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Secret number sentence

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Here is a game for primary arithmetic, providing stimulating drill on mathematical sentences and on addition, subtraction, multiplication, and division combinations.

Player A secretly fills in this pattern with a number sentence:

□ ○ △ = ——

Player A must choose his numbers from some agreed-upon set. In Grade 2, a suitable set would be 0, 1, 2, 3, 4, 5, 6, 7, 8, 9. If he selects 6 + 3 = 9 as his secret number sentence, he replaces the square and the triangle with 6 and 3, the circle with the operational sign +, and the blank with 9. It must also be understood which operations are to be used.

Player B puts the following on his paper:

□	○	△	=	——
0	+	0		0
1	−	1		1
2		2		2
3		3		3
4		4		4
5		5		5
6		6		6
7		7		7
8		8		8
9		9		9

Then Player B proceeds to ask certain questions of Player A until he discovers what Player A's secret sentence is. The object is to discover the secret sentence in as few questions as possible. Player B can only ask the following questions:

1. Is the numeral in the (square, triangle, blank) equal to__?
2. Is the numeral in the (square, triangle, blank) greater than__?
3. Is the numeral in the (square, triangle, blank) less than__?
4. Is the operation__? (addition, subtraction, etc.)

Each time Player B asks a question about a position, he is able to eliminate one or more numerals under that position. For the secret sentence 6 + 3 = 9, the question, "Is the numeral in the square equal to 4?" would eliminate 4 as a possibility for the square. And the question, "Is the numeral in the square greater than 7?" would be answered "No," revealing that 8 and 9 are not possible. After these two questions, Player B's paper should look like this:

□	○	△	=	——
0	+	0		0
1	−	1		1
2		2		2
3		3		3
~~4~~		4		4
5		5		5
6		6		6
7		7		7
~~8~~		8		8
~~9~~		9		9

If his next question were, "Is the numeral in the square less than 5?" he would

get a response of "No," and cross off 0, 1, 2, and 3. Then one or two more questions will reveal that 6 is the numeral in the square.

As the game is played, the pupil should become aware that "greater than" and "less than" questions usually yield more information than "equal to" questions.

When Player B succeeds in discovering Player A's secret sentence, the roles are reversed and Player A becomes the questioner. The player who discovers the other player's secret with the fewest questions wins.

It is advisable to start the game with the teacher in the role of Player A and the children asking questions, and to proceed in this manner until the children know how to play. However, while the game is highly stimulating as a group activity, it is doubtful that the group approach will result in significant gain for the child who needs it most. The kind of thinking promoted by the game requires that the child have time to ponder—to decide which questions to ask, and what information an answer provides him.

In the upper grades the game can be made more challenging by including all four fundamental operations and by allowing the relationship to include "greater than" and "less than" as well as "equals," so that secret sentences such as $4 \times 8 < 380$ may be used.