Mathematics Station Activities

for Texas Essential Knowledge and Skills (TEKS)

Grade 8

WALCH EDUCATION®

1 2 3 4 5 6 7 8 9 10

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J. Weston Walch, Publisher

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Introduction

This book includes a collection of station-based activities to provide students with opportunities to practice and apply the mathematical skills and concepts they are learning. It contains sets of activities for each of the Texas Essential Knowledge and Skills (TEKS) Mathematics strands: Number, Operation, and Quantitative Reasoning; Geometry and Spatial Reasoning; Measurement; Patterns, Relationships, and Algebraic Thinking; and Probability and Statistics. You may use these activities in addition to direct instruction, or instead of direct instruction in areas where students understand the basic concepts but need practice. The Discussion Guide included with each set of activities provides an important opportunity to help students reflect on their experiences and synthesize their thinking. It also provides guidance for ongoing, informal assessment to inform instructional planning.

Implementation Guide

The following guidelines will help you prepare for and use the activity sets in this book.

Setting Up the Stations

Each activity set consists of four stations. Set up each station at a desk, or at several desks pushed together, with enough chairs for a small group of students. Place a card with the number of the station on the desk. Each station should also contain the materials specified in the teacher's notes, and a stack of student activity sheets (one copy per student). Place the required materials (as listed) at each station.

When a group of students arrives at a station, each student should take one of the activity sheets to record the group's work. Although students should work together to develop one set of answers for the entire group, each student should record the answers on his or her own activity sheet. This helps keep students engaged in the activity and gives each student a record of the activity for future reference.

Forming Groups of Students

All activity sets consist of four stations. You might divide the class into four groups by having students count off from 1 to 4. If you have a large class and want to have students working in small groups, you might set up two identical sets of stations, labeled A and B. In this way, the class can be divided into eight groups, with each group of students rotating through the "A" stations or "B" stations.

Assigning Roles to Students

Students often work most productively in groups when each student has an assigned role. You may want to assign roles to students when they are assigned to groups and change the roles occasionally. Some possible roles are as follows:

- Reader—reads the steps of the activity aloud
- Facilitator—makes sure that each student in the group has a chance to speak and pose questions; also makes sure that each student agrees on each answer before it is written down
- Materials Manager—handles the materials at the station and makes sure the materials are put back in place at the end of the activity
- Timekeeper—tracks the group's progress to ensure that the activity is completed in the allotted time
- Spokesperson—speaks for the group during the debriefing session after the activities

Timing the Activities

The activities in this book are designed to take approximately 15 minutes per station. Therefore, you might plan on having groups change stations every 15 minutes, with a two-minute interval for moving from one station to the next. It is helpful to give students a "5-minute warning" before it is time to change stations.

Since the activity sets consist of four stations, the above time frame means that it will take about an hour and 10 minutes for groups to work through all stations. If this is followed by a 20-minute class discussion as described below, an entire activity set can be completed in about 90 minutes.

Guidelines for Students

Before starting the first activity set, you may want to review the following "ground rules" with students. You might also post the rules in the classroom.

- All students in a group should agree on each answer before it is written down. If there is a disagreement within the group, discuss it with one another.
- You can ask your teacher a question only if everyone in the group has the same question.
- If you finish early, work together to write problems of your own that are similar to the ones on the student activity sheet.
- Leave the station exactly as you found it. All materials should be in the same place and in the same condition as when you arrived.

Debriefing the Activities

After each group has rotated through every station, bring students together for a brief class discussion. At this time, you might have the groups' spokespersons pose any questions they had about the activities. Before responding, ask if students in other groups encountered the same difficulty or if they have a response to the question. The class discussion is also a good time to reinforce the essential ideas of the activities. The questions that are provided in the teacher's notes for each activity set can serve as a guide to initiating this type of discussion.

You may want to collect the student activity sheets before beginning the class discussion. However, it can be beneficial to collect the sheets afterward so that students can refer to them during the discussion. This also gives students a chance to revisit and refine their work based on the debriefing session.

Materials List

Class Sets

- calculators
- protractors
- rulers

Station Sets

- 12 counters or other small objects, such as pennies or beans
- 120 one-inch cubes (wood or plastic)
- 3 paper cups
- 5 spaghetti noodles
- 5 stir sticks
- 8" × 10" graph paper
- algebra tiles
- blank slips of paper
- box of toothpicks
- colored pens or pencils
- compass
- corkboard
- deck of 52 playing cards
- equation mat
- opaque bag containing 55 Goldfish® crackers and 10 pretzel Goldfish®
- pushpins
- small box in the shape of a rectangular prism
- small empty container (e.g., small food container, empty soup can, or coffee mug)
- small square tiles and small round tiles
- soup can with the label still on
- spinner divided into four sections: 20% red, 20% blue, 20% green, and 40% yellow
- wooden square pyramid geometric solid

Ongoing Use

- graph paper
- index cards (filled out as directed within particular stations)
- number cubes (numbered 1–6)
- pennies
- scissors
- sheets of plain white paper
- tape (clear and masking)

Number, Operation, and Quantitative Reasoning

Set 1: Rational and Irrational Numbers

Instruction

Goal: To provide opportunities for students to develop concepts and skills related to rational and irrational numbers

Texas Essential Knowledge and Skills (TEKS)

1. Number, operation, and quantitative reasoning. The student understands that different forms of numbers are appropriate for different situations. The student is expected to:
   a. compare and order rational numbers in various forms including integers, percents, and positive and negative fractions and decimals.
   b. select and use appropriate forms of rational numbers to solve real-life problems including those involving proportional relationships.
   c. approximate (mentally and with calculators) the value of irrational numbers as they arise from problem situations (such as π, $\sqrt{2}$).

Student Activities Overview and Answer Key

Station 1

Students use a calculator to write decimal expansions for several given numbers. They work together to identify repeating decimals and terminating decimals (rational numbers), and they make a conjecture about the numbers whose decimal expansions are neither repeating nor terminating (these numbers are irrational).

Answers

1. 0.875
2. $0.\overline{2}$
3. $4.1\overline{6}$
4. 14
5. 4.1231056
6. 3.1415926
7. 15.625
8. $0.08\overline{3}$

Terminating decimals: $^{7}/_{8}$, $\sqrt{196}$, $(2.5)^3$; repeating decimals: $^{2}/_{9}$, $4\ ^{1}/_{6}$, $^{1}/_{12}$; neither: $\sqrt{17}$, π (these numbers are irrational)

Station 2

Students use a number cube to create radicals with two-digit radicands. Students work together to decide if each radical is a rational number or an irrational number. Students write reasons for their responses.

Instruction

Answers: Answers will vary depending upon the numbers rolled.

Possible reasons: If the radicand is a perfect square, the number is rational. Otherwise it is irrational.

Station 3

Students are given a set of ten cards with numbers on them. The goal is to sort the cards into two piles. One pile should contain only rational numbers, and the other should contain only irrational numbers. Once students have sorted the cards, they reflect on the strategies they used.

Answers: Rational: $^3/_5$, $0.\overline{8}$, $\sqrt{4}$, $\sqrt{16}$, –2, 0, 4.173

Irrational: $\sqrt{2}$, $\sqrt{5}$, π

Possible strategies: Begin by looking for whole numbers, fractions, and repeating or terminating decimals. These are all rational. For radicals, determine whether the radicand is a perfect square. If so, the number is rational. If not, the number is irrational.

Station 4

Students are given a set of eight cards with numbers on them. They use the cards to form four radicals with two-digit radicands. The goal is to create two rational numbers and two irrational numbers. Once they have formed the radicals, students work together to check their work and reflect on their strategies.

Answers: There are several correct ways to form the radicals. One possibility is $\sqrt{16}$ and $\sqrt{25}$ (rational), and $\sqrt{41}$ and $\sqrt{96}$ (irrational).

Possible strategies: Begin by using pairs of cards to form two-digit perfect squares. The square roots of these numbers are rational. Use the leftover cards to form two-digit numbers that are not perfect squares. The square roots of these numbers are irrational.

Materials List/Setup

Station 1 calculator

Station 2 number cube (numbered 1–6)

Station 3 10 index cards with the following numbers written on them:

$^3/_5$, 0.8, $\sqrt{4}$,$\sqrt{16}$, –2, 0, 4.173, $\sqrt{2}$, $\sqrt{5}$, π

Station 4 8 index cards with the following numbers written on them:

1, 1, 2, 4, 5, 6, 6, 9

Instruction

Discussion Guide

To support students in reflecting on the activities and to gather some formative information about student learning, use the following prompts to facilitate a class discussion to "debrief" the station activities.

Prompts/Questions

1. What does it mean for a number to be rational?
2. Is every whole number rational? Why or why not?
3. What can you say about the decimal expansion of a rational number?
4. How can you use a calculator to help you decide if a number is rational?

Think, Pair, Share

Have students jot down their own responses to questions, then discuss with a partner (who was not in their station group), and then discuss as a whole class.

Suggested Appropriate Responses

1. The number can be written as a fraction (i.e., as a quotient of two whole numbers). Equivalently, the number is a terminating or repeating decimal.
2. Yes. It may be written as a fraction with a denominator of 1.
3. It is either repeating or terminating.
4. Use the calculator to convert the number to a decimal. If the decimal is repeating or terminating, the number is rational.

Possible Misunderstandings/Mistakes

- Assuming that any square root is irrational
- Not realizing that any number written as a fraction must be rational
- Incorrectly simplifying radicals
- Incorrectly converting between fractions and decimals

Number, Operation, and Quantitative Reasoning

Set 1: Rational and Irrational Numbers

Station 1

You will need a calculator for this activity.

Use the calculator to help you write each of the following numbers as a decimal. Work together to decide how to use the calculator to convert the numbers to decimals.

1. $\frac{7}{8}$
2. $\frac{2}{9}$
3. $4\frac{1}{6}$
4. $\sqrt{196}$
5. $\sqrt{17}$
6. π
7. $(2.5)^3$
8. $\frac{1}{12}$

Work together to identify the numbers that have terminating decimals. Write them below.

_____

Work together to identify the numbers that have repeating decimals. Write them below.

_____

Write the numbers that do not appear to have terminating or repeating decimals.

_____

What can you say about the numbers that don't have terminating or repeating decimals?

_____

_____

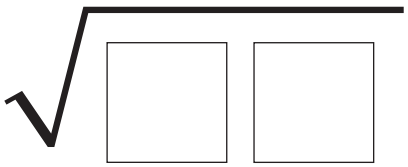
Number, Operation, and Quantitative Reasoning

Set 1: Rational and Irrational Numbers

Station 2

You will find a number cube at this station. Use the number cube to create square roots.

Roll the number cube two times. Write the two numbers in the boxes inside the radical sign below.

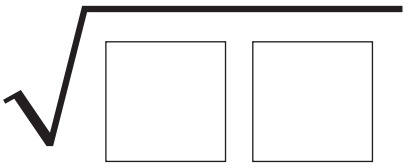


Work with other students to decide if the radical is a rational number or an irrational number. Write your answer below. Give a reason for your answer.

_____

_____

Repeat the process four more times.



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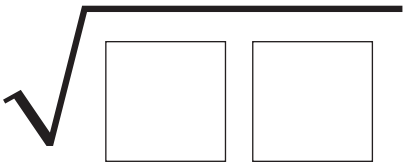

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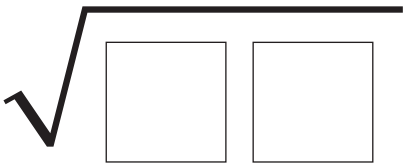

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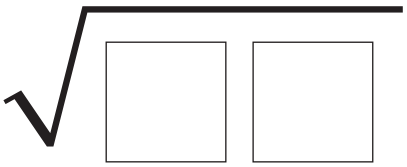

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Number, Operation, and Quantitative Reasoning

Set 1: Rational and Irrational Numbers

Station 3

You will find a set of 10 cards at this station. The cards have the following numbers written on them:

0 $\quad \frac{3}{5}$ $\quad \sqrt{2}$ $\quad 0.\overline{8}$ $\quad \pi$ $\quad \sqrt{4}$ $\quad \sqrt{16}$ $\quad -2$ $\quad \sqrt{5}$ $\quad 4.173$

Work with other students to sort the cards into two piles. One pile should contain only rational numbers. The other pile should contain only irrational numbers.

Write your results below.

Rational: _____

Irrational: _____

Work together to check that you have sorted the numbers correctly. Describe any strategies you could use to solve this problem.

_____

_____

_____

Number, Operation, and Quantitative Reasoning

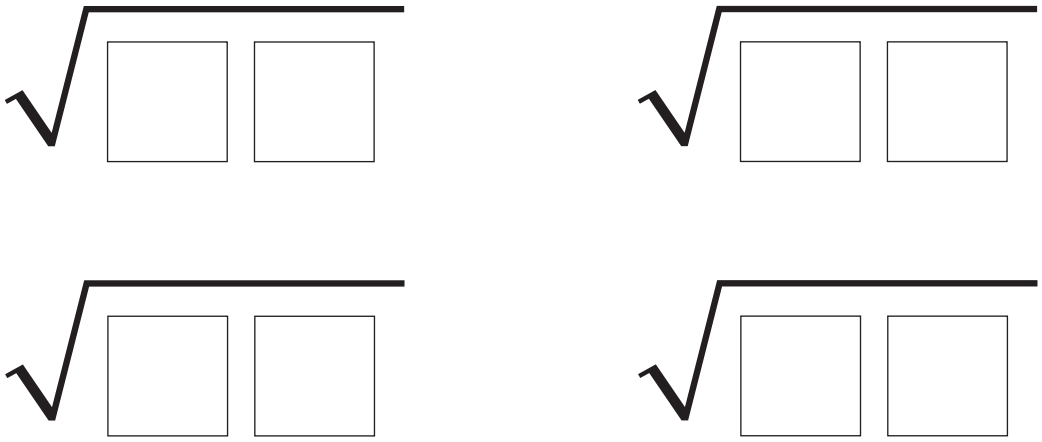
Set 1: Rational and Irrational Numbers

Station 4

You will be given a set of eight index cards. The cards have the following numbers written on them:

1 1 2 4 5 6 6 9

Write numbers in the boxes to form four radicals of two-digit numbers. The goal is to create two rational numbers and two irrational numbers.



Work together to check that you have created two rational numbers and two irrational numbers. Write the numbers below.

Rational: _____

Irrational: _____

Explain the strategies you could use to solve this problem.

_____

_____

_____