

Title: Inchology -- The Study of Inches

Brief Overview:

This unit involves students reading to perform a task. The students will utilize rulers to design and construct a math game. The students also will create problem cards using various operations in math. The students will then write to persuade. The students will work in cooperative groups to complete these activities with the exception of the independent writing assignment.

Links to NCTM 2000 Standards:

- **Standard 1: Number and Operation**

Mathematics instructional programs should foster the development of number and operation sense so that all students understand the meaning of operations and how they relate to each other; and use computational tools and strategies fluently and estimate appropriately.

- **Standard 4: Measurement**

Mathematics instructional programs should include attention to measurement so that all students understand attributes, units, and systems of measurement; and apply a variety of techniques, tools, and formulas for determining measurements.

- **Standard 6: Problem Solving**

Mathematics instructional programs should focus on solving problems as part of understanding mathematics so that all students build new mathematical knowledge through their work with problems; develop a disposition to formulate, represent, abstract, and generalize in situations within and outside mathematics; apply a wide variety of strategies to solve problems and adapt the strategies to new situations; and monitor and reflect on their mathematical thinking in solving problems.

- **Standard 7: Reasoning and Proof**

Mathematics instructional programs should focus on learning to reason and construct proofs as part of understanding mathematics so that all students recognize reasoning and proof as essential and powerful parts of mathematics; and select and use various types of reasoning and methods of proof as appropriate.

- **Standard 8: Communication**

Mathematics instructional programs should use communication to foster an understanding of mathematics so that all students organize and consolidate their mathematical thinking to communicate with others; express mathematical ideas coherently and clearly to peers, teachers, and others; extend their mathematical knowledge by considering the thinking and strategies of others; and use the language of mathematics as a precise means of mathematical expression.

- **Standard 9: Connections**

Mathematics instructional programs should emphasize connections to foster an understanding of mathematics so that all students recognize and use connections among different mathematical ideas; understand how mathematical ideas build on one another to produce a coherent whole; and recognize, use, and learn about mathematics in contexts outside of mathematics.

Grade/Level:

Grades 3-5

Duration/Length:

Approximately 5 - 6 class periods

Prerequisite Knowledge:

Students should have working knowledge of the following skills:

- Use of a ruler to measure inches
- Basic computation skills; using addition, subtraction, and multiplication
- Business letter format
- Elements of persuasive writing
- Working in a cooperative group
- Identifying parts of a whole ($\frac{1}{4}$, $\frac{1}{2}$, and $\frac{3}{4}$)

Student Outcomes:

Students will:

- measure to the nearest $\frac{1}{4}$ " , $\frac{1}{2}$ " , $\frac{3}{4}$ " , and 1".
- estimate to the nearest unit of measure.
- solve problems using mathematical operations.
- communicate their findings orally and in writing.
- compare and contrast a variety of games.
- identify characteristics of a boardgame.
- write a set of directions.
- write a persuasive letter.
- work in a cooperative group.
- use a scoring tool.

Materials/Resources/Printed Materials:

- Standard ruler (class set)
- Classroom objects
- Variety of board games
- Student resource sheets (included)
- Overheads of student resource sheets
- 1" tile squares
- Colored paper : green, yellow, blue, white (one set for each group)
- Scissors
- Crayons, colored pencils, markers
- Poster board (one for each group)
- Student Resource Sheets
- Student/Teacher Resource Sheet (Sample game board plan)

Development/Procedures:**Activity 1: Reviewing Linear Measurement**

- Have students brainstorm the purpose and function of a ruler.
- Review and label parts of a ruler with the class.
- Model and demonstrate how to use a ruler correctly, measuring to the nearest $\frac{1}{4}$ " , $\frac{1}{2}$ " , $\frac{3}{4}$ " , and 1".
- Emphasize starting at zero and the difference in scale.

- Set up four stations with various objects to be measured. Label each station with a different unit of measurement to be used. (For example: 1/4", 1/2", 3/4", and 1")
- Assign students to one station followed by a rotation to each station.
- Students will set up their own record sheet and record the data from each station.
- Develop a class chart discussing the differences between each unit of measurement.

Activity 2: Game Discussion

- Students will share why they play games.
- Brainstorm and list various games they have played.
- Examine a variety of games supplied by the teacher. Discuss the similarities and differences of the games presented.
- As a class, make a list of characteristics of a boardgame. This list should include:
 - * Title
 - * Recommended age
 - * Number of players
 - * Playing pieces
 - * Object of the game
 - * Rules and directions
 - * Game board
- Share Student/Teacher Resource #1 with the students.

Activity 3: Design a Game

- Review characteristics of a game.
 - Introduce Student Resource #1 with the class and discuss the criteria in the scoring tool (Student Resource #2).
 - Reinforce strategies used when reading to perform a task.
 - Divide students into cooperative groups and have the students determine jobs each member will have (e.g., Board Designer, Graphic Artist, Color Setter, Card Maker).
 - Set them free and watch them work!
 - Teacher should establish format for writing directions to the game. Refer to the characteristics from Activity 2.
- * This task may take about 2-3 class periods. One to two periods for the board construction and one day for the cards.
- * Continuation of this task may vary based on teacher expectation and student age and ability. For example, use task as performance instruction or assessment.

Activity 4: Writing to Persuade

- Review parts of a business letter.
- Introduce and analyze the writing prompt (Student Resource #3).
- As a class, brainstorm reasons why a game might be selected by the company.
- Have students design a graphic organizer to help them during the prewriting stage.
- Write the persuasive letter using business letter format (Student Resource #4).

Performance Assessment:

Inchology is a five to six day unit divided into four tasks that provide scoring tools. Assessment can be done through oral presentations, teacher observations, and written work (Student Resource 5).

Extension/Follow Up:

- Students can play with the boardgames presented by the teacher.
- Students can collect data and construct bar graphs showing favorite boardgames.
- After the student-created boardgames are finished, the students can critique the games.
- Use other operations such as division, fractions, and patterns on the problem cards.
- Rotate each team's problem cards between groups.
- Students can create a boardgame using metric units.
- Develop stance questions relating to creating a board game.

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Reading to Perform a Task: Designing a Game

The PTA President has requested that all students create an item to help raise funds for field trips. Your teacher feels there needs to be a fun way to practice math operations and measurement.

Your team's job is to create a math game by following a set of directions. The principal will then select one game idea to be chosen for production. This game will be sold by the PTA to raise funds for upcoming field trips.

Read the directions below to help your team create a math board game.

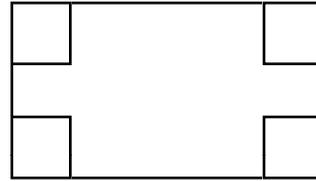
MATERIALS NEEDED:

poster board
ruler
pencil
1" tile square
colored paper - blue
- green
- yellow
- white
scissors
crayons, colored pencils, markers

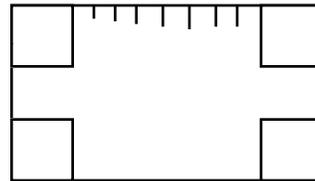
DIRECTIONS:

1. Use a ruler to draw a rectangle with a length of 18" and a width of 12". (Hint: Use your tile square to form the right angles.)
2. Use the tiles to form four corners with an area of 9 sq. inches.

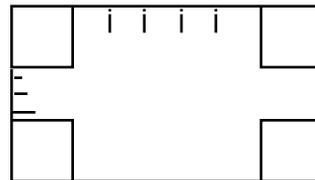
3. Trace the square created in each corner.



4. Use the ruler to measure 1'' increments between two corners on one side of the game board.



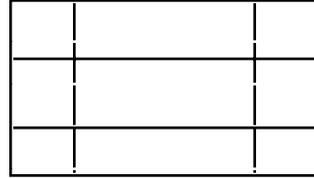
5. Use the ruler to measure 1/2'' increments between two corners on another side of the game board.



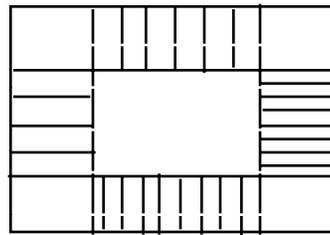
6. Use the ruler to measure 1 1/2'' increments between two corners on the third side of the board. (See Sample Game Board.)

7. Now mark off 3/4'' increments between two corners along the last side of the game board. (See Sample Game Board.)

8. Draw a horizontal line connecting each corner together.
(Four lines should be drawn without intersection)



9. Using a ruler, connect all of the increments around the board to the horizontal line. This will form your playing spaces.



10. Draw three 2" by 3" shapes and one 3" by 3" square in the middle of the game board to place your cards.
11. Using each sheet of colored paper, cut out 10 cards that are 2" by 3". You should have a total of 30 cards. (10 in each color)
12. Using the white sheet of paper, draw and cut out 6 squares that are 3" by 3".
13. On each side of the game board, shade in one space of each color : blue, green and yellow. These will be the Math Fact spaces.
14. Label each corner with one of the following:
Measure to the nearest $\frac{1}{4}$ inch
Measure to the nearest $\frac{1}{2}$ inch
Measure to the nearest 1 inch
" GO "

- 15. Give your game a name and write it in the middle of the game board.**
- 16. As a team, using the 2" by 3" cards, create a set of addition game cards, subtraction game cards, and multiplication game cards, using the colored sets of cards. Remember to use one colored set for each operation.**
- 17. Using the 3" by 3" cards, identify six objects that can be measured in the classroom. These cards will be used when you reach the corners.**
- 18. Decorate and make your game board attractive.**
 - * Fill in the empty spaces with your own ideas and activities and make sure to label the colored spaces for using the Math Fact cards.**

**WAHOO!!! You did a wonderful job making your game!!!
Tomorrow, you will be developing and writing directions on how to play your game.**

CRITERIA

- _____ Neat and colorful
- _____ Four sides accurately measured
- _____ Spaces labeled appropriately
- _____ Game directions clearly written
- _____ Game cards neat and correct
- _____ Directions followed correctly

_____ TOTAL POINTS

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_____ TOTAL POINTS

WRITING PROMPT

Your principal has decided that all of the games are outstanding and a decision cannot be made. It is your job to write a persuasive letter to a game company persuading them to select your game to be sold by the PTA. You also need to include a sketch of your game board design.

Remember your letter must include the elements of persuasion:

O pinion

R easons

E xamples

O pinions restated

Be sure to check for correct spelling, grammar, and punctuation.

Holistic Rubric

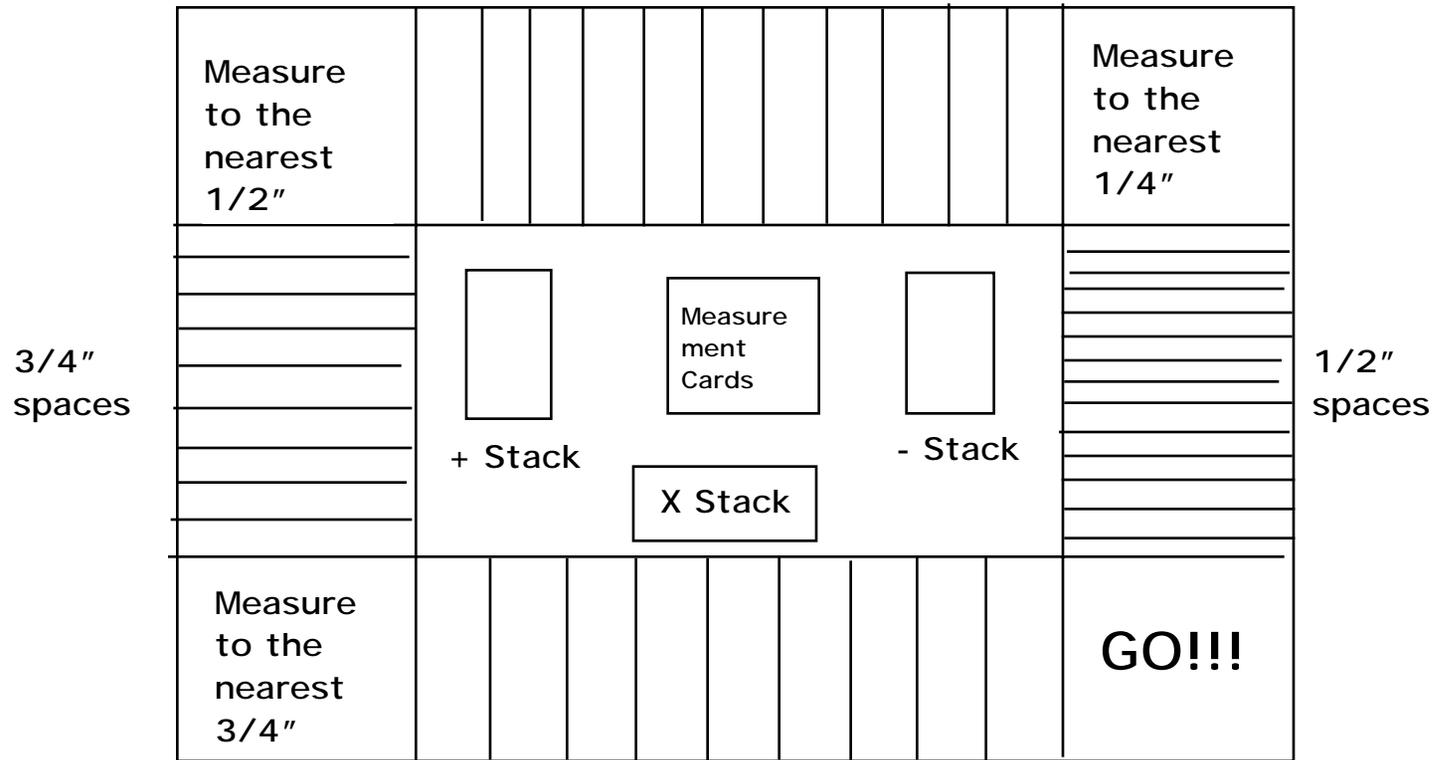
Writing to Persuade: Game Board

The writer:

- 3** includes at least three reasons and examples for their game to be produced
- includes all parts of a business letter
- always uses complete sentences
- has no errors in punctuation, capitalization, and spelling
- 2** includes only two reasons and examples for their game to be produced
- includes only four parts of a business letter
- sometimes uses complete sentences
- has very few errors in punctuation, capitalization, and spelling
- 1** includes only one reason and example for their game to be produced
- includes only three parts of a business letter
- rarely uses complete sentences
- has many errors in punctuation, capitalization, and spelling
- 0** little or no response

Sample Game Board Plan

Sides measured in 1" spaces



Sides measured in 1 1/2" spaces