

The Superply Games

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Game Summary

The *Superply Games* are reinforcement games for mathematics, science, and language arts. Here we concentrate on their use for the mathematics curriculum for grades 3 through 6 with possible extensions to higher grades. The game philosophy is simple: give children a fun, slightly competitive, experience to hone their skills. Each game reinforces a different topic, but the rules remain the same. Skill and strategy play a far larger role than luck. The games can be played on a board or on the web. We present the board game version here.

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SuperPly Rules

Equipment:

1. A board, one for each topic.
2. White, red, and orange tiles.

All boards consist of a grid, row and column headers, and an operation. The value in the leftmost cell in a row, the value in the column header, and the operation determine the value of the corresponding cell. For example, if the operation is multiplication, the leftmost value of a row is 5, and the column header is 4, then the value in the grid cell at the intersection of that row and column is 20. Similar tables have been created for addition, subtraction, division, least common multiple, place value, simple algebra.

The rules are simple:

1. Advanced players initialize the board by placing white tiles on all grid squares as in photo 1.
2. The Red and Orange Players alternate moves. In each move a player attempts to replace white tiles by his or her color. The Red Player wins by constructing a connected path across the board (from the left side to the right side). The Orange Player wins by constructing a connected path down

the board. Two tiles are connected if they touch vertically, horizontally, or diagonally (at corners).

3. A Red Player's turn proceeds as follows (the orange player moves analogously).

Red picks a card. It contains a hint. (For example, "a value containing a 2.") Red locates a grid cell covered by a white tile satisfying the hint expressed on the card. (On the multiplication board, the cell having value 12 corresponding to row 4 and column 3 would be one possibility.) If Red is correct then Red replaces the white tile by a red one. (See photo 2.) If incorrect, Orange places an orange tile there. In either case, Red's turn has ended. If both players agree that there is no such cell, then the card is removed.

Variant for Experienced Players:

If Red believes there is no cell covered by a white tile satisfying the hint, he or she says, "No cell. Challenge if you dare."

- i) Orange may then challenge by showing such a cell. If Orange is correct in the challenge, then Orange places an orange tile on that cell and Red's turn ends. If Orange is incorrect then Red places a red tile on the challenge cell and picks a new card.
- ii) Orange may choose not to challenge in which case Red picks a new card.

Those are all the rules. Note that younger or less advanced players need not cover the board with white tiles. So the situation after placing red tiles on 12 and 15 might look like photo 4. For advanced players, there are sophisticated strategies that may help you win if you remember the order of the cards. Please look for them.

Computer Version

The computer version of the game works the same way, but eliminates the need for white chips. Cells that haven't been claimed can simply be blank. Given a hint, clicking on a cell corresponds to putting down one's color on the cell. The computer can tell whether the hint is satisfied as well as the other adjacency rules. All of this could be implemented in a portable way on many browsers using, for example, Javascript.

Topics Covered

We have designed games for the following topics, which come from the standard NCTM curriculum.¹ Teachers may wish to vary the order of the presentation and the games can be played in any order and some can be skipped. Other topics can be added.

¹Principles and Standards for School Mathematics, published by National Council of Teachers of Mathematics, Inc. 1906 Association Drive, Reston, Va 20191-9988 www.nctm.org ISBN 0-87353-480-8

- Third Grade
 - Addition (single digit)
 - Subtraction facts (0-20)
 - Multiplication facts (1-9 on a side, though 1-12 is an option)
 - Identifying fractions (FractionPies)
 - Row headers: 1-4 (numerators)
 - Column headers: 1-8 (denominators)
 - Grid cells: pies showing the fraction.
 - Place Value
 - Row headers: 1 ten, 2 tens, 3 tens ..20 tens
 - Column Headers: 1 one, 2 ones, 3 ones ..12 ones
 - Grid cells, e.g.: 4 tens and 8 ones = 48
 - Rounding
 - Row headers: 69500 94449 55511 42888 80249 51417
 - Column headers: round to nearest 10, round to nearest 100, round to nearest 1000, round to nearest 10000.
- Fourth Grade
 - Addition facts: (one digit but out of order)
 - Column headers: 5,9,1,4,0,2,8,6,3,7
 - Row headers: 7,3,6,8,2,0,9,1,4,5
 - Grid cells: the sums
 - Subtraction facts: (three digit minus two digit)
 - Multiplication facts: (review of basic math facts)
 - Place Value (review of Third Grade material)
 - Multiplying by multiples of ten
 - Row headers: 1, 2, 3, 4, 5, 6, 7, 8, 9
 - Column headers: 10, 20, 30, 40, 50, 60, 70, 80, 90
 - Identifying fractions (review of FractionPies)
 - Renaming fractions
 - Row headers: nine numbers between 1 and 20
 - Column headers: nine numbers between 1 and 20
 - Grid cells: answers in simplest form so $15/9$ would be $1\ 2/3$.
 - Least Common Multiples
 - Row headers: nine numbers between 1 and 12
 - Column headers: nine numbers between 1 and 12
 - Grid cells: least common multiples (e.g. 9 and 6 have 18 as their least common multiple).

- Greatest Common Factors
 - Row headers: ten numbers between 2 and 20
 - Column headers: nine numbers between 2 and 15
 - Grid cells: greatest common factors (e.g. 12 and 9 have 3 as their greatest common factor).
- Fraction Addition
 - Row headers: fractions such as $1/2$, $1/3$, $3/8$, $1/6$, ...
 - Column headers: similar collection of fractions
 - Grid cells: their sum in simplest form so ($5/6 + 1/4$ would give $1 \frac{1}{12}$)
- Reading decimals
 - Row headers: tenths, hundredths, thousandths
 - Column headers: numbers from 1 to 20
 - Grid cells: words such as eight tenths, one and 4 tenths etc.

- Fifth Grade

- Advanced Place Value
 - Row headers: 10 tens, 14 ones, 35 tens, 18 ones, ...
 - Column headers: 10 hundreds, 15 hundreds, 12 thousands, 7 thousands, ...
 - Grid cells: the sum of the two in reduced form so 35 tens and 10 hundreds become 1,350.
- Multiplication facts (review)
- Multiplying by multiples of ten (review)
- Renaming fractions (review)
- Addition of fractions (review)
- Multiplication of fractions
 - Row headers: $1/2$, $1/3$, $1/4$, $1/5$, $1/6$, $2/3$, $3/4$, $5/6$, $6/7$, $7/8$, $8/9$, $1/12$, $5/12$
 - Column headers: $1/2$, $1/3$, $1/4$, $1/5$, $1/6$, $2/3$, $3/4$, $5/6$, $6/7$, $7/8$, $8/9$, $1/12$, $5/12$
 - Grid cells: products.
- Division of fractions (Similar to multiplication but the grid cells have quotients)
- Reading decimals (review)
- Addition of decimals
 - Row headers: .1, .2, .3, .4, .5, .6, .7, .8, .9, .02, 1.2, .03, .24, 9.86, 4.7
 - Column headers: .1, .3, .5, .6, .7, .8, .9, .02, 1.2, .03, .24, 9.86, 4.7
 - Grid cells: sums
- Multiplication of decimals (Similar to addition but with products)

- Sixth Grade
 - Multiplication facts (review)
 - Multiplying by multiples of ten (review)
 - Powers (exponents)
 - Row headers: 1-12
 - Column headers: 0, 1, 2, 3, 4
 - Side is the base, top is the power. Grids have value (eg. 3 on the side, 4 on the top, cell is 81)
 - Scientific Notation
 - Row headers: 24,000; 240,000; 7,000,000; 70,000; 9,100
 - Column headers: 10; 100; 1000; 10,000; 100,000
 - Grid cells: the product in scientific notation (e.g.. $24,000 \times 1000 = 2.4 \times 10^7$)
 - Integers (combining positives and negatives)
 - Row headers: positive and negative integers between -10 and 10
 - Column headers: positive and negative integers between -10 and 10
 - Grid cells: the sum.
 - Integers (multiplication and division)
 - Renaming fractions (review)
 - Addition of fractions (review)
 - Multiplication of fractions (review)
 - Division of fractions (review)
 - Reading decimals (review)
 - Addition of decimals (review)
 - Multiplication of decimals (review)
 - Long division
 - Row headers: large dividends 426, 5629, 872, 7871, ..
 - Column headers: divisors 151, 32, 14, 901
 - Grid cells: quotients and remainders.
 - Evaluation of algebraic formulas, e.g., given that $x = 2$, $y = 4$, and $z = -2$, evaluate $3x+2y+4z$. This gives $(3 \times 2) + (2 \times 4) + (4 \times (-2))$ or 6.
 - Solving simple algebraic equations
 - Row headers: $3x+2$, $2x+1$, $-4x+3$ Column headers: simple expressions: $x+3$, $4x+5$, $-2x -5$
 - Grid cells: solution for x assuming that row and column are equal (e.g., $3x+2$ and $4x+5$, when equal, imply that $x=-3$.)
- Extra-standard Enrichment

- Logic puzzles: (given facts about relative ages, determine how many people Joe is older than)
Example: Suppose a column header says, “Tom older than Judy. Judy older than Linda. David older than Linda. Tom older than Henry.” and a row header says “Joe older than Judy.” Then the grid cell will say 2.
- Elementary set theory: intersection, union, difference
- Word problems involving distance.