## The 44 puzzle

24 is a classic math card game where you select cards and use addition subtraction, multiplication and division to create the number 24. Math problems like this have been used by classroom teachers to review basic skills as well as challenge students to think in creative ways about basic operations.

A similar math problem called “The 44 puzzle” does not require cards. This problem was very common in old math books so many solutions are available. It is important to review the order of operations and the use of parentheses before you hand out the challenge.

You must decide if you will limit the operations to addition subtraction, multiplication and division to create the numbers or allow other operations like square roots. Continuation, that is, 44 and 444.can be used. All solutions may not exist using only addition subtraction, multiplication and division but thats OK. If all the operations of math are used then there is a solution. but you may need to use factorials and other operations to complete this puzzle.

## The 44 puzzle

Use four 4’s and any operations you like to write equations that have the numbers from 0 to 88 as the answer. For more complicated answers you may use parentheses to make the order of operations clear. A solution for each number may not be possible using just addition subtraction, multiplication and division. You may also consider using a square root in you solution and even then all the numbers may not have a solution.

For example $4 + 4 – 4/4$ requires the 4/4 be done first so $4 + 4 – 4/4 = 4 + 4 –1 = 7$
but $(4 + 4 –4 ) / 4 = 4/4 = 1$

I put this chart on the wall

## The 44 puzzle

Bring up the solution to me. If you are the first to find a solution for that number I will list your solution and your name next to that number.

1. _____ 2. _____ 3. _____ 4. _____

5. _____ 6._____ 7. _____ 8. _____

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85. _____ 86. _____ 87. _____ 88. _____

One advantage of these type of problems is that every students can get a lot of solutions. The harder to find solutions can be left to the very clever or very diligent students.

### Change the problem

Its easy to change the problem to allow the use of more numbers or different numbers. Just change the rules and put up a chart. It takes very little work and creates a lot of math activity in the class.

Some possible solutions are shown below. Addition, subtraction, multiplication, division, square roots sqrt. and factorials are used. Continuation, that is, 44, 444 can be used.

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|---|---|---|---|
| 0 = 44-44 | 1 = 44/44 | 2 = 4/4+ 4/4 | 3 = (4+ 4+ 4)/4 |
| 4 = 4*(4-4)+ 4 | 5 = (4*4+ 4)/4 | 6 = 4*.4+ 4.4 | 7 = 44/4-4 |
| 8 = 4 4.4-.4 | 9 = 4/4+ 4 4 | 10 = 44/4.4 | 11 = 4/.4+ 4/4 |
| 2 = (44+ 4)/4 | 13 = 4!-44/4 | 14 = 4*(4-.4) -.4 | 15 = 44/4+4 |
| 6 = .4*(44-4) | 17 = 4/4+4*4 | 18 = 44*.4+.4 | 19 = 4!-4-4/4 |
| 20 = 4*(4/4+4) | 21 = (4.4+4)/.4 | 22 = 44*sqrt(4)/4 | 23 = (4*4!-4)/4 |
| 24 = 4*4+4+4 | 25 = (4*4!+4)/4 | 26 = 4/.4+4*4 | 27 = 4-4/4+4! |
| 28 = 44-4*4 | 29 = 4/.4/.4+4 | 30 = (4+4+4)/.4 | 31 = (4!+ 4)/4+4! |
| 32 = 4*4+4*4 | 33 = (4-.4)/.4+4! | 34 = 44-4/.4 | 35 = 44/4+4! |
| 36 = 44-4-4 | 37 = (sqrt(4)+4!)/sqrt(4)+4! | | 38 = 44-4!/4 |
| 39 = (4*4-.4)/.4 | 40 = 44-sqrt(4*4) | 41 = (sqrt(4)+4!)/.4-4! | 42 = sqrt(4)+44-4 |
| 43 = 44-4/4 | 44 = 44.4-.4 | 45 = 4/4+44 | 46 = 44-sqrt(4)+4 |
| 47 = 4!+4!-4/4 | 48 = 4*(4+4+4) | 49 = (4!-4.4)/.4 | 50 = 4!/4+44 |
| 51 = (4!-sqrt(4))/.4-4 | 52 = 4+4+44 | 53 = sqrt(4)/.4+4!+4! | 54 = 4/.4+44 |
| 55 = 44/(.4+.4) | 56 = 4*(4/.4+4) | 57 = (4!-.4)/.4-sqrt(4) | 58 = (4^4-4!)/4 |
| 59 = 4!/.4-4/4 | 60 = 4*4+44 | 61 = 4!/.4+4/4 | 62 = (.4+.4+4!)/.4 |
| 63 = (4^4-4)/4 | 64 = 4!-4+44 | 65 = (4^4+4)/4 | 66 = (4!+4)/.4-4 |
| 67 = (sqrt(4)+4!)/.4+sqrt(4) | | 68 = 4*4*4+4 | 69 = (4-.4+4!)/.4 |
| 70 = 4!/.4+4/.4 | 71 = (4!+4.4)/.4 | 72 = ????? | 73 = ?????? |
| 74 = (4!+4)/.4+4 | 75= 4!/(.4+.4)/4 | 76 = 4!/.4+4*4 | 77 = sqrt(4/.4~)^4-4 |
| 78 = 4*(4!-4)-sqrt(4) | 79 = (4!-sqrt(4))/.4+4! | 80 = 4*(4*4+4) | 81 = (4/4-4)^4 |
| 82 = 4*(4!-4)+sqrt(4) | 83 = (4!-.4)/.4+4! | 84 = 44*sqrt(4)-4 | 85 = (4/.4+4!)/.4 |
| 86 = 44/.4-4! | 87 = ????? | 88 = 44+44 | |

The first printed occurrence of this activity is in "Mathematical Recreations and Essays" by W. W. Rouse Ball published in 1892. In this book it is described as a "traditional recreation". In his discussion of the problem Ball calls it "An arithmetical amusement, said to have been first propounded in 1881, ...." . This date aligns with the appearance of the problem in Knowledge, An Illustrated Magazine of Science, (Dec 30, 1881) edited by Richard Proctor, the English astronomer who is remembered for one of the earliest maps of Mars.