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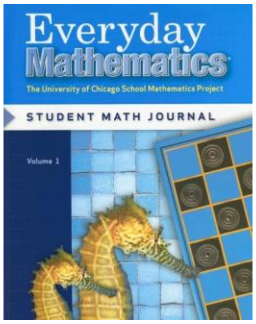


Everyday Mathematics Parent Handbook

Letter from the Assistant Superintendent

August 2010

Dear Parents,

This Mathematics Parent Handbook is designed to give information to Franklin Community School parents about the elementary mathematics curriculum taught in our schools in grades K-6. It offers tools you may find helpful as you support your child's learning at home.

Everyday Mathematics, developed by the University of Chicago School of Mathematics, is the textbook series selected by the Franklin Community Schools in 2010. As you review your child's work in mathematics, you will see that many of the assignments will appear unfamiliar compared to more traditional sets of computation assignments and story programs. Our program is a blend of computation and algorithms and rigorous problem solving. Students will be expected to compute correctly and efficiently. They will also be expected to describe processes, write about their problem-solving strategies, and use other devices that enrich student's understanding of mathematics.

This handbook provides answers to frequently asked questions and explains unfamiliar exercises to support your student's learning. This is the first edition of the Parent Handbook. Please feel free to share your comments and suggestions with your student's teacher and/or principal.

Thank you for your support!

Sincerely,

Dr. Victoria Davis
Assistant Superintendent

Philosophy

“What is Everyday mathematics and why are we involved with it?” Everyday Mathematics is the elementary component of The University of Chicago School Mathematics Project (UCSMP), which is a long-term project designed to improve mathematics at all grade levels.

We have heard for years of the need for a richer mathematics curriculum. We have also heard about how poorly our students score in mathematics compared to other countries. Reports from international studies show U.S. students learning much less mathematics than students in many other countries.

Everyday Mathematics attempts to remedy this problem by giving your student a wide range of mathematical experiences and ideas. We achieve this by integrating mathematics instruction into other curricular areas, like science and social studies.

Everyday Mathematics is written based on a “spiral” curriculum, meaning a specific concept is taught five times in two years, giving your student many opportunities to grasp the idea when developmentally ready to do so. For example, multiplication concepts are introduced in kindergarten with skip counting, again first grade, in second grade through building arrays, and focused on in depth in third grade. Your child has many exposures to concepts before mastery is expected.

Your student is involved in sharing ideas through discussions. Students gain important mathematical insights by building on discoveries. This promotes good listening habits and a receptive attitude toward the ideas of others. Students are constantly talking about how they solved a problem and what they are thinking mathematically. By discussing their thoughts, they are clarifying and solidifying their learning.

Your student will explore, learn and practice mathematics in a range of settings including whole class, small groups, partners and individually. They will learn to work cooperatively and independently as they solve problems based on real-life situations.

The math classroom has changed dramatically. Our focus is much broader. Your student is involved in activities focusing on numeration, counting, operations, relations, problem solving, mental arithmetic, data collection and analysis, geometry, measures and reference frames, money, rules and patterns, as well as arithmetic skills.

Our hope is that this parent manual will answer many of your questions. It has been compiled based on information given us through comments and suggestions. You are a very important part of your child's education. We greatly appreciate your continued support.

Answers to Frequently Asked Questions

Basic Facts

Q: Will my child learn and practice basic facts?

A: Absolutely. Your child will learn and practice all of the basic facts in many different ways. She will play mathematics games in which numbers are generated randomly by dice, dominoes, spinners, or cards. She will work with Fact Triangles, which present fact families and stress the addition/subtraction and multiplication/division relationships. In fourth grade, she will take timed “50-facts” multiplication tests that will require her to learn the facts she does not already know. She will have continuing access to Addition/Subtraction and Multiplication/Division Fact Tables that will serve both as references for the facts she does not yet know and as records of the facts she does. She will take part in short, oral drills to review facts with her classmates during transitional moments throughout the day. Also, there are many other activities and routines that will help your child increase and reinforce her knowledge of basic facts throughout the year.

Computation

Q: Does my child have opportunities to learn, develop, and practice computation skills?

A: Yes. Computational proficiency has always been, and will continue to be, an integral part of mathematics education. Your child gains the fact knowledge he needs for computation from basic facts practice. He solves problems in a meaningful way through number stories about real-life situations that require him to understand the need for computation, which operations to use, and how to use those operations. He often has the opportunity to develop and explain his own strategies for solving problems through algorithm invention. He practices mental arithmetic during Minute Math or 5-Minute Math. He also performs activities that encourage him to round or estimate numbers mentally

Assessment

Q: How do you measure my child’s progress? What can you show me that demonstrates what he has learned?

A: Your child will be given ample opportunities to demonstrate his mathematical understanding. Teachers frequently make written observations of students’ progress as they watch students working on Math Boxes or slate activities. They also evaluate students’ Minute Math responses, the interactions during group work or games, and their written responses to Math Messages. Unit reviews and assessment pages are used to evaluate individual student progress. This variety provides richer and more comprehensive information to use in reviewing and assessing students’ progress.

Instead of sending home traditional grade reports for mathematics, the teacher may show you a “rubric”, a framework for tracking your child’s progress. The rubric may be divided into categories describing different skill levels, such as Beginning, Developing, and Secure. Using these categories, the teacher indicates your child’s skill in and understanding of a particular mathematical topic. The teacher can use this record of progress to decide which areas need further review and whether certain students need additional help or challenge.

Mastery

Q: Why does my child have to move on to the next lesson if she hasn’t mastered skills in the current lesson?

A: Mastery varies with each child and depends on her learning and problem-solving styles. Because people rarely master a new concept or skill after only one exposure, the program has a “spiral” design that informally introduces topics for two years before formal study. The “spiral” approach offers both consistent follow-up and a variety of experiences. If your child does not master a topic the first time it is introduced, she will have the opportunity to increase her understanding the next time it is presented. Your child will regularly review and practice concepts by playing content-specific games and by completing written exercises and assessments. Your classroom teacher can give you a list of skills your child is expected to master this year.

Addressing Individual Needs

Q: Everyday Mathematics seems too difficult for my child. Will he be able to succeed in the program? How can the program address his individual needs?

A: If your child is having difficulty, continue to expose him to the program and give him a chance to meet its high expectations. Everyday Mathematics has many open-ended activities that will allow your child to succeed at his current skill level. While playing games, inventing algorithms, writing number stories, and solving problems in Minute Math and Math Boxes exercises, your child will develop his strengths and improve in his weak areas. Rest assured that he will receive repeated exposures to all concepts throughout the program. Furthermore, your child’s teacher may group students to best suit their needs. For example, your child may be part of a small group working directly with the teacher or he may be paired with another student. The teacher may also modify or adjust program material according to student needs. Finally, we hope the resources in this handbook will help you work with your student.

Games

Q: Why does my child play games in class?

A: Everyday Mathematics games reinforce mathematics concepts in a valuable and enjoyable way. They are designed to help your child practice her basic facts and computation skills and develop increasingly sophisticated solution strategies. Games are not seen as tedious drill to the children. Games allow your child to carry play into serious practice of her number skills. They offer the flexibility to practice more than fact and operation skills. She also could be practicing money exchange, logic, geometric intuition, shopping skills, probability and chance intuition. Because most games involve generating numbers randomly, they can be played over and over without repeating the same problems. This randomness increases the opportunity for her to practice all the facts, not just the ones she knows.

Calculators

Q: Why is my child using a calculator? Will he become dependent on the calculator for solving problems?

A: Your child uses a calculator to learn concepts, recognize patterns, develop estimation skills, and explore problem solving. However, a calculator does not replace the need to learn basic facts, to compute mentally, and to do paper-and-pencil computation. He learns when a calculator can help solve problems beyond his current paper-and-pencil capabilities. On the other hand, he also learns that in some situations, he can rely on his own problem-solving power to get an answer more quickly. Your child also uses basic fact and operations knowledge and estimation skills to determine whether the calculator's solution is reasonable. He/she becomes comfortable with the calculator as one technological tool.

Parent Involvement

Q: How can I get involved? How can I reinforce my child's mathematics learning at home?

A: Communicate with your child's teacher on a regular basis. If possible, volunteer to help with Explorations or Projects or observe a mathematics lesson. Attend school functions, such as Math Night, planned to inform you about Everyday Mathematics and your child's progress. At home, talk with your child about real-life situations that involve mathematics, such as buying groceries or balancing the checkbook. Ask your child to "teach" you the mathematics lessons he is learning, including favorite games and creative solution strategies.

Concepts Developed in Everyday Math

People rarely learn something new the first time they experience it. For this reason, key ideas are repeated, usually in slightly different contexts, several times throughout the year. New material follows the 2/5 rule - that is, a concept is informally introduced for two years before it is formally studied, and once introduced, the concept is practiced in five or more different settings.

Everyday Mathematics materials let children explore the full range of mathematics across all grade levels. Math activities are connected to past experiences and studied in a problem-rich environment with links to many areas both within mathematics and other subject areas. Each grade level includes content from the areas listed below:

- Numeration and Counting: saying, reading, and writing numbers; counting patterns; place value; whole numbers, fractions and decimals
- Operations and Relations: number facts (computation); operation families; informal work with properties
- Problem Solving and Number Models: mental and written arithmetic along with puzzles, brain teasers and real-life problems
- Measures and Reference Frames: measures of length, width, area, weight, capacity, temperature and time; clocks; calendars; timelines; thermometers; ordinal numbers (first, second, etc.)
- Exploring Data: collecting and ordering data; tables, charts and graphs; exploring uncertainty; fairness; making predictions
- Geometry: exploring two- and three-dimensional shapes
- Rules and Patterns: functions, relations, attributes, patterns and sequences
- Algebra and Uses of Variables: generalizing patterns, exploring variables, solving equations

Children often work together with partners and small groups, sharing insights about math and building on each other’s discoveries. Talking about math is an important part of thinking about math, and verbalizing helps clarify concepts. Cooperative grouping helps children work together as a team, develops good listening habits, and stimulates their learning.

The materials that you see and hear about vary somewhat by grade level, and some are probably different than what you remember from elementary school.

Tools and Exercises Used in Everyday Mathematics

Calculators: Evidence is growing that students' intelligent use of calculators enhances understanding and mastery of arithmetic and helps develop good number sense. Moreover, teacher experience and considerable research show that most children develop good judgment about when to use and when not to use calculators. Students learn how to decide when it is appropriate to solve an arithmetic problem by estimating or mentally calculating, by using paper and pencil, or by using a calculator.

Calculators are useful teaching tools. They make it possible for young children to display and read numbers before they are skilled at writing numbers. Calculators can be used to count by any number, forward and backward. They also allow children to solve interesting, everyday problems requiring calculations that might otherwise be too difficult for them to perform.

Please encourage children to use their calculators whenever they encounter interesting numbers or problems that may be easier to handle with calculators than without them. This includes numbers or problems that may come up outside of the mathematics period. Encourage them also to think about when not to use a calculator because it is easier and faster to solve a problem mentally.

Explorations: Explorations are independent or small-group activities that allow children to investigate, develop and extend math concepts. These are a key part of the math program in the early grades and often involve manipulating materials. During this time teachers interact with students, both for teaching and for assessment.

Games: Mathematical games are an important part of the Everyday Mathematics program. They reinforce math fact computation and provide an alternative form of practice. They build fact and operation skills, but also reinforce other skills: for example, calculator skills, money exchange and shopping skills, logic, geometric intuition, and probability and chance intuition. Games can be repeated without repeating the same problem since most games involve generating numbers randomly. Rules can be altered to allow players to progress from easy to more challenging versions. Games are fun; families can play them at home to provide additional practice in an interesting way. Some games can be played by students across a variety of grade levels.

Home Links (Kindergarten – 3rd grade)**/Study Links** (4th – 6th grade): These provide an important connection between home and school. Most are activities that require interaction with parents, other adults, or another child. They are designed to provide follow-up and review of skills and concepts, and an extension of the material covered in the daily lessons.

Journal: The journal contains the problem material and pages on which the children record the results of their activities. It provides a record of their mathematical growth over time and is used in place of student worksheets, workbook, and textbook.

Math Boxes: Math Boxes (the EDM name for worksheets) are 4 - 6 short problems on a page used on a regular basis for review and practice. Many of these worksheets have blank boxes so teachers can individualize work for students.

Math Messages: Many teachers begin each day with a Math Message to be completed by the children before the start of the lesson for that day. Math Messages vary. They consist of problems to solve, directions to follow, tasks to complete, notes to copy, sentences to complete or correct, or brief quizzes. Most are used as lead-in activities for the lessons of the day or as reviews of previously learned topics. Follow-ups to the Math Messages usually occur during the lesson itself.

Math Tool Kit: Students use a variety of math tools throughout the year. Ruler, tape measure, geometry template, counters, money, and calculators are among the items kept in the math tool kit. Children learn responsibility for their learning tools and have them available when needed.

Minute Math (Kindergarten – 3rd grade)**/5-Minute Math** (4th – 6th grade): Minute Math and 5-Minute Math are brief activities for transition times and for spare moments throughout the day. The activities serve as a source of continuous review and provide problems for mental problem solving and arithmetic.

Algorithms and Arithmetic in Everyday Mathematics

An algorithm is a set of rules for solving a math problem which, if done properly, will give a correct answer each time.

Algorithms generally involve repeating a series of steps over and over, as in the borrowing and carrying algorithms and in the long multiplication and division algorithms. The Everyday Mathematics program includes a variety of suggested algorithms for addition, subtraction, multiplication and division. Current research indicates a number of good reasons for this — primarily, that students learn more about numbers, operations, and place value when they explore math using different methods.

Arithmetic computations are generally performed in one of three ways: (1) mentally, (2) with paper and pencil, or (3) with a machine, e.g. calculator or abacus. The method chosen depends on the purpose of the calculation. If we need rapid, precise calculations, we would choose a machine. If we need a quick, ballpark estimate or if the numbers are "easy," we would do a mental computation.

The learning of the algorithms of arithmetic has been, until recently, the core of mathematics programs in elementary schools. There were good reasons for this. It was necessary that students have reliable, accurate methods to do arithmetic by hand, for everyday life, business, and to support further study in mathematics and science. Today's society demands more from its citizens than knowledge of basic arithmetic skills. Our students are confronted with a world in which mathematical proficiency is essential for success. There is general agreement among mathematics educators that drill on paper/pencil algorithms should receive less emphasis, and that more emphasis be placed on areas like geometry, measurement, data analysis, probability and problem solving, and that students be introduced to these subjects using realistic problem contexts. The use of technology, including calculators, does not diminish the need for basic knowledge, but does provide children with opportunities to explore and expand their problem solving capabilities beyond what their pencil-and-paper arithmetic skills may allow.

Sample Algorithms: Below are examples of a few procedures that have come from children's mental arithmetic efforts. Each is a legitimate algorithm, that is, a set of rules that if properly followed yields a correct result. As parents, you need to be accepting and encouraging when your children attempt these computational procedures. As they experiment and share their solution strategies, please allow their ideas to flourish. If you are not comfortable with the vocabulary of arithmetic, you may want to review the glossary entries for addition, subtraction, multiplication and division before reading the sample algorithms.

Addition Algorithms

1. Left-to-right Algorithm

A. Starting at the left, add column-by-column, and adjust the result.

	2	6	8
	+4	8	3
1. Add	6	14	11
2. Adjust 10's and 100's	7	4	11
3. Adjust 1's and 10's	7	5	1

B. Alternate procedure: For some students this process becomes so automatic that they start at the left and write the answer column by column, adjusting as they go without writing any in-between steps. If asked to explain, they say something like this:

2	6	8
+4	8	3
6^1	4^1	1
7	5	1

“Well, 200 plus 400 is 600, but (looking at the next column) I need to adjust that, so write 7. Then, 60 and 80 is 140, but that needs adjusting, so, write 5. Now, 8 and 3 is 11, no more to do, write 1.”

This technique easily develops from experiences with manipulatives, such as base-10 blocks and money, and exchange or trading games, and is consistent with the left-to-right patterns learned for reading and writing.

2. Partial-Sums Algorithm

Add the numbers in each column. Then add the partial sums.

Students who use this type of algorithm often show more awareness of place value than those who learned the traditional method. This procedure works well for larger numbers too.

	268
	+483
1. Add 100's	600
2. Add 10's	140
3. Add 1's	+11
4. Add partial sums	751

3. Rename-Addends Algorithm (Opposite Change)

If a number is added to one of the addends and the same number is subtracted from the other addend, the result remains the same. The purpose is to rename the addends so that one of the addends ends in zeros.
This strategy indicates a good number sense and some understanding of equivalent forms.

A. Rename the first addend, and then the second.

268	->	(+2)	->	270	->	(+30)	->	300
+483	->	(-2)	->	+481	->	(-30)	->	+451
							Add	751
Explanation: Adjust by 2, and then by 30.								

B. Rename the first addend, and then the second.

268	->	(-7)	->	261	->	(-10)	->	251
+483	->	(+7)	->	+490	->	(+10)	->	+500
							Add	751
Explanation: Adjust by 7, and then by 10.								

4. Counting-On Algorithm

A. Rename the first addend, and then the second.

268 + 483

Begin at 268 and count by 100’s, 4 times: 368, 468, 568, 668; then count by 10’s, 8 times: 678, 688, 698, 708, 718, 728, 738, 748; continue to count by l’s, 3 times: 749, 750, 751.

B. Counting-on algorithm alternate method

With larger numbers children may use a combination of counting on and counting back. Begin at 268 and count by 100’s, 5 times: 368, 468, 568, 668, 768; then count back by 10’s, twice: 758, 748; continue to count by 1’s, 3 times: 749, 750, 751.

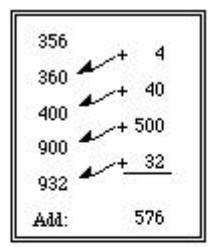
Subtraction Algorithms

1. Add-Up Algorithm

Add up from the subtrahend (bottom number) to the minuend (top number).

Students may mentally keep track of the numbers that are added or use paper to record the addends on the side. Most of us often use some form of this method when making change.

932
-356



2. Left-to-Right Algorithm

Starting at the left, subtract column by column.

932
-356

1. Subtract 100's	932 -300
2. Subtract 10's	632 -50
3. Subtract 1's	582 -6
	576

3. Rename Subtrahend Algorithm (also called Same Change)

If the same number is added to or subtracted from the minuend (top number) and subtrahend (bottom number), the result remains the same. The purpose is to rename both the minuend and the subtrahend so that the subtrahend ends in zero.

This type of solution method shows a strong ability to hold and manipulate numbers mentally.

A. Add the same number

932	->	(+4)	->	936	->	(+44)	->	976
-356	->	(+4)	->	-360	->	(+40)	->	-400
							Subtract	576
Explanation: Adjust by 4, and then by 40.								

B. Add the same number

932	->	(-6)	->	930	->	(+54)	->	976
-356	->	(-6)	->	-350	->	(+50)	->	-400
							Subtract	576
Explanation: Adjust by 6, and then by 50.								

4. Two Unusual Algorithms

A. Subtract by adding column-by-column with adjustments. (Same problem as above.) Some students who use the add-up algorithm extend that to subtraction. They just write the answer with no other remarks. Asked to explain, they say something like this:
“To get to 900 from 300, add 600; but the tens need help, so make it 5 [for 500]. To get to 130 from 50, add 80; but the ones need help, so write 7 [for 70]. To get to 12 from 6, add 6. No more to do.”

B. Write partial differences, negative if necessary, and adjust. A few students who love negative numbers use some variation of the procedure shown here.

This method may be less common than some of the others. Yet, some students seem to have an informal sense of working with negatives (deficits).

	932
	-356
1. Subtract 100's: 900-300	600
2. Subtract 10's: 30-50	-20
3. Subtract 1's: 2-4	-4
4. Add the partial differences	576
(600-20-4, done mentally)	

Multiplication Algorithms

In Third Grade Everyday Mathematics, a “partial-products” algorithm is the initial approach to solving multiplication problems with formal paper-and-pencil procedures. This algorithm is done from left to right, so that the largest partial product is calculated first. As with left-to-right algorithms for addition, this encourages quick estimates of the magnitude of products without necessarily finishing the procedure to find exact answers. To use this algorithm efficiently, students need to be very good at multiplying multiples of 10, 100, and 1000. The fourth-grade program contains a good deal of practice and review of these skills, which also serve very well in making ballpark estimates in problems that involve multiplication or division, and introduces the * as a symbol of multiplication.

1. Partial-Product Algorithm

In the partial-product multiplication algorithm, each factor is thought of as a sum of ones, tens, hundreds, and so on. For example, in 67 * 53, think of 67 as 60 + 7, and 53 as 50 + 3. Then each part of one factor is multiplied by each part of the other factor, and all of the resulting partial products are added together.

	67
	*53
50 x 60	3000
50 x 7	350
3 x 60	180
3 x 7	+21
	3551

This method reinforces the understanding of place value and emphasizes the multiplication of the largest product first.

2. Modified Standard U.S. Algorithms

Example *a* is the standard U.S. algorithm.
Example *b* replaces the blank with a zero, which makes it clear that for the second partial product, we are multiplying by 50 (five 10's) and not just by 5.
Example *c* works from left to right, but is otherwise the same as the standard algorithm with zero in place of the blank. This method may be less common than some of the others yet students using it are able to do arithmetic easily and apply it in many different situations.

a.		b.		c.	
	67		67		67
	*53		*53		*53
	201		201		3350
	+335		+3350		+201
	3551		3551		3551

A Division Algorithm

The key question to be answered in many problems is, “How many of these are in that,” or “How many n's are in m?” This can be expressed as division: “m divided by n,” or “m/n.”

One way to solve division problems is to use an algorithm that begins with a series of “at least/less than” estimates of how many n’s are in m. You check each estimate. If you have not taken out enough n’s from the m’s, take out some more; when you have taken out all there are, add the interim estimates.

For example, 158/12 can be thought of as the question, “How many 12’s are in 158?” You might begin with multiples of 10, because they are simple to work with. A quick mental calculation tells you that there are at least ten 12’s in 158 (10 * 12 = 120), but less than twenty (since 20 * 12 = 240).

12)158	
-120	10
38	
-36	+3
2	13

You would record 10 as your first estimate and remove (subtract) ten 12’s from 158, leaving 38. The next question is, “How many 12’s are in the remaining 38?” You might know the answer right away (since three 12’s are 36), or you might sneak up on it: “More than 1, more than 2, a little more than 3, but not as many as 4.” Taking out three 12’s leaves 2, which is less than 12, so you can stop estimating.

To obtain the final result, you would add all of your estimates (10 + 3 = 13) and note what, if anything is left over (2). There is a total of thirteen 12’s in 158; 2 is left over. The quotient is 13, and the remainder is 2.

It is important to note that, in following this algorithm, students may not make the same series of estimates. In the example, a student could have used 2 as a second estimate, taking out just two 12’s and leaving 14 still not accounted for—another 12, and a remainder of 2. The student would reach the final answer in three steps rather than two. One way is not better than another.

12)158	
-120	10
38	
-24	2
14	
-12	+1
2	13

The examples show one method of recording the steps in the algorithm.

One advantage of this algorithm is that students can use numbers that are easy for them to work with. Students who are good estimators and confident of their extended multiplication facts will need to make only a few estimates to arrive at a quotient, while others will be more comfortable taking smaller steps. More important than the course a student follows is that the student understands how and why this algorithm works and can use it to get an accurate answer.

Another advantage of this algorithm is that it can be extended to decimals once students have a pretty good sense of “How many n’s are in m?” Sometimes it may be desirable to express the quotient as a decimal. Sometimes n may be larger than m (the divisor larger

12)158.0	
-120.0	10.0

than the dividend), or all the information is in decimal form. For the example 158 / 12, the estimates could be continued by asking, “How many 12’s in the remainder 2?”

38.0	
-36.0	3.0
2.0	
-1.2	+0.1
.8	13.1

A student with good number sense might answer, “At least one-tenth, since 0.1 * 12 is 1.2, but less than two-tenths, since 0.2 * 2 = 2.4. The answer then could be l3.1 (12’s) in 158, and a little bit left over.”

The question behind this algorithm, “How many of these are in that?” also serves well for estimates where the information is given in “scientific notation” (see glossary). The uses of this algorithm with problems that involve scientific notation or decimal information will be explored briefly in grades 5 and 6, mainly to build number sense and understanding of the meanings of division.

Summary

An algorithm is any series of steps which, if followed properly, always yield a correct result. There are many ways to add, subtract, divide, and multiply that meet this definition. Your child will learn to compute accurately and quickly.

Although you probably learned only one or two algorithms for each kind of arithmetic, it is important that you support your child's use of many. In fact, if you closely observe your own computations in a variety of real-life settings — counting change, making estimates, balancing your checkbook, etc. — you will probably find that you use different algorithms at different times, and some of them are probably your own inventions.