

TEN3 Primary Maths Curriculum

INTRODUCTION

This curriculum is based on the research and recommendations of L.P. Benezet in his article, "[The Teaching of Arithmetic: The Story of an Experiment](#)."

He demonstrated through his work in the schools under his leadership that students learn better if they are *not* made to undergo formal instruction in arithmetic, in which they learn formulas and tables but then have difficulty knowing how to apply them.

Instead, he had students spend their time in reading and giving oral summaries of what they read, for the development of clear thinking and expression.

To prepare for mathematics, children are made familiar with numbers and given appropriate reasoning exercises about quantities.

They also pick up incidentally maths that they actually will use in everyday life and play, such as telling time and money.

In Primary 5 they are given mental (not written) arithmetic problems to begin their thinking about how to work precisely with numbers

In Primary 6 formal instruction in arithmetic begins. That was actually a concession on Benezet's part, as he initially preferred starting it in the seventh grade.

His results, as you can read in his paper, were astounding. Not only were his students able to pick up in two years' time all the arithmetic that their peers in other schools had taken eight years to learn, but they were much more adept in expressing the concepts and applying them in various theoretical situations.

That is why we encourage this approach. What follows is a guide based on Benezet's curriculum for grades 1-8.

PRIMARY 1

ROOM SETUP

Number Chart

Have a number chart up to 100 on the wall. It will help with counting reference, and will help them to see patterns in our numbers. It should look like a big version of this:

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

This might be fun when we get to counting by 3s, etc.: give students a copy of this number chart and have them colour the numbers, so they can see the patterns. That would make base conversions a lot easier too if we ever tackle them.

Calendar

Also have a wall calendar visible with the students' birthdays marked on it.

One of the first days of the year, discuss the calendar. Teach them the days of the week, and the months of the year. They will recite these

together twice a week. Also discuss what the year means: AD means "*Anno Domini*" which is, "In the year of the Lord." That is marked by when Jesus was born, because Jesus' life and death and resurrection is the very most important thing ever to happen in the world.¹ Explain to the students that is because all humanity was trapped in sin, and that all death and suffering is because of sin. We were slaves to sin and in the devil's kingdom, and could not get out of it. The only hope the world had was that God had promised a Saviour who would make an end of sin and give life. That Saviour was Jesus; He was God being born as a human to be with us and conquer sin and death for us. We call it "the year of the Lord" because He has taken away the devil's authority; now He rules and gives life to those who trust in Him. So AD 2017 means it is two thousand seventeen years since Jesus came.

This is probably too much for young children, but something for you to ponder: There are technology enthusiasts today who talk about achieving immortality through medical advances and using machines to supplement our bodies. For instance, in 2013 an article came out explaining that Google engineering director was insisting that immortality is within reach. First, he said, he's taking 150 vitamin supplements per day to help him last until the next development is ready, which will be to "reprogram biology away from disease," and then tiny robots that can help us fight disease, produce nutrients, get rid of toxins and fat, etc. We will no doubt push our bodies further than ever before, but there is always a trade-off. Ultimately, when we reprogram our biology and supplement our bodies with robots, we may stay biologically alive longer, but those things may well kill part of our humanity in the process. And regardless, corruption will still wreak havoc on us in some way or another. Only Christ can save us forever from death.

1 Scholars today think Jesus was actually born 4-6 years earlier than 1 AD, but this is the traditional reckoning.

DAILY ACTIVITIES

Numbers In Reading

During reading time, pause each time a number, whether as digits or written out, appears. Write it both ways on the board. For example, when you get to this lesson in the first reader:

Ex.

Ann. how old are you?

I am six.

Are you but six? Why,

I am ten.

But you are not as big as I am.

McGuffey's Newly Revised First Reader

You will write "six" and "6" and "ten" and "10" on the board or in their exercise book, having the students repeat the numbers together aloud. After you finish the reading lesson, come back to these lines and count up to the number 6, and then continue to the number 10.

Ask the students to find pages 6 and 10 in the book.

Note

Don't worry if you don't encounter any numbers in a day's reading. There will be opportunities.

Number Games

You can use any of these games, or make up your own. Spend 20 minutes a day playing a game that involves counting. For example:

- Take the students outside and play jump rope. Count together how many jumps each student makes.
- Have students stand in a circle. Toss a ball to one student, who tosses it to another, and another, and so on. Count each time it is successfully caught. Start over if the ball is dropped.
- Count things in the class: students, pencils, light bulbs. Bring in a bowl of little objects like beads or candies and pull them out one by one and have them counting.

- Segway into comparisons (see next section) by counting two groups of things and comparing them. Perhaps you will count pencils and chalk. You may have 8 pencils and 3 pieces of chalk, so you will say, "Eight is more than three. I have more pencils than chalk." Or count windows and chairs, and say, "There are three windows and twelve chairs. Three is fewer than twelve. There are fewer windows than chairs in this classroom." Practice this regularly until the students can fill in "more" and "fewer" without your help.

Once every week, use the number chart to count all the way to one hundred. After they can count to one hundred with ease, begin adding 10 each week, so they are counting to 110, then later to 120, then to 130, and so on.

Compare And Estimate

Spend 10 minutes per day doing exercises in comparing two amounts and estimating. For example:

Have two students stand side-by-side and ask who is taller and who is shorter. Once the answer has been established, have all the class say together, "Henry is taller than Mary. Mary is shorter than Henry."

Hold up five pencils and three pieces of chalk. Ask, "which do I have more of, the pencils or the chalk?" Then count each, and say, "five is more than three."

Point to the doorknob and the top of your desk. Ask, "Which is higher? Which is lower?" When the answer has been established, say it as a class, for instance, "The doorknob is higher than the desk. The desk is lower than the doorknob."

Bring up five students. Choose one and ask, "How many of these students are taller than this one?"

Talk about your school schedule discussing events that happen earlier and later than others, for instance, lunch happens earlier than dismissal.

Bring a cardboard box into class. Have several objects on hand, all *shorter* than the box but not all *wider*, and ask which ones are wider than the box and which are narrower. Test by seeing if they fit into the box. Note, you want them only comparing *one dimension* at this grade

so you do not confuse them. To review ask, "How many objects are wider than the box?" "How many are narrower?"

Ex.



The box is *taller and longer* than all the other objects, but the football and pot will not fit into it because they are *wider* than the box. The banana and light bulb will fit because they are *narrower*.

Alternatively, you could make a little "doorway" out of wood or cardboard and check if items are wider or narrower than the doorway by seeing if they fit through it.

TWICE A WEEK

Calendar

Twice per week, point students to the calendar. Recite the days of the week and months of the year. Point out today's date, and then say and have the whole class repeat together, "Today is Monday, the fourth of September, AD 2017." After a couple of weeks when they find that easy, add, "Yesterday was Sunday the third, and tomorrow will be Tuesday the fifth." (Of course, you will adjust it for the actual date; this is just an example.)

Point out whose birthday is when for this month. Also point out any holidays. When you are within ten days of a holiday, have the students count together how many days until the holiday. You will have to be patient to help them understand that they do not count the days starting from the current day and ending on the holiday; rather you count the *movement* to each day. For example, if you are coming up on Easter in 2019, and today is Tuesday the 16th:

Sun	Mon	Tues	Wed	Thurs	Fri	Sat
14	15	16 	17	18	19	20
21 EASTER	22	23	24	25	26	27

Students will want to start counting on the 16th since that is today, but they need to start when they move to the 17th, *after* today. For a simpler example, if you are just counting until the 17th, you do not start on 16 and say there are two days from Tuesday to Wednesday. The passing from Tuesday to Wednesday is one day, so also from Tuesday to Sunday is five days. So start with your pointer on Tuesday, but they only count when the pointer moves. So when it moves from Tuesday to Wednesday, that is one, then when it moves from Wednesday to Thursday, that is two. That will have you end with five, the correct number ($21-16=5$).

Note: This example calendar starting on Sunday is standard in the USA. If your country has a different starting day of the week, that is fine. Use whatever is standard in your country.

When appropriate, you may also discuss seasons, such as when rainy season and dry season start. There will also be a time you will want to discuss when on the calendar your school terms begin and end.

At some point, need to include Roman numerals. Maybe 4th grade?

School Arithmetics: p. 2, 3 (problems 1-8; money will be tackled in primary 2), 4 (2 problems per day once per week)

p.7 optional

put somewhere: as a school class, grow a garden. All the children should participate in it. Have them count the rows, the seeds put in each hole, etc. Talk about the different fruits, vegetables, and flowers you are growing: the meaning of annual and perennial, the definition of a fruit, the health benefits of each plant, if any part of the plant is inedible (for instance, the tomato plant is poisonous, whereas the fruit is safe). Talk about the insects in the garden, which ones are harmful because they eat the crop, and which are helpful because they eat the "bad bugs." This is integrating maths, science, and life skills.

WEEK PLANNER

Activity	Frequency
Number in Reading	Daily
Number Games	Daily
Compare & Estimate	Daily
Calendar	Twice/Week

We have included 16 weeks of planning which should be enough for most schools term. This way you have a space to make a plan showing how you accomplished the different actives for the frequency given. The above chart will help you to remember. Also the Activity names of links so if you want to look at the game examples, you can just click on the Number Games in the chart and it will jump up to the games.

We recommend you fill out a week at a time on Friday so you are ready for the next week. Of course, you can adjust your plan during the week, but it gives you a place to start.

This is designed to edited by your PDF reader in your copy of this documents or you can print the pages if that is better for you.

If you need help with editing the PDF, see the Complete_Tablet_Tutorial.pdf in the teacher and student folders on the tables.

Week 1

Monday

Number in Reading	
Number Games	
Compare & Estimate	
Calendar	

Tuesday

Number in Reading	
Number Games	
Compare & Estimate	
Calendar	

Wednesday

Number in Reading	
Number Games	
Compare & Estimate	
Calendar	

Thursday

Number in Reading	
Number Games	
Compare & Estimate	
Calendar	

Friday

Number in Reading	
Number Games	
Compare & Estimate	
Calendar	

Notes:

Week 2

Monday

Number in Reading	
Number Games	
Compare & Estimate	
Calendar	

Tuesday

Number in Reading	
Number Games	
Compare & Estimate	
Calendar	

Wednesday

Number in Reading	
Number Games	
Compare & Estimate	
Calendar	

Thursday

Number in Reading	
Number Games	
Compare & Estimate	
Calendar	

Friday

Number in Reading	
Number Games	
Compare & Estimate	
Calendar	

Notes:

Week 3

Monday

Number in Reading	
Number Games	
Compare & Estimate	
Calendar	

Tuesday

Number in Reading	
Number Games	
Compare & Estimate	
Calendar	

Wednesday

Number in Reading	
Number Games	
Compare & Estimate	
Calendar	

Thursday

Number in Reading	
Number Games	
Compare & Estimate	
Calendar	

Friday

Number in Reading	
Number Games	
Compare & Estimate	
Calendar	

Notes:

Week 4

Monday

Number in Reading	
Number Games	
Compare & Estimate	
Calendar	

Tuesday

Number in Reading	
Number Games	
Compare & Estimate	
Calendar	

Wednesday

Number in Reading	
Number Games	
Compare & Estimate	
Calendar	

Thursday

Number in Reading	
Number Games	
Compare & Estimate	
Calendar	

Friday

Number in Reading	
Number Games	
Compare & Estimate	
Calendar	

Notes:

Week 5

Monday

Number in Reading	
Number Games	
Compare & Estimate	
Calendar	

Tuesday

Number in Reading	
Number Games	
Compare & Estimate	
Calendar	

Wednesday

Number in Reading	
Number Games	
Compare & Estimate	
Calendar	

Thursday

Number in Reading	
Number Games	
Compare & Estimate	
Calendar	

Friday

Number in Reading	
Number Games	
Compare & Estimate	
Calendar	

Notes:

Week 6

Monday

Number in Reading	
Number Games	
Compare & Estimate	
Calendar	

Tuesday

Number in Reading	
Number Games	
Compare & Estimate	
Calendar	

Wednesday

Number in Reading	
Number Games	
Compare & Estimate	
Calendar	

Thursday

Number in Reading	
Number Games	
Compare & Estimate	
Calendar	

Friday

Number in Reading	
Number Games	
Compare & Estimate	
Calendar	

Notes:

Week 7

Monday

Number in Reading	
Number Games	
Compare & Estimate	
Calendar	

Tuesday

Number in Reading	
Number Games	
Compare & Estimate	
Calendar	

Wednesday

Number in Reading	
Number Games	
Compare & Estimate	
Calendar	

Thursday

Number in Reading	
Number Games	
Compare & Estimate	
Calendar	

Friday

Number in Reading	
Number Games	
Compare & Estimate	
Calendar	

Notes:

Week 8

Monday

Number in Reading	
Number Games	
Compare & Estimate	
Calendar	

Tuesday

Number in Reading	
Number Games	
Compare & Estimate	
Calendar	

Wednesday

Number in Reading	
Number Games	
Compare & Estimate	
Calendar	

Thursday

Number in Reading	
Number Games	
Compare & Estimate	
Calendar	

Friday

Number in Reading	
Number Games	
Compare & Estimate	
Calendar	

Notes:

Week 9

Monday

Number in Reading	
Number Games	
Compare & Estimate	
Calendar	

Tuesday

Number in Reading	
Number Games	
Compare & Estimate	
Calendar	

Wednesday

Number in Reading	
Number Games	
Compare & Estimate	
Calendar	

Thursday

Number in Reading	
Number Games	
Compare & Estimate	
Calendar	

Friday

Number in Reading	
Number Games	
Compare & Estimate	
Calendar	

Notes:

Week 10

Monday

Number in Reading
Number Games
Compare & Estimate
Calendar

Tuesday

Number in Reading
Number Games
Compare & Estimate
Calendar

Wednesday

Number in Reading
Number Games
Compare & Estimate
Calendar

Thursday

Number in Reading
Number Games
Compare & Estimate
Calendar

Friday

Number in Reading
Number Games
Compare & Estimate
Calendar

Notes:

Week 11

Monday

Number in Reading	
Number Games	
Compare & Estimate	
Calendar	

Tuesday

Number in Reading	
Number Games	
Compare & Estimate	
Calendar	

Wednesday

Number in Reading	
Number Games	
Compare & Estimate	
Calendar	

Thursday

Number in Reading	
Number Games	
Compare & Estimate	
Calendar	

Friday

Number in Reading	
Number Games	
Compare & Estimate	
Calendar	

Notes:

Week 12

Monday

Number in Reading
Number Games
Compare & Estimate
Calendar

Tuesday

Number in Reading
Number Games
Compare & Estimate
Calendar

Wednesday

Number in Reading
Number Games
Compare & Estimate
Calendar

Thursday

Number in Reading
Number Games
Compare & Estimate
Calendar

Friday

Number in Reading
Number Games
Compare & Estimate
Calendar

Notes:

Week 13

Monday

Number in Reading	
Number Games	
Compare & Estimate	
Calendar	

Tuesday

Number in Reading	
Number Games	
Compare & Estimate	
Calendar	

Wednesday

Number in Reading	
Number Games	
Compare & Estimate	
Calendar	

Thursday

Number in Reading	
Number Games	
Compare & Estimate	
Calendar	

Friday

Number in Reading	
Number Games	
Compare & Estimate	
Calendar	

Notes:

Week 14

Monday

Number in Reading
Number Games
Compare & Estimate
Calendar

Tuesday

Number in Reading
Number Games
Compare & Estimate
Calendar

Wednesday

Number in Reading
Number Games
Compare & Estimate
Calendar

Thursday

Number in Reading
Number Games
Compare & Estimate
Calendar

Friday

Number in Reading
Number Games
Compare & Estimate
Calendar

Notes:

Week 15

Monday

Number in Reading	
Number Games	
Compare & Estimate	
Calendar	

Tuesday

Number in Reading	
Number Games	
Compare & Estimate	
Calendar	

Wednesday

Number in Reading	
Number Games	
Compare & Estimate	
Calendar	

Thursday

Number in Reading	
Number Games	
Compare & Estimate	
Calendar	

Friday

Number in Reading	
Number Games	
Compare & Estimate	
Calendar	

Notes:

Week 16

Monday

Number in Reading
Number Games
Compare & Estimate
Calendar

Tuesday

Number in Reading
Number Games
Compare & Estimate
Calendar

Wednesday

Number in Reading
Number Games
Compare & Estimate
Calendar

Thursday

Number in Reading
Number Games
Compare & Estimate
Calendar

Friday

Number in Reading
Number Games
Compare & Estimate
Calendar

Notes:

PRIMARY 2

DAILY ACTIVITIES

Numbers In Reading

Continue the Numbers in reading exercise. If necessary, continue it for numbers 1-100 for review. Once they are familiar with them, you need only call attention to numbers 200-1000.

Comparatives

Continue the use of comparatives begun in Primary 1. Begin to make them slightly more complicated, for instance putting two items together through your "doorway" or in your box to illustrate, "this is more than twice as wide as this." You may also say that "this book is three times as long as this chalk."

If you can obtain a balance, compare the weights of things, including sometimes if one item weighs half as much as another, or three times as much, etc.

WHEN APPROPRIATE

Occasionally throughout the year, give the students *oral* instruction and practice in the following:

Time

Teach them to read a clock pointed at the hour and the half-hour.

Money

Teach them the denominations of your local currency. Play games in which items are purchased so they get some oral practice with money. For instance, if something costs twelve pence, and you have denominations of ones, fives, tens, and twenties, they they should practice saying, "I would give you one tenpence and two onepence." Do not discuss making change yet. See "School Arithmetics," p. 17 for

some example problems you could present. Remember that all this work for now is oral.

Measurements

Teach them any common use of volume measurements that they may encounter at home or school, such as litres, mililitres, cups, or mudu. If you have these measures available, practice measuring something like water, flour, or sand.

PRIMARY 3

REGULAR ACTIVITIES

Each day, do some of the following activities. Do "Numbers in reading" whenever students encounter a significant number in the books they read. Do comparisons frequently, and Time and Money often enough that they are very comfortable with both. Only do the Addition section if they show good understanding of the rest and seem ready for more.

Numbers In Reading

As students encounter numbers in reading, take time to explain their value. Is the author telling them it is an unusually large number, an unusually small number, a healthy expected number? Help them think about what the numbers mean in the contexts they read.

Teach them in their books to use page numbers, the table of contents, and the index.

Money

Reiterate how your denominations relate to each other. How many of one coin is worth another coin? If a mango costs 3 shillings, how many pennies is that?

Time

This year they should learn to tell the time any minute. They learn that there are 60 minutes in an hour. They are first taught to say 3:50; 2:35; etc. Do not cover "ten minutes to four" or "fifteen minutes to six" or other such expressions yet.

Also explain how there are 24 hours in a day, so the hour hand goes all the way around the 12 numbers twice. 24 is twice 12.

Students should be able to recite all days of the week, and months of the year. Practice occasionally reciting which months have 28, 30, and 31 days. In February, mention that every 4 years it has 29 days. That is because it takes about $365 \frac{1}{4}$ days for the earth to go completely around the sun.² Explain how we know this because we can measure the daylight to determine the *summer solstice*, *winter solstice*, *vernal equinox*, and *autumnal equinox*. If we did not have the leap year, then these days would "drift" slowly along the calendar, but with the leap year, they will be on the same day every year. **Have these four dates marked on your wall calendar to point them out.** You may also explain that the closer you are to the equator, the less difference there is in daylight throughout the year. But in places very far south like southern Chile, or very far north like Norway, it is dark almost all the time in winter, and light almost all the time in summer.

Comparisons

Continue to do oral comparisons. Begin to have students estimate before closely comparing which item will be taller, shorter, wider, narrower, heavier, lighter, etc. and then check to see if their estimation was right. Especially do comparisons that use such concepts as "double," "half," "three times," "one-third," and the like. You may also do addition comparisons, such as, "this book is as long as a pencil and three paper clips."

² Actually it is slightly less than $365 \frac{1}{4}$, which is why in years that are divisible by 100 but not 1000, it is not a leap year, even though it is divisible by 4. Do not explain that to them at this early age though; that is complicated enough for secondary school!

Number Identification

Share other such numbers as are encountered in everyday life, such as children's house numbers, telephone numbers, and automobile license numbers. They should learn to identify them, particularly how many digits to expect.

Crossover with science: continue measurements of volume, and compare them on a balance, so students learn that some substances are heavier than others. For instance, which is heavier, 500mL of water or 500mL of sand? Can illustrate weight of air by comparing an empty balloon with a full one.

Addition

If the children seem to master all of the above with ease at least six weeks before the end of the year, use School Arithmetics 1, pages 5, 7, 10, 19, and 15, *oral problems only!* You may also make up such oral addition problems as, "How many boys do we have in class? How many girls? How many children have we all together?" "How many pencils do I have? How many pens? How many writing utensils do I have all together?" Keep them to numbers easy to count to. The idea is simply to teach them to think about bringing items together to get more items, so they can begin to expect *reasonable* results. (In other words, it is okay if they do not get it exactly right each time, though they should get close. When they do not get it exactly right, simply orally correct them, have them repeat the problem and answer once after you, and move on. Don't repeat the same questions over and over to make them get it right. You are teaching them to think, not to parrot.) If they find an oral problem you gave them too difficult, simply back up to something easier and build up the difficulty more slowly; it is okay even if you do not do much in double-digit addition this year.

PRIMARY 4

Estimating And Measuring

This exercise should be done most days: Use rulers and meter sticks to teach meters, centimeters, and millimeters. Each day, have them practice

estimating the length of various objects, for instance, the height of a certain child, or the width of a window, or the length of the room. They should each write on paper what they think the length is. Then you will measure the item in question, and they will write the actual length beside their estimate. After about six weeks, students may be called on to do the measuring for these exercises if the measurement is in centimeters or millimeters; only be particular that they do it with care, starting at the very edge, and holding the stick straight out rather than letting it veer off at an angle. Once they show they can do this well, you can introduce how to measure things that are multiple meters by carefully marking the end of the measuring stick and starting again at the mark.

Set aside a few days in the year for this lesson: Teach students to read the thermometer. Teach them the significance of 0 degrees, 100 degrees, and 37 degrees. If Fahrenheit is used in your community, give the significance of 32 degrees, 98.6 degrees, and 212 degrees. (You may add the tidbit that there are several stories about how Daniel Gabriel Fahrenheit devised this thermometer. Some say 0 degrees Fahrenheit was the coldest liquid he could make, and he intended for 100 to be the temperature of the human body, but he was off a little bit. Others say he just mathematically modified an already-existing scale.) Choose two days out of the year in which to experiment with heating water and checking the temperature. They should notice that water that has been left to room temperature feels colder than the air, even though it is the same temperature. Heat it until it feels neither hot nor cold and measure its temperature. You will find it is close to the human body. By the time it reaches 43 degrees, it will feel hot, though still be safe to touch. If you wish, then bring it to boiling point (**without** letting them touch it, obviously) to see that it does indeed boil about 100 degrees. If it is a little off, explain that elevation (being on a mountain or a plain), the weather, and impurities in the water can change the boiling point some. To illustrate, add a spoonful of salt, and they will see the boiling point increases.

About 12 weeks into the year: Teach weight measurement with grams and kilograms, and that kilo means 1000, so a kilogram is 1000 grams. (If your community uses other weight measurements like pounds and

ounces, teach this as well.) Occasionally do your estimating and measuring exercises with weight.

Once students are comfortable estimating and measuring length with a meter stick, introduce the terms "centimeter squared," and "meter squared," as units of surface measure. For now, do not teach them to mathematically calculate it based on a length and width measurement. After all, they have not yet learned formally to multiply. Rather, have paper squares of 1cm and teach them to fill a small surface with them and count the results. They will then observe that, for instance, an item 5cm long and 5cm wide will contain 25 square centimeters.

Toward the end of the year: The children will have done a great deal of work in estimating areas, distances, etc., and in checking their estimates by subsequent measuring. Now teach them "half kilometer," "quarter kilometer," and "kilometer" give them an idea of these distances by actual comparisons, such as telling the distance across your city, or from your village to other villages, and across your country. If possible, take them in an automobile and use the speedometer to bring them exactly 1 kilometer so they can observe the distance.

Money

With toy money (or real coins, if available) have them practise making change, in denominations of 5's only. They are to play as if they are buying items from one another. Explain that all prices must end in a 0 or 5 so that they will be making change no more detailed than 5. All of this work is done mentally. Any problem in making change which cannot be solved **without** putting figures on paper or on the blackboard is too difficult and is deferred until the children are older.

Time

You will not likely need to do much more instruction on time, as they will naturally use it in their daily activities. You may want to cover the expressions like "ten minutes to two" this year.

Near the end of the year, have the students make the following table. They do **not** need to memorize it, only keep it for reference:

	In a minute	In an hour	In a day	In a year
Days	-	-	-	365*
Hours	-	1	24	8760
Minutes	1	60	1,440	525,600
Seconds	60	3600	86,400	31,536,000

*except leap years, which have 366

Make sure to explain how a table is used, going along the rows to see what information pertains to them in each column.

PRIMARY 5

FIRST HALF OF THE YEAR

Beginning Multiplication

Practice counting by 10s orally, up to 100. When students find this easy, practice counting by 5s. Then 2s, then 4s, then 3s. When all students can easily count by all these numbers, teach the multiplication tables for these numbers. Have them fill them out on paper, one times table three times per week, until the halfway point of the year.

Money

With toy money, or with real coins if available, the children practise making change in more precise amounts. Continue playing purchases in the store, encouraging them to increase their purchases so they purchase more than one thing

Estimating And Measurement

The informal work of previous grades in the estimating of distance, area, time, weights, measure of capacity, and the like, is continued. The ability to guess and estimate by games is developed. Each child in the class writes his estimate before these are checked up by actual measurement.

Fractions

Give manipulatives to the students to illustrate fractions. It may be play dough they can cut into even shapes and then divide, or paper pieces, or perhaps interlocking blocks. Guide them to divide one into half, and another into thirds. Ask them to compare them. They should discover *for themselves* that $\frac{1}{3}$ is smaller than $\frac{1}{2}$ and greater than $\frac{1}{4}$; i.e., that the larger the denominator the smaller the fraction. **Do not lecture or test this point.** Just let them observe it on their own.

Mental Arithmetic

Toward the end of the semester the children are given the book, *Practical Problems in Mental Arithmetic*, grade IV. The solution of these problems involves a knowledge of denominations which the children have not had and the use of tables and combinations which have not yet been taught to them. Nevertheless, children with a natural sense of numbers will be able to give the correct answers. The teacher will not take time to explain by formula or tables the solution of any problem to those who do not grasp it quickly and naturally. The purpose of the mental arithmetic book is to stimulate quick thinking and to get children away from the old-time method of using the fingers to do the work of the head. If some of the children do not grasp the problems easily and quickly, the teacher simply passes on, knowing that the power to reason will probably develop in them a year or two subsequently. The one thing which is avoided is that children shall get the idea that a fixed method or formula can be used as a substitute for thinking. The problems listed under September, October, and November are covered before the end of the semester.

This book seems to be available nowhere except the Library of Congress. I am evaluating possible substitutes.

SECOND HALF OF THE YEAR

Beginning in the second half of the year, the children are asked to count by 6's, 7's, 8's, and 9's. This work is done mentally without written tables before them, either upon paper or on the blackboard. After a time this leads naturally to the multiplication tables of 6's, 7's, 8's, and 9's.

The attention of the children is called to the fact that in the table of 9's the second digit is always diminished by one [18, 27, 36, etc.] and the reason is explained that adding 9 is the same as adding 10 and taking away 1. In similar fashion it is shown that adding 8 is the same as adding 10 and taking away 2, so that in the table of 8's the second digit of each successive product is 2 less than the second digit of the product above it [48, 56, 64]. In similar fashion it is shown that adding 7 is the same as adding 10 and taking away 3. After the tables have been learned the teacher makes sure that the children know the products in any order; i.e., that it is not necessary for the child to start at the beginning of the table and run through until he reaches the product which he is asked to give. They learn that 2 times 3 is always equal to 3 times 2.

Reaffirm and further explain what the children have learned about the relative value of the fractions $\frac{1}{2}$, $\frac{1}{4}$, $\frac{1}{5}$, and $\frac{1}{10}$. Use concrete examples. For instance, when the children remember that 2 quarters are worth one half dollar, it is easy to show them that twice $\frac{1}{4}$ equals $\frac{1}{2}$, or that twice $\frac{1}{10}$ equals $\frac{1}{5}$.

The problems listed under December to June, inclusive, in the book *Practical Problems in Mental Arithmetic*, grade IV, are covered in the course of the semester. If the children do not grasp the problem quickly and easily, the teacher does not stop to explain the method or prescribe any formula for solution. Of course as new terms occur in the problems [pecks, gallons, etc.] the teacher explains, incidentally, what they mean.

PRIMARY 6-8

This is where formal arithmetic is done. Benezet used a book difficult to find, but Wentworth & Smith's "School Arithmetics" has been recommended as very comparable, and is freely available online. We will evaluate where to begin in these books.

Contributors

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