The 24 Game

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The **24 Game** is a popular math card game developed in China in the 1960s. The object of the game is to use arithmetic to find ways to manipulate four numbers so that the end result is the number 24. Addition, subtraction, multiplication, and division (and parentheses) are the tools that may be used to transform the four digits into 24. More advanced versions of the game also use exponents.

The rules are simple. All four numbers must be used once and only once and the final answer must always be 24. For example, given the numbers 1, 2, 4, 3 possible solutions include the following:

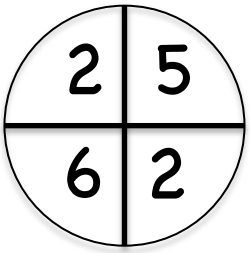
1 x ***2*** = 2 → 2 x ***4*** = 8 → 8 x ***3*** = 24

1 + ***2*** = 3 → 3 + ***3*** = 6 → 6 x ***4*** = 24

2 + ***4*** = 6 | ***1*** + ***3*** = 4 → 4 x 6 = 24

Often there is more than one correct solution as 24 can be reached in a number of different ways. However, depending on the numbers chosen, a solution may not be possible. In the Blackboard version teachers should take care in choosing numbers that have a solution. In the Playing Card version the numbers are random and so may not work out.

Blackboard 24 Game



This is a great way to begin a class (Bell Work), end a class (Reward) or break up a long math period (Refocus). Draw a circle on the blackboard, divide it into four quadrants and write a number in each quadrant as shown in the diagram on the right. Provide your class some scrap paper and a pencil and challenge the class to find possible solutions like the one provided. In the beginning, make sure that you choose numbers that work out. The 24 Game is an exercise in problem solving activity that reinforces the basic skills (+ - x ÷). Although the numbers may not be challenging, visualizing and solving a three-step problem is. Most students have the competencies to be successful with this problem solving activity. The 24 Game can help students to view the skills of arithmetic as useful tools and develop some self-confidence in the process. All of these conditions make the 24 Game fun for students.

5 - ***2*** = 3 | ***6*** + ***2*** = 8 → 8 x 3 = 24

The basic game outline above can be morphed into any popular classroom challenge like:

- boys against the girls
- math baseball
- mad minute
- 100% equals a Party! (if the whole class solves the challenge, celebrate on Friday)

Regardless of how you use the 24 Game, I recommend that you insist that your students show each step of their solution as a complete number sentence, like the solutions presented here.

Factors of 24

1 x 24 = 24
2 x 12 = 24
3 x 8 = 24
4 x 6 = 24

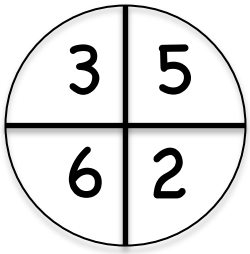
1, 2, 3, 4, 6, 8, 12, 24

Using Factors to Help Solve the 24 Game

The reason the number 24 is the object of this game is because there are so many way to make 24 from four numbers. This is

mainly a result of the many factors that 24 has. Knowing the factors of 24 provides a useful strategy for students to pursue.

Take two of the numbers and try to make them equal a factor of 24. Then take the other two numbers and try to make them equal the corresponding factor of 24. Finally multiply the two factors to get 24.



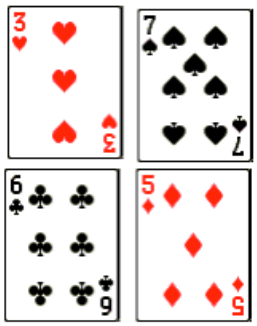
5 + 3 = 8 (a factor of 24)→ can 6 & 2 be made to equal 3 (the corresponding factor)? Yes they can…divide them. 6 ÷ 2 = 3 and 3 x 8 = 24

Also

5 - 3 = 2 (a factor of 24)→ can 6 & 2 be made to equal 12 (corresponding factor)? Yes they can…multiply them. 6 x 2 = 12 and 2 x 12 = 24

This does not work all of the time, but it is a good place to start or a strategy to try if a solution does not jump out at you.

Playing Card 24 Game



7+ 5= 12 | 6÷3=2
12 x 2=24

Originally the 24 Game was played with an ordinary deck of playing cards with all the face cards removed and the aces given the value of 1. The game proceeds by dealing four cards face up. The first person that can achieve the number 24 exactly using only addition, subtraction, multiplication, division, and parentheses wins the hand and keeps the cards. If 24 is not possible and everyone gives up, the cards are shuffled back into the deck. The game continues until all the cards are gone. In this version, the player with the most cards wins.

Another version of the game has all the cards being dealt out to four players. A round begins with each player flipping over a card and pushing it to the middle of the table for all to see. The first player to solve the set and get 24, takes the four cards and replenishes their pile. Players are eliminated as they run out of cards.

The game can be made more difficult by including the face cards, Jack, Queen, and King, giving them the values 11, 12, and 13, respectively.

Commercial 24 Game

The game was first developed in China with ordinary playing cards. It is now available as a commercial math game with many variations including:

- add/subtract
- multiply/divide
- factors/multiples
- integers
- single digits
- double digits
- fractions/decimals
- algebra/exponents

Games cost about $25 each and are available from educational suppliers or from www.24game.com