Problems for the Web

P4W5: Putting Numbers in their Places

Curriculum Areas: Number Sense, Computation, Problem Solving

Introduction:

This is a real problem-solving activity in which students are given clues to decide which number belongs in which spot. This activity could be presented as a 'math mystery'. Frequently a clue will allow more than one number but eventually other clues will help to eliminate these possibilities (except for Game 2 which has two possible solutions).

This means that in solving the problems, students cannot simply process information in the order in which it is presented, but must go back and forth among the clues. This kind of 'intermingling' of data is necessary in reading most math books at secondary level and beyond. Puzzles like this are one way of introducing this type of reading to students.

The games are intended for a wide range of students.

For the Teacher:

Note that "between" should not be interpreted as "inclusive". That is, "between 3 and 6" means only 4 and 5, not 3, 4, 5, and 6.

Terms such as "multiple" (Game 9) may need review, but a teacher who is reading the clues to the class could use simpler words for some of the clues to make the problem suitable for younger children. Older students could make up problems that use fractions or decimals. In each case the numbers to be placed in the squares should be listed alongside the clues.

P4W5 a): Games

Answers to Games 1 to 6 (though you should really try them for yourself):

1: 6, 4, 5, 2, 1, 3

2: 2, 3, 5, 6, 4, 1 or 3, 2, 5, 6, 4, 1

3: 5, 4, 1, 6, 3, 2

4: 6, 4, 3, 2, 5, 1

5: 5, 2, 6, 4, 1, 3

6: 3, 1, 5, 2, 4, 6

For Games 7 to 9, students are asked to write clues so that there is only one solution. Some will find this difficult. Some will write clues such as "The number is 2". A discussion that shares clues written by different students will show all students a wide variety of clues. Different solutions will result from different clues, too.

Game 7: a is 6; b is either 1 or 2; c is either 3 or 4; d is 5; thus the new clues must establish placements for 1, 2, 3, 4.

Game 8: a is 1, 2, or 3; b is 5; c is 6; d is 4; thus the new clues must locate 1, 2, and 3.

Game 9: a is 1 or 3; b is 3 or 6; c is 4; d is 5; new clues must pin down 1, 2, 3, and 6.

P4W5 b): A Challenge

It is certainly easier to write clues for a game that has several different solutions (see last question). Writing "is less than 7" for every clue would certainly give many solutions. Some students may realize this. Good for them!

For the Students:

P4W5: Putting Numbers in their Places

P4W5 a): Games

Cut apart the number cards at the end of these problems. There are 3 blank cards in case you need extras.

A different number from 1 to 6 belongs in each square of the game board.

a	b	c
d	e	f

Each game gives clues so that you can decide which number belongs in each square.

Use the shaded cards when you are not certain which number belongs in one of the spaces. For example, if the clue says "greater than 3" you could place

| 4 | , | 5 | and | 6 | in that space to start with.

Then use the other clues to eliminate all but the correct number.

Use the white cards when you are certain of the number. For example, if the clue says, "between 1 and 3", then place | 2 | in that space.

When you are finished you should have one white card in each space.

One of these games has more than one solution. Each of the others has just one solution.

Game 1 Game 2 Game 3

a greater than 4 **a** less than 5 **a** > 4

b between 2 and 6 **b** greater than 1 **b** between 3 and 6

c half of 10 **c** between 4 and 6 **c** < 3

d less than 5 **d** $2 + 4$ **d** $6 + 0$

e before 2 **e** greater than 3 **e** precedes 4 when counting

f between 2 and 4 **f** before 2 **f** follows 1 when counting

Game 4 Game 5 Game 6

a greater than 1 + 3 **a** > 3 x 1 **a** between 1 x 2 and 2 x 2

b less than 2 x 3 **b** < 3 + 1 **b** < 2 x 1

c half of 6 **c** an even number **c** > 6 - 3

d 6 - 4 **d** between 3 and 5 **d** between 6 - 5 and 6 - 3

e between 4 and 6 **e** 6 - 5 **e** less than 2 + 3

f less than 5 - 3 **f** 6 ÷ 2 **f** 2 x 3

In each game below there are not enough clues. Add more clues so that there is only one possible solution for each game.

Game 7 Game 8 Game 9

a > 4 **a** < 2 x 4 **a** an odd number

b < 3 **b** > 1 x 4 **b** a multiple of 3

c between 2 and 5 **c** half of 12 **c** between 2 + 1 and 2 + 4

d 2 + 3 **d** half of 8 **d** 2 x 3 - 1

e _____ **e** _____ **e** _____

f _____ **f** _____ **f** _____

P4W5 b): A Challenge

Make up a game of your own with just one solution. Give it to a friend to solve.

Make up a game that has more than one solution. Is that harder or easier than making up a game with just one solution? Why?

1	2	3	4	5	6	1	2	3	4	5
6	1	2	3	4	5	6	1	2	3	4
5	6	1	2	3	4	5	6			