BERNARDS TOWNSHIP PUBLIC SCHOOLS
BASKING RIDGE, NEW JERSEY

FRAMEWORK FOR COMPUTATIONAL FLUENCY

GRADE 1

Summer 2008

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In order to develop students' math skills, the mathematics curriculum should include a balance and connection between conceptual understanding and computational fluency. "Fluency refers to having efficient, accurate and generalizable methods (algorithms) for computing that are based on well-understood properties and number relationships" (Principles and Standards for School Mathematics, p.144). Developing a conceptual understanding of mathematical reasoning is essential. Students need to acquire computational fluency in order to be successful problem solvers.

Not all students develop automatic recall of basic facts at the same time. However, teachers should work with students so that each student acquires an understanding of several computational strategies and implements them appropriately with the goal of gaining automaticity with basic facts and computational algorithms. For example, a focus in the primary grades is to master computational fluency with addition and subtraction facts through twenty. Students should develop multiplication and division fact power between third and fourth grade.

Algorithms are important tools that help students become fluent and flexible in computing. In addition to the algorithm instruction provided in *Everyday Mathematics*, students should learn the appropriate "traditional" algorithm. In order to facilitate a smooth articulation of the teaching of the "traditional" algorithms, Grade 2 teachers are responsible for teaching the multi-digit addition algorithm with regrouping, Grade 3 teachers are responsible for teaching the multi-digit subtraction algorithm with regrouping, Grade 4 teachers are responsible for teaching the multi-digit multiplication algorithm, and Grade 5 teachers are responsible for teaching the long division algorithm. Sometimes students bring the "traditional" algorithms from home and introduce them

into the instructional setting at various other times during the course of the school year. Teachers should allow the students to utilize the "traditional" algorithm (even if the timing is not congruent with that listed above) as long as the student demonstrates an understanding of and competency with the algorithm itself. As always, teachers should encourage the students to practice a variety of appropriate computational algorithms as the use of various algorithms will increase the students' computational fluency. On an individual student basis, teachers can also make suggestions for use of a particular algorithm for those students who appear to lack fluency with computational algorithms.

The *Framework for Computational Fluency (FCF)* provides a variety of materials to use in addition to the materials already provided in *Everyday Mathematics*. Teachers should use the *FCF* book for developing and practicing computational fluency and basic facts prior to accessing other math resources. Teachers can utilize the *FCF* book in a variety of ways. The pages in the booklet are organized by grade level, however teachers are free to use pages from other units or grade levels to differentiate instruction in order to better meet the needs of the learners. The activities in the booklet can be used in place of or along with a Math Message or the Mental Math and Reflexes. They can be used as practice or as assessment, timed or not timed. Teachers are encouraged to present *FCF* worksheets via the Smartboard with students using slates and/or notebooks to record their work. For ease of implementation some of the pages are aligned with the lessons in *Everyday Mathematics*. Each grade level within the *FCF* has a sheet that aligns the *FCF* pages with the *Everyday Mathematics* lessons.

References

Bell, J., et al. (2007). *Everyday mathematics the University of Chicago School of Mathematics project*: *Teacher's lesson guide.* Chicago, IL: McGraw Hill Wright Group.

National Council of Teachers of Mathematics (NCTM) (2006). *Curriculum focal points for prekindergarten through grade 8 mathematics.* Retrieved July 8, 2008, from http://www.nctm.org/focalpoints.aspx?linkidentifier=id&itemid=270

National Council of Teachers of Mathematics (NCTM) (2000). *Principles and standards for school mathematics.* Reston, VA: The National Council of Teachers of Mathematics, Inc.

Primary mathematics textbook 1A/B. (2007). Singapore: Marshall Cavendish Education.

Primary mathematics textbook 2A/B. (2007). Singapore: Marshall Cavendish Education.

Primary mathematics textbook 3A/B. (2007). Singapore: Marshall Cavendish Education.

Primary mathematics textbook 4A/B. (2007). Singapore: Marshall Cavendish Education.

Primary mathematics textbook 5A/B. (2007). Singapore: Marshall Cavendish Education.

Suggested Implementation Guide for Framework for Computational Fluency

Teachers should feel free to implement pages at their own professional discretion.

Unit 1: Establishing Routines

Lesson	Title	Supplemental Materials
1.1	Daily Routines	
1.2	Investigating the Number Line	1-4
1.3	Tools for Doing Mathematics	
1.4	Number-Writing Practice	
1.5	One More, One Less	
1.6	Comparing Numbers	
1.7	Recording Tally Counts	
1.8	Investigating Equally Likely Outcomes	
1.9	The Calendar	
1.10	Working in Small Groups	
1.11	Explorations: Exploring Math Materials	
1.12	Weather and Temperature Routines	
1.13	Number Stories	

Unit 2: Everyday Uses of Numbers

Lesson	Title	Supplemental Materials
2.1	Number Grids	1-29
2.2	Numbers All Around	
2.3	Compliments of 10	
2.4	Unit Labels for Numbers	
2.5	Analog Clocks	
2.6	Telling Time to the Hour	
2.7	Explorations: Exploring Length, Straightedges, and Dominoes	
2.8	Pennies	
2.9	Nickels	
2.10	Counting Pennies and Nickels	
2.11	Number Models	
2.12	Subtraction Number Models	1-2, 1-32, 1-34
2.13	Number Stories	1-7, 1-30

Unit 3: Visual Patterns, Number Patterns, and Counting

Lesson	Fractions	Supplemental Materials
3.1	Visual Patterns	
3.2	Even and Odd Number Patterns	
3.3	Number-Grid Patterns	
3.4	Explorations: Exploring Number Patterns, Shapes, and Patterns	
3.5	Counting on the Number Line	
3.6	Adding and Subtracting on the Number Line	
3.7	Telling Time to the Half-Hour	
3.8	Introduction to the Frames-and-Arrows Routine	
3.9	More Frames-and-Arrows Problems	
3.10	Counting with a Calculator	
3.11	Dimes	1-1, 1-3
3.12	Counting Dimes, Nickels, and Pennies	
3.13	Data Day	1-13
3.14	Domino Addition	

Unit 4: Measurement and Basic Facts

Lesson	Title	Supplemental Materials
4.1	Math Message and Reading a Thermometer	
4.2	Nonstandard Linear Measures	
4.3	Personal “Foot” and Standard Foot	
4.4	The Inch	
4.5	The 6-Inch Ruler	
4.6	Measuring with a Tape Measure	
4.7	Explorations: Exploring Data, Shapes, and Base-10 Blocks	
4.8	Telling Time on the Quarter-Hour	
4.9	Timelines	
4.10	Number Scrolls	
4.11	Introducing Fact Power	
4.12	Good Fact Habits	1-10

Unit 5: Place Value, Number Stories, and Basic Facts

Lesson	Title	Supplemental Materials
5.1	Place Value: Tens and Ones	1-25, 1-26, 1-41
5.2	Place Value with Calculators	
5.3	Relations: Greater Than, Less Than, Equal to	1-27
5.4	Explorations: Exploring Area, Weight, and Counting	
5.5	Animal Weights	
5.6	*More Than* and *Less Than* Number Stories	
5.7	Comparison Number Stories	1-11, 1-12
5.8	Solving Number Stories	1-16
5.9	Dice Sums	
5.10	Turn-Around Facts	
5.11	Easy Facts	
5.12	"What's My Rule?"	
5.13	Applying Rules	1-14, 1-15, 1-28, 1-40

Unit 6: Developing Fact Power

Lesson	Title	Supplemental Materials
6.1	The Addition/Subtraction Facts Table	
6.2	Equivalent Names	1-31
6.3	Fact Families	1-5
6.4	Fact Triangles	1-33
6.5	Using the Facts Table for Subtraction	
6.6	The Centimeter	
6.7	Explorations: Exploring Pattern Blocks, Addition Facts, and Triangles	
6.8	Addition Facts Practice with "What's My Rule?"	
6.9	Quarters	1-42
6.10	Digital Clocks	
6.11	Introducing *My Reference Book*	
6.12	Data Landmarks	1-6, 1-8

Unit 7: Geometry and Attributes

Lesson	Title	Supplemental Materials
7.1	Attribute Rules	
7.2	Explorations: Exploring Attributes, Designs, and Fact Platters	
7.3	Pattern-Block and Template Shapes	
7.4	Making Polygons	
7.5	Spheres, Cylinders, and Rectangular Prisms	
7.6	Pyramids, Cones, and Cubes	
7.7	Symmetry	1-9

Unit 8: Mental Arithmetic, Money, and Fractions

Lesson	Title	Supplemental Materials
8.1	Review: Money	
8.2	Dollars	
8.3	Place Value: Hundreds, Tens, and Ones	
8.4	Application: Shopping at the School Store	
8.5	Making Change	
8.6	Equal Shares	1-36, 1-37, 1-38, 1-39
8.7	Fractions	
8.8	Sharing Pennies	
8.9	Explorations: Exploring Fractional Parts and Addition Facts	1-35

Unit 9: Place Value and Fractions

Lesson	Title	Supplemental Materials
9.1	Tens and Ones Patterns on the Number Grid	
9.2	Adding and Subtracting Tens	
9.3	Number-Grid Puzzles	
9.4	Adding and Subtracting 2-Digit Numbers	
9.5	Explorations: Exploring Capacity, Symmetry, and Heights	
9.6	Fractional Parts of the Whole	
9.7	Comparing Fractions	
9.8	Many Names for Fractional Parts	

Unit 10: Year-End Review and Assessment

Lesson	Title	Supplemental Materials
10.1	Data Day: End-of-Year Heights	
10.2	Review: Telling Time	
10.3	Mental Arithmetic: Using a Vending Machine Poster	
10.4	Mental Arithmetic (Continued)	
10.5	Year-End Geometry Review	
10.6	Review: Thermometers and Temperature	
10.7	Review: Place Value, Scrolls, and Number Grids	

The supplemental materials can be found in the following files:

1-1 through 1-16: FCF Grade 1 Worksheets 1a.doc
1-17 through 1-25: FCF Grade 1 Worksheets 1b.doc
1-26 through 1-35: FCF Grade 1 Worksheets 1c.doc
1-36 through 1-42: FCF Grade 1 Worksheets 1d.doc

Computational Fluency

Name:_____ Date: _____ Time: _____

Mental Math

1.	5 + 5 = _____	2.	5 + 6 = _____
3.	5 + 1 = _____	4.	4 + 4 = _____
5.	7 + 7 = _____	6.	4 + 9 = _____
7.	6 + 4 = _____	8.	7 + 7 = _____
9.	6 + 4 = _____	10.	7 + 6 = _____
11.	9 + 5 = _____	12.	7 + 5 = _____
13.	8 + 4 = _____	14.	9 + 6 = _____
15.	3 + 8 = _____	16.	9 + 2 = _____
17.	7 + 9 = _____	18.	5 + 4 = _____
19.	3 + 7 = _____	20.	6 + 7 = _____

Computational Fluency

Name:_____ Date: _____ Time: _____

Mental Math

1. 6 – 5 = _____	2. 5 – 3 = _____
3. 10 – 4 = _____	4. 10 – 3 = _____
5. 8 – 4 = _____	6. 4 – 2 = _____
7. 7 – 3 = _____	8. 9 – 5 = _____
9. 7 – 5 = _____	10. 8 – 6 = _____
11. 10 – 6 = _____	12. 8 – 7 = _____
13. 5 – 3 = _____	14. 10 – 5 = _____
15. 4 – 3 = _____	16. 6 – 4 = _____
17. 9 – 3 = _____	18. 9 – 2 = _____
19. 8 – 2 = _____	20. 8 – 4 = _____

Computational Fluency

Name:_____ Date: _____ Time: _____

Mental Math

1. 13 – 7 = _____
2. 11 – 4 = _____
3. 16 – 9 = _____
4. 11 – 6 = _____
5. 11 – 8 = _____
6. 13 – 4 = _____
7. 16 – 7 = _____
8. 15 – 6 = _____
9. 15 – 9 = _____
10. 12 – 3 = _____
11. 17 – 8 = _____
12. 18 – 9 = _____
13. 11 – 9 = _____
14. 15 – 7 = _____
15. 14 – 9 = _____
16. 12 – 8 = _____
17. 13 – 6 = _____
18. 12 – 9 = _____
19. 14 – 6 = _____
20. 15 – 8 = _____

Computational Fluency

Name:_____ Date: _____ Time: _____

Mental Math

1.	580 – 300 = _____	2.	61 – 2 = _____
3.	625 + 3 = _____	4.	298 + 100 = _____
5.	642 – 30 = _____	6.	303 – 200 = _____
7.	82 – 2 = _____	8.	152 + 200 = _____
9.	94 + 20 = _____	10.	82 – 20 = _____
11.	14 – 10 = _____	12.	673 – 10 = _____
13.	54 + 20 = _____	14.	432 + 10 = _____
15.	203 – 10 = _____	16.	760 + 30 = _____
17.	807 – 3 = _____	18.	73 – 2 = _____
19.	541 + 300 = _____	20.	146 + 200 = _____

Computational Fluency

Name:_____ Date: _____ Time: _____

Mental Math

1.	13 – 7 = _____	2.	11 – 4 = _____
3.	16 – 9 = _____	4.	11 – 6 = _____
5.	11 – 8 = _____	6.	13 – 4 = _____
7.	16 – 7 = _____	8.	15 – 6 = _____
9.	15 – 9 = _____	10.	12 – 3 = _____
11.	17 – 8 = _____	12.	18 – 9 = _____
13.	11 – 9 = _____	14.	15 – 7 = _____
15.	14 – 9 = _____	16.	12 – 8 = _____
17.	13 – 6 = _____	18.	12 – 9 = _____
19.	14 – 6 = _____	20.	15 – 8 = _____

Computational Fluency

Name:_____ Date: _____ Time: _____

Mental Math

1. 580 – 300 = _____
2. 61 – 2 = _____
3. 625 + 3 = _____
4. 298 + 100 = _____
5. 642 – 30 = _____
6. 303 – 200 = _____
7. 82 – 2 = _____
8. 152 + 200 = _____
9. 94 + 20 = _____
10. 82 – 20 = _____
11. 14 – 10 = _____
12. 673 – 10 = _____
13. 54 + 20 = _____
14. 432 + 10 = _____
15. 203 – 10 = _____
16. 760 + 30 = _____
17. 807 – 3 = _____
18. 73 – 2 = _____
19. 541 + 300 = _____
20. 146 + 200 = _____

Computational Fluency

Name:_____ Date: _____ Time: _____

Mental Math

1.	52 + 5 = _____	2.	38 + 3 = _____
3.	52 + 6 = _____	4.	28 + 2 = _____
5.	25 + 5 = _____	6.	19 + 8 = _____
7.	65 + 4 = _____	8.	18 + 2 = _____
9.	65 + 8 = _____	10.	54 + 8 = _____
11.	56 + 6 = _____	12.	30 + 60 = _____
13.	27 + 6 = _____	14.	80 + 10 = _____
15.	34 + 6 = _____	16.	79 + 9 = _____
17.	24 + 3 = _____	18.	17 + 7 = _____
19.	62 + 8 = _____	20.	73 + 4 = _____

Computational Fluency

Name:_____ Date: _____ Time: _____

Mental Math

1. 63 – 7 = _____
2. 67 – 9 = _____
3. 80 – 40 = _____
4. 73 – 9 = _____
5. 34 – 3 = _____
6. 60 – 7 = _____
7. 48 – 5 = _____
8. 31 – 7 = _____
9. 70 – 50 = _____
10. 32 – 9 = _____
11. 40 – 9 = _____
12. 70 – 10 = _____
13. 59 – 6 = _____
14. 66 – 7 = _____
15. 39 – 3 = _____
16. 86 – 7 = _____
17. 26 – 2 = _____
18. 10 – 4 = _____
19. 63 – 4 = _____
20. 60 – 4 = _____

Computational Fluency

Name:_____ Date: _____ Time: _____

Mental Math

1. 4 + 3 = _____
2. 72 + 4 = _____
3. 352 + 3 = _____
4. 18 + 6 = _____
5. 799 + 1 = _____
6. 77 + 6 = _____
7. 371 + 6 = _____
8. 120 + 50 = _____
9. 217 + 5 = _____
10. 8 + 6 = _____
11. 483 + 70 = _____
12. 38 + 6 = _____
13. 17 + 3 = _____
14. 80 + 20 = ____
15. 6 + 4 = _____
16. 880 + 20 = _____
17. 66 + 4 = _____
18. 888 + 20 = _____
19. 759 + 8 = _____
20. 460 + 90 = _____

Computational Fluency

Name:_____ Date: _____ Time: _____

Mental Math

1. 21 – 3 = _____
2. 41 – 3 = _____
3. 331 – 3 = _____
4. 84 – 8 = _____
5. 44 – 8 = _____
6. 564 – 8 = _____
7. 709 – 5 = _____
8. 479 – 5 = _____
9. 799 – 5 = _____
10. 152 – 9 = _____
11. 532 – 90 = _____
12. 300 – 60 = _____
13. 306 – 60 = _____
14. 432 – 30 = _____
15. 630 – 50 = _____
16. 220 – 70 = _____
17. 120 – 70 = _____
18. 540 – 80 = _____
19. 349 – 80 = _____
20. 672 – 90 = _____

Computational Fluency

Name:_____ Date: _____ Time: _____

Mental Math

1. 33 + 4 = _____
2. 62 + 5 = _____
3. 44 + 6 = _____
4. 59 + 6 = _____
5. 26 + 7 = _____
6. 25 + 4 = _____
7. 64 + 8 = _____
8. 77 + 4 = _____
9. 71 + 7 = _____
10. 35 + 7 = _____
11. 27 + 8 = _____
12. 35 + 3 = _____
13. 56 + 4 = _____
14. 36 + 6 = _____
15. 36 + 6 = _____
16. 73 + 6 = _____
17. 59 + 8 = _____
18. 38 + 3 = _____
19. 79 + 7 = _____
20. 28 + 2 = _____
21. 17 + 7 = _____
22. 19 + 8 = _____
23. 73 + 4 = _____
24. 18 + 2 = _____
25. 59 + 9 = _____
26. 36 + 3 = _____
27. 54 + 8 = _____
28. 13 + 5 = _____
29. 82 + 9 = _____
30. 53+ 7 = _____

Computational Fluency

Name:_____ Date: _____ Time: _____

Mental Math

1. 11 + 70 = _____

2. 17 + 50 = _____

3. 62 + 20 = _____

4. 60 + 60 = _____

5. 78 + 10 = _____

6. 70 + 40 = _____

7. 98 + 20 = _____

8. 56 + 80 = _____

9. 12 + 50 = _____

10. 77 + 50 = _____

11. 34 + 90 = _____

12. 32 + 90 = _____

13. 86 + 40 = _____

14. 32 + 40 = _____

15. 52 + 50 = _____

16. 70 + 67 = _____

17. 60 + 60 = _____

18. 78 + 20 = _____

19. 38 + 50 = _____

20. 24 + 60 = _____

Computational Fluency

Name:_____ Date: _____ Time: _____

Mental Math

1. 411 + 10 = _____
2. 728 + 40 = _____
3. 460 + 60 = _____
4. 312 + 70 = _____
5. 677 + 20 = _____
6. 321 + 20 = _____
7. 451 + 50 = _____
8. 229 + 50 = _____
9. 462 + 50 = _____
10. 877 + 70 = _____
11. 334 + 90 = _____
12. 232 + 200 = _____
13. 386 + 400 = _____
14. 232 + 400 = _____
15. 252 + 500 = _____
16. 273 + 600 = _____
17. 56 + 500 = _____
18. 673 + 400 = _____
19. 209 + 30 = _____
20. 752 + 200 = _____

Computational Fluency

Name:_____ Date: _____ Time: _____

Mental Math

1.	90 – 8 = _____	2.	21 – 6 = _____
3.	42 – 9 = _____	4.	73 – 8 = _____
5.	94 – 8 = _____	6.	86 – 8 = _____
7.	82 – 4 = _____	8.	75 – 7 = _____
9.	53 – 9 = _____	10.	94 – 7 = _____
11.	33 – 4 = _____	12.	32 – 9 = _____
13.	42 – 6 = _____	14.	75 – 8 = _____
15.	71 – 2 = _____	16.	67 – 9 = _____
17.	62 – 7 = _____	18.	53 – 6 = _____
19.	55 – 8 = _____	20.	83 – 4 = _____

Computational Fluency

Name:_____ Date: _____ Time: _____

Mental Math

1. 100 – 30 = _____
2. 100 – 75 = _____
3. 100 – 7 = _____
4. 100 – 98 = _____
5. 100 – 6 = _____
6. 100 – 35 = _____
7. 100 – 48 = _____
8. 100 – 25 = _____
9. 100 – 46 = _____
10. 100 – 10 = _____
11. 100 – 77 = _____
12. 100 – 12 = _____
13. 100 – 5 = _____
14. 100 – 29 = _____
15. 100 - 23 = _____
16. 42 + _____ = 100
17. 61 + _____ = 100
18. 57 + _____ = 100
19. 60 + _____ = 100
20. _____ +40 = 100
21. _____ +35 = 100
22. _____ +3 = 100
23. _____ +22 = 100
24. 100 – _____ = 50
25. 100 – _____ = 61
26. 100 – _____ = 84
27. 100 – _____ = 53
28. 100 – _____ = 38
29. 100 – _____ = 79
30. 100 – _____ = 9