{12}$	$\frac{70}{700}$	$\frac{5}{40}$	$\frac{7}{35}$	$\frac{13}{52}$	$\frac{11}{33}$	$\frac{60}{120}$	$\frac{14}{21}$	$\frac{54}{72}$	$\frac{19}{19}$	$\frac{9}{54}$

2. a. $\frac{3}{4}$, 75% > 33% b $\frac{12}{18}$, 67% > 50%

3. 10 dogs
   1) 100% - 60% = 40%
   2) 25 × 40% = 10 dogs

   or
   1) 25 × 60% = 15
   2) 25 - 15= 10 dogs

4. 33% of new cars
   1) $\frac{16}{48}$
   2) 16 ÷ 48 = 0.333
   3) 0.333 × 100 = 33%

5. 25 trees
   1) $\frac{1}{8}$ = 12.5%
   2) 200 × 12.5% = 25

6. $510
   1) 600 × 15% is $90
   2) $600 – 90 = $510

7. a. $14 b. $84
   1) 70 × 20 % = $14
   2) 70 + 14 = $84

8. a. 25%
   1) 20/80
   2) 20 ÷ 80 = 0.25
   3) 0.25 × 100 = 25%

   b. 75%
   1) 100 - 25 = 75%

9. a. 30% b. 20% c. 40% d. 10%
   1) 6 + 4 + 8 + 2 = 20
   2) $\frac{6}{20}$ = 30%
   3) $\frac{4}{20}$ = 20%
   4) $\frac{8}{20}$ = 40%
   5) $\frac{2}{20}$ = 10%

2. Journal writing is always an excellent way for students to reinforce their own learning. Below is a list of prompts you can give to individual students, teams, or the whole class. Choose one or two for each Instruction Block, or give one prompt per team.


Individual

or


Small group

or

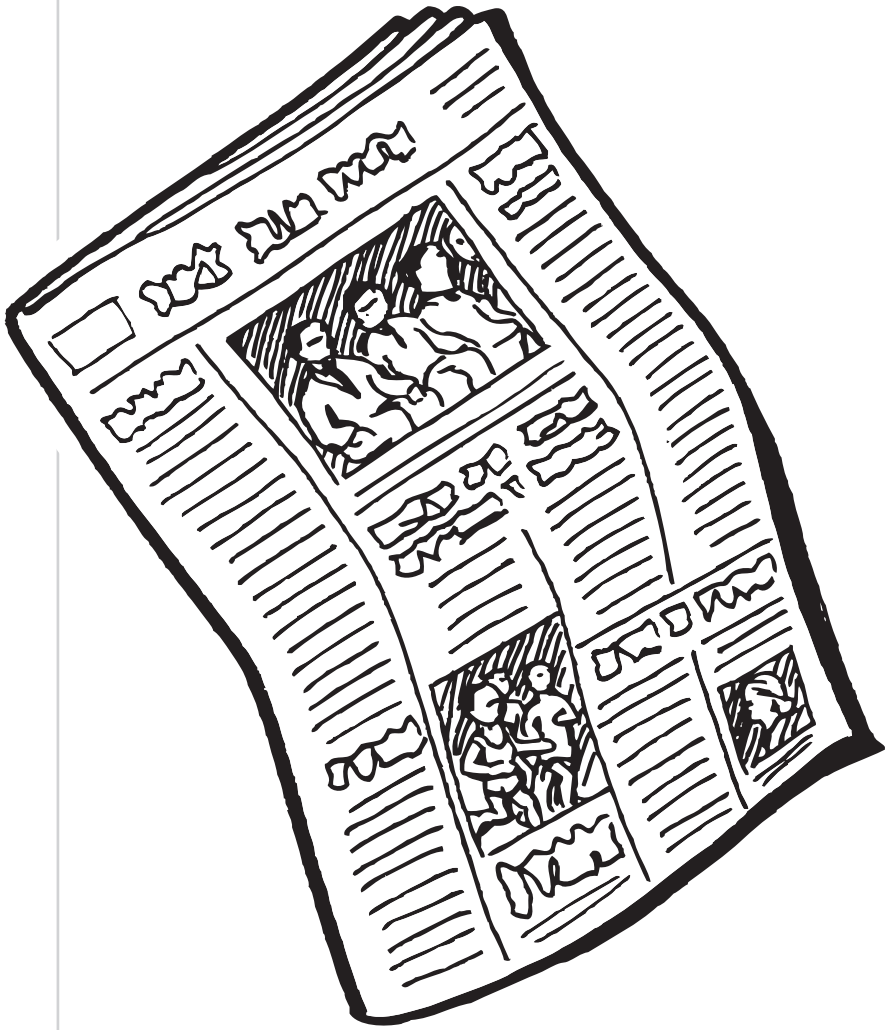

Whole class

Allow students to write for at least three minutes. Direct them to first share what they wrote with their team. Ask for volunteers to share with the whole class. Look for common comments and strategies that students write.

- Objective 1 prompt: Explain how you found the fraction/percent equivalent values on the Fraction–Percent Equivalencies Worksheet.
- Objective 2 prompt: How does knowing two fractions' percent values help you to determine which is larger?
- Objective 3 prompt: In a poll, why must a pollster always include a choice for "none of the above"? (Three choices implies a closed set. They need to include "none" for those who do not want any of the three choices.)

3. Real-life situations

- If you completed Activity A, consider spending more time creating graphic representations of the poll results—bar graphs, pictographs, or circle graphs. Students can use percent to determine the degrees of a circle needed to represent each value.
- Look in newspapers or weekly magazines to find poll results. Have students write true statements reflecting the poll's results. Also consider having them create graphic representations of these polls.



Instruction Block Five

The Golden Square: Solving Problems Using Fractions, Decimals, and Percent

***Golden Square concepts**—Students will:*

- Recall common equivalent fractions, decimals, and percents
- Demonstrate an understanding of 0% and 100%
- Interpret a fraction, decimal, and/or percent in a context
- Solve word problems involving fractions, decimals, and percents by using mental math and/or pencil and paper
- Appreciate that knowing equivalent forms of fractions, decimals, and percents makes solving math problems easier
- Appreciate that knowing equivalent forms of fractions, decimals, and percents allows them to solve math problems experienced in real life by using only mental math

Materials

Purple Square—*one per student*

Glue or tape—*one per team*

Simple calculators with the following functions: + , - , × , ÷ , and % — *one per student*

Duplicate

Golden Square Tasks Worksheet—*one per student*

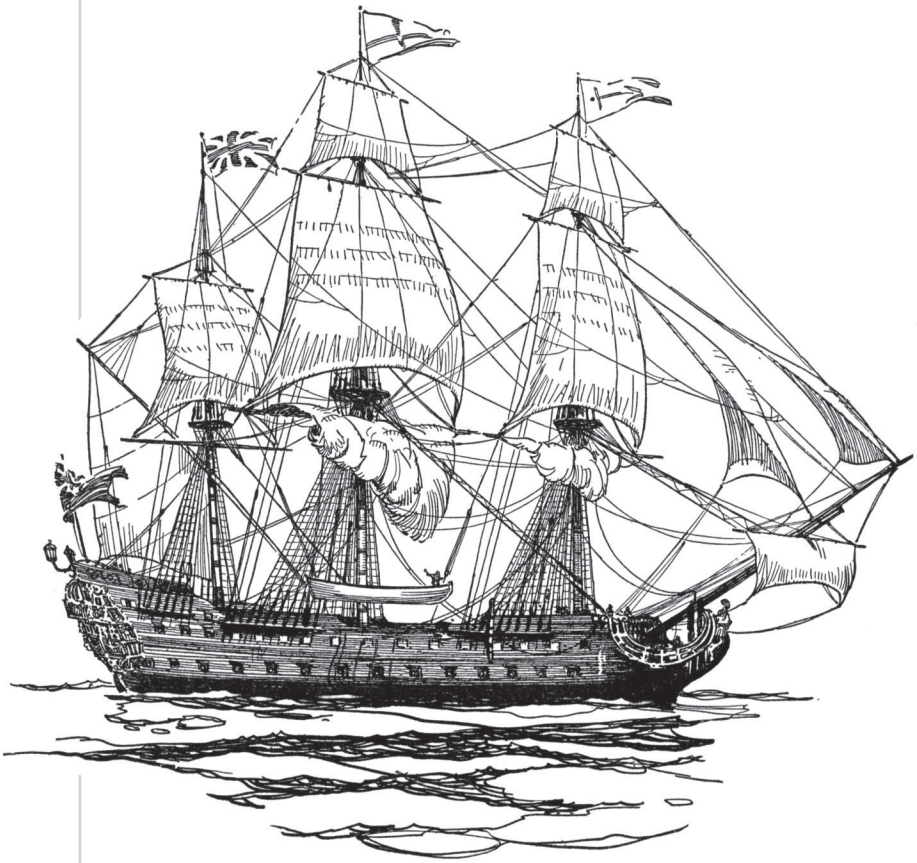
Golden Square Challenges—*one per student*

Special Award Certificate—*one per student who is Squared Away*

Special Award Certificate with Golden Square notation—*one per student who is Squared Away and has earned a Golden Square*

Lesson-plan schedule

- Award squares
- Modeling Golden Square tasks
- Golden Square Tasks Worksheet
- Golden Square Tasks Worksheet Answer Key
- Golden Square Challenge 1—common fractions, decimals, and percents test
- Golden Square Challenges 2–6
- Celebration and Special Award Certificates



Lesson Plan


Small group

Awarding squares

1. Arrange the room and send students into teams. If you have not already done so, announce/award the Fourth Squares (purple) to all the students who have mastered the concepts in Instruction Block Four and all the other squares.

    a. The Fourth Square is the final square required to be considered Squared Away. Award the squares, but consider waiting until the whole class passes the Square Four Test to celebrate. See the Final Award Celebration on p. 10

    b. Assign new student roles, quickly reviewing the duties of each role and the Cooperative Group Work Rubric

2. After you get the class started on the Golden Square activities, you may decide to work with those students who have not mastered all four instruction block concepts. The others will need to work cooperatively, because you will not be available.

Modeling Golden Square Tasks

3. Model how to do the activities by writing this example on the board: *There are 240 students in the school, and on Friday, 20% were absent. How many students were present on Friday?*

    a. Discuss what they know just by reading the problem. The first step to problem solving is to **read the problem carefully** and then ask, *"What information do I have?"* and, *"What am I trying to find out?"* It's a good idea to underline the whole question.

    b. Students may glean three important facts from reading the question:

        - There are 240 students in the school. The answer cannot be 240 or larger because not all students were present.
        - 20% were absent
        - The question asks, *"How many students were present?"* The answer must be a whole number and must be labeled "Students." Suggest that they draw a blank line with a sentence label: *" students were present."*

4. Ask students to offer different ways to solve this problem. *How many students were present on Friday?* (192 students were present.)

    a. As they offer suggestions, write a list of steps, including the

Teaching tip

Stress that the answers to word problems must have labels.

input numbers and [operation keys]

b. There are at least three strategies for solving this problem:

First:

- If 20% were absent, then 80% were present
- [240] [×] [80] [%]. (Students will see the answer as soon as they push the [%] key.) The answer is that 192 students were present on Friday.

Second:

- 20% were absent
- [240] [×] [20] [%]—48 students were absent
- [240] [–] [48] [=]—192 students were present on Friday

Third:

- Using mental math, 10% of 240 is 24, so 20% is (24 + 24), or 48
- [240] [–] [48] [=] 192 students were present on Friday

Teaching tip

With some calculators, students can enter [240] [–] [20] [%] and get the answer 48. However, this does not work with all calculators, especially those that do other higher functions.

Golden Square Task Worksheet

5. Have team Managers come to you for Golden Square Task Worksheets—*one per team member*

   a. Tell students that they should work cooperatively on this worksheet with their team. (This is especially important if you will be unavailable because you are working with students who have yet to pass the Square Four Test.)

   b. Remind students that to reach level 4 on the Cooperation Group Work Rubric, they should "consistently *and* actively *help classmates to achieve their goals…[and] communicate well with others, encouraging them and helping them to understand…*"

6. Go over these directions with the whole class:

   a. Students must show how they solve the problems

   b. The steps they use must be numbered and labeled. (Refer back to your example.)

   c. All members of the team must participate in solving the problem and write at least one strategy on their papers for each question

   d. Encourage mental-math strategies using equivalent fractions

and percents

e. Award extra credit to teams or individuals that come up with two or three different strategies for solving the problems

7. If you are not busy with other students, walk around, checking and listening to conversations as teams work. Remind students of the importance of labels.

8. Remind students that because the Golden Squares problems are more complex, they should take their time, carefully read the questions, and remember what they have learned. When they finish a problem, they should check to be sure the answer makes sense and is labeled.

Golden Square Tasks Worksheet Answer Key

9. When all the teams are finished, go over the answers and strategies for all the tasks. Have teams offer strategies as well as answers. Give extra credit to teams that recorded more than one strategy.

10. Golden Square Task 1: *Theresa bought a sweater that originally sold for $48, but it was on sale for 25% off. How much did she spend for the sweater on sale?* (Theresa paid $36 for the sweater, on sale.)

    Strategies:

    - Find 25% of $48 ($48 \times 25\% = 12$)
    - Subtract $12 from $48 ($48 - 12 = 36$)

    or

    - Realize that they will have to pay for 75%
    - Multiply by 75% ($48 \times 75\% = 36$)

    or

    - Realize that $25\% = \frac{1}{4}$; divide $48 by 4 to determine 25% of the original price ($48 \div 4 = 12$)
    - Subtract $12 from $48 ($48 - 12 = 36$)

11. Golden Square Task 2: *Tim has a big fish tank. $\frac{8}{24}$ of Tim's fish are guppies. He has 70 guppies. How many fish does he have in all?*

    Strategies:

    - Using the calculator, change $\frac{8}{24}$ into a decimal (0.3333…)

- Recognize that 0.3333 = $\frac{1}{3}$
- If a third of his fish are guppies, then two-thirds are not guppies ($\frac{1}{3}$ = 70; $\frac{2}{3}$ = 140; total fish = 210)

12. Golden Square Task 3: *Tanya's weight is 7/8 of Clarence's weight. Clarence weighs 144 pounds. What does Tanya weigh?* (Tanya weighs 126 pounds.)

    Strategies:

    - Recognize that $\frac{1}{8}$ = 12.5%
    - Multiply 144 by 12.5%. (144 × 12.5% = 18 pounds)
    - Subtract 18 from 144 (144 – 18 = 126 pounds)

    or

    - Multiply 12.5% x 7 to equal 87.5%, or change $\frac{7}{8}$ into a percent (87.5%)
    - Multiply 144 x 87.5% = 126 pounds

13. Golden Square Task 4: *Juan and his friends worked together mowing lawns. Juan worked 20 hours, Miguel worked 15 hours, George worked 10 hours, and Stan worked 5 hours. Together they made $400. If they shared the money* fairly, *how much was each paid?*

    Strategies:

    - Add the total hours worked (20 + 15 + 10 + 5 = 50 hours)
    - Determine the fraction that each boy worked: Juan worked $\frac{20}{50}$ hours, Miguel $\frac{15}{50}$ hours, George $\frac{10}{50}$ hours, and Stan $\frac{5}{50}$ hours
    - Use calculators to change the fractions into percents
    - Multiply $400 × each percent to find how much pay each received
    - Juan was paid $160 ($400 × 40%), Miguel $120 ($400 × 30%), George $80 ($400 × 20%) and Stan $40 ($400 × 10%)

    or

    - Add up the hours (50)
    - Divide $400 by 50 to get the hourly rate ($8/hr)

Teaching tip
Talk about the difference between the words "fairly" and "equally."

- Multiply the hours worked by \$8. For example, Juan is $20 \times \$8 = \$160$

14. Golden Square Task 5: *There were 5 candidates in the primary election, and 3000 people voted. Some of the results were given in percent, others as actual numbers. Complete the chart to know all the percents and all actual number counts.*

15% of the votes were for Candidate A	450 voters chose Candidate A
25% of the votes were for Candidate B	750 voters chose Candidate B
35% of the votes were for Candidate C	1050 voters chose Candidate C
20% of the votes were for Candidate D	600 voters chose Candidate D
5% of the votes were disqualified	150 votes were disqualified

Strategy:

- Use a calculator with a [%] key to find the number counts (e.g., $3000 \times 15\% = 450$ votes)
- Use the calculators to divide each candidate's vote count by 3000 ($1050 \div 3000 = 0.35$)
- Multiply the answer by 100 to get the percent ($0.35 \times 100 = 35\%$)

Golden Square Challenges

15. Students need at least 30 minutes to complete the Golden Square Challenges. These are for individual students, not teams. Separate the desks for privacy.

Individual

a. Before handing out calculators or the challenge paper, give the final test for equivalent decimals and percents of common fractions (see page 90)

b. Collect those papers and distribute the Golden Square Challenge worksheets to those students who have completed all four squares

c. Handout retests for students who still have Square Tests to retake. The retest should be a new copy of the same test with those items he/she must redo circled or highlighted. Correct these as soon as they finish, and give them a Golden Square Challenge sheet only after those tests are completed

d. Remind all students to label their answers

Golden Square Challenges		
Fraction	**Decimal**	**Percent**
$\frac{1}{10}$	0.1	10%
$\frac{1}{8}$	0.125	12.5%
$\frac{1}{5}$	0.2	20%
$\frac{1}{4}$	0.25	25%
$\frac{1}{3}$	0.333	33%
$\frac{1}{2}$	0.5	50%
$\frac{2}{3}$	0.666	67%
$\frac{3}{4}$	0.75	75%

e. Suggested criteria for achieving a Golden Square (allow up to 5 points per challenge): For Challenge 1, give 5 for a perfect list, 2 for one error, and 0 for two or more errors. For the remaining challenges, give 2 for a correct answer, 1 for a correct label, and 2 for a correct numbered strategy. 20 points or better earns a Golden Square.

Golden Square Challenges Answer Key

- Golden Square Challenge 1: *Commons fractions, decimals, and percents*
- Golden Square Challenge 2: *Maria paid $8400 for the car, on sale*
- Golden Square Challenge 3: *Juan worked 60 hours and earned $480, Miguel worked 45 hours and earned $360, George worked 30 hours and earned $240, and Stan worked 15 hours and earned $120*
- Golden Square Challenge 4: *Tim has 400 chickens in all*
- Golden Square Challenge 5: *Juanita is 48" tall*
- Golden Square Challenge 6:

35% of the votes were for Candidate A	140,000 voters chose Candidate A
15% of the votes were for Candidate B	60,000 voters chose Candidate B
36% of the votes were for Candidate C	*144,000* voters chose Candidate C
14% of the votes were for Candidate D	*56,000* voters chose Candidate D

16. Celebration and Special Award Certificates

    a. See Final Award Celebration information on p. 10 of this guide

    b. Award the Golden Squares and allow students time to mount their four-square on top

    c. Hand out Special Award Certificates and congratulate the students for their achievement. One certificate is for students who are Squared Away; the other is for students who also achieved the Golden Square.

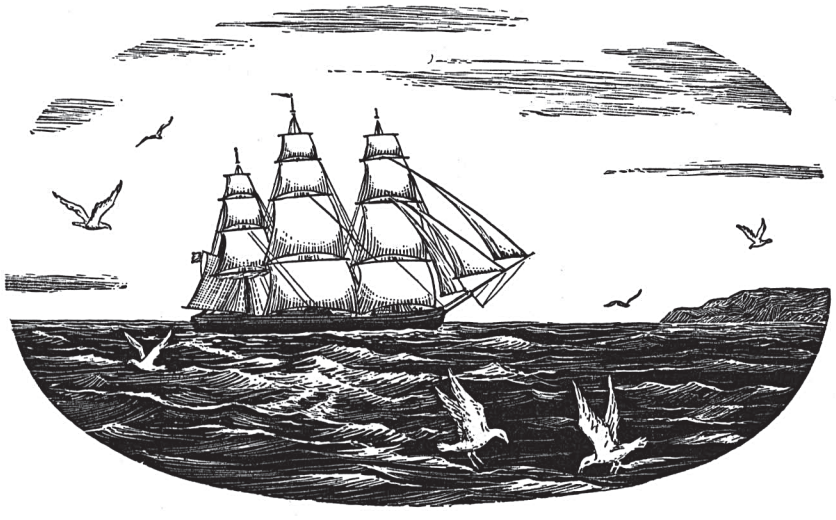
Introduction

"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 it to describe sailors who completed a task with competency, as in, "He was right squared away!" In this unit, you will learn all about fractions, decimals, and percent. When you can demonstrate your skill in working with these three concepts, you will be considered Squared Away.

This unit is divided into five instructional blocks. At the end of each block, you will be tested on specific skills and content. When you have demonstrated you have mastered the material, you will be awarded a colored square. When you have earned four squares, you will be considered Squared Away. The fifth square is called the Golden Square. In order to earn a Golden Square, you must go beyond the basic level of understanding and achieve an exemplary score on a challenging test that requires higher thinking skills.

You will be working in teams of three or four in activities designed to teach fractions, decimals, and percent. You will learn how these three concepts are closely related, and this knowledge will help you solve math problems more quickly and accurately.

There are practice materials associated with each day's lesson that reinforce what you have learned. The more consistently you complete these extra activities, the deeper your understanding will be. Don't miss the opportunity each day to share what you are learning with your parents.



Name: _____ Date: _____

Pretest / Posttest

1. Circle the numerator in this fraction: $\frac{12}{15}$

2. Write a fraction that describes the number of shaded circles. _____ circles

3. Write a fraction to describe how much of the circle is missing. _____

4. Write the following fractions:

a. four fifths	b. nineteen hundredths	c. one hundred sixty thousandths

5. Write the following decimals:

   a. seven tenths _____ b. fourteen hundredths _____

   c. eight hundred fifty-five thousandths _____

6. What fraction of this rectangle is shaded? Circle your answer.

$\frac{0}{3}$ or $\frac{3}{0}$ or $\frac{3}{3}$ or $\frac{0}{0}$

You may use your calculator for the rest of these questions.

7. Change the following fractions into percent:

   a. $\frac{12}{48}$ = _____% b. $\frac{15}{75}$ = _____% c. $\frac{18}{18}$ = _____%

8. Circle the fractions that are equal to 75%:

$\frac{3}{5}$ $\frac{5}{40}$ $\frac{3}{4}$ $\frac{34}{34}$ $\frac{12}{16}$ $\frac{50}{70}$

On the back of the paper, write the steps you followed to solve each problem.

9. There are 250 students in the high school. 60% attended the big game. How many students came to the game? Label your answer. _____

10. Susanne bought at $72 sweater on sale at 25% off. How much did she spend for the sweater on sale? _____

11. Which fraction is larger, $\frac{21}{28}$ or $\frac{14}{21}$? Circle your answer. On the back of the paper, *explain* how you figured it out.

Cooperative Group Work Rubric

4 ***Exemplary***

— You *consistently* and *actively* help your classmates achieve their goals, whether you are working in a team, with a partner, or by yourself. You communicate well with others, encouraging them and helping them understand the lesson. You *willingly* share materials and responsibilities.

3 ***Expected***

— You *usually* help your classmates to achieve their goals, whether you are working in a team, with a partner, or by yourself. You *generally* communicate well with others, encouraging them and helping them understand the lesson. You share materials and responsibilities.

(If your evaluation is less than expected, try to use your cooperation skills more consistently.)

2 — You *sometimes* help your classmates achieve their goals and help them understand the lesson

1 — You *do very little* to help your classmates achieve their goals or understand the lesson

Cooperative Group Work Rubric

	4 Exceeds Expectations	3 Meets Expectations	2 Nearly There	1 Ineffective
Contributing	I consistently contribute to the group by sharing my opinions and ideas.	I usually contribute to the group by sharing my opinions and ideas.	I sometimes contribute to the group by sharing my opinions and ideas.	I rarely contribute to the group by sharing my opinions and ideas.
Listening	I actively listen to and support other people's opinions, ideas, and efforts.	I usually listen to and support other people's opinions, ideas, and efforts.	I sometimes listen to and support other people's opinions, ideas, and efforts.	I rarely listen to and support other people's opinions, ideas, and efforts.
Teamwork	I actively encourage all members to participate and work together.	I often encourage all members to participate and work together.	I occasionally encourage all members to participate and work together.	I rarely encourage all members to participate and work together.
Problem solving	I consistently help my team work through problems by actively seeking and suggesting solutions.	I often help my team work through problems by seeking and suggesting solutions.	I sometimes help my team work through problems by seeking and suggesting solutions.	I do not try to help my team work through problems or suggest any solutions.
Staying on task	I consistently stay on the task and complete the work required.	I stay on the task and complete the work required.	I stay on the task some of the time and complete some of the work required.	I am often off-task and do not complete the work required .

Content/Skills Checksheet **Student Names**																									
Square One Concepts—*Students will:*																									
Recognize that fractions describe parts of a whole or parts of a collection																									
Review/learn the parts of a fraction (numerator and denominator)																									
Read a fraction correctly																									
Recognize that when the numerator and denominator are equal, then the fraction describes a whole or all of a collection																									
Recognize that when there is a zero in the numerator, the fraction describes none or no part of a whole																									
Write a fraction to describe a divided whole or parts of a collection in a math situation																									
Interpret a fraction in a context																									
Square Two Concepts—*Students will:*																									
Understand that fractions are numbers that can be written as $\frac{a}{b}$ (but b cannot be zero)																									
Recognize that the symbol for division (÷) displays the form of a fraction																									
Recognize that fractions describe division problems. The numerator is the dividend and the denominator is the divisor (N ÷ D)																									
Understand that every fraction can be renamed as a decimal																									
Read a fraction and a decimal to the thousandths place																									
Generate a decimal equivalent to a fraction																									
Recognize the equivalent forms of decimals for commonly used fractions																									

Content/Skills Checksheet **Student Names**																									
Square Three Concepts—*Students will:*																									
Understand that when there is a zero in the numerator of a fraction, the fraction represents 0%																									
Understand that when a percent equals 100%, it describes a whole or all of the collection																									
Recognize that the symbol for percent (%) also displays the form of a fraction																									
Understand that every fraction can be renamed as a decimal or a percent																									
Understand that some fractions can be described as terminating percents, but others only as repeating percents																									
Generate a percent equivalent to a decimal or fraction																									
Know the equivalent forms of decimals and percents for commonly used fractions																									
Understand that repeating decimals are generally rounded in percents																									
Interpret a fraction, decimal, and/or percent in a context																									
Solve word problems involving fractions, decimals, or percent by using mental math or a calculator																									
Square Four Concepts—*Students will:*																									
Interpret a fraction, decimal, and/or percent in a context																									
Understand that many different fractions are equivalent to common percents																									
Solve word problems involving fractions, decimals, and percent by using mental math or a calculator																									
Know the equivalent decimals and percents for commonly used fractions																									

Square One Math Situation Strips

Duplicate—*1 for every 8 teams*

1	Barbara, Sara, Lola, and Maria bought one pizza. Make a drawing to show how they will share it. Color Maria's piece. Be sure to include LABELS.
2	Miguel, Teddy, Chuck, Juan, George, and David went out to dinner and ordered lasagna. Make a drawing to show how they shared the whole lasagna. Color Teddy's share. Be sure to include LABELS.
3	Joseph has seven books. One of his books is nonfiction and six are fiction. Color the nonfiction book. Be sure to include LABELS.
4	The box of brownie mix said that the mix would make eight servings. Make a drawing to represent this situation. Color one of the brownies. Be sure to include LABELS.
5	There are fifteen circles of different sizes on the page. One of them is colored. Draw the circles. Be sure to include LABELS.
6	Peggy, Sandy, and Trudy bought a foot-long sandwich. Make a drawing to show how they will share it. Color Trudy's share. Be sure to include LABELS.
7	Consuela picked five plums from the tree. One was rotten. Draw the plums and put an X over the one that was rotten. Be sure to include LABELS.
8	There are twelve hours on a clock face. Draw a clock face and color one hour. Be sure to include LABELS.

Worksheet to Reinforce Square One Concepts

1. Write a fraction for the following:

   a. Of 19 dogs, 8 were beagles.

   ☐ dogs are beagles

   b. Of 23 playing cards, 3 are jacks.

   ☐ cards are jacks

   c. 6 of 15 new cars are SUVs.

   ☐ cars are SUVs

   d. 5 of 8 pieces of cake were eaten.

   ☐ cake was eaten

   e. 1 piece of a pizza was cut into 5 pieces.

   ☐ candy bar

   f. 1 candy bar was shared by 4 people. Each share is worth

   ☐ pizza

   Write a fraction for the shaded parts

   g. 

   ☐ bar is shaded

   h. 

   ☐ circle is shaded

2. Write D for denominator and N for numerator:

   a. _____ describes the total number of a collection

   b. _____ describes the part or parts of the whole identified (colored)

   c. _____ describes the total number of parts in a whole

   d. _____ describes the top number

   e. _____ describes the bottom number

3. Write the fraction:

a. 3 twelfths	b. 14 twenty-firsts	c. 6 fifty-seconds	d. 9 four hundred sixty-thirds

4. How do you say these fractions? Write the words.

   a. $\frac{3}{8}$ _____

   b. $\frac{1}{6}$ _____

   c. $\frac{4}{13}$ _____

5. Write a situation that could be described as $\frac{8}{8}$. _____

   _____

   _____

Team: _____ Name: _____ Date: _____

Quick Team Quiz One

1. Sammy and two friends bought one candy bar. Draw the candy bar and how they will share it. Color Sammy's piece.

2. Does this situation describe a collection or parts of a whole? _____

3. Write and label the fraction describing Sammy's piece

4. Write and label a fraction that describes the friends' pieces together

5. Write a fraction to show the whole candy bar

6. There were five rose bushes in the yard. Dark red roses grew on two, and white roses grew on the other three. Make a drawing of the rose bushes.

7. Does this situation describe a collection or parts of a whole? _____

8. Write and label a fraction describing the white rose bushes

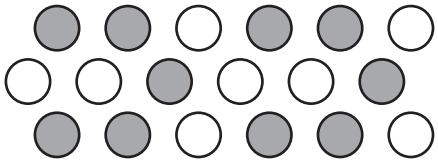
9. Write and label a fraction describing the dark rose bushes

10. Write and label a fraction describing the pink rose bushes

Name: _____ Date: _____

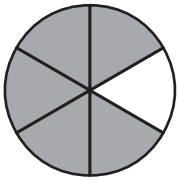
Square One Test

1. Write a fraction to describe the total number of circles that are shaded



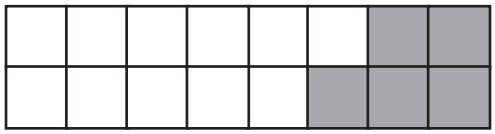
Is this a collection or parts of a whole? _____

2. Write a fraction to describe the total number of shaded pieces



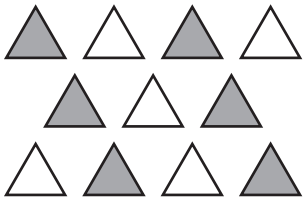
Is this a collection or parts of a whole? _____

3. Write a fraction to describe the total number of shaded squares



Is this a collection or parts of a whole? _____

4. Write a fraction to describe the total number of triangles that are shaded



Is this a collection or parts of a whole? _____

5. Billy and seven friends shared his birthday cake equally. Draw the cake and show how Billy cut it. Color Billy's piece.

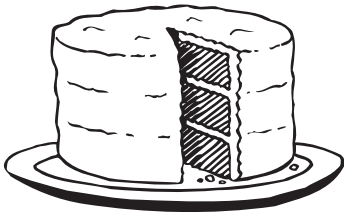
6. Does the birthday situation describe a collection or parts of a whole? _____

7. Write and label the fraction describing Billy's piece

8. Write and label a fraction that describes the cake pieces his guests shared

9. Write a fraction to show the whole birthday cake

10. Write a fraction to show how much birthday cake was left after Billy and all his guests ate their pieces



Team: _____ Date: _____

Fractions to Decimals Worksheet

Fractions to Decimals		
Fraction	**How it is said**	**Equivalent decimal**
$\frac{3}{10}$		
$\frac{12}{100}$		
$\frac{135}{1000}$		
$\frac{8}{10}$		
$\frac{65}{100}$		
$\frac{403}{1000}$		
$\frac{9}{10}$		
$\frac{99}{100}$		
$\frac{999}{1000}$		

How to read decimals		
Decimal	**How it is said**	**Equivalent fraction**
0.7		
0.2		
0.14		
0.58		
0.783		

Rule
Answer:

Worksheet to Reinforce Square Two Concepts

1. Complete the chart by writing the fraction, decimal, or how each is said. Remember to add the zero before the decimal place.

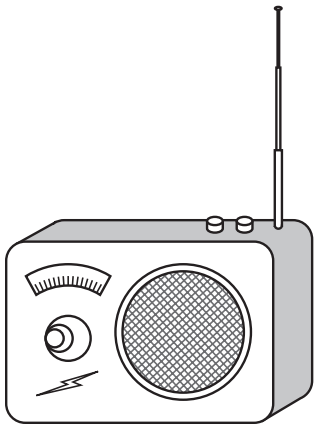
How it is said	Fraction	Decimal
6 tenths		
37 hundredths		
59 hundredths		
239 thousandths		
	$\frac{5}{10}$	
		0.41
		0.816

2. Complete this rule: To change a fraction into a decimal, divide the _____ by the _____.

3. What calculator keys do you push to change $\frac{5}{8}$ into a decimal?

				0.625

4. Write the fraction and the decimal:
   a. 7 of the 10 cars were Fords
   b. 14 of the 100 club members were eighth graders
   c. 55 of the 100 horses were palominos
   d. 368 of the 1000 new songs were played on the radio



5. Write a fraction and a decimal that means ALL of a collection or the WHOLE:

   Fraction: Decimal: _____

6. Write a fraction and a decimal that means NONE of a collection or the WHOLE:

   Fraction: Decimal: _____

7. What number can never be in the denominator? _____

8. Write the fraction and use your calculator to find the decimal for the following situations:

   a. Out of 130 cars in the parking lot, 13 were SUVs. Write the fraction and decimal:

      ☐ cars were SUVs _____ cars were SUVs

   b. Out of 2950 books in the library, 590 books were nonfiction. Write the fraction and the decimal:

      ☐ books were non-fiction _____ books were non-fiction

   c. 10,000 voters voted. 6,700 voters voted for Mr. Alvares. Write the fraction and the decimal:

      ☐ voters voted for Mr. Alvares _____ voters voted for Mr. Alvares

Master

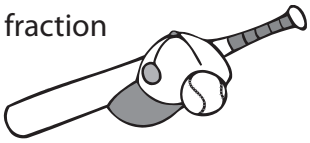
Team: _____ Name: _____ Date: _____

Quick Team Quiz Two

1. Fill in the empty blocks with the fraction, decimal, or how it's said. Remember to add the zero before the decimal point.

How it is said	Fraction	Decimal
6 tenths		
98 hundredths		
47 hundredths		
455 thousandths		
	$\frac{2}{10}$	
		0.24
		0.127

2. *The team had a good season, winning 7 of their 10 games.* Write the fraction and decimal from this situation to describe the wins.



3. *In the past 100 days, it rained 34 times.* Write a fraction and decimal for this situation to describe the rainy days.

4. Use your calculator to change $\frac{4}{5}$ into a decimal. _____

5. Complete this rule: *To change a fraction into a decimal,* _____

_____

6. Put an X over the fraction that cannot describe a situation:

$\frac{0}{13}$ or $\frac{3}{0}$

7. *There were 16 students on the bus. 4 students were wearing hats.* Write a fraction and decimal to describe the students wearing hats. Don't forget labels.

Name: _____ Date: _____

Square Two Test

1. Write the fraction and decimal for the following. Remember to add the zero before the decimal point.)

How it is said	Fraction	Decimal
4 tenths		
57 hundredths		
83 hundredths		
995 thousandths		
	$\frac{3}{10}$	
		0.66
		0.703

2. *There were100 new cell phone customers. 75 customers decided to buy the option for text messaging.* Write the fraction and decimal from this situation to describe those *without* text messaging.

3. Use your calculator to change $\frac{5}{20}$ into a decimal. _____

4. Complete this rule: *To change a fraction into a decimal,* _____

_____

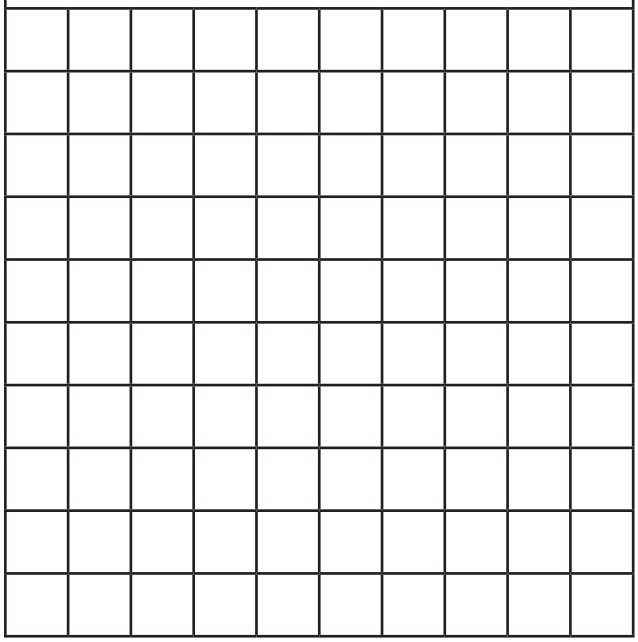
5. *There were 28 students in the class. 14 are girls.* Write a fraction and a decimal to describe the students who are girls. Remember labels.

6. Five people are planning to order pizza. The restaurant always cuts their pizzas into sixths. How many pizzas must they order so that each of them can have $\frac{6}{6}$ pizza? _____

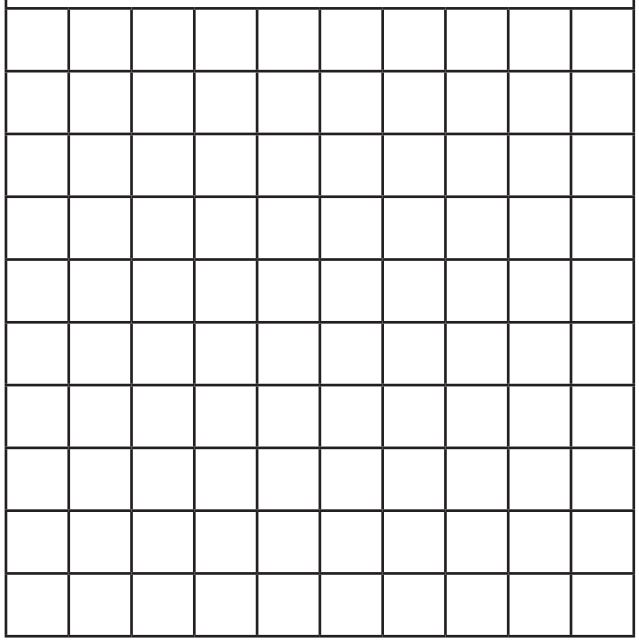
Name: _____ Date: _____

Hundreds Block

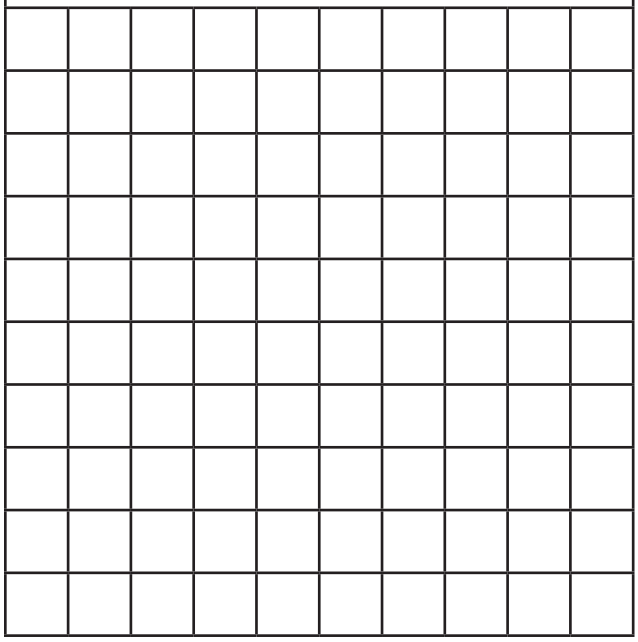
Hundreds block A



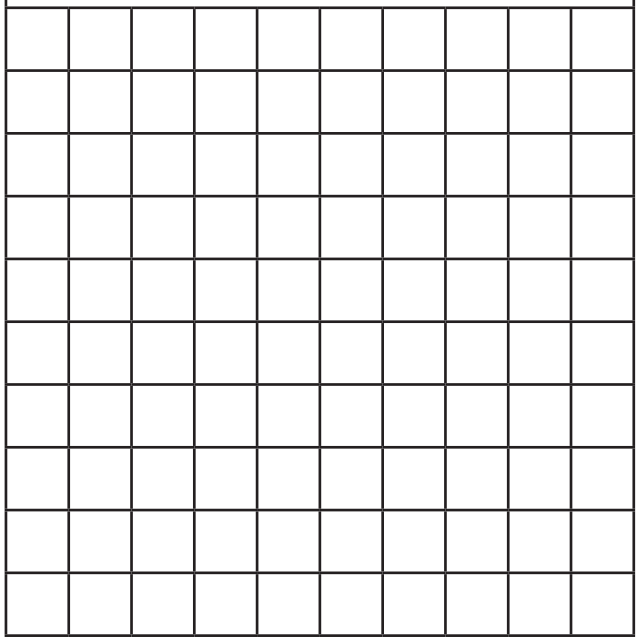
Hundreds block B



Hundreds block C



Hundreds block D



Name: _____ Date: _____

Changing Fractions Into Percents

Part 1 fraction	Divide to find the decimal	Multiply by 100 to find the percent
$\frac{3}{5}$		
$\frac{3}{12}$		
$\frac{3}{6}$		
$\frac{4}{8}$		
$\frac{9}{12}$		
$\frac{6}{8}$		

What percent were on time? What percent of students wore hats? What percent of the class were girls?

Part 2 fraction	Decimal and percent	The rest of the whole or collection?
$\frac{10}{20}$ students were late		
$\frac{4}{16}$ students with hats		
$\frac{3}{15}$ of the class were boys		

Part 3 fraction	Decimal and percent	Interpretation
$\frac{9}{9}$ students bought tickets		
$\frac{0}{8}$ students rode the bus		

Equivalencies to Memorize

Fraction	Decimal	Percent
$\frac{0}{n}$	0.0	0%
$\frac{1}{10}$	0.1	10%
$\frac{1}{8}$	0.125	12.5%
$\frac{1}{5}$	0.2	20%
$\frac{1}{4}$	0.25	25%
$\frac{1}{3}$	$0.\overline{333}$	33%
$\frac{1}{2}$	0.5	50%
$\frac{2}{3}$	$0.\overline{666}$	67%
$\frac{3}{4}$	0.75	75%
$\frac{n}{n}$	1.0	100%

Worksheet to Reinforce Square Three Concepts

1. Which fractions and decimals describe a whole or all of a collection?

   a. 0.99 b. 1.00 c. 0.981 d. $\frac{4}{4}$ e. $\frac{997}{1000}$ f. $\frac{89}{89}$

2. Per CENT means per _____.

3. If 25 blocks of a 100-block square are shaded,

   a. What fraction is shaded?

   b. What decimal is shaded? _____

   c. What percent is shaded? _____

4. If 56 blocks of a 100-block square are shaded,

   a. What fraction is NOT shaded?

   b. What decimal is NOT shaded? _____

   c. What percent is NOT shaded? _____

5. What calculator keys do you push to change $\frac{3}{5}$ into a percent?

				0.6				60%

6. Change fractions into decimals and percent:

   a. $\frac{4}{5}$ _____ _____

   b. $\frac{14}{28}$ _____ _____

   c. $\frac{18}{24}$ _____ _____

   d. $\frac{40}{40}$ _____ _____

   e. $\frac{1}{3}$ _____ _____

   f. $\frac{0}{5}$ _____ _____

7. Round repeating decimals to hundredths:

   a. Round 33.3333% _____%

   b. Round 66.6666% _____%

8. What four keys do you press to find 25% of 20?

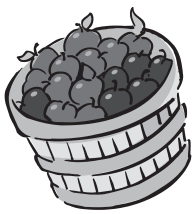
9. Use the percent key on your calculator:

   a. 35% of 200 is _____

   b. 20% of 90 is _____

   c. 75% of 80 is _____

4. Use your calculator to find the answers:



   a. 35% of 800 voters voted for Dan. How many votes did he get? _____

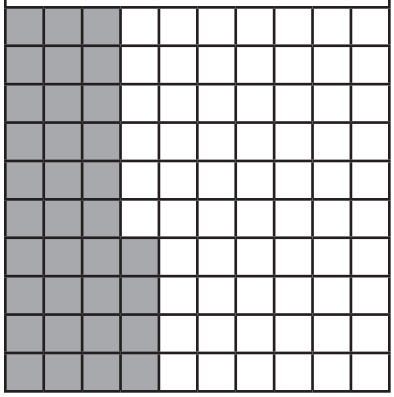
   b. 20% of 360 sailboats had no engines. How many sailboats were without engines? _____

   c. 75% of 240 apples were made into applesauce. How many apples were made into applesauce? _____

Team: _____ Name: _____ Date: _____

Quick Team Quiz Three

Hundreds block A



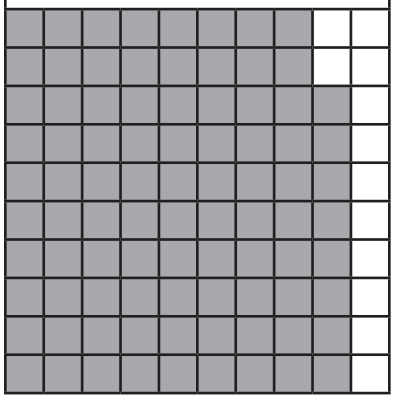
1. Write the decimal and percent to describe the shaded squares of block A:

   _____ of the block _____ of the block

2. Write the decimal and percent to describe the white squares of block A:

   _____ of the block _____ of the block

Hundreds block B



3. Write the decimal and percent to describe the shaded squares of block B:

   _____ of the block _____ of the block

4. Write the decimal and percent to describe the white squares of block B:

   _____ of the block _____ of the block

5. To change a decimal to a percent, you must multiply by _____

6. Complete the chart:

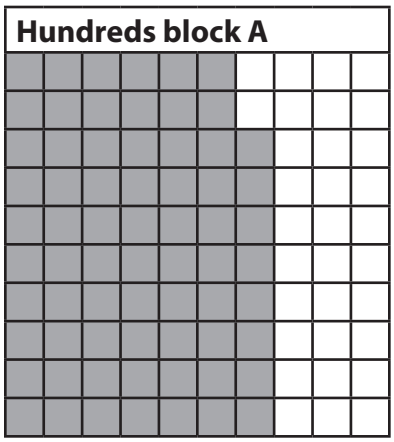
Fraction	Decimal	Percent
$\frac{3}{12}$		
$\frac{2}{3}$		
$\frac{13}{26}$		
$\frac{56}{56}$		

7. Change the fraction to a percent and complete the statement:

   $\frac{8}{10}$ students were on time, therefore _____% students were on time, and _____ % students were late.

Name: _____ Date: _____

Square Three Test



1. Write the decimal and percent to describe the shaded squares of block A:

   _____ of the block _____ of the block

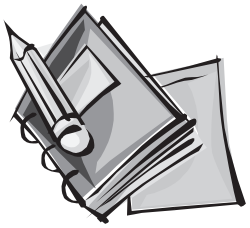
2. Write the decimal and percent to describe the white squares of block A:

   _____ of the block _____ of the block

3. To change a decimal to a percent, you must multiply by _____

4. Complete the chart:

Fraction	Decimal	Percent
$\frac{6}{24}$		
$\frac{3}{9}$		
$\frac{16}{20}$		
$\frac{0}{56}$		



5. Change the fraction to a percent and complete the statement:
   $\frac{15}{20}$ *students did their homework*. Therefore, _____ % students did their homework,

   but _____% students did not do homework.

6. There were 16 brownies in the pan. If Dan and his three friends each had four brownies, what percent of the brownies did each eat? (LABEL) _____

7. Write how you say $\frac{6}{10}$ _____

8. Write how you say $\frac{18}{100}$ _____

9. Write a fraction with 6 in the numerator _____

10. Why do mathematicians put a line over the numbers in $0.\overline{333}$?

Fraction–Decimals Equivalencies Worksheet

Use the following fractions to complete the chart on the **Fraction–Decimals Equivalencies Worksheet**.

$\frac{28}{42}$	$\frac{36}{48}$	$\frac{5}{15}$	$\frac{5}{10}$	$\frac{30}{300}$
$\frac{8}{12}$	$\frac{0}{18}$	$\frac{1}{3}$	$\frac{1}{2}$	$\frac{12}{18}$
$\frac{200}{200}$	$\frac{2}{3}$	$\frac{3}{4}$	$\frac{1}{10}$	$\frac{5}{40}$
$\frac{13}{13}$	$\frac{16}{17}$	$\frac{110}{1000}$	$\frac{1}{8}$	$\frac{600}{6000}$
$\frac{1}{4}$	$\frac{120}{240}$	$\frac{0}{29}$	$\frac{10}{100}$	$\frac{3}{12}$
$\frac{15}{20}$	$\frac{3}{24}$	$\frac{12}{36}$	$\frac{10}{30}$	$\frac{12}{48}$
$\frac{20}{30}$	$\frac{30}{40}$	$\frac{51}{0}$	$\frac{120}{1200}$	$\frac{75}{75}$
$\frac{100}{800}$	$\frac{180}{18000}$	$\frac{42}{42}$	$\frac{6}{24}$	$\frac{21}{28}$
$\frac{12}{96}$	$\frac{16}{32}$	$\frac{162}{162}$	$\frac{75}{125}$	$\frac{70}{0}$
$\frac{90}{3000}$	$\frac{30}{100}$	$\frac{0}{35}$	$\frac{0}{467}$	$\frac{200}{800}$

Name: _____ Date: _____

Fraction–Decimal Equivalencies Worksheet

Use your calculators to find the equivalent fractions and percents among the numbers on this page. Put the equivalent fractions in the spaces under the correct percents. Put the fractions that do not equal a percent on this chart in the two columns under "not equivalent."

0%	10%	12.5%	25%	33%	50%	67%	75%	100%	Not equivalent	

Worksheet to Reinforce Square Four Concepts

1. Find percent equivalents of these fractions:

$\frac{70}{700}$ $\frac{14}{21}$ $\frac{13}{52}$ $\frac{54}{72}$ $\frac{9}{54}$ $\frac{0}{12}$ $\frac{60}{120}$ $\frac{19}{19}$ $\frac{5}{40}$ $\frac{11}{33}$ $\frac{7}{35}$

0%	10%	12.5%	20%	25%	33%	50%	67%	75%	100%	NONE

2. Compare the fractions by comparing the percent. Circle the larger and explain your answer.

a. $\frac{3}{4}$ or $\frac{5}{15}$ b. $\frac{12}{18}$ or $\frac{16}{32}$

Complete the following problems on a separate piece of paper. Write the steps you use to solve the problems. Don't forget to number your steps. Don't forget LABELS.

3. There were 25 dogs at the pet parade. If 60% of the dogs had collars, how many dogs did not have collars? _____

4. There were 48 new cars on the lot. If 16 new cars were red, what percent of the cars were red? _____

5. There were 200 new trees planted on Arbor Day. If $\frac{1}{8}$ of the trees were evergreens, how many trees were evergreens? _____

6. If a new bicycle usually costs $600, how much would you pay if the bike were on sale at 15% off the regular price? _____

7. We usually leave a tip for the waitress that is 20% of the cost of the meal. If the meal costs $70:
   a. How much is the tip, and _____
   b. How much is the total bill? _____

8. There were 80 students trying out for the team, but only 20 students would be chosen.
   a. What percent would be chosen for the team? _____ students
   b. What percent would NOT be chosen? _____ students

9. There were 6 red marbles, 4 blue marbles, 8 white marbles, and two steelies.
   a. _____% of the marbles were red
   b. _____% of the marbles were blue
   c. _____% of the marbles were white
   d. _____% of the marbles were steelies

Team: _____ Name: _____ Date: _____

Quick Team Quiz Four

1. Use your calculator to find equivalent percents of the following fractions:

$\frac{12}{36}$ $\frac{5}{10}$ $\frac{4}{32}$ $\frac{14}{14}$ $\frac{27}{36}$ $\frac{8}{64}$ $\frac{26}{26}$ $\frac{6}{18}$ $\frac{8}{16}$ $\frac{15}{20}$

12.5%	33%	50%	75%	100%

Write the steps you take to solve the following three problems:

2. The home team played 120 games. They lost 48. Write two percent statements to describe their wins and losses. Remember labels.

3. Marcia read 16 books all together, and 75% of the books were fiction. How many fiction books did she read? Remember labels.

4. 350 tourists came to the zoo on Saturday. 96% of the tourists bought their tickets ahead of time on the Internet. How many tourists bought tickets <u>at the door</u>?

5. Which is larger, $\frac{1}{8}$ or $\frac{1}{9}$? How do you know?

6. Which is larger, $\frac{9}{45}$ or $\frac{12}{48}$? Explain how you determined this answer.

Name: _____ Date: _____

Square Four Test

1. Use your calculator to find equivalent percents of the following fractions:

$\frac{4}{8}$ $\frac{18}{24}$ $\frac{7}{56}$ $\frac{27}{27}$ $\frac{6}{48}$ $\frac{11}{11}$ $\frac{5}{15}$ $\frac{10}{20}$ $\frac{4}{12}$ $\frac{36}{48}$

12.5%	33%	50%	75%	100%

2. Martin shot 124 free-throws. He missed 31. Write two statements to describe the percentage of free-throws he made and missed (LABEL).

_____

_____

3. If 55% of the students went on a field trip, what percent of students did not go on the trip? _____

4. If 0% of 5 cats were black, how many cats were black? _____

5. If 100% of the 8 cats had green eyes, how many of the cats had green eyes? _____

6. Write a fraction with 5 in the denominator. _____

7. Why do mathematicians put a line over the numbers in $0.\overline{666}$?

8. Theo was into collecting bottles and cans to recycle. He collected 476 items. 75% were cans, and the rest were bottles.
How many cans did he recycle? _____ How many bottles? _____
Write the steps you take to solve this problem.

9. Which fraction is larger, $\frac{27}{36}$ or $\frac{36}{45}$? **Explain how you determined this.**

Name: _____ Date: _____

Master

Golden Square Tasks Worksheet

Tasks	Strategies
1. Maria bought a sweater that originally sold for $48, but it was on sale for 25% off. How much did she spend for the sweater on sale?	
2. Tim has a big fish tank. $\frac{8}{24}$ of Tim's fish are guppies. He has 70 guppies. How many fish does he have in all?	
3. Tanya's weight is $\frac{7}{8}$ of Clarence's weight. Clarence weighs 144 pounds. What does Tanya weigh?	
4. Juan and his friends worked together mowing lawns. Juan worked 20 hours, Miguel worked 15 hours, George worked 10 hours, and Stan worked 5 hours. Together they made $400. If they shared the money fairly, how much was each paid?	

5. There were 5 candidates in the primary election, and 3000 people voted. Some of the results were given in percent, others in actual numbers. Complete the chart to know all the percents and all actual number counts. List strategies.

15% of the votes were for Candidate A	_____ voters chose Candidate A
25% of the votes were for Candidate B	_____ voters chose Candidate B
_____ % of the votes were for Candidate C	1050 voters chose Candidate C
20% of the votes were for Candidate D	_____ voters chose Candidate D
_____ % of the votes were disqualified	150 votes were disqualified

Golden Square Tasks Worksheet

Name: _____ Date: _____

Golden Square Challenges

1. Golden Square Challenge 1 (**no calculators allowed**): Write the equivalent decimals and percents next to the fractions.

Fraction	Decimal	Percent
$\frac{0}{n}$		
$\frac{1}{10}$		
$\frac{1}{8}$		
$\frac{1}{5}$		
$\frac{1}{4}$		
$\frac{1}{3}$		
$\frac{1}{2}$		
$\frac{2}{3}$		
$\frac{3}{4}$		
$\frac{n}{n}$		

Name: _____ Date: _____

Golden Square Challenges

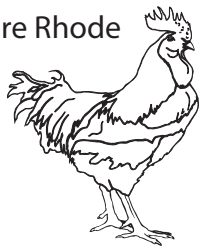
Directions: In order to earn full credit for these problems, you must write the strategies you used to solve these problems, as well as the answers. Remember the LABELS.

2. Golden Square Challenge 2: Maria bought a car that originally sold for $11,200, but it was on sale for 25% off. How much did she spend for the car **on sale**?

3. Golden Square Challenge 3: Juanita is $\frac{3}{5}$ as tall her horse. Her horse is 80 inches tall. How tall is Juanita?

4. Golden Square Challenge 4: Juan and his friends worked together mowing lawns. Juan worked 60 hours, Miguel worked 45 hours, George worked 30 hours, and Stan worked 15 hours. Together they made $1200. If they shared the money fairly, how much was each paid?

5. Golden Square Challenge 5: Tim has a chicken farm. $\frac{15}{20}$ of Tim's chickens are Rhode Island Reds. He has 300 Rhode Island Red chickens. How many chickens does he have in all?



6. Golden Square Challenge 6: There were four candidates in the big election and four hundred thousand (400,000) voters voted. Some of the results were given in percent, others in actual numbers. Complete the chart to know all the percents and all actual number counts:

_____ of the votes were for Candidate A	**140,000** voters chose Candidate A
_____ of the votes were for Candidate B	**60,000** voters chose Candidate B
36% of the votes were for Candidate C	_____ voters chose Candidate C
14% of the votes were for Candidate D	_____ voters chose Candidate D

Special Award

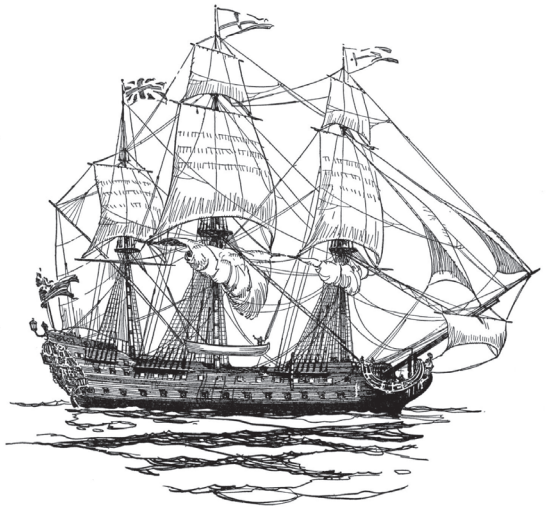
Recently we have been working on a special math unit called Squared Away. “Squared away” was originally a nautical term used to announce that the sails of a square-rigger sailing ship were correctly set. The navy came to use it to describe sailors who completed a task with competency, as in, “He was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

Students can only master the concepts and skills of this Squared Away unit by learning a great deal about fractions, decimals, and percent. They must know how the three are all related. They must have committed to memory the equivalent decimal and percent value of common fractions and can determine equivalent values when the fraction is unfamiliar. Most importantly, they must be able to use fractions, decimals, or percent when solving word problems, not only in math class, but in situations in the real world.

Congratulations to

_____

For being Squared Away in
fractions, decimals, and percent



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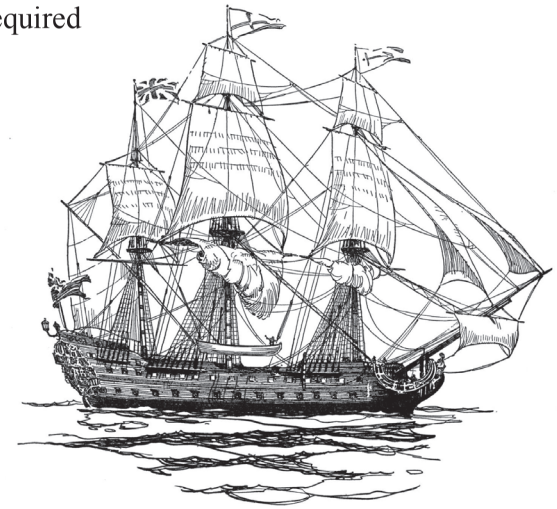
Only some student also earned a Golden Square. These students had to achieve an exemplary score on the Golden Square Challenges, which were difficult and required excellent math thinking skills.

Congratulations to

_____

For being Squared Away in fractions, decimals, and percent, and earning a Golden Square!



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