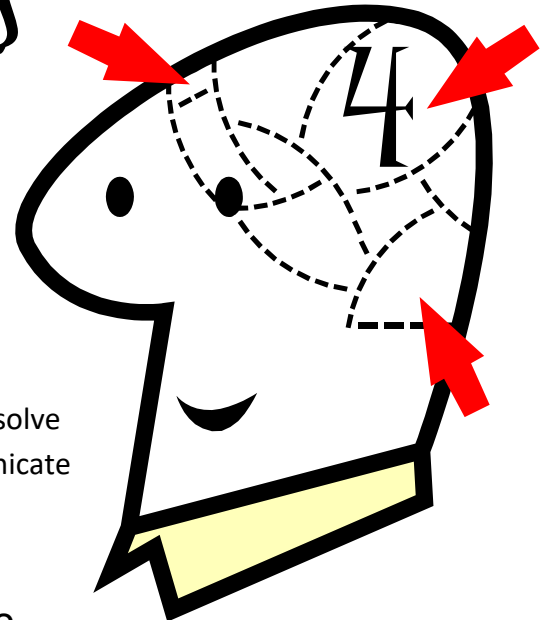


Four-Heads



Primary Objectives:

Students will:

- Practice grade-level appropriate math skills.
- Develop mathematical reasoning.
- Move flexibly between concrete and abstract representations of mathematical ideas in order to solve problems, model mathematical ideas, and communicate solution strategies.

Examples of **Possible** Academic Standards to Incorporate:

Kindergarten:

- 6.2.1 Count objects in a set and use numbers, including written numerals to 25.
- 6.2.5 Model the numbers 1 through 10 as sums or differences of different sets of whole numbers (composing and decomposing numbers).
- 6.2.10 Recognize 6 through 10 as “five and some ones.”
- 6.2.13 Add and subtract single-digit numbers whose total or difference is between 0 and 10.
- 6.2.14 Understand add as “put together” or “count on” and solve addition problems with sums less than 20.
- 6.2.15 Understand subtraction as “break apart” or “take away” and solve subtraction problems using numbers 1 through 10.
- 6.2.17 Understand that numbers can be represented by different groupings.

1st Grade:

- 6.1.8 Recognize the “word clues” and mathematical symbols for addition and subtraction.
- 6.2.3 Develop strategies for learning basic addition facts and related subtraction facts.

- 6.2.4 Use multiple representations (including groups of ten) to model two-digit addition and subtraction.
- 6.2.8 Relate “counting on” and “counting back” to addition and subtraction and understand them as inverse operations.
- 6.2.9 Add three single-digit numbers.
- 6.2.12 Use various models to develop strategies for solving arithmetic problems.
- 6.2.13 Solve problems that require addition and subtraction of numbers through 100.

2nd Grade

- 6.2.7 Develop fluency at recalling basic addition facts and related subtraction facts.
- 6.2.8 Use efficient procedures, and understand why they work, to solve problems involving the addition and subtraction of two- and three-digit whole numbers (including those that require regrouping for addition only).
- 6.2.9 Apply appropriate methods to estimate and mentally calculate sums or differences with ones, tens, and hundreds.
- 6.2.10 Add three two-digit numbers.
- 6.2.11 Solve addition and subtraction problems in context using various representations.

3rd Grade

- 6.2.2 Develop understanding of multiplication and related division facts through multiple strategies and representations.
- 6.2.4 Solve multiplication and division problems using various representations.
- 6.2.4 Use a variety of methods to perform mental computations and compare the efficiency of those methods.
- 6.2.1 Read and write numbers up to 10,000 in numerals and up to 1,000 in words.
- 6.2.5 Identify various representations of multiplication and division.
- 6.2.6 Recall basic multiplication facts through 10 times 10 and the related division facts.
- 6.2.7 Compute multiplication problems that involve multiples of ten using basic number facts.
- 6.2.8 Solve problems that involve the inverse relationship between multiplication and division.
- 6.2.9 Solve contextual problems involving the addition (with and without regrouping) and subtraction (with and without regrouping) of two- and three digit whole numbers.

4th Grade

- 6.2.6 Solve problems involving whole numbers, fractions, and/or decimals using all four arithmetic operations.
- 6.2.3 Multiply two- and three-digit whole numbers.
- 6.2.6 Divide three-digit whole numbers by one-digit divisors fluently with pencil and paper.
- 6.2.13 Solve multi-step problems of various types using whole numbers, fractions, and decimals.
- 6.2.12 Solve problems using whole number division with one- or two-digit divisors.
- 6.2.11 Solve problems using whole number multi-digit multiplication.

5th Grade

- 6.2.3 Develop fluency with division of whole numbers. Understand the relationship of divisor, dividend, and quotient in terms of multiplication and division.
- 6.2.6 Add and subtract mixed numbers.
- 6.2.7 Understand the placement of the decimal point in calculations of multiplication and long division, including the placement in the estimation of the answer.
- 6.2.1 Read and write numbers from millions to millionths in various contexts.
- 6.2.4 Solve problems involving the division of two- and three-digit whole numbers by one- and two-digit whole numbers.

6th Grade

- 6.2.1 Understand and explain the procedures for multiplication and division of fractions, mixed numbers, whole numbers, and decimals.
- 6.2.2 Solve multi-step mathematical, contextual and verbal problems using fractions, mixed numbers, whole numbers, and decimals.

7th Grade

- 6.2.1 Extend understandings of addition, subtraction, multiplication and division to integers.
- 6.2.15 Report results of calculations appropriately in a given context (i.e. using rules of rounding, degree of accuracy, and/or significant digits).
- 6.2.5 Solve contextual problems that involve operations with integers.

- 6.1.2 Apply and adapt a variety of appropriate strategies to problem solving, including estimation, and reasonableness of the solution.
- 6.1.1 Use mathematical language, symbols, and definitions while developing mathematical reasoning.

8th Grade

- 6.1.2 Apply and adapt a variety of appropriate strategies to problem solving, including estimation, and reasonableness of the solution.
- 6.1.1 Use mathematical language, symbols, and definitions while developing mathematical reasoning.
- 6.1.5 Use mathematical ideas and processes in different settings to formulate patterns, analyze graphs, set up and solve problems and interpret solutions.
- 6.1.6 Read and interpret the language of mathematics and use written/oral communication to express mathematical ideas precisely.
- 6.1.8 Use a variety of methods to solve real-world problems involving multi-step linear equations (e.g., manipulatives, technology, pencil and paper).

High School: Algebra

- 2.1.5 Recognize and use mathematical ideas and processes that arise in different settings, with an emphasis on formulating a problem in mathematical terms, interpreting the solutions, mathematical ideas, and communication of solution strategies.
- 2.1.6 Use a variety of strategies to estimate and compute solutions, including real-world problems.
- 2.1.20 Estimate solutions to evaluate the reasonableness of results and to check technological computation
- 2.2.1 Understand computational results and operations involving real numbers in multiple representations.

Examples of **Possible** Math Academic Vocabulary to Incorporate:

Kindergarten

- | | | |
|--------------|------------|---------------|
| • Addition | • Location | • Position |
| • Afternoon | • Minus | • Shapes |
| • Classify | • Number | • Sort |
| • Compare | • Order | • Subtraction |
| • Difference | • Pattern | • Sum |

- Time
- Today

- Value
- Zero

1st Grade:

- Data
- Digit
- Direction
- Equal to
- Estimate
- Even

- Greater than/less than
- Numeral
- Odd
- One-half
- Part
- Place value

- Plus
- Skip count
- Solve
- Symbol
- Total
- Whole
- Whole number

2nd Grade:

- Dollar
- Elapsed time/time interval
- Equivalent
- Event

- Extend
- Fraction
- Interpret
- Likely/unlikely
- Multiplication
- One-fourth

- One-third
- Outcome
- Second (time)
- Set
- Unknown

3rd Grade:

- Conclusion
- Conjecture
- Decimal
- Denominator (like, unlike)
- Division

- Divisor
- Factor
- Frequency
- Multiples
- Numerator
- Product

- Quotient
- Reasonableness
- Fraction

4th Grade:

- Accuracy
- Chance
- Common fraction
- Computation
- Convert

- Expression
- Improper fraction
- Mixed number
- Prime
- Probability

- Proper fraction
- Relationship
- Remainder
- Right

5th Grade:

- Exponent
- Exponential notation
- Formula
- Inequality
- Model
- Natural numbers

- Numerical data
- Order of operations
- Rational numbers
- Remainder
- Round

- Significant digits
- Solution
- Undefined
- Variable
- View

6th Grade:

- Base (of exponent)
- Circumference
- Negative

- Percent
- Random
- Sample
- Similarity

- Simple event
- Simulation

7th Grade:

- Absolute value
- Function
- Least common multiple

- Linear equation
- Negative exponents
- Property

- Scientific notation
- Square root

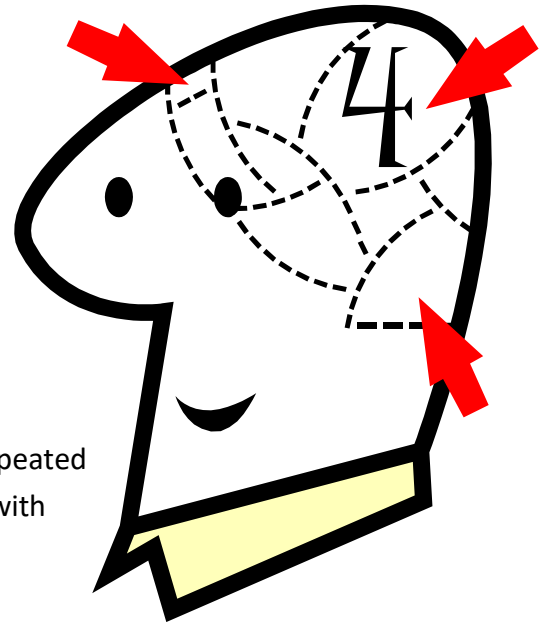
8th Grade:

- Infinite
- Monomial
- Polynomial
- Sequence
- Deductive and inductive reasoning
- Simulation

Four-Heads

Use the following games to help students practice the following grade-level appropriate math skills.

Note: Some skills are in **bold** to help you see which skills are repeated in multiple age groups and grades, and so can be worked on with multiple age-groups.



Kindergartners need to:

- Count up and down (with pictures and/or numbers)
- Add and subtract the numbers **1-10** with single digit numbers (with or without pictures)

1st Graders:

- Adding and subtracting with numbers and pictures
- The numbers **1-20**
- Adding one and two digit numbers for sums up to 20
- Subtracting one-digit numbers from two-digit numbers

2nd Graders:

- Adding and subtracting with numbers and pictures
- Adding and subtracting multiples of 100
- Adding and subtracting two three-digit numbers
- word problems
- Adding and subtracting three or more numbers
- The numbers **1-20**
- Subtracting multiples of 10
- Adding one and two digit numbers for sums up to 20

3rd Graders:

- Adding three or more numbers up to three digits each
- Adding two numbers with four or more digits
- Adding two numbers with four or more digits
- **Working on multiplication and division facts up to 12**

4th Graders:

- **Practicing multiplication and division facts to 12**

- **Multiply 1 digit numbers by larger numbers.**
- Multiplying two digit numbers by two digit numbers.
- Divide larger numbers with one digit divisors.
- Divide by two digit numbers.

5th Graders:

- Add and subtract decimal numbers
- **Multiplication facts to 12**
- **Multiply by 1-digit numbers**
- Multiply numbers ending in zeroes
- Multiply by 3-digit numbers
- Multiply three numbers up to 3 digits each
- **Division facts to 12**
- Divide multi-digit numbers by 1-digit numbers
- Divide numbers ending in zeroes
- Divide by 2-digit numbers
- Add, subtract, multiply, and divide whole numbers
- Reduce fractions to simplest form (Ex. Write $\frac{4}{10}$ in simplest form)

6th Grade:

- Add, subtract, multiply, and divide money amounts
- Add and subtract decimals and whole numbers
- **Multiply whole numbers, numbers ending in zero, and whole numbers with four or more digits**
- Divide whole numbers, numbers ending in zero, and whole numbers with 2 to 3 digit divisors
- Multiply and divide decimals
- **Add, subtract, multiply, and divide whole numbers.**
- Add and subtract fractions with like or unlike denominators
- Reduce fractions to simplest form (Ex. Write $\frac{4}{10}$ in simplest form)

7th Grade:

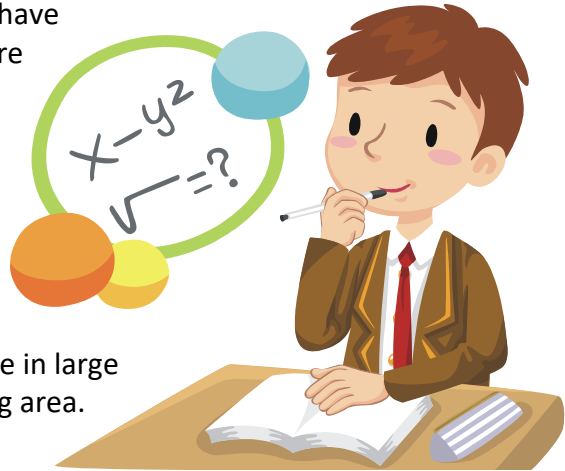
- Add and subtract multiply and divide decimals.
- Add, subtract, multiply, and divide money amounts, ex. Word problems.
- Estimate to solve word problems
- Simplify fractions
- Find the least common denominator
- Reduce fractions to simplest form (Ex. Write $\frac{4}{10}$ in simplest form)

8th Grade and higher:

- Add and subtract integers (using counters or not using counters) Ex. $2 - -1 = ?$
- **Multiply and divide integers ($-6 \times -5 = ?$)**
- Simplify fractions
- Find the least common denominator
- Add, subtract, multiply, and divide rational numbers

Math Jeopardy!

Reviewing math skills can be fun and entertaining if you review them in the Jeopardy game format. Not only is it fun, it provides students with the opportunity to work together to solve problems. Everyone benefits as slower students will have good role models for solving math problems and more advanced students can be challenged by more difficult questions.



1. Using five library book pockets designed to fit into the back of a library book, or small envelopes, label the point value from 100 to 500 in hundreds on the envelopes. You will need at least 5 sets to complete your Jeopardy game board. Be sure to write in large numbers that can be read from the classroom seating area.
2. The Teacher will create a large chart on poster board. Mark a space for the heading of each category such as addition, subtraction, division, and "word problems." Write the category on index card and stick it on with double sided tape or Velcro® dots the categories can be changed whenever the Teacher wishes to review new concepts.
3. Label each category in large colorful print. You may wish to layout the columns that will hold the pockets with bold lines. Be sure to allow enough room for the pocket to fit inside the area you mark.
4. Remove the paper backing on the adhesive of the library pockets or put tape or glue on the backs of envelopes and place them in columns under each category. 100 should be the first pocket in the column and it should end with 500.
5. Create a set of math problems (or use flashcards) to fit each category and add the questions to the individual pockets.
6. Play the game as a whole class or in small groups. Allow students to choose a category and the point value. Remove the first question. If the student answers correctly he is awarded the point value he chose. If he answers incorrectly deduct that number of points from his total score.

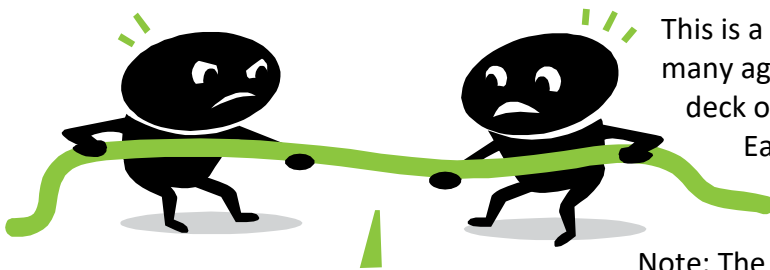
Option: You can even include 2 Daily Doubles for double the points if you wish.

Four-head Math

1. The Teacher will have a stack of playing cards, with the face cards and ace pulled out leaving the numbers 1-10, and will have the students split into two teams.
2. The Teacher will have the students line up in their teams, with the first person in each line facing the first person in the other line.
3. The Teacher will put a number card on the two students foreheads, the student holding it in place so that they can see the opposing player's card but not their own.
4. The Teacher will then give the solution to a math problem using the two numbers on the cards (addition, subtraction, multiplication) Ex. Student A has 8. Student B has 4. $8 \times 4 = 32$ so the teacher would say 32.
5. The students must guess what their number is before the other student guesses their own. (In the example Student A must say 8 and Student B must say 4). The student who gets it correct first gains a point for their team.



Math War (Partner Game)

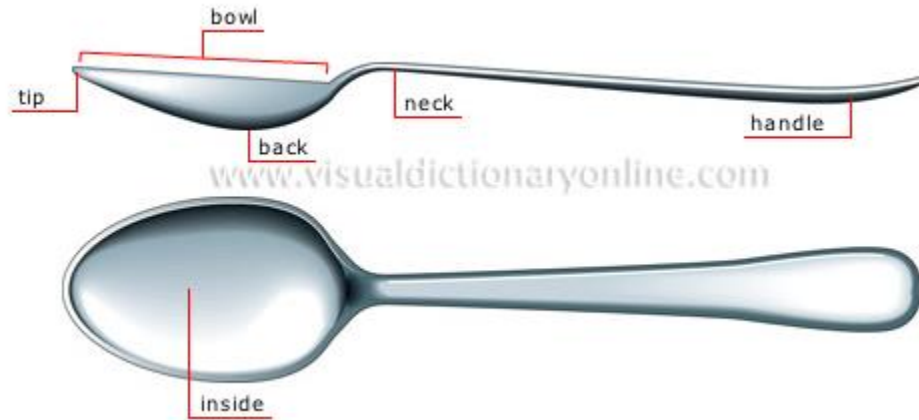


This is a partner game that can be modified for many age and skill levels. The Teacher will need a deck of cards per pair (minus the picture cards). Each student flips a card over and the first one to add the exposed numbers together wins those cards.

Note: The Teacher can modify this game and have the children subtract or multiply the numbers instead. Kids who didn't want to learn their multiplication tables suddenly want to know the answers so that they will win the game.

Snag a Spoon!

In this version of the classic card game, students gain a solid understanding of basic equivalents, while having so much fun they may not realize it's a math review. But



when it comes time for that big equivalents quiz, your students will remember the equivalents practice they got while snatching that spoon!

Note: This game can also be modified to practice other skills. Ex. Have students have a goal number they must reach using addition/subtraction, such as 10. So students could have a 6,3, 2, 1 in their hands and say “6+3+2-1=10” and grab a spoon.

Materials:

- White paper
- Marker
- Spoons

What You Do:

1. Cut sheets of white paper into 52 playing cards. Divide the cards into 13 sets of 4.
2. For each of the 13 sets, choose a decimal, such as .25, and write it on one of the cards. On the rest of the cards in the set, write equivalent percents or fractions. For example, one set of cards would be: .25, 25%, 25/100, 25%.
3. As you are making the game, explain decimal and fraction equivalents by applying them to money. For example, explain that \$.25 = 25 cents. 25 cents = 25 pennies. There are 100 pennies in a dollar. Therefore, \$.25 (25 cents) = 25/100. Next, explain decimal and percent equivalents. For example, remind your child that .25 = 25/100. 25/100 means “25 per 100”. “Cent” means 100 (in Latin) 25/100 = 25 percent or 25%
4. Once the playing cards are complete, shuffle and gather a few more players. In the middle of the table, place one less spoon than the number of players. For example, if there are 5 players, use 4 spoons. Deal 4 cards to each player and explain the rules.
5. The object is to get “4 equivalents of a kind”, for example .30, 30/100, 30%, .30. The dealer will begin by taking the top card from the deck. She will look at it and decide if

she wants to keep it or pass it. If she keeps it, she must discard one of her cards and pass it face-down to the next player. If she doesn't want it, she simply passes the card face-down to the next player.

6. Play continues in a circle until one player gets "4 equivalents of a kind". That player grabs a spoon – trying to do so secretly. As soon as another player notices someone has grabbed a spoon, he should grab one, too! Suddenly, everyone will be grabbing for a spoon! The player who does not get a spoon is out. Remove one and continue playing until there are no spoons left – whoever gets the last one is the champion!

Note: Play moves quickly so be sure all players have 4 cards at all times.

As your fifth-grader's knowledge of equivalents becomes more advanced, make playing cards of equivalent fractions in lowest terms. For example, .25, 25%, $\frac{1}{4}$, 25/100 or .50, 50%, $\frac{1}{2}$, 50/100.



Shiritori!

This is a great warm up game from Japan for older elementary or junior high kids! The traditional way to play it is to write a word, then the next kid comes and writes another word that begins with the last letter of the previous word.

In this math version the kids have to write a sum on the board. But the first number of their sum has to start with the last number of the previous sum e.g.

$1 + 2 = 3$
 $3 - 2 = 1$
 $1 + 6 = 7$
 $7 - 2 = 5$ etc.

1. The Teacher will split the kids into two groups.
2. The Teacher will start the stopwatch
3. The front person from each group writes a sum on the board e.g. " $4 + 2 = 6$ "
4. The next person from the group comes up and writes a sum that starts with the last number of the previous sum. e.g. if the last sum was " $4 + 2 = 6$ " the new sum could be " $6 - 3 = 3$ " or " $6 + 4 = 10$ " etc.
5. Repeat from step 4.
6. When the time is up, see which team has the most sums!

You could also decide to give 2 marks for longer or advanced sums!!

Note: The Teacher may want to assign a certain type or two types of math problem to make it more challenging such as Division/Multiplication or Adding/Subtraction.