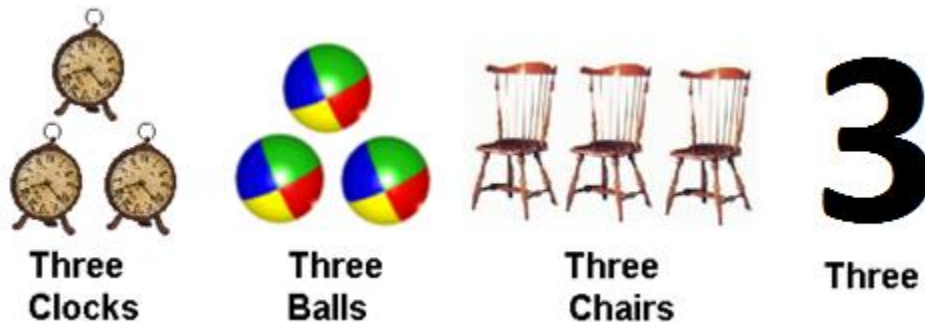


MATH LESSON PLAN 2 ARITHMETIC & NUMBERS

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Section 1: What is Arithmetic?

1. The word ARITHMETIC comes from Greek, ARITHMOS number + TECHNE skill, which means “number skill”.
2. Arithmetic starts with counting. In counting we use numbers. At first we see numbers in objects as 3 clocks, 3 balls and 3 chairs. Later we learn to recognize numbers as patterns, which we can write with digits.

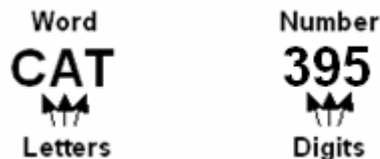


What operation does Arithmetic start with?

Answer: Arithmetic starts with Counting.

Section 2: Digits & Numbers

3. Mathematics is a special language. A language has letters that make up words.
For example, the English language has 26 different letters:
ABCDEFGHIJKLMNOPQRSTUVWXYZ
These letters make up thousands of words.
4. In mathematics, we refer to letters as “digits”; and to words as “numbers”. You write the word CAT with letters C, A, and T. Similarly, you write the number 395 with digits: 3, 9, and 5.



5. In mathematics, there are only ten different digits that make up all the numbers. These digits are. **0 1 2 3 4 5 6 7 8 9.**

How many digits make up the following numbers?

- (a) 536 (b) 72 (c) 3,532 (d) 6 (e) 652,900 (f) 1,000,000,000

Solution: (a) 3 (b) 2 (c) 4 (d) 1 (e) 6 (f) 10

Section 3: The Place Values

6. The digits in a number have the place values of ONE-TEN-HUNDRED from right to left.

$$395 = 3 \text{ HUNDREDS} + 9 \text{ TENS} + 5 \text{ ONES}$$

PLACE VALUES

HUNDRED	TEN	ONE
3	9	5

7. Each digit on the left is 10 times the digit to its right.

$$\begin{aligned} 1 \text{ TEN} &= 10 \text{ ONES} \\ 1 \text{ HUNDRED} &= 10 \text{ TENS} \end{aligned}$$

8. The ONES are like pennies, the TENS are like dimes, and HUNDREDS are like dollars.

$$\begin{aligned} 1 \text{ dime} &= 10 \text{ pennies} \\ 1 \text{ dollar} &= 10 \text{ dimes} \end{aligned}$$



Dollar (100 cents)	Dime (10 cents)	Penny (1 cent)
HUNDREDS	TENS	ONES

9. We may write

$$395 \text{ cents} = 3 \text{ dollars} + 9 \text{ dimes} + 5 \text{ pennies}$$

Section 4: Writing Numbers

10. The basis of numbers is “no count” for which we use zero (“0”). Therefore, we set all places in a number to “0” in the beginning.

HUNDRED	TEN	ONE
0	0	0

11. The counting starts from 1 and goes up to 9 in the “ONES” place.

$$\text{“001”} \quad \text{to} \quad \text{“009”}$$

12. We write them as single-digit numbers as follows.

$$1, 2, 3, 4, 5, 6, 7, 8, \text{ and } 9$$

13. There are no more than ten different digits. Therefore, “9” is followed by “0” in ONES place. As “9” goes to “0” in ONES, “0” goes to “1” in TENS.

$$\text{“009”} \quad \rightarrow \quad \text{“010”}$$

14. Therefore, the single-digit number “9” is followed by the double-digit number “10”.

$$1, 2, 3, 4, 5, 6, 7, 8, 9 \text{ and } 10$$

15. The number “9” is the largest single-digit number. The number “10” is the smallest double-digit number.

16. The digit in TENS remains at “1” while the digits in ONES once again increase from “1” to “9. This gives the following numbers after “10”.

11, 12, 13, 14, 15, 16, 17, 18, and 19

17. Once again as “9” goes to “0” in ONES, the digit “1” goes to “2” in TENS. Therefore, the number “19” is followed “20”.

“019” → “020”

18. Every time “9” goes to “0” in ONES the digit in TENS increases by 1 in the sequence “1, 2, 3, 4, 5, 6, 7, 8, and 9”. Therefore, at every ten counts we get

10, 20, 30, 40, 50, 60, 70, 80, and 90

19. After 90, the numbers increase as follows.

91, 92, 93, 94, 95, 96, 97, 98, and 99

20. At “99” when “9” goes to “0” in ONES, the “9” also goes to “0” in TENS. This makes “0” go to “1” in HUNDREDS. Therefore, the number “99” is followed by “100”.

“099” → “100”

21. The number “99” is the largest double-digit number, and “100” is the smallest three-digit number. There are a total of ninety double-digit numbers.

22. Three-digit numbers increase to “999” as they follow the above pattern. “999” is the largest three-digit number. There are a total of nine hundred three-digit numbers.

23. This pattern of writing numbers can express extremely large numbers in a simple way.

What are the smallest and largest four-digit numbers?

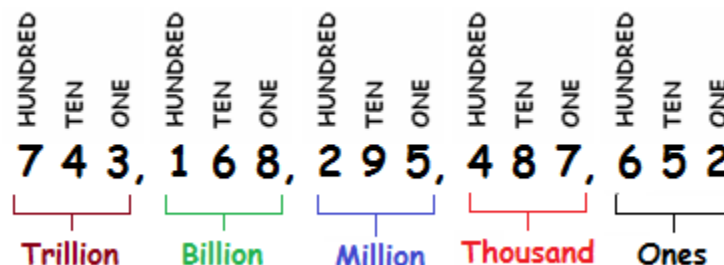
Solution: The four-digit numbers are from 1,000 to 9,999.

What are the next ten counts following 1095?

Solution: The ten counts following 1095 are: 1096, 1097, 1098, 1099, 1100, 1101, 1102, 1103, 1104 and 1105.


Section 5: The Large Numbers

24. The place values of “ONE-TEN-HUNDRED” repeat as groups. From right, the most used groups are ONES, THOUSANDS, MILLIONS, BILLIONS, and TRILLIONS as shown below. You separate these groups by commas.



We read this number as: **Seven hundred forty-three trillion, one hundred sixty-eight billion, two hundred ninety-five million, four hundred eighty-seven thousand, six hundred fifty-two.**

25. We do not omit any place in a number. When a place value has no count, we place a “0” there. For example, we write the number “**302 trillion, 4 billion, 865 million, and 7**” as follows. In this number the count for THOUSANDS is altogether missing.

3 0 2, 0 0 4, 8 6 5, 0 0 0, 0 0 7

Trillion Billion Million Thousand Ones

26. Since digit on the left is 10 times the digit to its right, we have.

1 THOUSAND = 10 HUNDREDS
1 MILLION = 10 HUNDRED THOUSAND
1 BILLION = 10 HUNDRED MILLION
1 TRILLION = 10 HUNDRED BILLION

Place commas at the correct place in the following numbers

(a) 8268 (c) 6032650 (e) 76098305009023
(b) 82682 (d) 15973037 (f) 801000006000759

Solution: (a) 8,268 (b) 82,682 (c) 6,032,650 (d) 15,973,037 (e) 76,098,305,009,023 (f) 801,000,006,000,759

Read the following numbers.

(a) 52,762,869 (c) 75,765,532,658 (e) 409,008,007,006,834
(b) 273,045,008 (d) 30,006,000,074 (f) 590,000,060,000,001

Solution: (a) 52 million, 762 thousand, and 869 (b) 273 million, 45 thousand, and 8 (c) 75 billion, 765 million, 532 thousand, and 658 (d) 30 billion, 6 million, and 74 (e) 409 trillion, 8 billion, 7 million, 6 thousand, and 834 (f) 590 trillion, 60 million, and 1.

Write the following numbers.

(a) 304 thousand, and 516
(b) 45 million, 464 thousand, and 801
(c) 1 billion, 5 million, and 6
(d) 25 billion, 43 million, 60 thousand, and 50
(e) 43 trillion, 6 thousand, and 35
(f) 608 trillion, 45 million, and 529

Solution: (a) 304,516 (b) 45,464,801 (c) 1,005,000,006 (d) 25,043,060,050 (e) 43,000,000,006,035 (f) 608,000,045,000,529

Identify the place values of each digit in the following number.

(a) 319,475,765,532,658

Solution: From left to right: (a) 3 hundred trillion, 1 ten trillion, 9 trillion, 4 hundred billion, 7 ten billion, 5 billion, 7 hundred million, 6 ten million, 5 million, 5 hundred thousand, 3 ten thousand, 2 thousand, 6 hundred, 5 ten, and 8.

☺ **Lesson Plan 2: Check your Understanding**

1. What are digits used for? How many digits are there?
2. How many real elephants are there in the room with you? What digit would you use to represent this number of elephants?
3. Give examples for (a) a single-digit number (b) a double-digit number (c) a three-digit number (d) a five-digit number.
4. How many double-digit numbers are there?
5. What are the three place values (from right to left) in a group?
6. What are the most used groups in a number from right to left?

Check your answers against the answers given below.

Lesson Plan 2: Answer

- 1) You use digits to write numbers. There are ten different digits.
- 2) Most likely there is no real elephant in the room with you. You will use the digit '0' in that case to represent the number of elephants.
- 3) Your example may differ: (a) 7 (b) 32 (c) 483 (d) 63,153
- 4) From 10 to 99 there are 90 double-digit numbers.
- 5) One-Ten-Hundred
- 6) Ones, Thousands, Millions, Billions, and Trillions