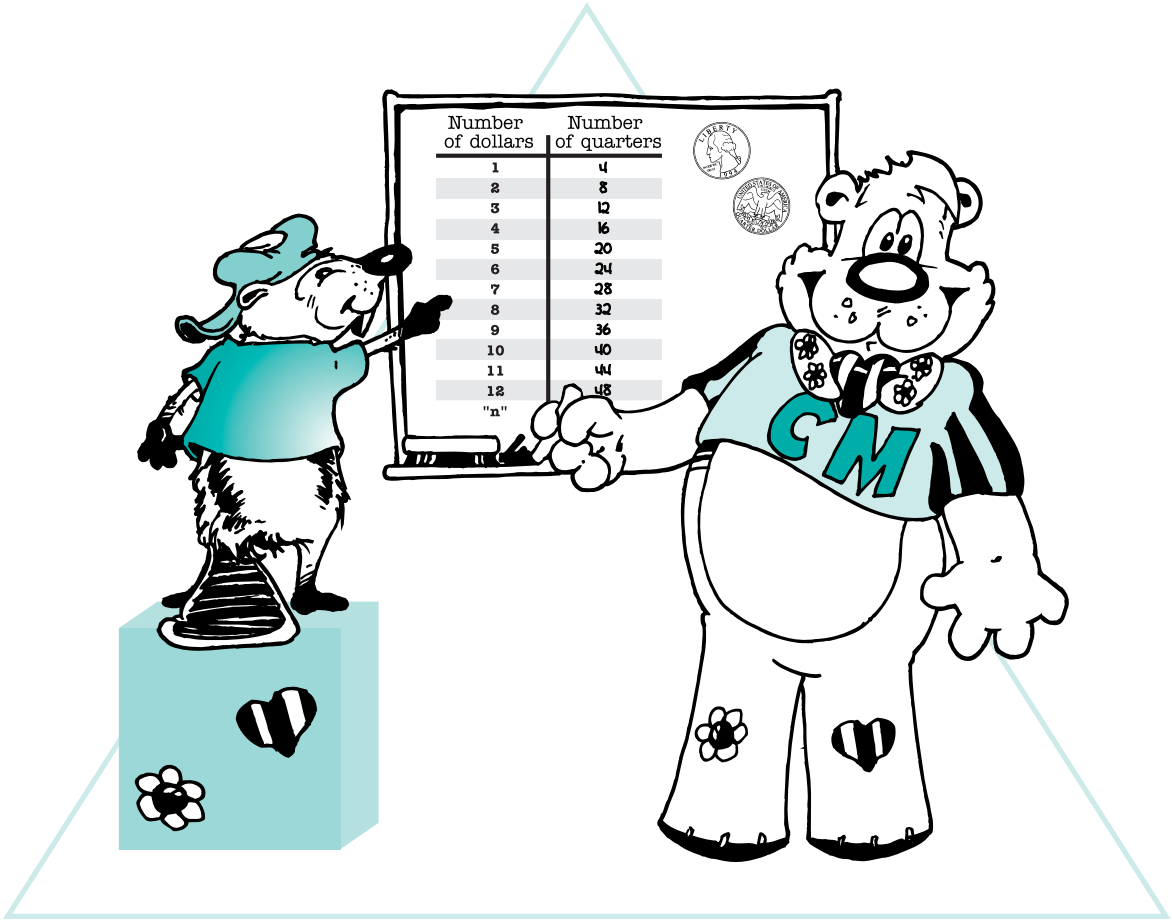
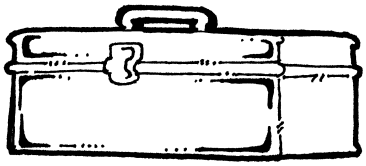
Six Guiding Principles for Teaching Mathematics



by
Kim Sutton
Creative Mathematics
www.creativemathematics.com

P is for Patterns!

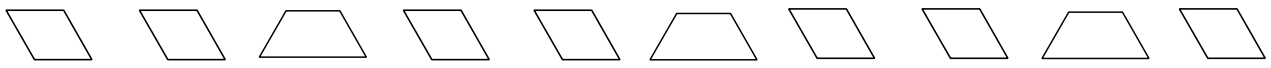
MATH TOOLS



- **Beep Beep, Vroom Vroom!**
- pattern blocks
- response boards

Introduce the book, **Beep Beep, Vroom Vroom!** written by Stuart J. Murphy, holding the cover up for students to view. Discuss what the book might be about. What kind of patterns do you notice in the world around us? There are two kinds of patterns in mathematics--**repeating and growth patterns.** It is important to look at mathematics through patterns.

The teacher can start a pattern by using "claps and snaps." Students should attempt to follow the pattern. After repeating many times, the teacher should stop and ask students to represent that pattern using a manipulative like pattern blocks. For example, "clap, clap, snap, clap, clap snap, clap, clap, snap." A representation for that pattern might be:



A A B A A B A A B A

Students would describe this pattern as rhombus, rhombus, trapezoid, rhombus, rhombus, trapezoid, etc. This representation would allow students the opportunity to use very rich mathematical language describing the geometric shapes used from the set of pattern blocks.

Students should always be encouraged to transfer their patterns to an algebraic representation using letters of the alphabet to stand for their pattern parts.

Guide the class discussion with these questions about the patterns that students have created:

- √ Can you describe the repeating pattern you have created?
- √ How many ways can you describe your pattern?
- √ Can you build an algebraic representation of the pattern?

Patterns are the foundation of mathematics. Encourage students to be "pattern seekers" as part of the learning experience with mathematics.

Triangles

by
Ron Brown
Math Beats

Triangles, triangles, triangles!
Triangles, triangles, triangles!

An isosceles is a triangle
With two equal sides.
A scalene triangle has
No sides the same.

Triangles, triangles, triangles!
Triangles, triangles, triangles!

A right triangle is a triangle
With one right angle.
An equilateral triangle
Has all three sides the same.

Triangles, triangles, triangles!
Triangles, triangles, triangles!

An isosceles is a triangle
With two equal sides.
A scalene triangle has
No sides the same.

Triangles, triangles, triangles!
Triangles, triangles, triangles!

A right triangle is a triangle
With one right angle.
An equilateral triangle
Has all three sides the same.

Triangles, triangles, triangles!
Triangles, triangles, triangles!
Three sides!

Place Value Rap

by
Ron Brown
Math Concepts I and II

Hold up your hands.
And look down your nose.
We're gonna look at numbers.
In the place value row.

The ones are on the right.
The tens are next in line.
Move once more to the left
For the hundreds every time.

Ones, tens, hundreds!
Ones, tens, hundreds!
Ones, tens, hundreds!

Fitting Around the Point

How many _____ fit around the point?

What is the measure around the point?

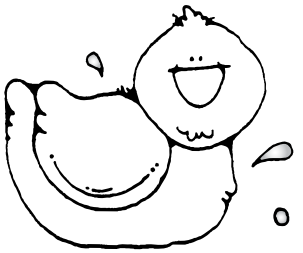
What are the angle measures within the _____?

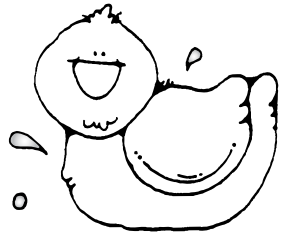
How many _____ fit around the point?

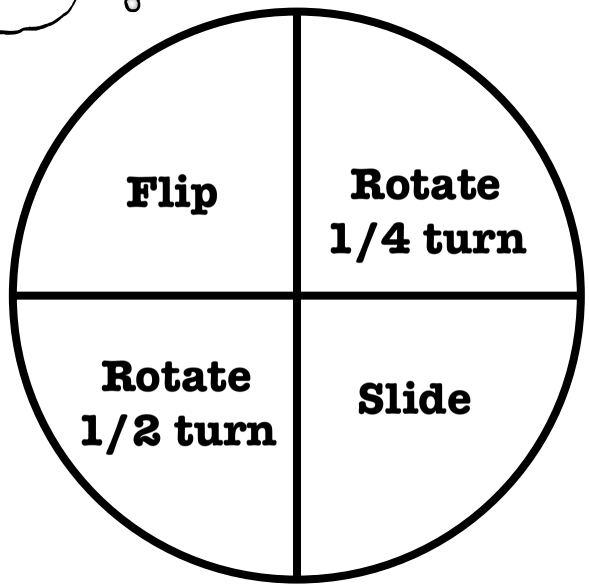
What is the measure around the point?

What are the angle measures within the _____?

Moving Ducks







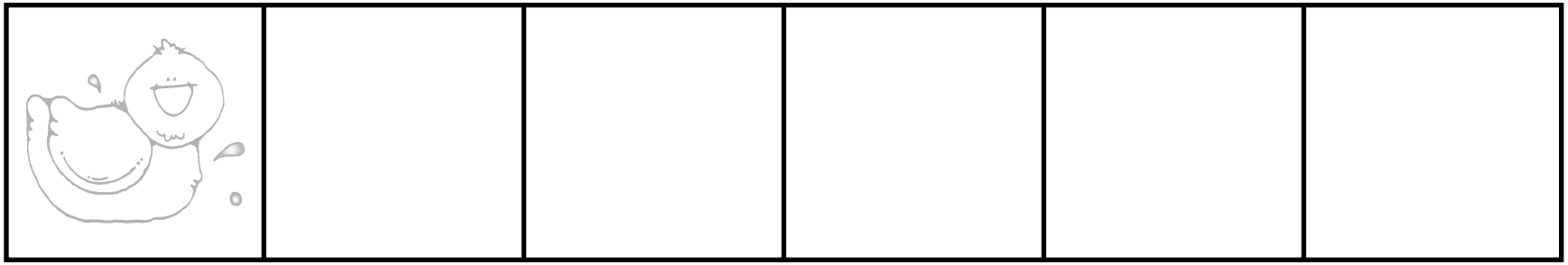
Directions

1. Trace your duck in the first square on the left.

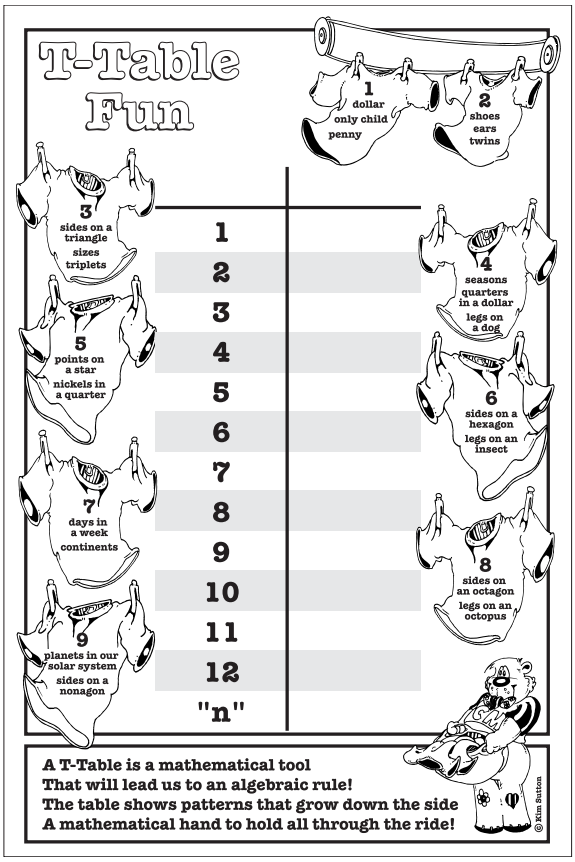
2. Take turns spinning the spinner and following the transformation. Your duck will only move to the right on a slide (translation).

3. The winner is the first person to the last square in the same position as the duck started.

Start



Meaningful Math Visuals



T-Table Poster

A class T-Table poster is an important visual to show relationships between constants of count and growth patterns. It should be a yearlong pursuit to find objects in the real world that come in numbered sets. Those objects should be listed. From those lists, the relationships on the T-Table can be built. Anytime data is posted on a T-Table, a growth pattern will emerge going down the right hand side of the T-Table. It is important to analyze that pattern with students. The left to right relationship on the T-Table is the algebraic function of that relationship. That relationship can be called the "any rule" and a letter can be used to stand for a number. Children should build the T-Table with numbers through 12 before attempting the rule.

Kim's Number Line

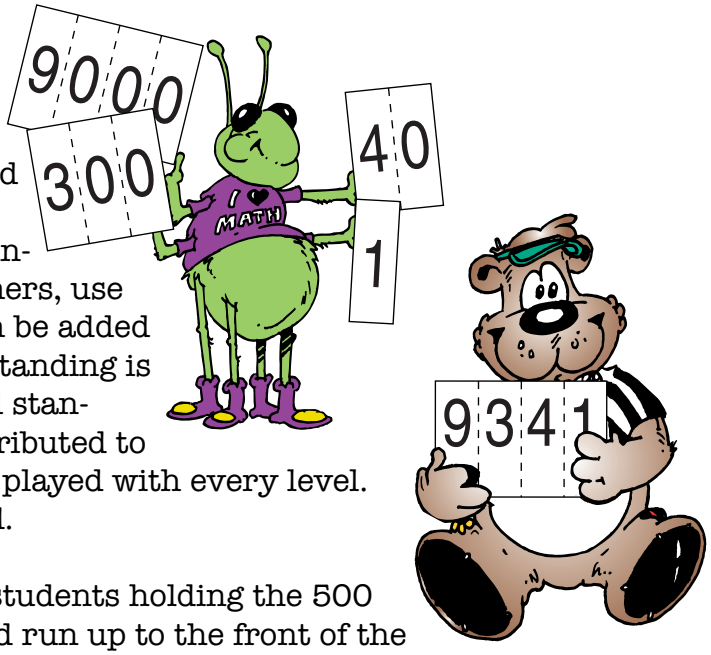
This number line is designed to make a visual pattern of number multiples. This number line is unique because it starts at zero and goes to 144. In the classroom, the number line starts the year blank. It can be laminated before the colored dots are added. Colored dots are added as the skip counting/choral chanting is done.

- Primary grades (K-2) should color code the number line for twos, fives, and tens.
- From third grade on, the connection with multiplication facts is made.
- Fourth grade through eighth grade should have the number line coded through the multiples of 12.

The number line will then show the prime numbers less than 12. The number line is an excellent tool for reducing fractions by looking for common factors.

in the Elementary Classroom

Aerobic Place Value



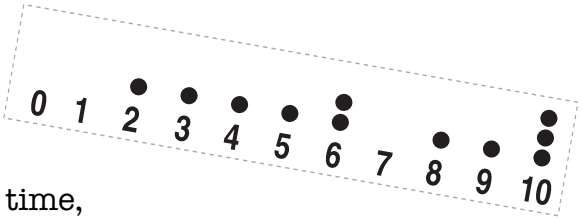
Aerobic Place Value cards are designed to have students practice place value understanding with the ones, tens, hundreds, and thousands. For early learners, use only the ones and tens. Hundreds can be added when students are ready. The understanding is created pictorially with expanded and standardized notation. The cards are distributed to the students. It is a game that can be played with every level. Students can hold more than one card.

A number is called out like 512. The students holding the 500 card, the 10 card and the 2 card would run up to the front of the classroom. The teacher calls out "expand" and the students would then separate the cards. The teacher calls out "standardize" and the students collapse to show the way that quantity is written. This allows students to see the meaning in a quantity and then see the way it is written to shortcut the process.

For ones, tens, and hundreds, a picture model for the overhead projector can be made by cutting 5 mesh plastic canvas into the correct configurations.

Students at their seats not holding the correct card, can make the number in their place value pocket found in this handout.

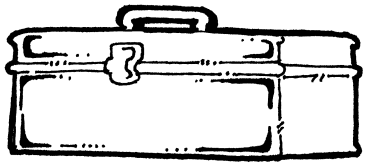
Groups of Statement



One of the most important meaning statements in mathematics is ____ groups of ____ = _____. This comes up mathematically in telling time, money, shapes, place value, multiplication, and basic understanding of quantity and measure. This is an "over and over" message that students need to hear, see, and do in every setting. At the second and third grade level, the times sign is introduced as a shortcut to writing that complete statement out. The meaning is never dropped though. It should be displayed on the calendar board and reinforced whenever it comes up mathematically.

Place Value Pocket Directions

MATH TOOLS



- place value pocket
- 2 sets of digit cards
- comparison graph

This game can be played with a small group or the whole class. Each player must have a place value pocket with 2 sets of digit cards. The cards are shuffled and placed face down in front of each player. As a group, each player counts "1, 2, 3" as they clap over their heads. On the "3" count, the top card is turned over. Each player must decide which pocket to place the digit card based on the goal of the game. Different goals for the game can be played:

- the largest number
- the smallest number
- the largest even number
- the smallest odd number
- any divisibility rule

Guide the class discussion with these questions:

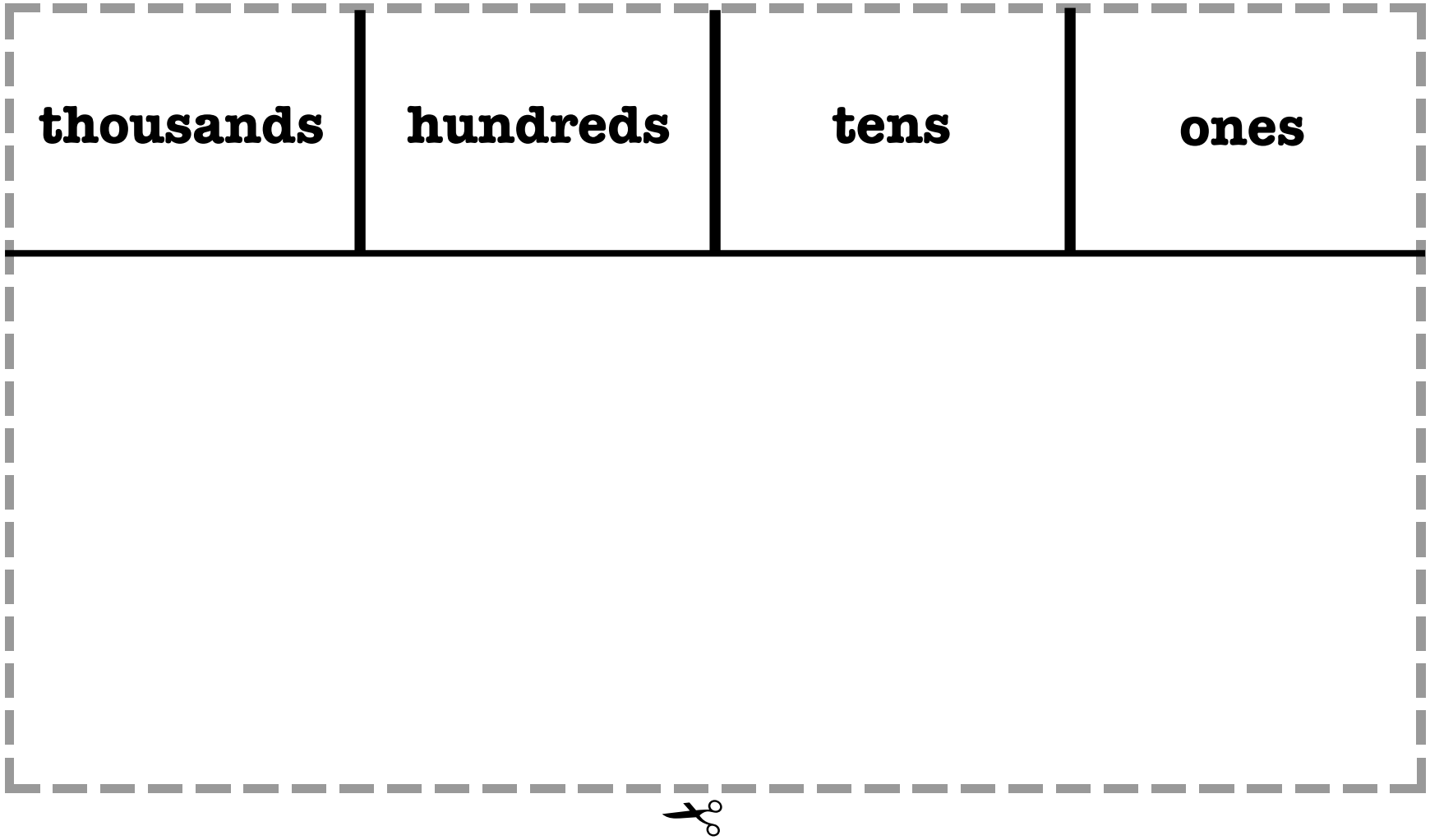
√ Is this a fair or unfair game?
√ Does the probability change with different goals?
√ How many different numbers can be made from your original number?

Challenge: Rearrange the numbers to form new numbers.

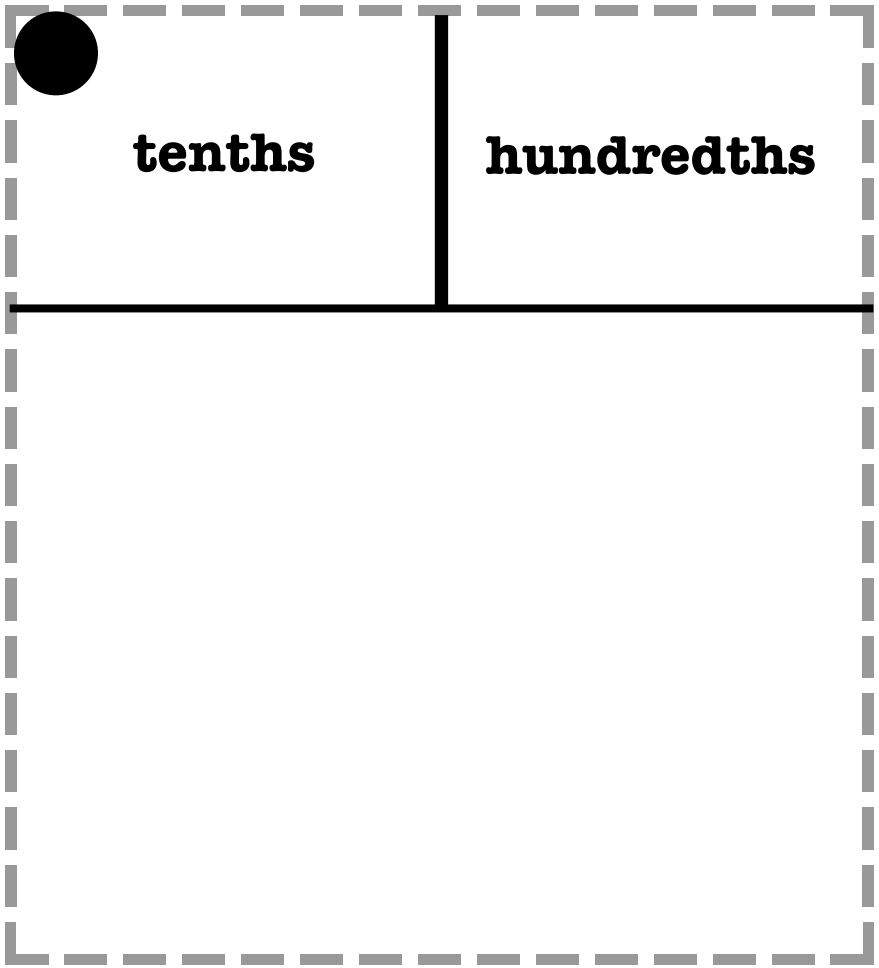
Digit Cards

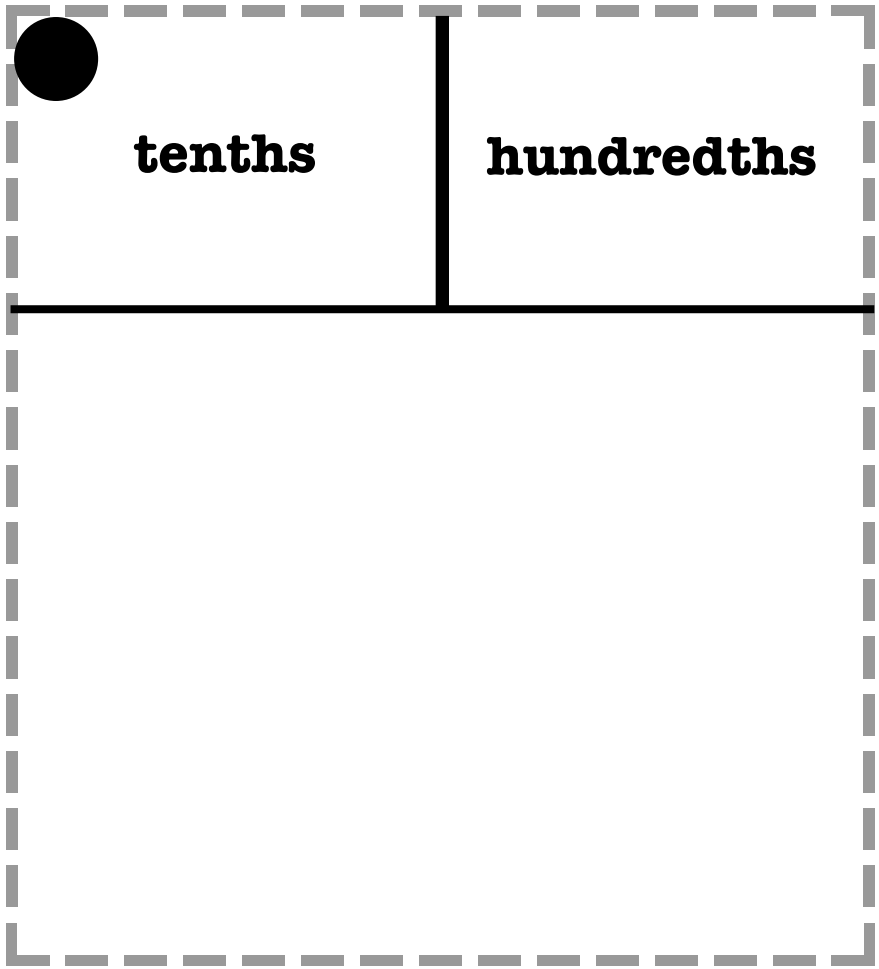
0	1	2	3	4
5	6	7	8	9

Place Value Pocket



Decimal Place Value Pocket





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Place Value Clues

1. I am thinking of a number between 50 and 80.

2. 100% of the digits are odd.

3. The difference between the digits is 2.

4. The digital root is 3.

5. The digit in the ten's place is less than the digit in the one's place.

6. My number is _____ .

Place Value Clues

1. I am thinking of a number between 300 and 600.

2. The sum of the digits in my number (the digital root) is 7.

3. 2/3 of the digits are even.

4. The digit in the ten's place is the identity element of multiplication.

5. My number is _____ .

Place Value Clues

1. I am thinking of a number less than 500.

2. 2/3 of the digits are odd.

3. The digit in the hundred's place is the smallest prime number.

4. The difference between the digit in the ten's place and the one's place is 4.

5. The digital root of the number is 3.

6. My number is _____ .

Place Value Clues

1. I am thinking of a number less than 800 but greater than 300.

2. 100% of the digits are odd.

3. The number is divisible by 5.

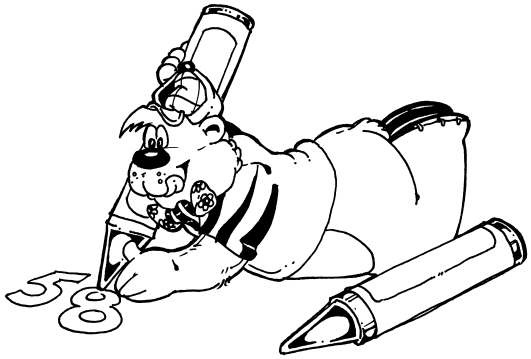
4. The digit in the hundred's place is prime.

5. The digital root of the number is four.

6. The difference between the hundred's digit and one's digit is 2.

7. My number is _____ .

100 Chart



1	2	3	4	5	6	7	8	9	10
11	12	13	14	15	16	17	18	19	20
21	22	23	24	25	26	27	28	29	30
31	32	33	34	35	36	37	38	39	40
41	42	43	44	45	46	47	48	49	50
51	52	53	54	55	56	57	58	59	60
61	62	63	64	65	66	67	68	69	70
71	72	73	74	75	76	77	78	79	80
81	82	83	84	85	86	87	88	89	90
91	92	93	94	95	96	97	98	99	100