## UNIT 1

## NUMBER SENSE AND PLACE VALUE



Throughout history people used numbers to measure and record amounts. Different civilizations created their own written numbering systems. In Ancient Egypt they used symbols that look like pictures of animals or plants to represent numbers.

| Egyptian Numeral Hieroglyphs |  |  |  |  |  |  |
| :---: | :---: | :---: | :---: | :---: | :---: | :---: |
| \| | $\bigcirc$ | $\rho$ | $\}$ | 9 | $4$ | 运 |
| 1 | 10 | 100 | 1,000 | 10,000 | 100,000 | 1,000,000 |



## Skills

Practice for Unit One：

Facts from First Grade（see answer key page 14 for more details）

The Romans created a different system using letters to represent some numbers．You may have seen their numerals inscribed on older buildings or on clocks．

| 1010 | Roman Numerals |  |  |  |  |  |  |  |  |  |  |
| :---: | :---: | :---: | :---: | :---: | :---: | :---: | :---: | :---: | :---: | :---: | :---: |
| 1 | 2 | 3 | 4 | 5 | 6 | 7 | 8 | 9 | 10 | 50 | 100 |
| I | II | III | IV | V | VI | VIII | VIII | IX | X | L | C |



This clock uses Roman numerals to show the numbers 1 to 12 ．


The date on the Rockefeller Center says 1932 in Roman numerals．

Other civilizations，such as the Babylonians and Mayans， invented numbering systems that are a little closer to what we use today．

| Y 1 | ＜ 41 | स 41 | 4．4 31 |
| :---: | :---: | :---: | :---: |
| 972 | 4价 12 | 449\％ 22 | $4{ }_{4} 1819$ |
| PTp 3 | 4TP17 ${ }^{13}$ |  | $4{ }^{4} 9$ STP 33 |
| 贸 4 | 人留14 |  | 枡管34 |
| \％ 5 | 4 15 | 4 25 | 4敉筬 35 |
| 䑝 6 | 〈器 16 | 世㗊 26 | 4稘36 |
| 7 | 遌 17 | 《遌 27 | 作遌 37 |
| 洼 8 | 《 18 | 《㻖 28 | 作38 |
| 無9 |  |  | 算兓39 |
| ＜ 10 | ＊ 20 | ［4630 | （40 |

Can you see a repeating pattern in the Ancient Babylonian


Do you see a pattern in this Mayan numeral system? Do you also see that there is a symbol for zero?

The numbers we use today are represented by digits and the placement of the digits affects their value. This is called place value and we'll learn all about it this year. The positions in our current place value system look like this:

## Place Value Chart



This system allows us to write numbers and perform operations much more easily. Which system do you think looks the easiest to learn?

| Numeral Systems |  |  |  |
| :--- | :---: | :---: | :---: |
| Hieroglyphs | Roman <br> Numerals | Ancient <br> Babylonian | Place Value |
| $\rho \cap \cap\\|\\|$ | CCXLIV | Vy | 244 |

Humans have continued to develop different systems for writing numbers. We've even developed a system of numbers using only zeros and ones for use with computers.


Binary code is a numbering system that is used by computers. It only uses two digits, 1 and 0 .

Of course, you already know that we still use some symbols in math. You've learned the following math symbols for plus $(+)$, minus ( - ), equals $(=)$, as well as others such as greater than ( $>$ ) and less than (<). And you will continue to learn more math symbols in your math journey.

It's important to realize, however, that in all these examples humans just found different ways to record the amounts that God already put in His creation. We can create new systems for recording and manipulating numbers, but only God can create the numbers themselves.

## CHAPTER

## NUMBERS AND PATTERNS

## In this chapter you will learn to:

* Use place value to read and write two-digit numbers
* Represent two-digit numbers in standard and expanded form
* Determine if a number is even or odd


## PLACE VALUE EXPLORATION

## You Will Need:

PaperPencilTimerColored pencils (to be used later)Lesson 1 Activity Sheet (to be used later)
## You Will Do:

1. Have your parent or a friend set the timer for one minute. Draw as many stars as you can on the piece of paper.
2. When the minute is up count up your stars.
3. Switch and have your parent or friend try while you time them. Who can draw the most? Record the winner in the space below.

4. Reflect. How did you count up the stars? Did
5. Reflect. How did you count up the stars? Did
you group them to help you keep track? Talk with your parent about what you did.

## Minute to Win It Stars Champion:


drew $\qquad$ stars in one minute.



## Practice

Carefully tear out the Lesson 1 Activity Sheet from the back of the answer key.

I. Look at the grid. How many total squares do you think there are?

I guess there are $\qquad$ squares.
2. Start numbering the squares in order from left to right starting in the top row. Fill in the numbers 1 to 23 .
3. Take another guess about how many squares are on the grid.

I guess there are $\qquad$ squares.
4. Fill in the rest of the squares to check your answer. Have your parent look over your chart to make sure you numbered it correctly.

There are $\qquad$ squares.
5. Now take out your colored pencils. We are going to color in certain parts of the chart to see if we notice any patterns. Color every number on the grid that ends with a zero green. Do you notice a pattern?
6. Color all the numbers that have a 4 at the end red. Do you notice a pattern? Talk with your parent about this.

## Challenge!

Color each number whose digits add to ten blue. What pattern do you notice?

## TENS AND ONES

## You will Need:

Base ten blocks$\square$ Hundreds chart (in the back of answer key)

## You Will Do:

1. Carefully tear out the hundreds chart from the answer key.
2. Use your base ten blocks to model the number 34 on your hundreds chart. First, cover the top three rows with ten rods. Now use 4 unit cubes to cover up 31, 32, 33 , and 34.
3. Fill in the blanks below.

$34=$ $\qquad$ tens and $\qquad$ ones
4. Model each of the following numbers below by laying the base ten pieces on the hundreds chart.
5. Write in how many tens and ones are in each number.

| Number | Place Value |
| :---: | :---: |
| 23 | tens and $\quad$ tens and $\quad$ ones |
| 84 | tens and $\quad[\quad$ ones |
| 31 | $\quad$ ones |

## Place Value with Base Ten Blocks

Our numbering system uses groups of tens to help us keep track of large numbers. When we write numbers down we use symbols called digits. In the unit opening you saw some of the picture or letter symbols that other cultures used. In our system we can write any number using these ten different digits.

## 0123456789

We use digits and place value to record numbers. Isn't it cool that we can write all numbers using just these ten digits? Place value just means that where you write a digit determines its value. Two-digit numbers have a tens place and ones place.



Digit: A symbol we use to write numbers.

If you switch the places of the digits you get a different number.


Place value:
A system of
writing numbers
where the location
of a digit affects its value.

Place value allows us to write large numbers using only a few digits.


## Practice

Use place value to write the numbers modeled with the base ten blocks. Count the ten rods first and write that number in the tens place. Then count the unit cubes and write that number in the ones place. Lastly, write the number using place value. The first one is done for you.



## Challenge!

Challenge: Make the first letter of your name using base ten blocks. If the first letter of your name has a curve use the single cubes to make the curve as best you can. When you are done add up all the base ten blocks. What is the value of the letter?

My letter equals

## RIGHT DIGIT, RIGHT PLACE

## You Will Need:

Paper
$\square$ Pencil

## You Will Do:

| $01 / 3476789$ |  |  |
| :---: | :---: | :---: |
| Guess | Digit | Place |
| 73 | \| | 0 |
| 25 | 0 | 0 |
| 43 | I | 1 |
| 47 | 2 | 2 |

1. Have your parent pick a secret two-digit number. Your job is to guess their number.
2. Write your first guess in the left column.
3. Now your parent looks at your guess. They write down how many digits are correct and then how many of them are in the correct place. The sample game board above demonstrates this.
4. Continue guessing. If you realize a certain digit definitely isn't in the number then cross it off at the top. In the example, the student knew that neither 2 nor 5 was in the answer.

| Guess | Digit | Place |
| :---: | :---: | :---: |
|  |  |  |
|  |  |  |
|  |  |  |
|  |  |  |
|  |  |  |
|  |  |  |



Expanded form:
A way of writing numbers that shows the value of each digit.

## Expanded Form

In the last lesson, you practiced using place value to write numbers that were represented with base ten blocks. Another way to write numbers is in expanded form. Expanded form shows the value of each digit. Look at the example below.

| Standard Form | Expanded Form |
| :---: | :---: |
| 47 | $40+7$ |

## Practice

Practice writing numbers in different forms by completing the table below．You can use lines and dots to draw the base ten blocks．

| Number | Expanded Form | Base ten blocks |
| :---: | :---: | :---: |
| 68 | $+$ |  |
|  | $20+1$ |  |
|  | $+$ | 䚀咟昞咟 |
| 53 | $+$ |  |
|  | $70+8$ |  |


| Nmber | Espmesf fom | asaem toses |
| :---: | :---: | :---: |
| 45 |  |  |
|  | $60+6$ |  |
| 92 | + |  |

Circle the value of the red digit.


## NUMBER MATCHING CARDS

## You Will Need:

Lesson 4 Activity Sheets (in the back of the answer key)
$\square$ Scissors

## You Will Do:

1. Carefully tear out the activity sheets from answer key.
2. Cut out the different puzzle pieces or have a parent help you.
3. Match the pieces together. There are four different pieces for each number.
4. When you have matched 4 pieces, check your answer with
 your parent.

## Number Word Names

Sometimes we need to write out a number using words instead of digits.
Practice reading the numbers in this chart out loud.


## 2 two

## 3 three



## 5 five

$$
6 \text { six }
$$

$$
7 \text { seven }
$$

$$
8 \text { eight }
$$

## 9 nine

10 ten


## Practice

Choose two numbers between 20 and 99 . Write them on the chart below. Then write them in expanded form and write their word names. Two word numbers under 100 are hyphenated. For instance, 23 is written as twenty-three.

| Number | Expanded Form | Word Name |
| :---: | :---: | :---: | :---: |
|  |  |  |
|  | $+\square$ |  |
|  | $+\square$ |  |
|  |  |  |

Use your knowledge of place value to solve the following number riddles.
I. I am thinking of a secret number. It is between 50 and 60 and the tens digit and the ones digit are the same. Can you guess what my number is?

| Tens digit | Ones digit |
| :---: | :---: |
|  |  |
|  |  |

2. I am thinking of a secret number. The number is less than 80 . The tens digit is six more than the ones digit. There are no zeros in my number. Can you guess what my number is?

| Tens digit | Ones digit |
| :---: | :---: |
|  |  |
|  |  |

3. I am thinking of a secret number. This number is bigger than 40 and the ones digit is double the tens digit.

| Tens digit | Ones digit |
| :---: | :---: |
|  |  |
|  |  |

4. Conrad has 4 boxes of 10 markers each and 3 single markers. How many markers does Conrad have? You may want to draw a picture.


## BUILD AND COMPARE

## You Will Need:

## Base ten blocks

## You will do:

1. Build each pair of numbers shown with base ten blocks on the mats below.
2. Look at just the ten rods first. Which number has more tens? The number with more tens is the greater number.
3. If the tens are the same, then look at the ones. The number with more ones is the greater number.
4. Circle the greater number in each pair.

First number

| 再 |  |
| :---: | :---: |
|  |  |
| Tens |  |

Which is greater?

| 37 | 28 |
| :--- | :--- |
| 43 | 34 |
| 51 | 55 |
| 30 | 32 |
| 47 | 51 |

Second number

## Comparing Numbers

In the opening activity, you circled the greater number. Mathematicians have a special symbol to show that one number is greater than another. Here is an example:


Notice that the side that is bigger is open toward the larger number. There is also a symbol for showing that one number is less than another. Here is an example:


Notice that the side that is smaller is closed and pointing toward the number that is smaller.


76 is greater than 67.


67 is less than 76.

Changing the direction of the sign changes its meaning. One way to remember is to imagine the symbol as the mouth of an alligator. The alligator always eats the larger number.

## Practice

Use the < and > symbols to compare the numbers below. When you are deciding which number is greater, remember to look at the tens column first. It may help to first underline the number in the tens place in each number.


Write numbers in the blanks to make each number sentence true.


## BASE TEN CHALLENGE

## You Will Need:

Base ten blocks (all 10 ten rods and all 100 cubes)

## You Will Do:

1. Your challenge today is to represent the number 43 using base ten blocks. The challenge is that you need to do it in 5 different ways. The first way will probably be the easiest for you. Use the rods and unit cubes to show 43. Draw a sketch of what you did in the box provided.
2. Now try building the number again with the blocks in a different way. Break down the number by substituting 10 ones for 1 ten rod.
3. Continue modeling with the blocks and sketching a picture of your answer in the spaces provided. See if you can find all 5 possibilities.

| Representation <br> $\# 1$ | Representation <br> $\# 2$ | Representation <br> $\# 3$ | Representation <br> $\# 4$ | Representation <br> $\# 5$ |
| :---: | :---: | :---: | :---: | :---: |
|  |  |  |  |  |
|  |  |  |  |  |
|  |  |  |  |  |
|  |  |  |  |  |

## Putting Numbers in Order

In the last lesson, you compared numbers by looking at the tens place first. You can use the same strategy to put several numbers in order from least to greatest.

Step One: Look at the digits in the tens place. Rearrange the numbers from least to greatest according to their tens digits.

Step Two: If any of the number have the same tens digit, then look at the ones place. Change the order if you need to.


## Practice

You can use the steps above to put these numbers in order from least to greatest. Underline each tens digit. If more than one number has the same tens digit, circle the ones digit to see which is smaller. Write your answers on the spaces provided.

$$
17,19,52,35,42
$$

## 84, 92, 73, 38, 7 I

$\qquad$ , $\qquad$
$\qquad$
$\qquad$ ,

## 77, 80, 56, 73, 19

$\qquad$
$\qquad$
$\qquad$
$\qquad$
$\qquad$

## LESSON 6

## Practice

Another tool mathematicians use to show the order of numbers is a number line. Fill in the missing numbers on the number lines below.
I.

2.

3.

4.


## FIND YOUR PARTNER

## You Will Need:

## 20 linking cubes

Colored pencils (to be used later)
## You Will Do:

1. 6 children are playing a game. They each need a partner. Will every child have a partner?
2. Use your linking cubes to act out the scenario. Start with 6 cubes. Snap the cubes together to show the pairs of children. Will they each have a
 partner? Tell your parent.
3. 5 children are playing a game. They each need a partner. Will every child have a partner?
4. Use your linking cubes to act out the scenario. Start with 5 cubes. Snap the cubes together to show the pairs of children. Will they each have a partner? Tell your parent.
5. Continue acting out the scenario for different numbers of children and record your results by filling in the table below. Do you notice any patterns?

| Number of <br> children | Does everyone <br> have a partner? | Draw a picture of what happened <br> when you made the pairs. |
| :---: | :--- | :--- |
| 1 |  |  |
| 2 |  |  |
| 3 |  |  |
| 3 |  |  |


| Number of <br> children | Does everyone <br> have a partner? | Draw a picture of what happened <br> when you made the pairs. |
| :---: | :--- | :--- |
| 4 |  |  |
| 5 |  |  |
| 6 |  |  |
| 7 |  |  |
| 8 |  |  |
| 9 |  |  |
| 10 |  |  |
|  |  |  |
|  |  |  |
|  |  |  |

## Even and Odd Numbers

The groups where everyone had a partner in the opening activity were all even numbers. Even numbers can be grouped evenly in pairs. The groups where one child didn't have a partner were all odd numbers. When you try to make pairs with an odd number there will always be one left over.

Color the even numbers red on the strip below. Color the odd numbers blue. Look at what happened in the opening activity if you are not sure whether a number is even or odd.


## What pattern do you notice? Tell your parent.

Based on that pattern, do you think the number 11 will be even or odd?
Circle you guess below in pencil.

## | | <br> even odd

Count out 11 linking cubes to check your answer. Can you group them into pairs with no cube leftover? If so, then 11 is even. If not, then it is an odd number. Change your answer if you need to make it correct.


## Practice

Circle whether each of these numbers is even or odd. Then check your answer with linking cubes. Fix any answers that are incorrect.


## | $\mid$ even odd

15 even odd
20
even
odd

16 even odd

Mom finds 7 socks in the laundry. Will every sock have a match? Why or why not?
Draw a picture to explain your answer.


## TOWER PAIRS

## You will Need:

20 linking cubes

## You Will Do:

1. Count out 10 linking cubes. Use the cubes to build two towers that are the same height. How many cubes are in each tower?
$\qquad$ cubes in each tower.
2. Count out 18 linking cubes. Use the cubes to build two towers that are the same height. How many cubes are in each tower?
$\qquad$ cubes in each tower.
3. Count out 14 linking cubes. Use the cubes to build two towers that are the same height. How many cubes are in each tower?
$\qquad$ cubes in each tower.
4. Count out 9 linking cubes. Can you build two towers that are the same height? Why or why not? Tell your parent.

5. Give some examples of numbers like 10 and 14 that you could use to build two towers that are the same height.
6. Give some examples of numbers like 9 that you could NOT use to build two towers that are the same height.

## Even and Odd Practice

The numbers that you used to build 2 towers of the same height are all even numbers. Look at the number 12, for instance. Twelve is an even number. It can be split into 2 equal groups of 6 .


If you started with an odd number of linking cubes - like 9,11 , or 5 - you couldn't build 2 towers that were the same height. One tower would always be one cube higher.


## Practice

Each of the numbers below is even. Write a number sentence showing how the number can be split into two equal groups. If you need help, use your linking cubes and build two towers like you did in the opening activity.


Odd numbers cannot be split into two equal groups. There will always be one left over. Look at these number sentences where the solutions are odd numbers.

$$
\begin{aligned}
& 7 \longrightarrow 3+3+1=7 \\
& 1|\longrightarrow 5+5+1=1|
\end{aligned}
$$



## Practice

Write number sentences for each of these odd numbers. If you need help, use your linking cubes and build two towers like you did in the opening activity. You will have one cube leftover.

$$
\begin{aligned}
& 5 \square+\square+1=5 \\
& 9 \quad \square+\square+\ldots . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . ~ \\
& 9
\end{aligned}+9
$$

$$
13 \square+\square+1=13
$$

$$
17 \square+\square+1=17
$$

## FINAL DIGITS

## You Will Need:

$\square$ Colored pencils

## You Will Do:

1. Look at the hundreds chart below. Color all the numbers that have a 2 as their final digit red.
2. Color all the numbers that have a 4 as their final digit blue.
3. Color all the numbers that have a 6 as their final digit green.
4. Color all the digits that have an 8 as their final digit purple.
5. Color all the digits that have a zero as their final digit yellow.

6. Look at all the squares that are colored in. Do you notice a pattern?

| 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 |

## More Even and Odd Practice

All even numbers end with the digit $2,4,6,8$, or 0 . This is why in the opening activity you ended up coloring in all the even numbers. Odd numbers end with the digit $1,3,5,7$, or 9 .

We now know several different things about even and odd numbers. The chart below will help you review.

Even numbers
Odd Numbers

| Last digit is $2,4,6,8$, or 0 |
| :--- | :--- |
| Can be divided into two |
| equal groups. |
| Can be grouped evenly |
| in pairs. |
| If you try to divide it into two |
| equal groups there will be one |
| left over. |



## Practice

Use what you know about the last digits of even and odd numbers to decide if each number below is even or odd. If you get stuck you can also look back at the hundreds chart you colored.

| 21 | even | odd | 27 |  | odd |
| :---: | :---: | :---: | :---: | :---: | :---: |
| 42 | even | odd | 31 | even | odd |
| 45 | even | odd | 50 | even | odd |
| 80 | even | odd | 75 | even | odd |
| 99 | even | odd | 72 |  | odd |

Give 3 examples of two-digit odd numbers.

## Practice

Look at the ten frames. Circle whether they show an even or an odd number.

even
odd

even odd

Give 3 examples of two-digit even numbers.


## Practice

Color the even numbers in the picture purple and the odd numbers blue to see what Anna's favorite snack is.


