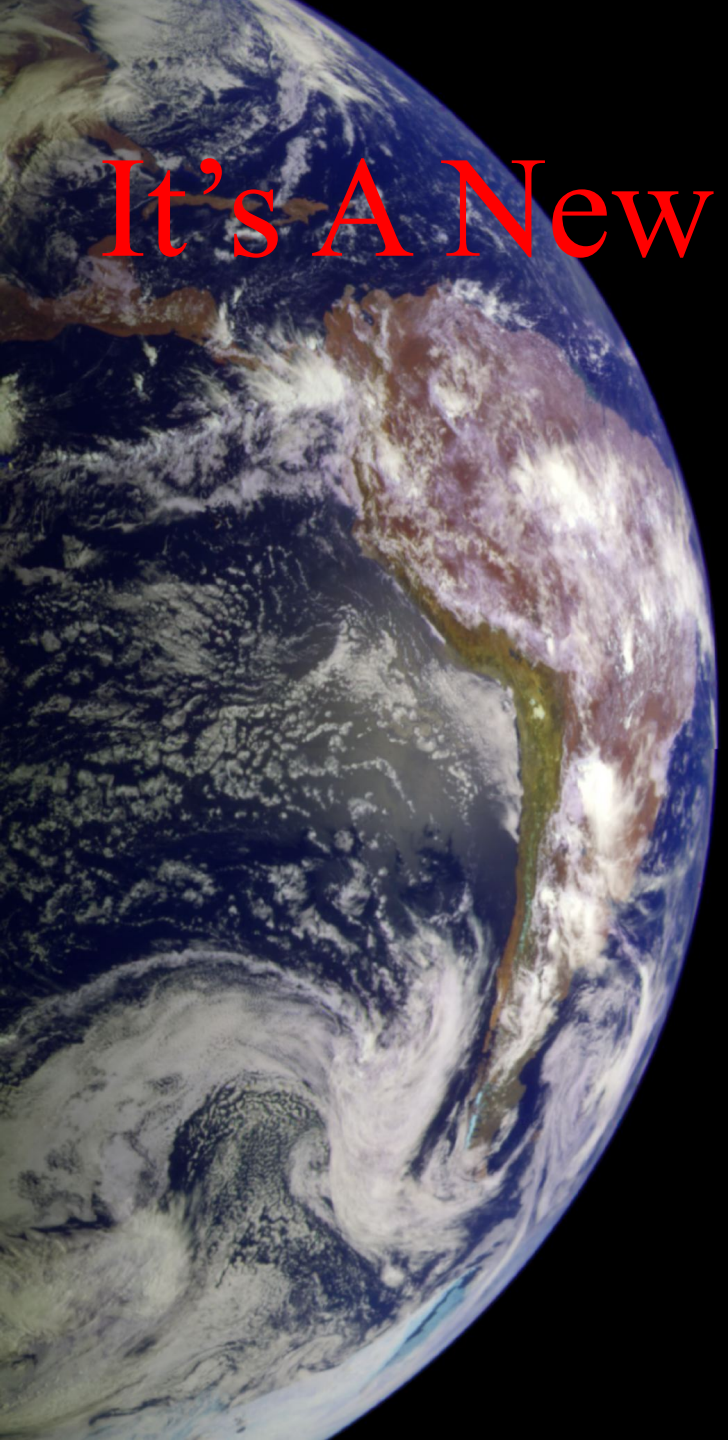
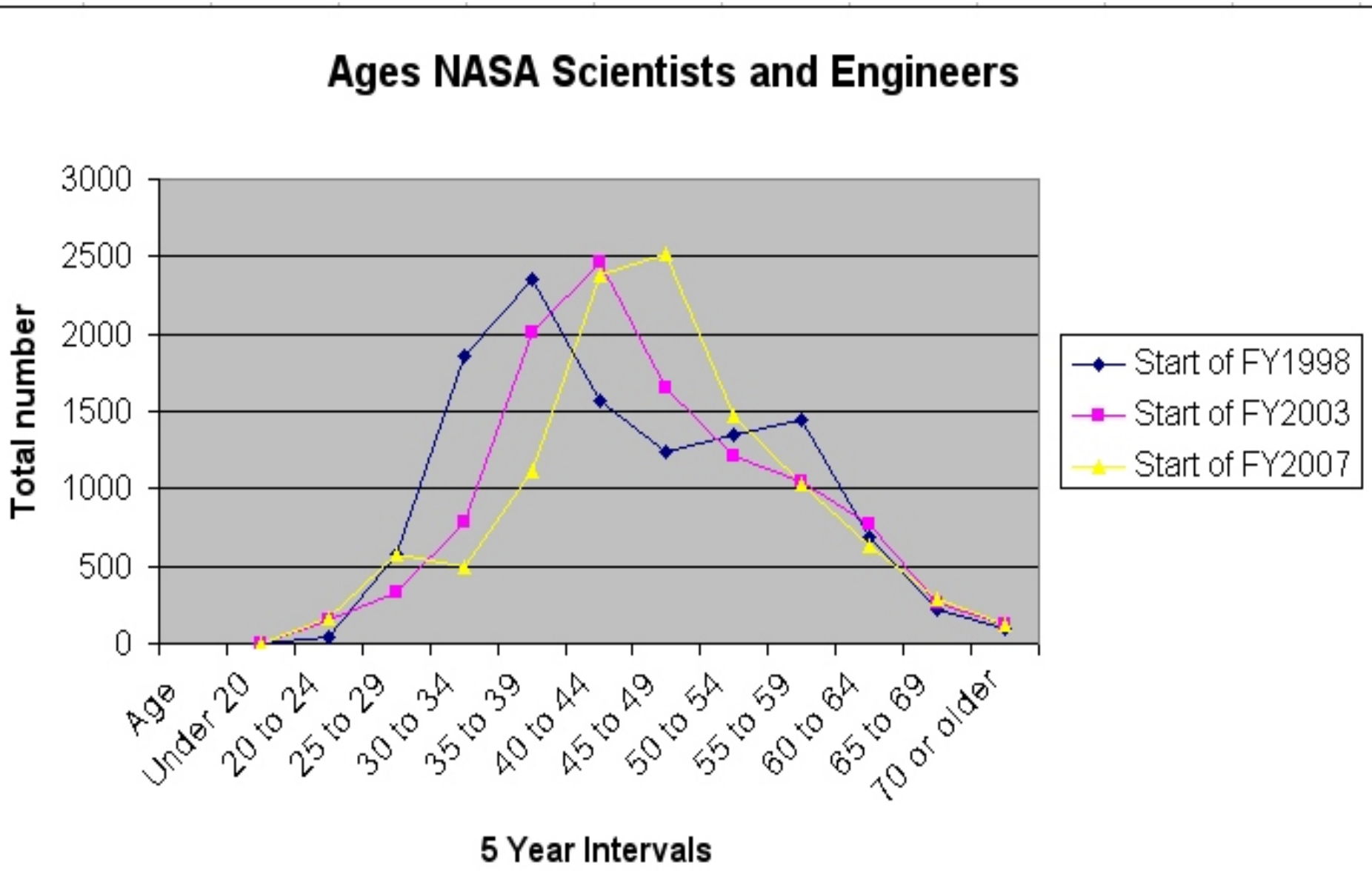
It's A New World Out There



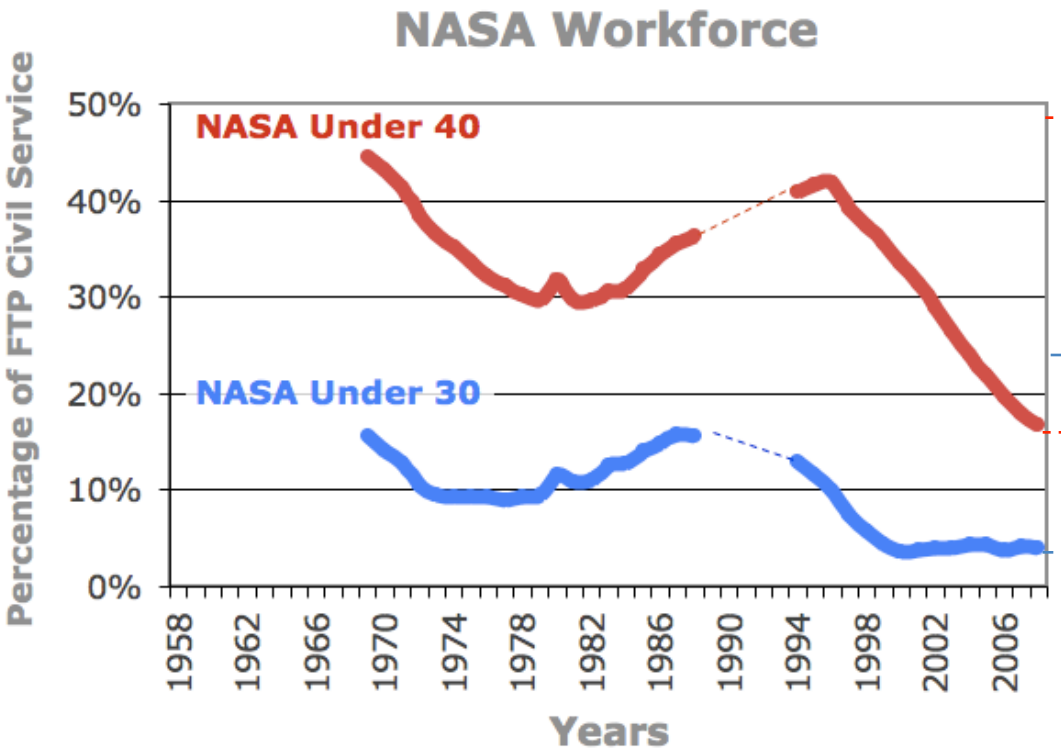
Do We Want our Students to be Prepared for it?

New Jobs Require More Education than Ever Before

- Top economists estimate that 2/3 of new jobs will require some college
- 1/3, the best paying, will require a college degree – usually in a technical (STEM) area.
- Over 80% of high school graduates attempt college today. Most do not succeed


Ages NASA Scientists and Engineers
Total number
3000
2500
2000
1500
1000
500
0
Age
Under 20
20 to 24
25 to 29
30 to 34
35 to 39
40 to 44
45 to 49
50 to 54
55 to 59
60 to 64
65 to 69
70 or older
5 Year Intervals
Start of FY1998
Start of FY2003
Start of FY2007

The younger workforce at NASA is at an all time low.



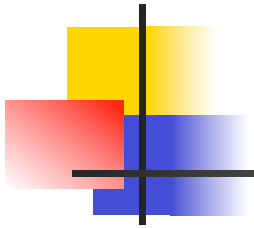
47% of the US workforce is under age 40.

compared to 16% at NASA.

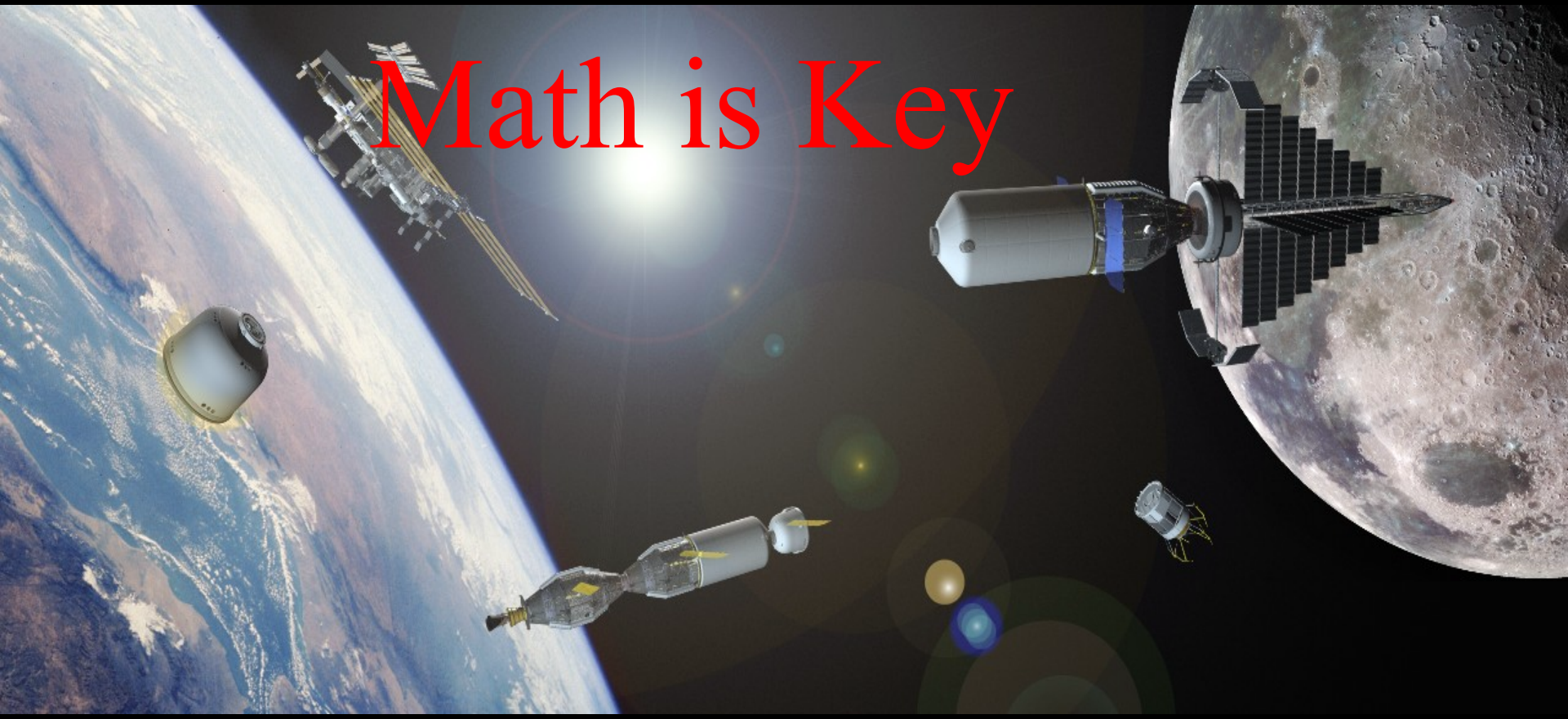
25% of the US workforce is under age 30.

compared to 4% at NASA.

Total Masters Degrees in Engineering by Year

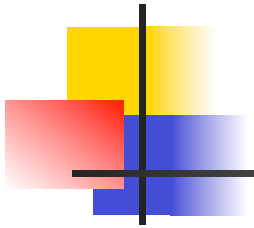


It is interesting to note that, as a government agency, NASA can only hire U.S. Citizens


Math is Key

We put more “material” in the lower grades

- We’ve added data analysis, statistics, and aspects of the “new math” including problem solving, Euclidian transformations and simple combinatorics since I was young.



And Our Outcomes Keep Getting Worse.

An eighth grade Maryland State Assessment Question

(1) Selected Response Sample

Look at the sequence below.
2, 6, 18, 54, . . .

What is the eighth number in the sequence?

A. 162
B. 234
C. 1,458
D. 4,374

View scoring information

An eighth grade Maryland State Assessment Question

(1) Selected Response Sample

Look at the sequence below.
2, 6, 18, 54, . . .

What is the eighth number in the sequence?

A. 162
B. 234
C. 1,458
D. 4,374

View scoring information

Answer: Who knows, it can be anything you want it to be

A Problem from the NAEP

Puppy's Age	Puppy's Weight
1 month	10 lbs.
2 months	15 lbs.
3 months	19 lbs.
4 months	22 lbs.
5 months	?

24. John records the weight of his puppy every month in a chart like the one shown above. If the pattern of the puppy's weight gain continues, how many pounds will the puppy weigh at 5 months?

This problem is not well posed.

A) 30

B) 27

C) 25

D) 24

Recently NCTM and the Math Community have worked together on these issues

- The result is the NCTM Focal Points.
- Three major topics per year
- When one looks at the overall structure, they align pretty well with what is done in high achieving countries.

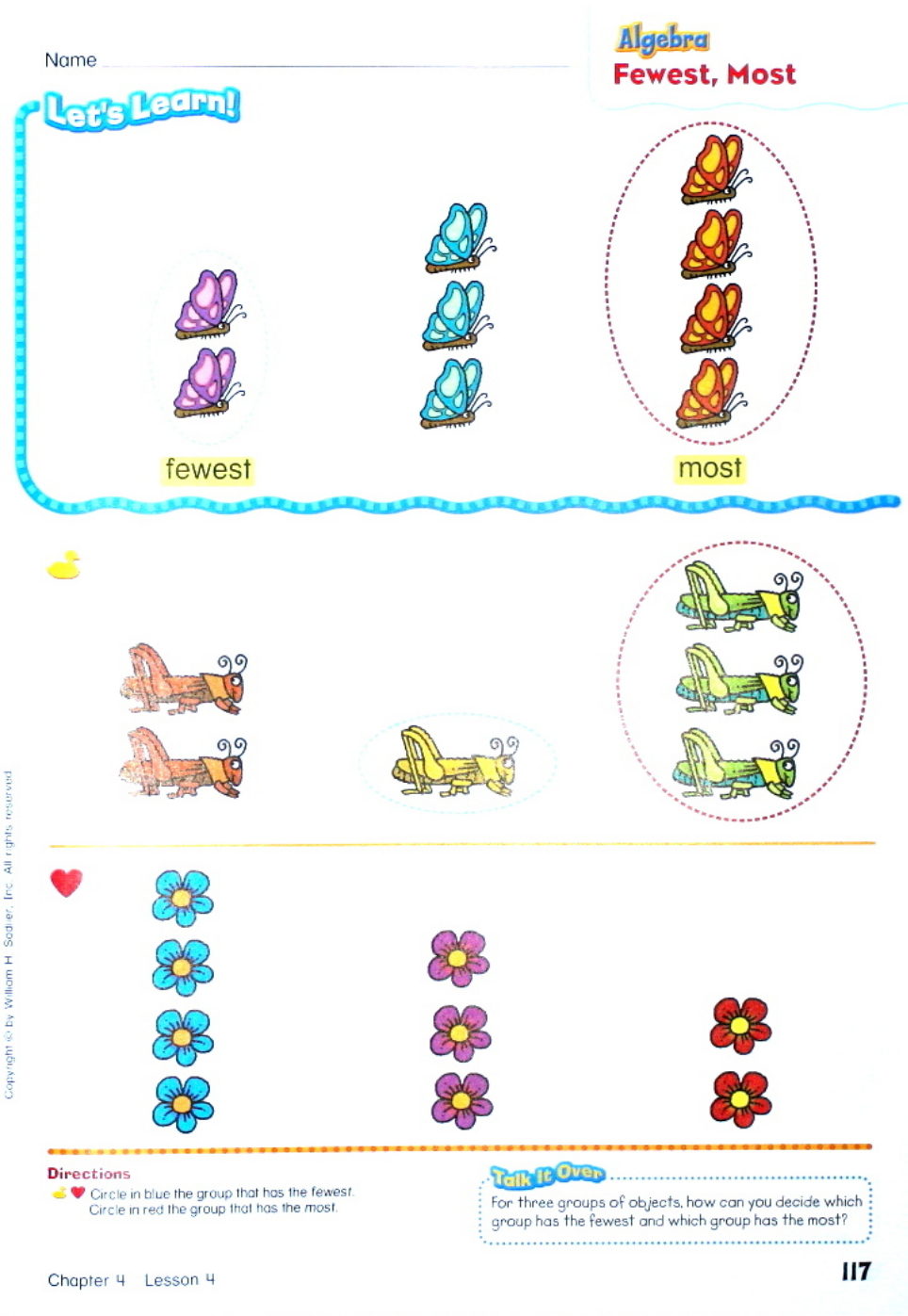
There are six topics students need to learn in K-7 – they must be learned to mastery

- Numbers, number operations and place value
- Fractions and decimals
- Ratios, rates, percents and proportions
- Core processes (algebra)
- Functions and equations
- Measurement and basic geometry

But it isn't just a focus on fewer topics. These topics should be learned as mathematics, rather than vocabulary or factoids.

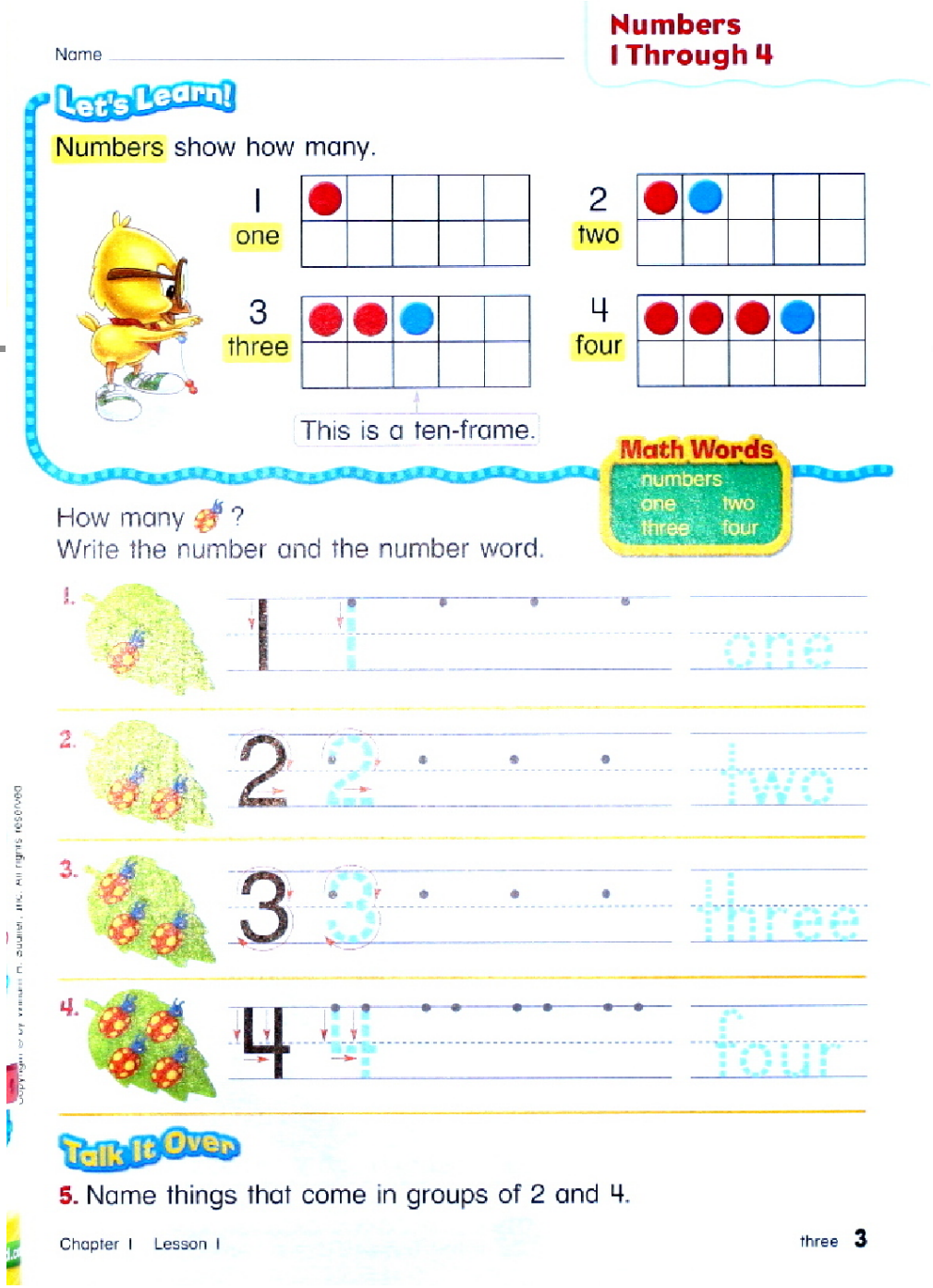
Kindergarten: Typical U.S. Lesson from Above average Program

Very cute. But it
Does not focus in
On the mathematics,
Rather it is about
Vocabulary.



Kindergarten: Typical U.S. Lesson from Above average Program

Note that the lesson
Is not focused,
Concepts are diffused
By vocabulary.



Name _____

Numbers
I Through 4

Let's Learn!

Numbers show how many.

1 one

2 two

3 three

4 four

This is a ten-frame.

Math Words
numbers
one two
three four

How many ?
Write the number and the number word.

1. 1 one

2. 2 two

3. 3 three

4. 4 four

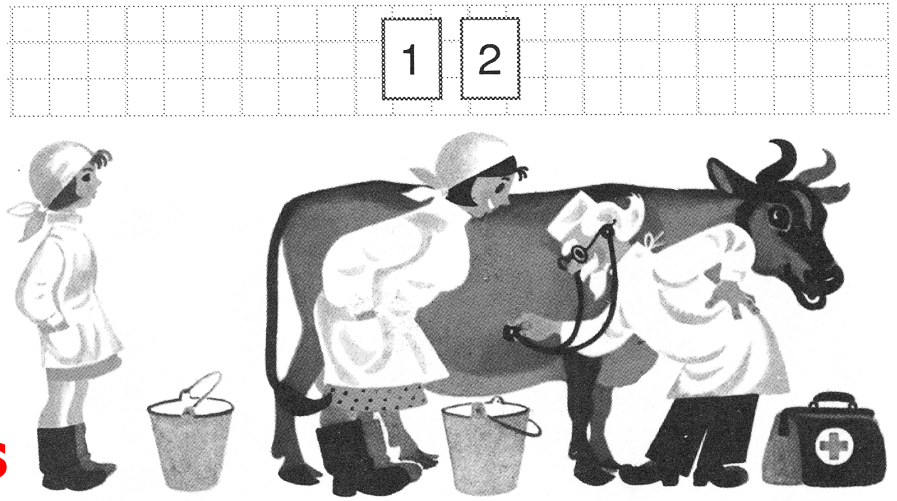
Talk It Over

5. Name things that come in groups of 2 and 4.

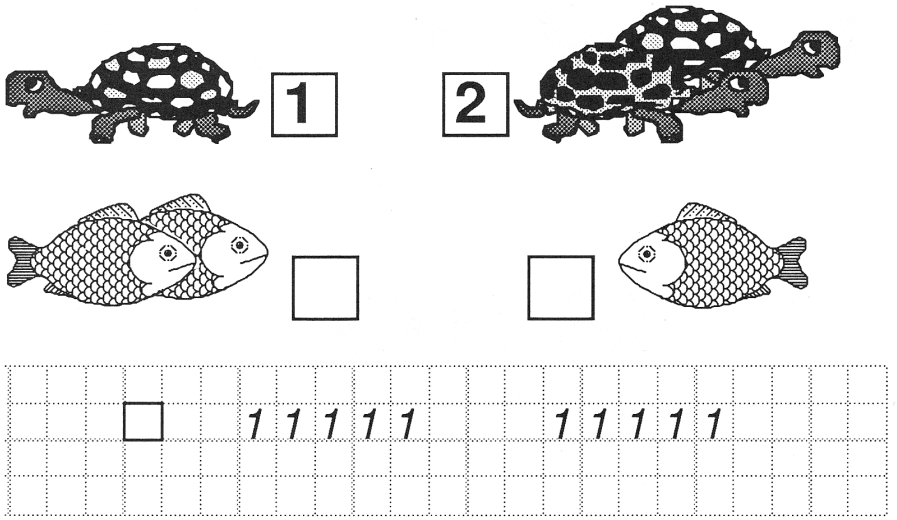
Chapter 1 Lesson 1

three 3

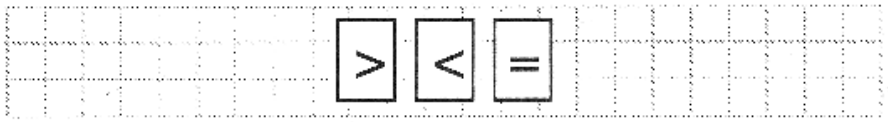
First few lessons
From first grade
Russian text:
Progenitor for
Almost all programs
In high achieving countries

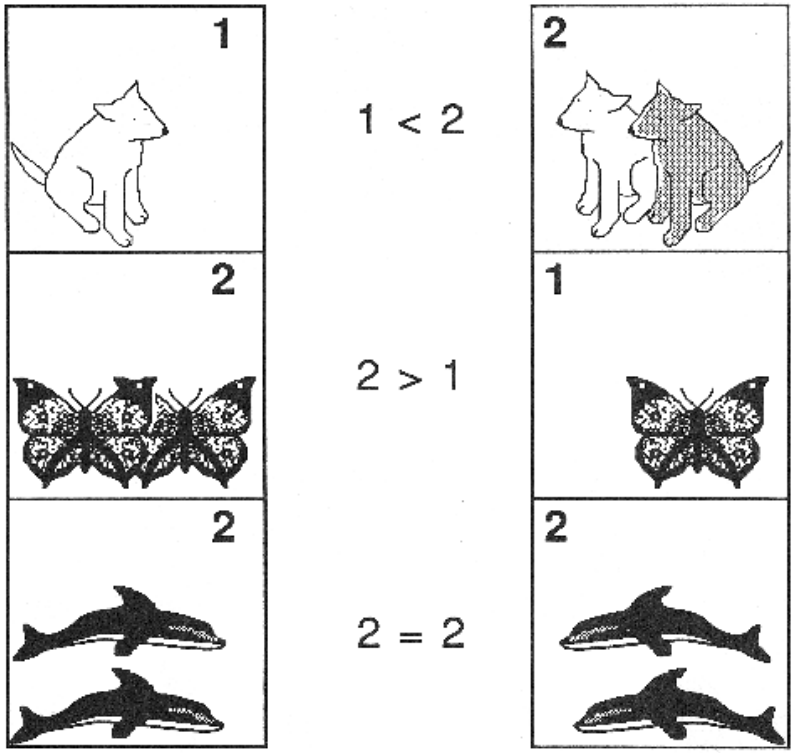


There are no
Words, just 2 key
Concepts and
The corresponding
Math symbols, not
vocabulary



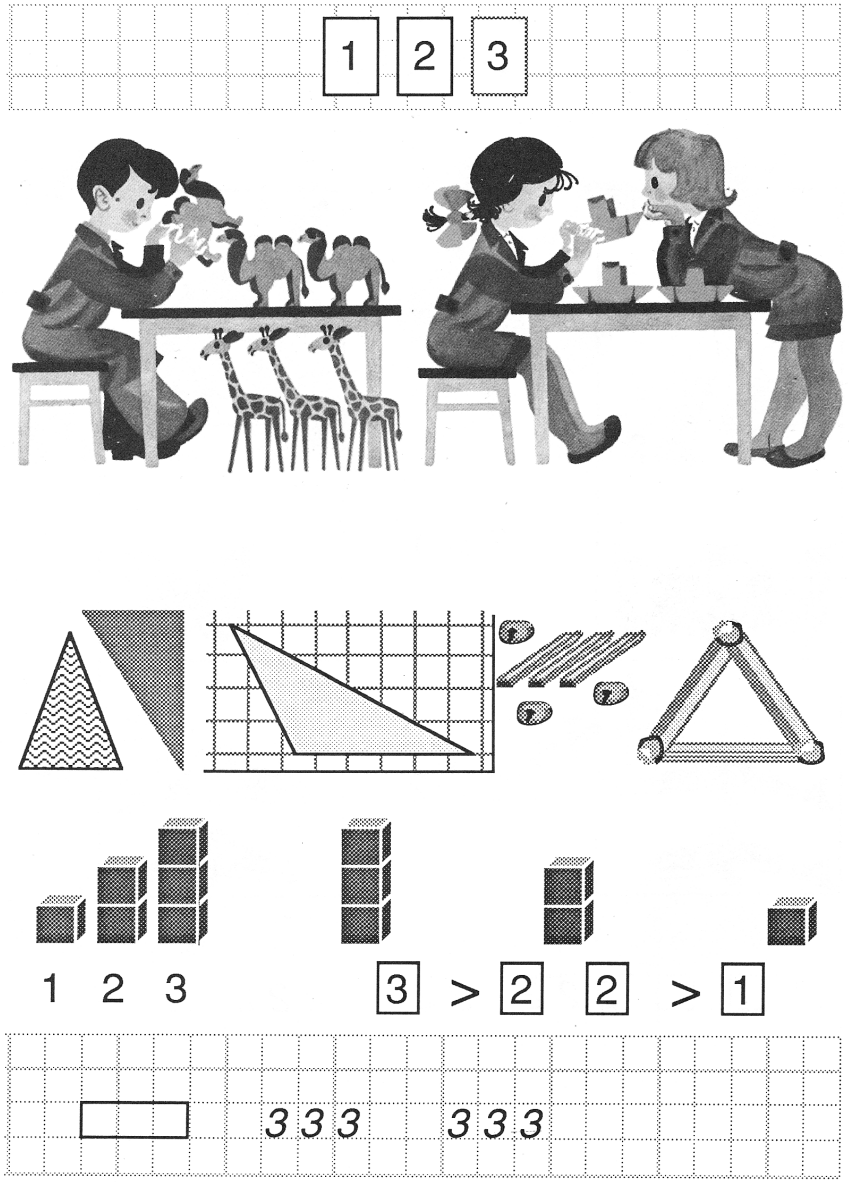
The quick introduction Of key concepts Takes advantage Of fact that small Numbers are Basically hard wired

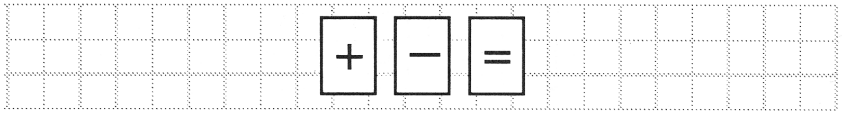




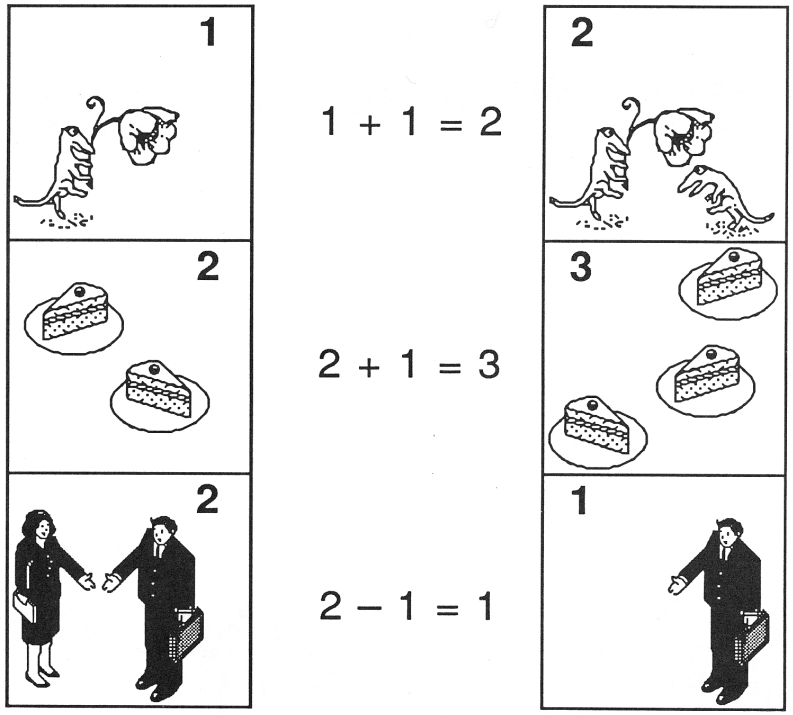
Again, note absence Of anything but Math concepts and Symbols

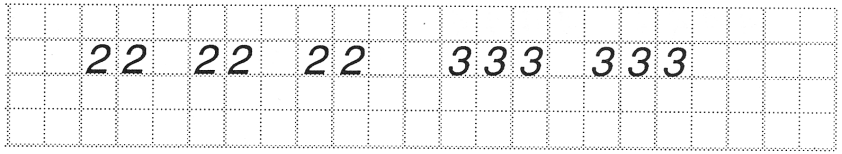
Exposed in their purest
Form without distractions





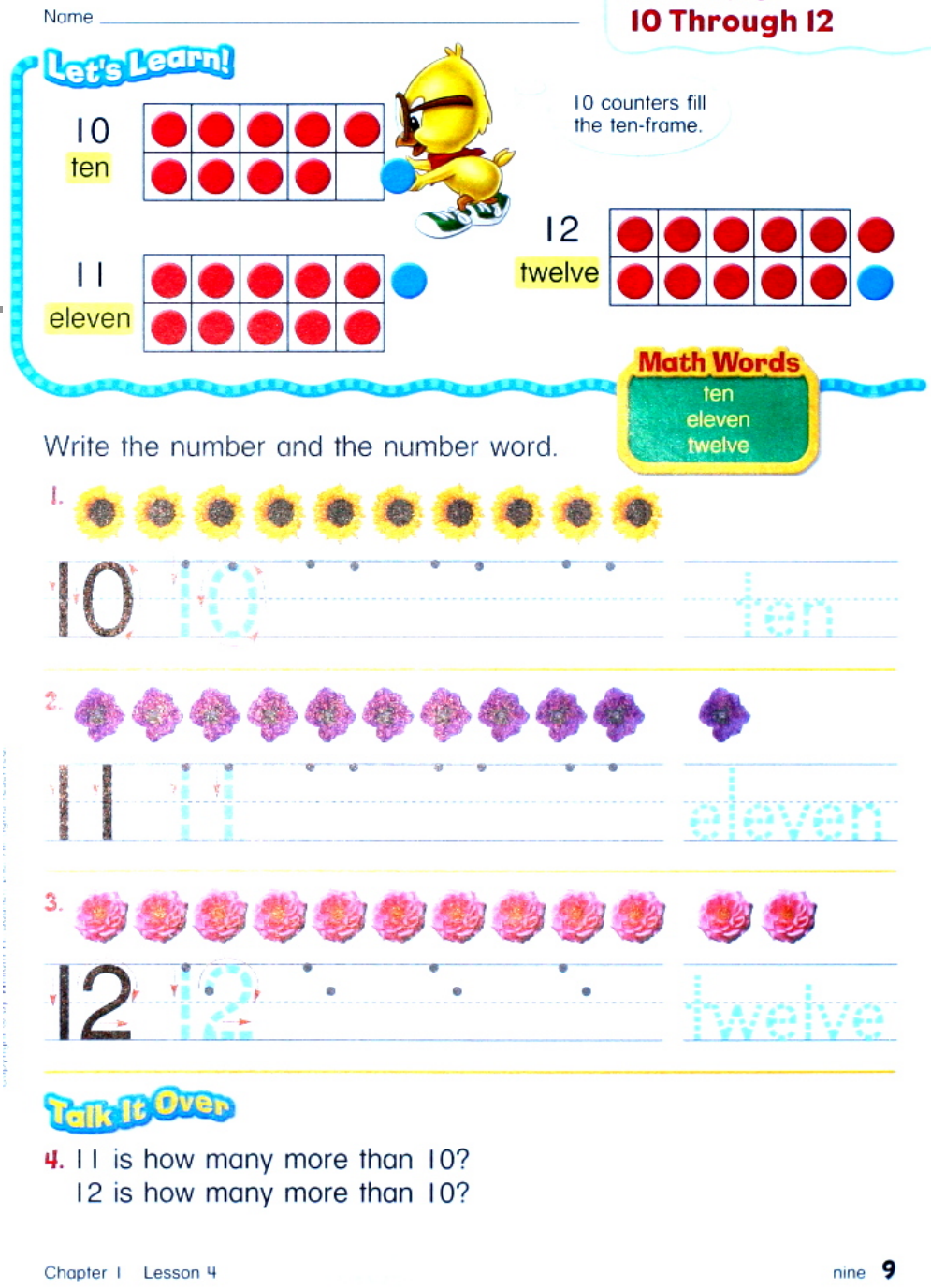
In these few earliest
Lessons the concepts
And symbols, =, + -, <, >
Have been explained
And used in a context
Students can understand

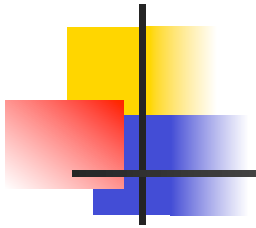




Our schools can
Say "Mary's ahead
Of the curve. She
Knows the numbers
Through 12, and her
Competition only knows
Them through 5."

But at best all Mary
Really knows are some
Counting words.





Another Huge Problem is Place Value

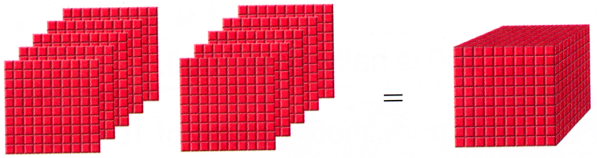
Third Grade Better than Average U.S Lesson on Place Value

Note Focus on Manipulatives
Linear model
For 10's, area for 100's, volume for 1000's

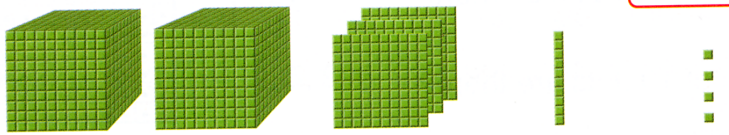
Update your skills. See page 1.

1-6 Thousands

Lisa wrote the number she modeled in different ways.



10 hundreds = 1 thousand
10 hundreds = 1000



2 thousands		3 hundreds		1 ten		4 ones		2,314
2,000	+	300	+	10	+	4		2,314
Expanded Form								Standard Form

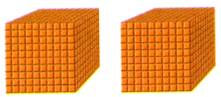
Read 2,314 as: two thousand, three hundred fourteen.

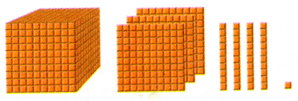
Study these examples.
Look at the place-value chart.

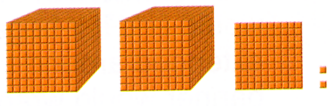
Four-digit numbers may be written with or without a comma.

thousands	hundreds	tens	ones	Expanded Form	Standard Form
6	2	7	0	6,000 + 200 + 70 + 0	6,270
5	0	0	4	5,000 + 0 + 0 + 4	5,004
3	0	1	5	3,000 + 0 + 10 + 5	3,015
9	6	0	0	9,000 + 600 + 0 + 0	9,600

Write the number in standard form.

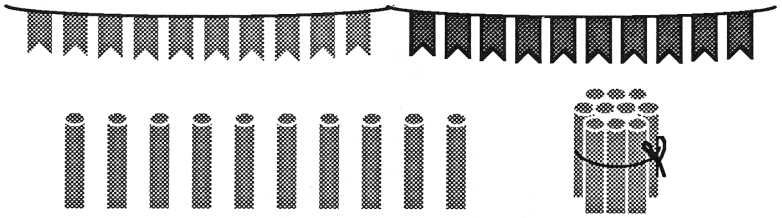
1. 

2. 

3. 

First Grade Russian Text: Place Value

The numbers from 11 to 20.

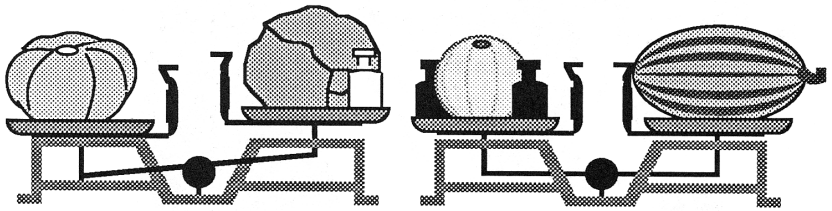


Ten A set of ten

1. How many sets of 10 are there?

2. $x + 7 = 10$ $6 + x = 8$ $x + 4 = 9$

3. A pumpkin weighs 8 kg and a cabbage weighs 4 kg less. How much does the cabbage weigh?



A cantaloupe weighs 5 kg and a watermelon weighs 4 kg more than the cantaloupe. How much does the watermelon weigh?

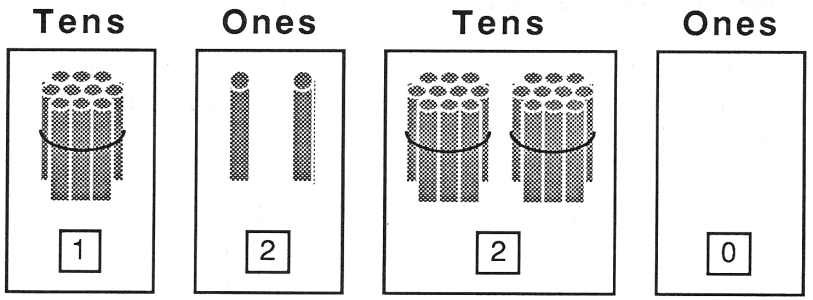
4.

7 – 4	9 – 6	6 + 2 – 1	8 – 2 – 2
7 – 5	9 – 5	5 + 2 – 1	8 – 2 – 6
7 – 6	9 – 4	7 + 2 – 1	10 – 3 – 2

First Grade: Russian Text: Models for Place Value.

Especially note use of Decimeters for putting (2 place) Place value on number line

22. 4 + 5 – 6 | 1 + 5 – 6 | 10 – 8 + 6 | 9 – 8 + 6
    3 + 5 – 6 | 2 + 5 – 6 | 10 – 7 + 6 | 9 – 5 + 6



What numbers are written in the tables?

Write the number which contains 1 ten and 8 ones.

23. What does each digit in the following numbers stand for: 15, 13, 18, 11, 10, 20?

24. Measure the length of the strips in decimeters and centimeters and write down the numbers you get.

25. 10 kg of currants were gathered from two currant bushes. 6 kg of currants were gathered from the first bush. How many kg of currants were gathered from the second bush?

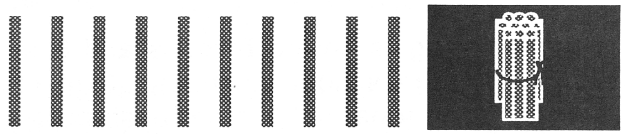
26. 9 kg of currants were gathered in a garden. This was 2 kg more than the amount of raspberries gathered. How many kilograms of raspberries were gathered in the garden?

27. 1 + 9 – 7 | 10 – 9 + 8 | 2 + 7 – 9 | 3 + 7 – 4
    10 – 2 – 7 | 9 – 7 + 8 | 4 + 6 – 10 | 4 + 5 – 3

Second Grade: Russian Text. Note consistency Of models for higher Places and tight focus

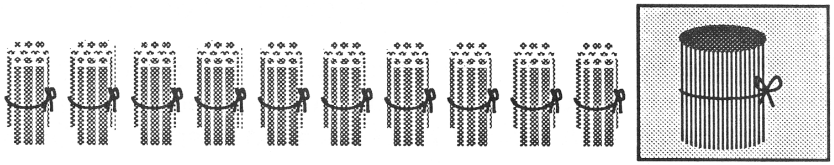
Numbering

886. (1) Count the individual sticks from 1 to 10.



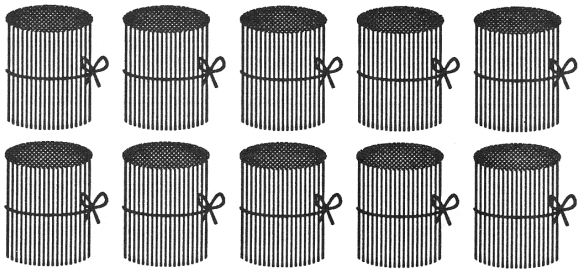
10 sticks form a set of ten sticks.

(2) Count the sets of ten sticks.



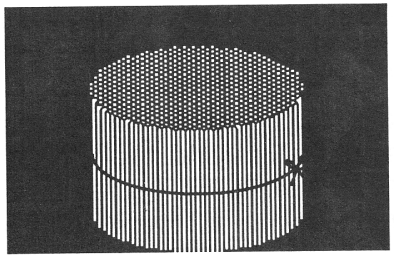
10 sets of ten sticks form one hundred sticks.

(3) Count the sets of one hundred:



Even 1000's are Consistent

E



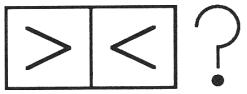
1 set of one hundred - **one hundred**
2 sets of one hundred - **two hundred**
3 sets of one hundred - **three hundred**
4 sets of one hundred - **four hundred**
5 sets of one hundred - **five hundred**
6 sets of one hundred - **six hundred**
7 sets of one hundred - **seven hundred**
8 sets of one hundred - **eight hundred**
9 sets of one hundred - **nine hundred**
10 sets of one hundred - **one thousand**

887. (1) Count by tens from seventy to one hundred.

(2) Count backward by tens from one hundred to sixty.

(3) Count by hundreds from eight hundred to one thousand.

(4) Count backward by hundreds from one thousand to five hundred.

888. 

5 m 2 dm * 2 m 5 dm
6 m 7 dm * 7 m 1 dm
3 m 2 dm * 8 dm
8 m 2 dm * 6 m 9 dm

Consistent models make Comparison easier. Note attention to Comparisons

Note the level of
The problems in the
Second grade Russian
Text – that's what
Proper focus does
For you

918. Draw in your workbook a rectangle with sides of 9 cm and 6 cm and calculate its perimeter.

919. A woman used 14 kg of potatoes in a week (7 days). How many kilograms of potatoes are needed for 4 days at the same daily rate?

920. On Monday 75 children visited the school library, on Tuesday 25 fewer children, and on Wednesday two times as many as on Tuesday. How many children visited the library on Wednesday? (Set up an expression based on the problem.)

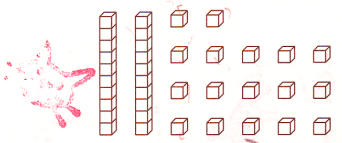
921. A bakery used 48 bags of flour in 3 days. How many days will 80 bags of flour last if the rate remains the same?

922.

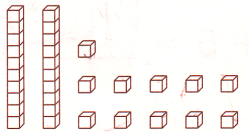
96 – 4 • 12 + 52	56 : 1 – 48 : 4	(42 + 7) : 7
72 : 3 + 76 – 100	75 : 25 + 4 • 23	(26 + 38) : 8
84 : 84 + 23 • 4	31 + 67 – 3 • 32	(58 + 14) : 6

Sometimes This Gets Personal

2. Write the numbers.



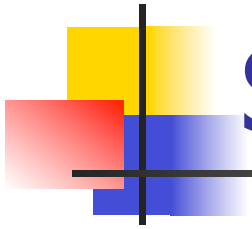
What am I? 37



What am I? 31

4. Count up by 10s. You may use your calculator.

155, 165, 175,
185, 195, 205,
215, 225, 235,
245, 255, 265,



Some Further References

- ftp://math.stanford.edu/pub/papers/milgram/FIE-book.pdf
- ftp://math.stanford.edu/pub/papers/milgram/numbers.pdf
- ftp://math.stanford.edu/pub/papers/milgram/grade2-and-3-algorithms.pdf