

# Place Value - It's about Patterns

## Summary

This activity helps students understand place value patterns and how to read large numbers.

## Materials

### Part One -- Place Value Patterns

Base 10 blocks

Base 10 grid blackline

- *A Million Fish. . . More or Less*

Butcher paper

Scissors

Glue or tape

Journals

- [Place Value Patterns](#) pdf

### Part Two -- Reading Large Numbers

- [Bear Family Story](#) pdf

- [Bear Family Houses](#) pdf

- [Bear Family Digit Cards](#) pdf

- [Place value tents](#) pdf

Student whiteboards

Markers

## Additional Resources

### Books

- *A Million Fish. . . More or Less*

by Patricia McKissack; ISBN 069880860

- *How Much is A Million*

, by David M. Schwartz; ISBN 978-0-688-09933-6

## Background for Teachers

Our place value system is based on a pattern of tens. Each place value increases ten times the value of the place to its right. We use the symbols 0, 1, 2, 3, 4, 5, 6, 7, 8, and 9 to write any whole number. The symbols are called digits. Digits have different values depending on their position in the number. You can count items using whole numbers, but not parts of things. When you are counting items that have parts less than one we use decimals.

Numbers are arranged into groups of three called periods. The places within a period repeat (hundreds, tens, ones etc.) Starting at the left, we read the three numbers in a period and then stop at the end of each period and read the unit name before continuing on. The units period does not have to be named when reading a number. We usually separate the periods with commas.

Students need to develop conceptual understanding of numbers larger than 1000. Even though models beyond 1000 are not readily available, in order for students to develop a strong number sense they need to manipulate physical models. It is difficult for students to fully understand models pictured in books. Another important component needed to develop number sense is to have students relate large numbers to actual things in the world.

## Intended Learning Outcomes

6. Represent mathematical ideas in a variety of ways.

## Instructional Procedures

### Invitation to Learn

#### Guess My Number

Tell the students that you are thinking of a two-digit number and that both of the digits are different. Check to make sure that students understand what "digit" means and what a "two digit number" is. Explain that the students are to guess your number. Inform them that you will keep track of their guesses and will give them clues to how many digits are correct and if the digits are in the correct place. Draw a three columned grid on the board to keep track of the guesses. Write how many digits are correct (0, 1, or 2) and how many digits are in the correct place (0, 1, or 2). (If one digit is correct, do not tell them which one it is; just say one is correct.) As you play the game remind the students to reflect on what they know about the number so far. Why is it important that the digits are in the correct place? Does the place change the value of the digit? For a more challenging game you can have students guess a three-digit number. For example, let's say the number is 68.

Guesses	Digit	Place
74	0	0
26	1	0
62	1	1

## Instructional Procedures

### Part One -- Place Value Patterns

Ask students to write in their journals everything that they know about our place value system. Give students about five minutes to complete this assignment and then ask some students to share what they wrote. Write some of their responses on the whiteboard or use an overhead projector.

After discussing some of their ideas, read the story *A Million Fish . . . More or Less*. Then ask: "Could these things really be true? How long would it take you to jump 5553 times? Could a million fish fit in a wagon? How do you write half a million?" Explain to the students that they will participate in some activities to increase their place value knowledge.

Use base ten blocks and review with students that a 1- centimeter cube represents the units or ones place. The tens place is ten centimeter cubes connected in a 10 cm x 1 cm strip. The hundreds place is represented by a square made up of 10 cm x 10 cm. Ask the students how they would represent the thousands place? Does anyone notice a pattern? (Although the thousand's place is often represented with a larger cube, for this activity the students need to see all of the centimeter squares and so the pattern will be square, strip, square, strip, etc.)

Tape ten of the hundred flats together. The strip should measure 1m x 10 cm. Make sure that students are making the connection that ten times the previous place makes the next place. How could we model ten thousand? What shape would it be? What would the dimensions be? Have students work in small groups to figure out the dimensions of a ten thousand piece. (Ten one thousand strips would go together to make a square that is 1 m x 1 m.) Work together to complete a ten thousand square.

If students are interested you can use a long piece of butcher paper to make the next strip to represent one hundred thousand. If you don't want to tape base 10 grids together you can mark off ten 1m x 1m squares on butcher paper to show how large one hundred thousand is. The strip would be 1 m x 10 m

Extend the activity as far as students show interest. (See extensions)

Have the students discuss what they learned from the activity about place value. Have them record their thoughts in their journals.

### Part Two -- Reading large numbers

Read the *Bear Family* story to the class.

Explain to the class that when we read large numbers that we first mark off the number in

groups of three starting from the right. We use a comma to separate these groups. Then starting at the left, we read the first group of numbers, stopping at the end to name the family or in mathematical terms the period. We do not need to name the units period. Put digits in the bear's houses and have the students practice reading numbers. (In fourth grade we only use the units house and the thousands house, and the millions house.) Then ask the students: "What is the value of the digit in the thousand's place? The hundred's place?" Check for understanding. Explain to the students that numbers can be written in three different ways: standard form, expanded form, and word form. The following activity will give the students practice using standard form and expanded form. Divide the students in partners. Pass out a whiteboard, a marker, and one set of place value tents to each partnership. Give the students an opportunity to look at the place value tents. Ask the students what they notice about the tents? (Hopefully students will point out that each digit shows its value depending on its place. You can make numbers in expanded form and standard form.) Have the partner groups model a three-digit number and check for understanding. Continue to have students model larger numbers that you say verbally. Call on students to reread the number aloud and to read the expanded form of the number. Explain that in each group the students will take turns writing or modeling large numbers. Have one student write a number in standard form on the whiteboard while the other student models expanded form using the place value tents. Students should be saying the number aloud when it is their turn. Have the students switch roles and take turns going first. Remind the students using the tents that they can mix-up the order of the number to challenge their partners to write it correctly.

### Extensions

Model one million by drawing with chalk a 10 m x 10 m square on the playground.

Group students with mixed abilities together for group activity.

Have students write in their journals before the activity and after to explain what they have learned.

### Family Connections

Students could play "Guess my number" with a family member.

Practice expanded and standard forms of numbers with a family member using the place value tents.

Have students go on a number hunt and find where large numbers are used in the real world and share with the class.

### Assessment Plan

Walk around the room while students are working on the above activities and observe what they are doing and saying. Are they able to read the numbers in standard and expanded form? Or are they struggling and making errors? Can they use the place value tents to form a number in expanded form? If the expanded number is out of order can the student put it in correct standard form?

Assess students understanding during whole group discussion from their comments. Are the comments correct or do they have misconceptions?

Assess students individually. Dictate several numbers for the student to write in standard form and expanded form. Write a number in expanded form or use the tents and mix-up the place value order and have the student put the number in correct standard form. Have the student read

numbers aloud.

## Bibliography

### Research Basis

Jensen, E. (2000). Moving with the brain in mind. *Educational Leadership*, 58 (3), 34-37. Retrieved January 18, 2007 from <http://www.newsletteronline.com/>

Brain research has shown that physical movement -- moving, stretching, and acting out concepts, can increase the learning process. Active learners remember the information longer and better than sedentary learners. Teachers should have students: engage in a variety of postures throughout the day, engage in movement during class, use their bodies to demonstrate concepts, role play and include a variety of physical activities to help students learn and if these ideas are not possible then students should at least stop and stretch every 20 minutes.

Marzano, R.J., Pickering, D.J., & Pollock, J.E. (2001). Nonlinguistic Representations. *Classroom Instruction that Works*, (72-83). Alexandria, Virginia: ASCD.

Researchers believe that students learn and store information in two different ways. The first form is a linguistic form where the learner either listens to the information or reads it in a book. In the second form, non-linguistic, the learner forms a mental image or a physical sensation by touching, smelling, listening, tasting, or kinesthetic association. Research has shown that when students learn using both forms their achievement improves greatly. After a non-linguistic form of learning has taken place students should be asked to explain and justify what they have learned. When students are able to explain their thinking and reasoning to others their knowledge increases and they are able to recall it easier. Non-linguistic representations include: making physical models, using manipulatives, drawing pictures, graphic organizers, or engaging in kinesthetic activities.

## Authors

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