

Meeting Standards with a Deck of Playing Cards

NCTM Session 676, Salt Lake City, Utah
Saturday, April 12, 2008, 10:00 a.m. - 11:30 a.m.

Session Description

Engage in hands-on activities that use a deck of playing cards to meet Content and Process Standards. Activities will include variations of card games with a mathematical twist (e.g., Integer War, Attribute Eights) and other card-based tasks.

Objectives

1. To use a deck of playing cards to illustrate concepts in mathematics.
2. To correlate activities to both content and process standards.
3. To discuss the place of this activity in the classroom and in preservice education.
4. To provide participants with a set of low-cost activities which have been prepared for classroom implementation.

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Games/Activities (Grades 3 through 8)

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Standards Reference

National Council of Teachers of Mathematics. (2000). *Principles and standards for school mathematics*.

Reston, VA: Author. (See <http://standards.nctm.org/>.)

(Goals and Expectations are listed with games/activities.)

Integer War

Using a standard deck of cards, or the cards from 1 (ace) to 10, cards are dealt to each student. Each student turns over a card. The first student to correctly add the numbers on the cards wins the hand and receives the cards. For integers, the given color code will be black is positive and red is negative. After all cards are played, the student who has the most cards wins the game.

Variations

- ❖ Addition (positive only).
- ❖ Multiplication (positive only).
- ❖ Integers (black is positive, red is negative).
- ❖ The jack, queen, and king cards can be counted as 10, or as 11, 12, and 13, respectively, or removed from the deck.
- ❖ Exponent War could be played, with the assistance of a calculator. Use a base (first card) and an exponent (second card), or a base (my card) and exponent (your card).

NCTM Standard 1, Number and Operations

Understand meanings of operations and how they relate to one another.

Grades 3-5

Understand various meanings of multiplication and division.

Understand the effects of multiplying and dividing whole numbers.

Compute fluently and make reasonable estimates.

Grades 3-5

Develop fluency in adding, subtracting, multiplying, and dividing whole numbers.

Fraction War

Using a standard deck of cards, or the cards from 1 (ace) to 10, cards are dealt to each student. Each student turns over two cards: a numerator (first card) and a denominator (second card). The student who has the larger fraction receives the cards. After all cards are played, the student with the most cards wins the game.

Variations

- ❖ The jack, queen, and king cards can be counted as 10, or removed from the deck.

NCTM Standard 1, Number and Operations

Understand numbers, ways of representing numbers, relationships among numbers, and number systems

Grades 6-8

Work flexibly with fractions, decimals, and percents to solve problems.

Compare and order fractions, decimals, and percents efficiently and find their approximate locations on a number line.

Salute

One general and two privates are needed for this game. Each private has half of a deck of cards, using 1 (ace) through 10. When the general says, “salute,” each private deals one card away from the deck and holds it face-up on his or her forehead. The general computes and states the product of the two numbers (positive only). Each private must find the value of the card on his or her forehead. After all cards are played, the student who has the most cards wins the game.

Variations

- ❖ Use integers (black is positive, red is negative).
- ❖ The jack, queen, and king cards can be counted as 11, 12, and 13, respectively, or removed from the deck.

NCTM Standard 1, Number and Operations

Understand meanings of operations and how they relate to one another.

Grades 3-5

Understand various meanings of multiplication and division.

Understand the effects of multiplying and dividing whole numbers.

Compute fluently and make reasonable estimates.

Grades 3-5

Develop fluency in adding, subtracting, multiplying, and dividing whole numbers.

24 with Playing Cards

Using a standard deck of cards, or cards from 1 (ace) to 10, place four cards face-up on the table. Each student, in turn, will use the cards to find a value of 24 using the correct order of operations for addition, subtraction, multiplication, and division. The student takes the cards used. Empty slots are filled with new cards. Play continues until the deck is used. If a value of 24 cannot be reached, add another card to the table. After all cards have been played, the winner is the student with the most cards.

Variations

- ❖ The jack, queen, and king cards can be counted as 10 and/or as 11, 12, and 13, respectively, or removed from the deck.
- ❖ Use a fifth card for the target number, rather than 24. Place four cards in a row, with the target card beneath the row.
- ❖ Exponents can be used.
- ❖ Buy the game! See <http://www.math24.com/>

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Grades 3-5

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Understand the effects of multiplying and dividing whole numbers.

Compute fluently and make reasonable estimates.

Grades 3-5

Develop fluency in adding, subtracting, multiplying, and dividing whole numbers.

NCTM Standard 6, Problem Solving, Grades P-12

Apply and adapt a variety of appropriate strategies to solve problems.
Monitor and reflect on the process of mathematical problem solving.

NCTM Standard 7, Reasoning and Proof, Grades P-12

Select and use various types of reasoning and methods of proof.

NCTM Standard 8, Communication, Grades P-12

Use the language of mathematics to express mathematical ideas precisely.

Set with Playing Cards

Place 12 cards, face up, on the table as a 3 by 4 array. When a set can be seen, the student says, “set,” and removes the cards. Empty slots are filled with new cards. Play continues until the deck is used. If a set cannot be found, add three cards to the table. After all cards have been played, the winner is the student with the most cards.

Sets include the following:

Three of a kind, e.g., 7 of hearts, 7 of diamonds, 7 of clubs.

Three in a row, all of the same suit, e.g., 3 of hearts, 4 of hearts, 5 of hearts.

Three in a row, all different suits, e.g., 8 of clubs, 9 of hearts, 10 of diamonds.

Ace can precede 2 or follow king.

Variations

- ❖ Buy a deck of Set cards!
- ❖ Solve the daily puzzle, online, with six solutions. See <http://www.setgame.com/>

NCTM Standard 2, Algebra

Understand patterns, relations, and functions

Grades 3-5

Describe, extend, and make generalizations about geometric and numeric patterns.

Represent and analyze patterns and functions, using words, tables, and graphs.

Grades 6-8

Represent, analyze, and generalize a variety of patterns with tables, graphs, words, and, when possible, symbolic rules.

NCTM Standard 7, Reasoning and Proof, Grades P-12

Select and use various types of reasoning and methods of proof.

NCTM Standard 10, Representation, Grades P-12

Use representations to model and interpret physical, social, and mathematical phenomena.

Area

1. Find the length, width, perimeter, and area of the playing card using U.S. customary units.
2. Find the length, width, perimeter, and area of the playing card using metric units.
3. If the playing card is an irregular shape, trace it on a piece of graph paper (square-inch, square-half-inch, or square-centimeter) to estimate the area.
4. Place one vertex of the playing card at the origin on a coordinate plane of square-inch paper (or square-half-inch paper, or square-centimeter paper). To the nearest inch (or unit used), label all vertices. Use both portrait and landscape orientations in each of the four quadrants.

Variations

- ❖ Adjust the unit size of the paper, and number of sheets of paper needed, based on the size of the card.
- ❖ In “portrait” orientation, draw one diagonal of the card, from the origin to the upper-right corner. Determine the slope of the line. Repeat with the other diagonal.
- ❖ Repeat the previous variation when the card is drawn in “landscape” orientation.
- ❖ Use the Pythagorean theorem to find the length of the diagonal.
- ❖ Use the distance formula to find the length of the diagonal.
- ❖ Find the point of intersection of the two diagonals using a system of two linear equations in two variables.

NCTM Standard 3, Geometry

Specify locations and describe spatial relationships using coordinate geometry and other representational systems.

Grades 3-5

Make and use coordinate systems to specify locations and to describe paths.

Apply transformations and use symmetry to analyze mathematical situations.

Grades 3-5

Predict and describe the results of sliding, flipping, and turning two-dimensional shapes.

Identify and describe line and rotational symmetry in two- and three-dimensional shapes and designs.

Grades 6-8

Describe sizes, positions, and orientations of shapes under informal transformations such as flips, turns, slides, and scaling.

Examine the congruence, similarity, and line or rotational symmetry of objects using transformations.

NCTM Standard 4, Measurement

Understand measurable attributes of objects and the units, systems, and processes of measurement.

Grades 3-5

Understand such attributes as length, area, weight, volume, and size of angle and select the appropriate type of unit for measuring each attribute.

Understand the need for measuring with standard units and become familiar with standard units in the customary and metric systems.

Grades 6-8

Understand both metric and customary systems of measurement.

Apply appropriate techniques, tools, and formulas to determine measurements.

Grades 3-5

Develop strategies for estimating the perimeters, areas, and volumes of irregular shapes.

Quiz Time

For a 10-item, true-false quiz, a student decides to use a deck of playing cards to select answers. Red will represent “true” and black will represent “false.” After randomly drawing a card and recording the answer, replace the card within the deck so that each card will be as likely to be drawn for each of the quiz items. What the student doesn’t know is that the teacher made up the answer key in the same manner. Using two decks of cards, simulate the teacher’s answer key and the student’s answers. Approximately what percent of quiz items will be correct? Write this value as a fraction, a decimal, and a percent.

Variations

- ❖ Use the four card suits, clubs, diamonds, hearts, and spades, to represent multiple-choice answers, “a,” “b,” “c,” and “d.” Approximately what percent of quiz items will be correct? Write this value as a fraction, a decimal, and a percent.
- ❖ Conduct 10 trials. Report the mean, median, and mode.
- ❖ Conduct 10 trials. Display the results in a graph.

NCTM Standard 5, Data Analysis and Probability

Understand and apply basic concepts of probability

Grades 3-5

Predict the probability of outcomes of simple experiments and test the predictions.

Understand that the measure of the likelihood of an event can be represented by a number from 0 to 1.

NCTM Standard 9, Connections, Grades P-12

Recognize and apply mathematics in contexts outside of mathematics.

NCTM Standard 10, Representation, Grades P-12

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

Use representations to model and interpret physical, social, and mathematical phenomena.

Attribute Eights

Using a standard deck of cards, identify the following attributes: (a) suit (clubs, diamonds, hearts, spades); and (b) number (1/ace through 10, jack, queen, king). Deal seven cards to each student. Turn over one card next to the deck as a discard pile. The student to the right of the dealer begins play. The student must play a card that shares an attribute with the card next to the deck, or an “8.” If the student cannot play a card, the student must draw one card from the deck. Play continues until one student plays all cards in his or her hand. If no student has played all cards before the deck is used, the winner is the student with the fewest cards.

Variations

- ❖ Use factors and multiples of the card on the discard pile.

NCTM Standard 1, Number and Operations

Understand numbers, ways of representing numbers, relationships among numbers, and number systems

Grades 3-5

Describe classes of numbers according to characteristics such as the nature of their factors.

Grades 6-8

Use factors, multiples, prime factorization, and relatively prime numbers to solve problems.

NCTM Standard 9, Connections, Grades P-12

Recognize and apply mathematics in contexts outside of mathematics.