TEKSING TOWARD STAAR

MATHEMATICS ®

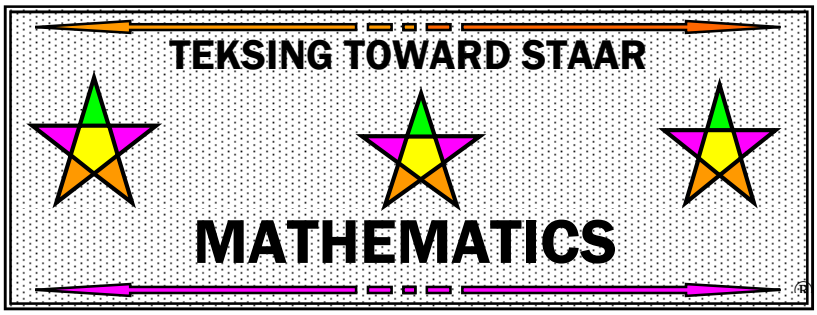
GRADE 8

TEKS/STAAR-BASED LESSONS

Parent Guide

Parent Guide Contents

Overview



OVERVIEW OF THE LESSONS AND THE GOALS

The universal use of calculators and computers has changed what is important in mathematics as well as what students need to know to be prepared for college and the work force. The past focus of mathematics curriculum was to practice and memorize some techniques that are no longer useful because they were isolated from their origins and their uses in the real world.

Current research on how students learn is now telling us that most students cannot learn mathematics effectively and efficiently by being asked to memorize given rules and practicing those rules for mastery of basic math skills. A report to the nation by the National Research Council entitled Everybody Counts stated, "Presentation and repetition may help students do well on some standardized tests and lower order skills, but are generally ineffective for long term learning, for higher-order thinking, and for versatile problem solving."

The Texas Essential Knowledge and Skills (TEKS) for Mathematics, Grade 2 state "The student is expected to recall and apply basic addition and subtraction facts within 20" Therefore, students should leave grade 2 with mastery of basic addition and subtraction facts. The TEKS for Mathematics, Grade 3 state "The student is expected to learn and apply multiplication facts through 10 by 10 and the corresponding division facts." Therefore, students should leave grade 3 with mastery of basic multiplication facts. The TEKS for Mathematics in grade 4 and above assume that each student has previously mastered basic addition, subtraction and multiplication facts.

Recent research has also impacted teaching methods. The research strongly indicates that a teacher telling and/or showing students how to "do math" has very little to do with promoting true learning. Students must construct their own understanding. Research shows that most students learn best when working in partner pairs or small groups to communicate and freely discuss important skills and concepts as they solve problems.

The curriculum is designed to reflect research, to reflect the National Council of Teachers of Mathematics (NCTM) Standards and to meet the requirements of the Texas Essential Knowledge and Skills for grades 6-8 mathematics through focusing on core concepts throughout the year. The intent of this design is to develop students' confidence in their ability to understand and use mathematics as a tool to solve problems as well as help students develop an understanding of the importance of mathematics in relation to their future world.

The curriculum is designed to be composed of many problems – some for spiraled review of skills and concepts already presented, some to help students develop an understanding of new skills and concepts, some to involve the use of hands-on mathematics, some to include other disciplines such as reading, writing, science, social studies, art, and architecture.

The design of each lesson is consistent and includes a format for delivery of instruction, assessment, and homework. Where appropriate, the use of manipulatives and technology is included in the lesson. Cooperative learning as a learning setting is utilized in each lesson.

Use of Manipulatives

Manipulatives are multisensory tools for learning that provide students with a means of communicating ideas by allowing them to model or represent their ideas concretely. Using manipulatives, however, does not guarantee understanding of a mathematics concept (Baroody, 1989). After allowing students to explore a concept using manipulatives, teachers must formulate questions to elicit the important mathematical ideas that enable students to make connections between the mathematics and the manipulatives used to represent the concepts. The authors of the *TEKSING TOWARD STAAR* Lessons assume that teachers will use manipulatives when appropriate for instruction in their classroom.

Use of Technology

Developments in technology have made the traditional, computation-dominated mathematics curriculum obsolete. As a result, the authors of this curriculum assume that grade 5 students will have access to appropriate calculators. Also assumed is the use of computers for demonstration purposes as well as cooperative group work or individual work.

Use of Cooperative Learning Groups

Traditionally, mathematics has been taught as a "solo," isolated activity, yet in business and industry mathematicians often work in teams to solve problems and attain common objectives (Steen, 1989). Allowing students to work in partner pairs of cooperative groups affords them the opportunity to develop social and communication skills while working with peers.

Cooperative learning environments, characterized by students working together and interacting with each other, contribute to internalizing concepts by forcing the students to defend their views against challenges brought by their peers. The value of this approach is supported by the work of Vygotsky [(1934)(1986)] who discussed the increasingly interrelated nature of language and cognition as children grow.

Cooperative learning groups are heterogeneous, and everyone must work together for the common good of all. Students who understand the concept being discussed are responsible for explaining it to those who do not understand. When using learning pairs or cooperative groups, teachers must consider new ways of evaluating performance to ensure the success of instructional objectives.

The Role of Assessment

Making changes in the content and methods of mathematics instruction also requires making changes in why and how students' work is assessed. Evaluation is an integral part of instruction and not limited to grading and testing. There are at least four reasons why teachers collect evaluation information:

- to make decisions about the content and methods of mathematics instruction
- to make decisions about classroom climate
- to help in communicating what is important
- to assign grades.

In other words, assessment includes much more than marking right and wrong answers. It "must be more than testing; it must be a continuous, dynamic, and often informal process" (NCTM 1989, p. 203). The *Curriculum and Evaluation Standards* recommends that teachers use a variety of types of evaluation: (1) *observing and questioning students* (2) *using assessment data reported by students*; (3) *assessing students' written mathematics work*; and (4) *using multiple-choice or short-answer items.* Use of these multiple methods of collecting assessment data will contribute to a thorough evaluation of students' work.

Principles and Standards for School Mathematics (National Council of Teachers of Mathematics, 2000) states: "Assessment should support the learning of important mathematics and furnish useful information to both teachers and students." NCTM (1995) identified the following six standards to guide classroom assessment:

Standard 1: Assessment should reflect the mathematics that all students need to know and be able to do.
Standard 2: Assessment should enhance mathematics learning.
Standard 3: Assessment should promote equity.
Standard 4: Assessment should be an open process.
Standard 5: Assessment should promote valid inferences about mathematics learning.
Standard 6: Assessment should be a coherent process.

Implementing the assessment process in the *TEKSING TOWARD STAAR* Middle School Lessons may result in significant changes in how teachers, students and parents view and use assessment as a tool toward student understanding and use of mathematics. Teachers will assess frequently to monitor individual performance and guide instruction.

One intent of the *TEKSING TOWARD STAAR* Lessons is to provide middle school teachers with a structure for instruction that incorporates characteristics of a good mathematics learning environment and the role of assessment as a starting point for student understanding and mastery of the TEKS. Another intent is to provide students with a structure for learning that involves understanding and implementation of "math that matters" in the real world today and in their future.

CURRICULUM COMPONENTS

Following is an overview of each of the critical components of the *TEKSING TOWARD STAAR* lessons.

STUDENT PROFILE BOOK

Recording and analysis of data is a critical component of the *TEKSING TOWARD STAAR* Lessons. Recording in a Student Profile Book by each individual student should occur on a regular basis. End of lesson Mini-Assessments, Six Weeks Assessments, Benchmark Assessments and/or Spiraled Practices are examples of data that might be recorded by a student.

SCOPE AND SEQUENCE

Each six weeks curriculum begins with a Scope and Sequence. The Scope and Sequence provides information for teachers, students, and parents regarding the focus of each *TEKSING TOWARD STAAR* lesson. This guide includes a Scope and Sequence for Six Weeks 1 - 5.

SIX WEEKS ASSESSMENT/REVIEW

Each six weeks has an open-ended review that can be used as part of the classroom instruction or as homework. Each six weeks ends with a multiple-choice assessment designed to assess all TEKS in lessons from the entire six weeks. This assessment will enable the teacher and student to evaluate student progress toward understanding and use of the skills and concepts for the TEKS addressed during the six weeks. Students should record all work and thinking in written format for each question on the assessment. Students should record individual data on the Student Profile Booklet.

LESSON COMPONENTS

Following is an overview of the various instructional materials contained in the lessons students will experience during the school year.

BACKGROUND INSTRUCTIONAL ACTIVITY

Each Instructional Activity in a lesson is specific to TEKS or major pieces of a TEKS. The introductory Instructional Activity(ies) in each lesson is provided to students in a whole class environment with written and illustrated visual aides for whole class instruction. The teacher places visual information in a large group viewing format such as an overhead projector or computerized projection device and leads an informational session designed to provide students with mathematics skills and vocabulary necessary for students to complete the Student Activity(ies) and Problem-Solving activity(ies).

Each student records the critical information from the Instructional Activity on their individual Math Notes page(s). Students record as much information as they choose. The information should be recorded in the student's own "words," "symbols," and pictures or diagrams.

Only minor discussion occurs during the Instructional Activity. This portion of the lesson is designed as an information-giving time. Students are asked to hold most questions until the Instructional Activity portion of the lesson is completed and they begin the Student Activity portion so that the teacher can meet needs on a partner-pair or individual basis.

The teacher leaves the Instructional Activity written information in a place where students can view it later if they find the need to take additional notes.

PROBLEM-SOLVING ACTIVITY

The Problem Solving activity(ies) are the next component of each lesson and contain problem-solving problems. Students may be assigned to work with a partner or in small groups, but each student must complete an individual Open-Ended student page. Students may utilize Math Notes and Student Activity pages while completing the Problem-Solving activity.

The teacher sets a time limit prior to students' beginning the Problem-Solving problem. The students will be provided the 10 questions that will be used on all Problem-Solving activities. Partner pairs are assigned specific "share" portions of the activity. The teacher calls time and the partner pairs guide class discussion on their "share" assignments. Students who did not complete the activity prior to the time limit may record on their individual papers during the discussion time but must record in a different color.

The Problem-Solving Activity is designed to be recorded as a portion of a grade. A holistic score may be recorded for each student. An example of a holistic scale follows:

- 1 = no understanding evident
- 2 = minimal understanding evident
- 3 = mostly understood or slight mathematical errors
- 4 = complete understanding evident and no mathematical errors
- 5 = goes beyond and extends understanding

STUDENT ACTIVITY

A Student Activity(ies) follows each Problem-Solving Activity. Students often work in pairs or small groups to complete a Student Activity; however, each student completes his or her own activity page(s). Math Notes are utilized to enable students to successfully complete the activity. If students did not take notes on material they need to complete the activity, the teacher invites them to view the Instructional Activity written information and to take more detailed notes.

Various partner pairs or small groups are assigned portions of the Student Activity for whole-class discussion. Before students begin the activity, the teacher informs the class of the time allotted for completion of the activity. Time is sometimes called even if all partner pairs or small groups have not completed the activity. Whole class discussion then begins with the partner pairs or small groups that were given assignments to lead the discussion. Students who did not complete the activity may complete the activity at this time by recording in a different color pencil or pen.

The Student Activity is **not** designed to be recorded as a grade based on correct answers, but may be recorded as a holistic score. An example of a holistic scoring scale follows:

- 1 = no understanding evident
- 2 = minimal understanding evident
- 3 = mostly understood or slight mathematical errors
- 4 = complete understanding evident and no mathematical errors

A variation of a Student Activity is included in most lessons. The teacher's notes for these activities include teacher questions posed before and during the activity. The teacher actively looks and listens to student work during the activity. The Student Activity designed as an active, involved, hands-on activity for all students and is often completed as a partner-pair or a group of four students.

SKILLS AND CONCEPTS HOMEWORK

Students will usually be assigned a homework assignment each day of a lesson. If a lesson is more than one instructional day in duration, more than one Homework assignment will be given. Each homework assignment includes 5 open-ended questions. Students should show all work on their homework assignment.

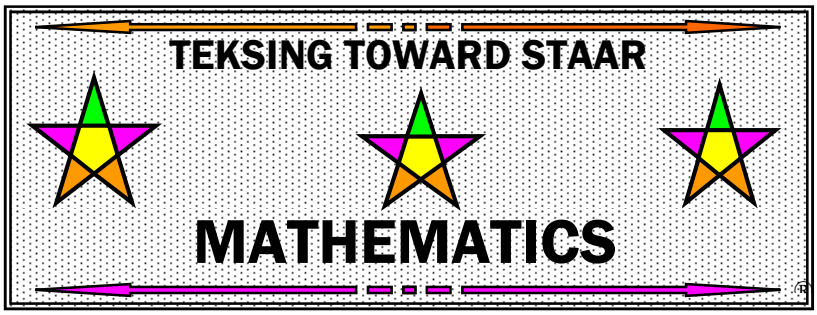
MINI-ASSESSMENT

Each lesson ends with a Mini-Assessment composed of 10 questions. The mini-assessment is completed individually by each student and graded by the teacher. No assistance is given by the teacher during the time allotted for completion of the Mini-Assessment. Most students will be able to complete the Mini-Assessment in approximately 20 minutes.

Students must show all work to answer each problem on the Mini-Assessment. Students should record data from each Mini-Assessment in their Student Profile Book.

As you can see from the overview of the curriculum, *TEKSING TOWARD STAAR* Lessons are extremely comprehensive, are research based and are designed to accelerate mathematics instruction for all students and align classroom instruction with state and national standards. As such, the program should routinely follow the guidelines described above in order to maximize the effectiveness of the curriculum for all students. However, parents should understand that individual teachers may use instructional activities other than those in this program. Teachers may add or delete activities depending on the ebb and flow of their individual classrooms.

Parental Role
and
Common Questions



PARENTAL ROLES, COMMON QUESTIONS AND ANSWERS
Grade 8 Mathematics Lessons

PARENTAL ROLES

As a parent, you are extremely interested in your child's education. When parents of middle school and junior high mathematics students work to help their children, they often discover a feeling that "this is not the math I encountered as an eighth grader" and begin to ask themselves what they can do to help their child. Often, parents find it difficult to decide what is "best" when helping their children. Some of the questions parents ask often include:

- *How much help should I give my child?*
- *What if I don't remember (or recognize) some of the math I learned in school?*
- *How can I help my child prepare for tests and other assessments?*
- *How can I help my child discover that math can be fun and doesn't need to be scary?*
- *How can I communicate with my child's teacher to find out what my child should learn?*
- *How can I communicate with my child's teacher to find out how my child is progressing with the understanding of math?*

A successful parent often takes on many roles in the process of parenting. The following roles are involved in helping your child become the best mathematics learner possible.

Role 1: Tutor
As a tutor, a parent can help with the practice and memorization that are part of getting a firm foundation for truly understanding many math concepts. In middle school mathematics students should practice conversion from decimals to fractions to percents, and then they should finally memorize a specific set of conversions that will enable them to begin to focus on problem solving rather than the skill of conversion. Your child's teacher will give him/her a specific set of conversions that should be memorized and a time line for the process of memorization.

You can also help your child learn about math skills and concepts he or she may have trouble understanding and applying. This guide provides background information to help your child with each lesson. You should start by helping your child work through the information and examples as they are presented in the background information, but you might think of another way to help your child understand that works even better.

Role 2: Role Model
Even if you had a difficult time with math or did not like math when you went to school, try to keep a very positive attitude about the math your child is learning this year. Sometimes it is easy to give the impression that it is OK for your child to do poorly in math when you talk about your own experiences with learning. Instead, focus on how often you use math in your everyday life – discuss situations like comparing prices in a store, balancing your checkbook, setting up newly-purchased electronic equipment, or estimating the cost of paint or flooring for a room in your home.

Share examples of times when you need to stop and think about a problem before solving it. Ask your child about the Problem-Solving Plan he or she is using in the math curriculum (this is explained in the very first lesson of the year). Talk to your child about the fact that some of your real-world problems are harder to solve than others, and that you end up spending more time on those problems and checking your work several times in several different ways. Discuss with your child how solving a very difficult problem is very satisfying, even though it takes a lot of time and hard work.

Role 3: Learning Facilitator
Your child may be very independent and be able to be very successful in math without your help at home. However, be sure to question your child daily about the lesson and homework, and make sure your child begins to review for the Six Weeks Assessment by the end of the fifth week of each six weeks. Also, keep reminding your child that you are always ready to help when needed, or you will find someone else who will help.

Role 4: Teaching Partner
By the time your child reaches middle school or junior high, he or she will probably have a different teacher for each subject on his or her class schedule. The math teacher does not have much time with each class each day and often has many more students than elementary teachers. Many math teachers teach 125 or more students each year, so it may take several weeks or even months for the math teacher to really get to know each individual student. There may be things you have learned about your child's approach to learning that would be helpful for the teacher to know. For example, your child may learn better by "doing an activity" than "taking notes or reading" about math. It is very important to provide your child's teacher with as much information as you can.

Knowing what is being taught and what your child is expected to learn is also very important as a parent. Your child's teacher will probably share information about the curriculum at an Open House early in the school year. If you are not able to attend the Open House, make sure that you communicate with the teacher that you would like information about the curriculum for the year so that you can reinforce the curriculum at home. Let the teacher know that you both have the same goal – to help your child learn to understand and successfully use math.

Role 5: Home Learning Environment Creator
Work with your child to find a place at home with good lighting and near enough to you or someone else to answer questions, help your child stay focused, and provide help if needed. Find a location with no distractions (if there are distractions in the room, your child may choose to work with a soothing music CD and earphones). Make sure the location has room to spread out all the tools and supplies (paper, pencils, pencil sharpener, erasers, graph paper, compass, protractor, scissors, centimeter ruler, and inch ruler, calculator).

Provide encouragement for your child to utilize the space on an almost daily basis. Make homework a part of your child's daily routine - after at least a 30-minute break from the school day – and long before late evening. Help your child get started and stay focused if necessary. Encourage and allow your child to take a five-minute break every 20 minutes while completing homework.

Role 6: Homework Helper
Homework is an extremely useful parental tool for assessing a child' progress in math. Homework provides opportunities for a parent to observe a child's comfort level and understanding of math skills and concepts. Following are steps a parent can take to help their child learn the math curriculum during the school year:

Step 1: Begin by reading the background information in this guide for each lesson.
Step 2: Ask your child to review the Math Notes taken during class for this lesson.
Step 3: Review any missing or incomplete background information with your child.
Step 4: Ask your child to describe each of the 5 homework problems to you in his or her own words.
Step 5: Ask your child to describe a process that can be used to answer each problem.
Step 6: After your child has solved the homework problems, ask if there is another way each problem might be solved. Share a different way you may have thought of, but remember that the way you learned to solve similar problems may or may not help your child understand the problem. Try not to value one method that works more than another method that also works. In mathematics, there are often several good ways to solve the same problem.
Step 7: Review your child's work. Praise your child for correct answers, then ask your child to redo any of the problems that were incorrect. Ask your child to explain his/her work as each problem is reworked. If the same errors are made again, your child probably does not understand the concept and should go back to his/her Math Notes for a review.
Step 8: If your child is having difficulty understanding homework, make sure he/she makes time in the daily schedule to attend tutorials offered by the teacher or the school.
Step 9: Review the previous day's homework with your child and/or review your child's Mini-Assessment after the teacher has graded it and returned it to your child.

Step10: Immediately contact your child's teacher and request a phone or in-person conference if your child appears to have difficulty for more than 3 days, or does not bring home a homework assignment for more than 2 days, or does not share graded Mini-Assessments with you on a regular basis.

You may have questions and we will try to help you with some answers to common questions on the next several pages of this guide.

COMMON QUESTIONS AND ANSWERS

The following questions from middle school and junior high parents are very common. Following each question is a brief answer.

Question 1: Why should my child be using a calculator at school and at home? Isn't he or she supposed to be learning how to do calculations?

ANSWER: The grades 6-8 TEKS state the following:

"Problem solving in meaningful contexts, language and communication, connections within and outside mathematics, and formal and informal reasoning underlie all content areas in mathematics. Throughout mathematics in Grades 6-8, students use these processes together with graphing technology and other mathematical tools such as manipulative materials to develop conceptual understanding and solve problems as they do mathematics."

Your child should be using a calculator as a tool in grades 6-8 in Texas. A good rule is to use calculators at home as they are used at school. Sometimes the main purpose of your child's math lesson and homework is to practice computations. For example, your child may be learning how to divide decimal numbers in a lesson at school, so the homework assignment should be done without a calculator. However, your child could check the homework using a calculator, then go back and redo any incorrect answers.

The TEKS, however, are rarely based on calculations. Many times the main purpose of a lesson is to practice solving non-routine problems. For example, if the computation is messy and the focus of the lesson and homework is to graph data, then your child should use the calculator. However, please make sure your child does have the skills necessary to do the computation by hand if he or she is not allowed to use a calculator.

If you are ever in doubt about when to allow your child to use a calculator at home for homework, please contact your child's teacher.

Question 2: My child has not been given a textbook, or says he or she doesn't need to use a textbook to do homework. I'd like to help him or her review from time to time, or help him study for tests, but I am not even sure what topics or TEKS are being presented in class or have been presented in class.

ANSWER: Refer to the Scope and Sequence in this guide. Your child should be able to help you identify current and past TEKS and topics presented during class. Look at the top of each homework page or curriculum page your student brings home. The TEKS focus for the lesson is always listed at the top of each page.

Make sure your child is keeping Math Notes, Student Activities, Problem-Solving problems, returned homework assignments, and returned Mini-Assessments in a notebook in an organized manner. You should be able to ask your child for his math notebook at any time and review any of the material with your child. Remember to review the math background in this guide if you need to. *If you are really trying to play the role of tutor for your child, you should both be able to refer to his or her work in order to choose areas of weakness for a more focused review.*

Question 3: Often my child rushes through the math homework and makes many careless errors, then asks me to check the homework instead of checking it himself. How can I make my child more responsible for the work?

ANSWER: Try to convince your child not to rush through the homework. There are only 5 problems so that students will have time to really think about the questions and do a good job completing the assignment with very few errors. Help your child understand that the teacher is giving fewer homework problems, therefore the teachers expects to see all the student's work to answer each problem, and also evidence the student has checked all answers to make sure they are accurate.

Offer to look over the homework and tell your child which problems contain errors. Your child should then check to find the incorrect answers. Eventually, your child should begin to slow down and be more careful when realizing that finding and correcting careless mistakes takes a lot more time than doing careful work in the first place.

Question 4: My child asks for help with homework, but what is really being asked is for me to do the work. How much help should I give?

ANSWER: Decide whether there is some non-math reason for your child's request for help. Your child could actually be overtired or would rather be doing something other than homework – if either of these is the case, try changing the routine homework time.

If your child really doesn't understand how to do the problem at all, first take a blank piece of paper and do the problem by yourself with your child being able to see your work as you do it (remember to refer to the background information for the lesson in this guide if you need help). Show every step and explain to your child what you are doing as you record your work. Next, remove the paper and ask your child to redo the same problem on the actual homework sheet, explaining each step to you just as you did for your child earlier.

If your child is still having difficulty, try recording the problem and your solution on another sheet of paper, this time leaving out parts of the solution. Have your child fill in the missing information.

One of the hardest jobs we have as a parent is to be extremely patient and take the time to work with our children, not take the easy, faster way out and do the work for our children.

If you child still doesn't seem to understand, work with your child to write a note to the teacher explaining the problem and promising to complete the homework assignment as soon as the teacher has time to provide additional help such as tutorials during, before and/or after school. Include all the work that you and your child did to try to solve the problem.

Question 5: My child is very independent and doesn't want me to be involved with math homework. However, sometimes the grade given on the assignment or assessment shows that my child didn't really understand a lesson. What can I do?

ANSWER: A major goal of all parents is to have a child grow into an independent adult. Don't discourage independence. A good goal is to have your child completely independent during homework time by the beginning of grade 9.

When your child finishes the homework, ask if you can check it over and ask your child to explain how one or two of the problems were solved. The explanation can help you decide if your child understands the main concepts. If your child does not want your help looking over the homework to find careless errors, then leave the finding of homework errors to the teacher. Your main concern is that your child understands the main concepts – and if you decide your child does not, then send

them back to the Math Notes taken in class and review the material in this guide in the background information for the lesson.

Question 6: What should I do if my child brings home an overwhelming amount of homework or no homework at all?

ANSWER: Ask your child if the teacher actually assigned all the homework to be completed in one night. Often, students forget to do their homework for several days and let it pile up – and often their grade will be penalized as "late work" if they do not complete the homework assignments within a certain number of days.

In general, students should have a math homework assignment each day – or should be studying for the end of six weeks assessment. Communicate with your child's teacher if there appears to be a lack of homework assignments, or your child is consistently telling you that the homework was done in class, or your child comes home with an overwhelming amount of homework – remember – each homework assignment includes only 5 problems to complete.

OTHER QUESTIONS???? – please contact your child's math teacher – if the teacher can't answer your question, feel free to contact the curriculum author at the following e-mail address:

Juanita Thompson JThom3250@sbcglobal.net

Student Activity Sample

Student Activity 1

Work with your partner to answer the following questions.

Problem 1: Complete the following statements by filling in the blank with an appropriate word or words.

A set of numbers is a _____ of numbers.

A subset is a _____ of a set.

The set {1, 2, 3, 4, 5, 6, …} is called the set of _____ _____.

The set {…-6, -5, -4, -3, -2, -1, 0, 1, 2, 3, 4, 5, 6, …} is called the set of _____.

The set of numbers that can be expressed as the ratio of two integers is the set of _____ numbers.

A non-terminating, non-repeating decimal is a(n) _____ number.

A repeating decimal is a decimal that _____ and is a(n) _____ number.

4.01020304…. is a _____, _____ decimal and is a _____ number.

Problem 2: Place a √ in each column that names a set the given number belongs to.

	Irrational Number	Rational Number	Integer	Whole Number	Counting Number
-16					
0					
1.5					
$\frac{21}{4}$					
$-\sqrt{42}$					
$-35\frac{2}{3}$					
1,250					
$0.\overline{12}$					
3.11121314…					
$-8.\overline{4}$					

Problem 3: Name 3 decimals that are irrational.

_____ _____ _____

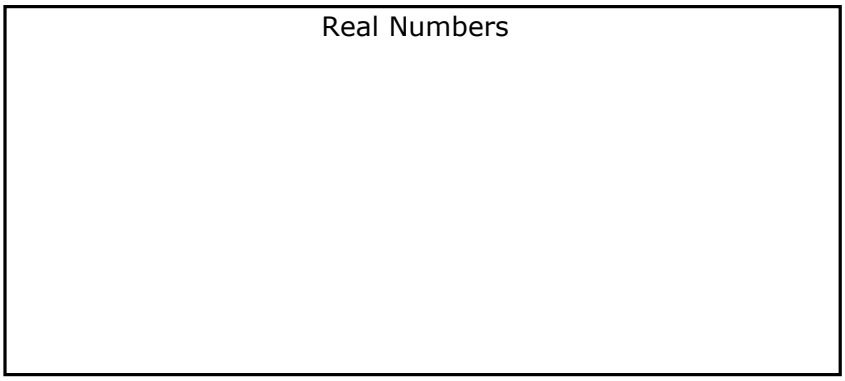
Problem 4: Name 3 radical numbers that are irrational.

_____ _____ _____

Problem 5: Name a rational number that would be between 3 and 3.1 on a number line. _____

Name an irrational number that would be between 3 and 3.1 on a number line.

Problem 6: Draw a Venn diagram that shows the relationship of the subsets of the real numbers.



Problem 7: Place the following numbers in the appropriate set on the Venn diagram you drew in Question 6.

218	-4	1.1	$\frac{21}{3}$	$\sqrt{3}$	125	$0.\overline{4}$	$-2\frac{1}{2}$
$-4.\overline{3}$	2.3031323334…	π	$\pi + 6$	$\sqrt{49}$	$-3+\sqrt{16}$		

Problem 8: Identify each statement below as T(true) or NT(not true).

_____1. All prime numbers are integers.

_____2. All decimals are rational numbers.

_____3. All whole numbers are counting numbers.

_____4. All whole numbers are integers.

Problem 9: Name 2 counting numbers that will be between 3 and 6.5 on a number line.
_____ and _____

Name two radical numbers that would be between 4 and 5 on a number line.
_____ and _____

Problem 10: Using a C for counting numbers, W for whole numbers, I for integers, R for rational numbers, and IR for irrational numbers identify all the sets of numbers that have members in the given set.

$\{-1,\ -3,\ -14,\ -13\}$_____

$\left\{\frac{22}{7},\ 3.\overline{14},\ \sqrt{41},\ 0\right\}$_____

$\left\{-20,\ -1.1,\ \frac{4}{3},\ -3,\ 2.121121112...\right\}$_____

Problem 11: Read each statement below. Decide if the statement is true or false. If it is false, give an explanation for your decision.

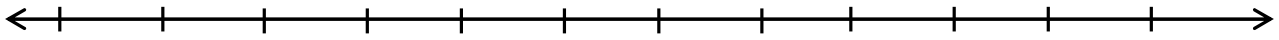
- If a number is negative, it is an integer._____

  _____.
- If a decimal is irrational, it can not be written exact. _____

  _____.

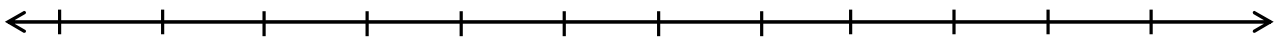
Problem 12: Place the following numbers on the number line below.

$$\left\{-4,\ 3\frac{2}{3},\ \sqrt{6},\ 2.5,\ \frac{2}{5},\ \frac{-11}{3}\right\}$$



Problem 13: Place the following numbers on the number line below.

$$\left\{-2,\ 1\frac{1}{3},\ \sqrt{16},\ \sqrt{24},\ \frac{1}{4},\ \frac{-12}{3}\right\}$$



Student Activity 2

Work with your partner to answer the following questions.

Problem 1: Identify the set of numbers that best describes each situation.

- The height of an airplane as it descends to land
- The number of free throws made by the school's basketball team in their last game
- A board game has a spinner with 3 sections- Lose your Turn, Move Forward, and Move Backward and a number cube with the numbers 1-6. The number of moves you make after a spin and a roll
- The length of a side of a square whose area is a whole number between 10 and 15 square units.
- The whole numbers and their opposites
- The balance in a person's check register
- The amount of water in a rain gauge after a rain storm

Problem 2: How can you show the relationship among the subsets of the real numbers?

Problem 3: Fill in the following graphic organizer with the following numbers: Place the number in all the sets it belongs to.

$$\left\{0,\ -12,\ \sqrt{32},\ \frac{3}{4},\ 50\%,\ -1.2,\ 3.12345\ldots,\ 0.\overline{8},\ 125\right\}$$

<table>
<tr><th colspan="2">Real Numbers</th></tr>
<tr><td>Rational Numbers</td><td rowspan="4">Irrational Numbers</td></tr>
<tr><td>Integers</td></tr>
<tr><td>Whole Numbers</td></tr>
<tr><td>Counting numbers</td></tr>
</table>

Problem 4: Name a negative number that is not an integer. _____

Problem 5: Name a negative number that is irrational.

Problem 6: What do you think the repeating decimal 0.999999…. represents?

Problem 7: Circle the irrational numbers below.

$\sqrt{64}$	1.213141	1.213141…
$\sqrt{72}$	8.1	3π
$-0.1234...$	$\frac{\sqrt{3}}{2}$	$\pi + 4$

Problem 8: To find the ratio of integers that a repeating decimal represents, look at the steps below.

Find the ratio of integers to represent 0.12121212….

Let $x = 0.12121212...$ Since there are two repeating digits, we multiply both sides by 100.
$100x = 12.121212...$

$100x = 12.12121212....$
$x = \ \ 0.12121212...$ Then we subtract the first equation from the second.

$99x = 12$ Divide both sides by 99

$\frac{99x}{99} = \frac{12}{99} = \frac{4}{33}$ 0.121212…… represents the rational number $\frac{4}{33}$.

Following those steps find the ratio of integers that represents 0.10101010…

Problem-Solving Sample

Problem-Solving Questions

Directions:

- **Work with a partner.**
- **Write your answers on notebook paper.**
- **Answer questions 1-3.**
- **Complete the solution to the problem(s).**
- **Answer questions 4-10.**

1. What is the main idea of this problem?

2. What are the supporting details in this problem?

3. What skills, concepts, and understanding of math vocabulary are needed to be able to answer this problem?

4. Did this problem involve mathematics arising in everyday life, society, or the work place?

5. What is a good problem solving strategy for this problem?

6. Can you explain how you used any math tools, mental math, estimation, or number sense to solve this problem?

7. Did this problem involve using multiple representations (symbols, diagrams, graphs, math language)?

8. Did you use any relationships to solve this problem?

9. How can you justify your solution to the problem?

10. How can you check for reasonableness of your solution to this problem?

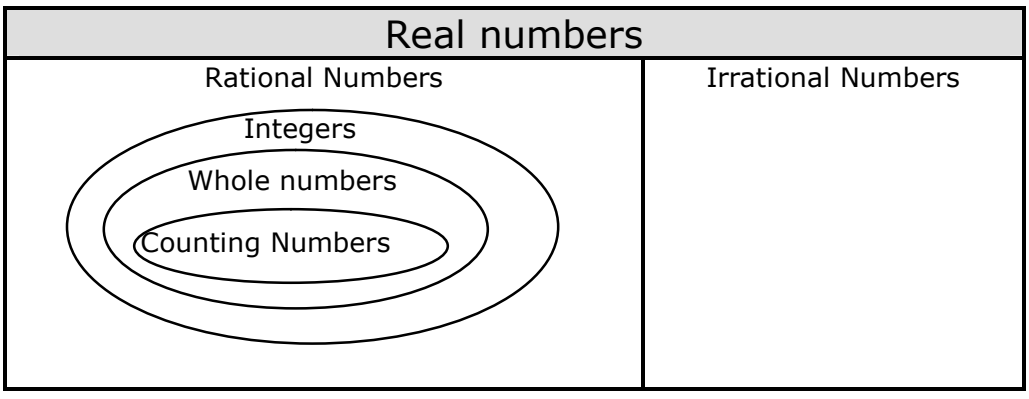
Problem-Solving 1

Problem 1: Which of the following statements are true? Use T or NT.

_____1. All integers are rational numbers.
_____2. Any rational number can be expressed as the ratio of two integers.
_____3. If a decimal does not terminate, it is an irrational number.
_____4. Some integers are irrational numbers.
_____5. The set $\{8,\ 8.5,\ \sqrt{10},\ -23\}$ are all rational numbers.
_____6. The set $\{-3,\ 19,\ 20,\ 0,\ -1\}$ are all integers.

For any statement you listed as NT, explain your reasoning.

Problem 2: Place -6, 0, $\sqrt{7}$, $\frac{12}{4}$, $-3\frac{1}{2}$ and $0.\overline{45}$ in the appropriate place on the Venn diagram.



Problem-Solving 2

Problem 1: Identify the set(s) of numbers that best describe the situations below.

- Numbers used in an area code

_____

- Score for the home team in soccer

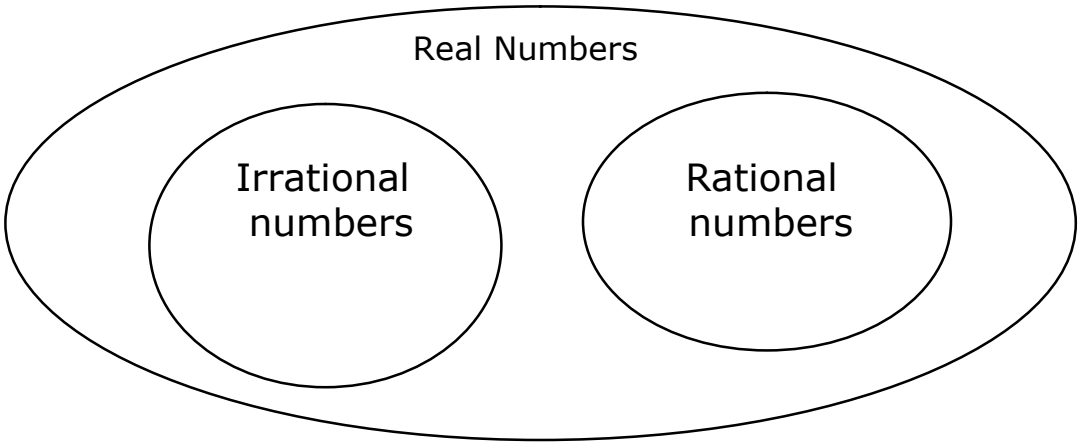
_____

- Length of a side of a square with area *A*

_____

Problem 2: Place the square root of each counting number 1-18 on the Venn diagram below.

Square Roots of Counting Numbers 1-18



Homework Sample

NAME_____ DATE_____ SCORE ___/5

8.2A Skills and Concepts Homework 1

1. Draw a Venn diagram or graphic organizer to show the relationship of the subsets of the real numbers.

2. Place a √ in each column that the given number belongs to.

	Irrational Number	Rational Number	Integer	Whole Number	Counting Number
-32					
-8.123					
103					
$3\frac{5}{8}$					
0.343434...					
$\sqrt{7}$					
1.213141…					
0					

3. Name a whole number that is NOT a counting number. _____

4. Name 3 rational numbers that are NOT positive and are NOT integers.

_____ _____ _____

5. Name a irrational number that is located between 31.5 and 31.6 on a number line. How do you know it is irrational?

NAME_____ DATE_____ SCORE ___/5

8.2A Skills and Concepts Homework 2

1. Identify the subset of real numbers that best describes each situation.

   - The number of cups of sugar in a cake recipe
   - Possible number of cookies in a package
   - Number of eggs in an Easter basket
   - Scores of the top 5 golfers on a leader board
   - Square of a whole number that is not a perfect square

2. Explain how the set of irrational numbers differs from the set of rational numbers.

3. What is a perfect square number?

   Give an example of 5 perfect square numbers.

4. Write the prime factorization of the following numbers. Then decide if the square root of the number will be a rational number or an irrational number.

   100 _____

   225 _____

   72 _____

   144 _____

5. Find the ratio of integers that is represented by the decimal 0.09090909….

Problem-Solving Model

Step	Description of Step
1	**Analyze the given information.** • Summarize the problem in your own words. • Describe the main idea of the problem. • Identify information needed to solve the problem.
2	**Formulate a plan or strategy**. • Draw a picture or diagram. • Guess and check. • Find a pattern. • Act it out. • Create or use a chart or table. • Work a simpler problem. • Work backwards. • Make an organized list. • Use logical reasoning. • Brainstorm. • Write a number sentence or an equation
3	**Determine a solution.** • Estimate the solution to the problem. • Solve the problem.
4	**Justify the solution.** • Explain why your solution solves the problem.
5	**Evaluate the process and the reasonableness of your solution.** • Make sure the solution matches the problem. • Solve the problem in a different way.

Mini-Assessment Sample

NAME_____ DATE_____ SCORE ___/10

Mini-Assessment 8.2A

1. Which number is an irrational number?

   A $\sqrt{9}$

   B $\sqrt{49}$

   C $\sqrt{100}$

   D $\sqrt{120}$

---

2. Which represents a rational number?

   F $\sqrt{110}$

   G $\sqrt{324}$

   H $\sqrt{65}$

   J $\sqrt{80}$

---

3. Which statement is NOT true?

   A Every rational number is a real number.

   B Every counting number is a whole number.

   C Every integer is a rational number.

   D Every decimal number is an irrational number.

---

4. A square has an area of x square units. x is a whole number between 20 and 24. What set of number best describes the length of the side of the square?

   F Rational numbers

   G Counting numbers

   H Integers

   J Irrational numbers

5. Which of the following represents a set of irrational numbers?

A $\{\sqrt{3},\ \sqrt{4},\ \sqrt{6},\ \sqrt{5}\}$

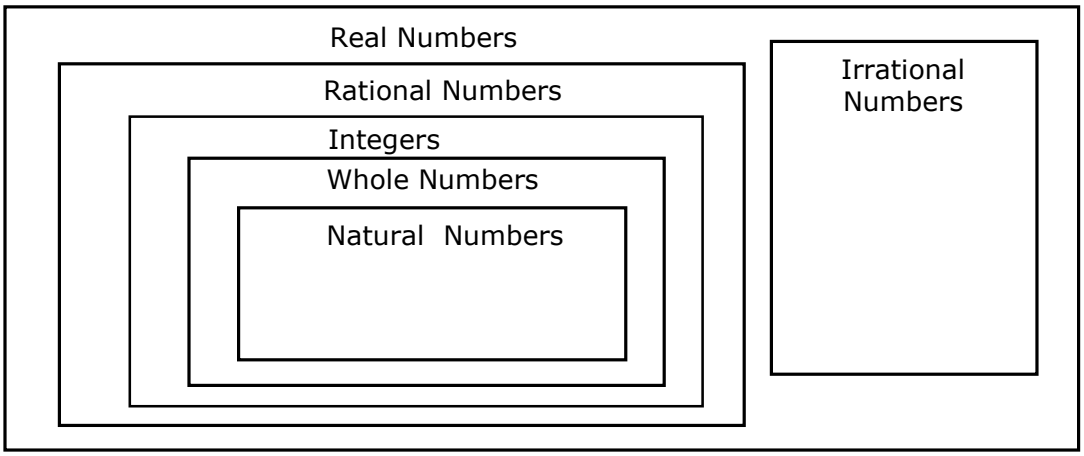
B $\{1.1,\ 1.234...,\ \sqrt{35},\ \pi\}$

C $\left\{\frac{11\pi}{4},\ \frac{\sqrt{2}}{4},\ 1.121314...,\ \sqrt{3}\right\}$

D Not Here

---

6. This diagram shows the relationship of the subsets of the real number system.



Which of the following sets contain only numbers that are NOT integers?

F $\{6,\ -5,\ 1.25\}$

G $\left\{\frac{3}{5},\ 4.5,\ 0.\overline{3}\right\}$

H $\{-8,\ 4,\ \sqrt{13},\ 25\}$

J $\left\{\frac{16}{4},\ 8,\ 7,\ \sqrt{9}\right\}$

---

7. Which statement is true?

A 0.121212… is a rational number.

B 0.34353637 is an irrational number.

C 8.14 is an irrational number.

D 5.12345… is a rational number.

8. Which of the following is NOT a subset of the rational numbers?

   F Integers

   G Whole Numbers

   H Perfect square integers

   J Irrational numbers

---

9. Margaret was asked to write 4 irrational numbers. Her list included the following numbers:

   $1.212223\ldots \qquad \sqrt{30} \qquad 3\pi \qquad \frac{\sqrt{2}}{2}$

   Which of the numbers Margaret wrote are irrational numbers?

   A None of them

   B All of them

   C $1.212223\ldots$ and $\sqrt{30}$ only

   D $\sqrt{30}$ and 3π and $\frac{\sqrt{2}}{2}$ only

---

10. Marian was asked to create a set of numbers so that 2 were integers, 2 were rational numbers that were not integers, and 2 were irrational numbers. Which of the following sets would satisfy the criteria for Marian's set?

    F $\left\{\sqrt{11},\ \pi,\ -3,\ 4,\ 1.5,\ \frac{5}{12}\right\}$

    G $\left\{9,\ 100,\ 1.1111\ldots,\ \pi,\ -6,\ \frac{20}{3}\right\}$

    H $\left\{5\sqrt{2},\ 3\pi,\ 3,\ -14,\ 3.5,\ \frac{24}{12}\right\}$

    J $\left\{\sqrt{20},\ 12.3456\ldots,\ 9,\ -14,\ 28,\ 4\frac{1}{2}\right\}$

Six Weeks 1
Lesson 1

Parent Guide
Six Weeks 1 Lesson 1

For this lesson, students should be able to demonstrate an understanding of how to represent and manipulate numbers and expressions. Students are expected to apply mathematical process standards to represent and use real numbers in a variety of forms.

Students are also expected to extend previous knowledge of sets and subsets using a visual representation to describe relationships between sets of real numbers.

The process standards incorporated in this lesson include:

8.1B Use a problem-solving model that incorporates analyzing given information, formulating a plan or strategy, determining a solution, justifying the solution, and evaluating the problem-solving process and the reasonableness of the solution

8.1D Communicate mathematical ideas, reasoning and their implications using multiple representations, including symbols, diagrams, graphs, and language as appropriate

8.1F Analyze mathematical relationships to connect and communicate mathematical ideas

Math Background-Understanding Real Numbers

A group of items or numbers is called a set. A part of that set is called a **subset**. The set of numbers we use in our every day lives is the set of real numbers. These are the numbers that are located on a number line. One subset of the real numbers is the set of whole numbers. **Whole numbers** are the numbers 0, 1, 2, 3, 4… Each of these numbers has an opposite 0, -1, -2, -3, -4… When the whole numbers and their opposites are joined together the set of **integers** is created.

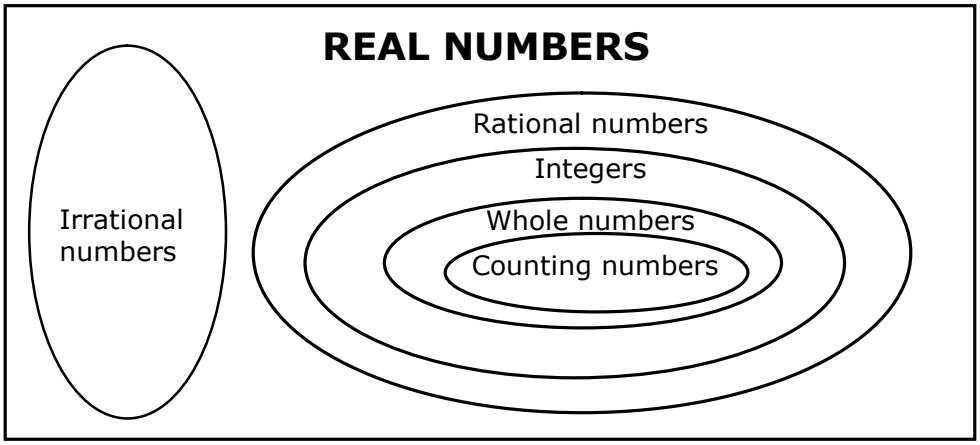
The set of integers are indicated in set notation as {…-4, -3, -2, -1, 0, 1, 2, 3, 4…}.

If zero is removed from the set of whole numbers, the set of **natural numbers** or **counting numbers** is created. The natural numbers can be indicated in set notation as $\{1,\ 2,\ 3,\ 4,\ 5,\ 6,\ 7,...\}$.
The whole numbers, counting numbers, and integers are all subsets of a larger set called the rational numbers. When a number of the form $\frac{a}{b}$ is created where *a* and *b* are both integers but $b \neq 0$, then the set of **rational numbers** is created. For example, the ratio of 3 to 5 creates $\frac{3}{5}$, so $\frac{3}{5}$ is a rational number. The ratio of 20 to 2 creates $\frac{20}{2}$ or 10 which is a whole number as well as a rational number. A mixed number like $5\frac{1}{2}$ is a rational number because it can be rewritten as an improper fraction, $\frac{11}{2}$, which is the ratio of two integers.

The real numbers, which are all the numbers on a number line, are divided into 2 large subsets. The **rational numbers** and the **irrational numbers**.

The irrational numbers are made up all numbers that CANNOT be expressed as a ratio of two integers. Some irrational numbers are numbers like $\sqrt{2}$, $\sqrt{3}$, $\sqrt{5}$ and π. Any decimal that does NOT terminate and does NOT repeat is an irrational numbers. For example, 5.123456… is an irrational decimal. A repeating decimal has a block of one or more digits that repeats indefinitely. These decimals, such as 0.3333333…. or 4.1212121212….are rational decimals.

The relationship between these sets of subsets of the real numbers can be shown with a Venn diagram.



This diagram shows that the rational numbers and the irrational number are disjointed. They do NOT share any numbers. The prefix Ir means "not" so irrational means not rational.

In determining if a radical number such as $\sqrt{a}$ is an irrational number or a rational number, be sure to simplify it first. If the number *a* is a perfect square number, then the radical will simplify into an integer. For example, if $b^2 = a$ and *b* is an integer, then a is a perfect square number and $\sqrt{a} = b$ and $-\sqrt{a} = -b$.

Example: Is $\sqrt{25}$ an irrational or rational number?

Since $5^2 = 25$, then 25 is a perfect square and $\sqrt{25} = 5$. 5 is rational number.

Therefore, $\sqrt{25}$ is a rational number.

Example: Is $\sqrt{90}$ an irrational or rational number?

Since 90 is between 81 and 100, then $\sqrt{90}$ is between 9 and 10. Since there are no integers between 9 and 10, $\sqrt{90}$ is a decimal. Using your calculator, find the decimal approximation the calculator will give you for $\sqrt{90}$. The calculator will give 9.486832981…. depending upon how many decimal places you request.

Therefore, $\sqrt{90}$ is an irrational number that can be approximated with the rational number 9.5 or 9.49.

Identifying Number Sets Used in Real-World Situations

Numbers used in real-world situations can be rational numbers or irrational numbers.

Example: The number of dollar bills in a person's wallet

Whole numbers This set best describes the number of dollar bills because the person may have 0, 1, 2, 3, … dollar bills in his wallet.

Example: The length of a side of a square with an area of 25 square feet

Whole Number Since the formula for the area of a square is $s^2 = A$, then $s = \sqrt{A}$ (take square root of both sides but use only the positive or principal root since length has to be positive.)
$s = \sqrt{25} = 5$ and 5 is a whole number.

Example: The length of a side of a square with an area of 40 square feet

Irrational number Since the formula for the area of a square is $s^2 = A$, then $s = \sqrt{A}$ (take square root of both sides but use only the positive or principal root since length has to be positive.) Since 40 is between the perfect squares 36 and 49, $\sqrt{40}$ will be a decimal between 6 and 7. There is NOT a terminating or repeating decimal that when multiplied times itself will have a product of 40. $\sqrt{40}$ can be **approximated** with a rational number such as 6.3.

If the square root of a whole number is rational, then its prime factorization can be divided into two equal sets.

Example: $\sqrt{144}$ is rational because the prime factorization of 144 is $(3 \times 2 \times 2)(3 \times 2 \times 2)$. Since the two sets are identical, the $\sqrt{144} = 3 \times 2 \times 2 = 12$, which is a whole number and thus rational.

Six Weeks 3
Lesson 8

Parent Guide
Six Weeks 3 Lesson 8

For this lesson, students should be able to demonstrate an understanding of how to represent and analyze data. Students are expected to apply mathematical process standards to use statistical procedures to describe data.

Students are expected to determine the mean absolute deviation and use this quantity as a measure of the average distance data points are from the mean using a data set of no more than 10 data points.

The process standards incorporated in this lesson include:

8.1B Use a problem-solving model that incorporates analyzing given information, formulating a plan or strategy, determining a solution, justifying the solution, and evaluating the problem-solving process and the reasonableness of the solution

8.1C Select tools, including real objects, manipulatives, paper and pencil, and technology as appropriate, and techniques, including number sense as appropriate, to solve problems.

8.1E Create and use representations to organize, record, and communicate mathematical ideas.

Math Background- Determining the Mean Absolute Deviation

A measure of center of data is a single number. One measure of center is the **median** (center data point). Another measure of center of data is the **mean**. The **mean** is the average of the data points. To find the mean, sum the data points and divide by the number of data points. The mean and median do not have to be a data point in the data set.

A measure of variability is a single number that is used to describe the spread of the data. The measure of variability we have already studied is the **range** of the data. Another measure of variability that we will study in this lesson is the **mean absolute deviation**. This value is often referred to as the MAD, which is the mean distance between each value of the data set and the mean of the data set.

The steps to find the mean absolute deviation of a data set are:

1. Find the mean of the data set. (Sum the data points and divide by the number of data points.)

2. Find the distance each data point is from the mean. (A table might be helpful for this step.)

3. Find the mean of these distances. (Use your calculator and round to the nearest tenth.)

A larger mean absolute deviation number tells you that the data is more spread out.

The smaller mean absolute deviation number tells you the values are all closer to the mean of the data set.

An outlier in your set can affect your MAD because it will be farther from the mean than the other data points.

Example: Find the mean deviation number for the set of values below. The values represent the number of blue marbles in various bags of marbles.

Data Set: 6, 8, 5, 2, 7, 7, 4, 6, 7, 8

Find the mean: $\frac{6+8+5+2+7+7+4+6+7+8}{10} = \frac{60}{10} = 6$

Find the distance each data point is from the mean.

Data point	6	8	5	2	7	7	4	6	7	8
Distance from mean	0	2	1	4	1	1	2	0	1	2

Find the mean of the distances.

$\frac{0+2+1+4+1+1+2+0+1+2}{10} = \frac{14}{10} = 1.4$

The MAD is 1.4. This is a small mean deviation number, but if the data point 2 had been a number closer to 6, the MAD would have been even smaller.

Example: The height of 6 team members of the boys' eighth grade basketball team is given as Data Set 1.The height of 6 team members of the girls' eighth grade basketball team is given as Data Set 2. The heights are given in inches.

Data Set 1 (boys' heights): 69, 62, 69, 60, 70, 72 Data Set 1 (girls' heights): 57, 60, 67, 63, 61, 62

Compare the mean absolute deviation for the two data sets.

Data Set 1:

Find the mean: $\frac{69+62+69+60+70+72}{6} = \frac{402}{6} = 67$

Find the distance each data point is from the mean.

Data point	69	62	69	60	70	72
Distance from mean	2	5	2	7	3	5

Find the mean of the distances.

$\frac{2+5+2+7+3+5}{6} = \frac{24}{6} = 4$ The MAD for the boys' heights is 4 inches.

Data Set 2:

Find the mean: $\frac{57+60+67+63+62+61}{6}=\frac{370}{6}\approx 61.7$

Find the distance each data point is from the mean.

Data point	57	60	67	63	62	61
Distance from mean	4.7	1.7	5.3	1.3	0.3	0.7

Find the mean of the distances.

$\frac{4.7+1.7+5.3+1.3+.3+.7}{6}=\frac{14}{6}\approx 2.3$ The MAD for the girls' heights is 2.3 inches.

The MAD for the girls' heights is smaller than the MAD for the boys' heights. The girls' height has less deviation in their heights. The heights of these six girls are closer to the mean of the data than the heights of the six boys to the mean of their data.