



# **A Parent's Guide to Computational Fluency:**

*An Essential Building Block of Mathematics*

**Pelham Public Schools**

Pelham, New York 10803

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There is nothing more we want in our classrooms than for students to be mathematically proficient and to have a strong appreciation of mathematics. To be mathematically proficient, students need to have conceptual understanding, strategic competence, adaptive reasoning and computational fluency. These components are not separate, but fundamentally intertwined.

This guide focuses on a deeper understanding of computational fluency and helps teachers and parents partner to create better mathematicians. It addresses computational fluency as an integral part of success in mathematics. Your child's teacher will provide you with direction on how to best utilize this guide and support your child in daily practice. In addition to the activities and resources we utilize at school, we have also listed other resources to access to engage your child in math practice at home. Most of these resources are free and readily available on the Internet.

## What is Computational Fluency?

In Pelham, **computational fluency** is identified as a key component for success in mathematics and should be developed in tandem with understanding. Computational fluency is a combination of being accurate, efficient, and flexible when working with basic facts (addition, subtraction, multiplication, and division).<sup>1</sup> Fluency involves a mixture of just knowing some answers, knowing some answers from patterns, and knowing some answers from the use of strategies.<sup>2</sup>

Knowledge of basic facts and development of computational skills are important in all areas of mathematics. Facts and skills are related to math as phonics and decoding are for reading: They build fluency. Fluency is important so that in problem solving situations students are involved in higher level thinking and are not caught up with basic calculations.<sup>3</sup>

- *Accuracy*-the ability to produce a correct answer
- *Efficiency*-denotes the ability to choose an appropriate, expedient strategy [and/or algorithm] for a specific computation problem
- *Flexibility*-the ability to use number relationships with ease in computation<sup>4</sup>

<sup>1</sup> This concurs with the definition of computational fluency that was used in the Evaluation of the K – 8 Mathematics Program, conducted in the spring of 2012. “Computational fluency for the purpose of this report is defined as flexibility, accuracy and efficiency in working with number relations.”

<sup>2</sup> New York State Department of Education, definition of *Fluency*, Math Standards Glossary, 2016

<sup>3</sup> Achieving Facts Fluency, for use with Math in Focus: Singapore Math, 2015. Florida: Houghton Mifflin Harcourt Publishing.

<sup>4</sup> Accuracy, efficiency, and flexibility as defined by Sherry D. Parrish in “Number Talks: Build Numerical Reasons” in *Teaching Children Mathematics*, October 2011.

# K-5 Computational Fluency\* Benchmarks

\***Fluency** involves a mixture of just knowing some answers, knowing some answers from patterns, and knowing some answers from the use of strategies.

	End of Year Benchmarks	Problems per minute
<b>Pre-K</b>	• Count up to 20 • 1:1 up to 10	
<b>K</b>	<ul style="list-style-type: none"> <li>Fluently add and subtract within 5</li> </ul>	
<b>1</b>	<ul style="list-style-type: none"> <li>Fluently add and subtract within 10</li> <li>Add and subtract within 20 using <u>strategies</u> such as counting on, making ten, decomposing a number leading to a ten, using the relationship between addition and subtraction, and creating equivalent but easier or known sums.</li> </ul>	
<b>2</b>	<ul style="list-style-type: none"> <li>Know from memory all sums within 20 of two one-digit numbers, up to 9+9</li> <li>Fluently add and subtract within 20.</li> <li>Add and subtract within 100 using strategies and developing place value understanding</li> </ul>	
<b>3</b>	<ul style="list-style-type: none"> <li>Know from memory all sums within 20 of two one-digit numbers, up to 9+9, and related subtraction facts</li> <li>Fluently add and subtract within 20.</li> <li>Know from memory all products of two one-digit numbers up to 9x9 (0-9 times tables)</li> <li>Add and subtract within 1000 using strategies and developing place value understanding</li> <li>Multiply and divide within 100 using strategies such as the relationship between multiplication and division, developing place value understanding and the properties of operations</li> </ul>	<ul style="list-style-type: none"> <li>20 problems/minute</li> <li>20 problems/minute</li> <li>20 problems/minute</li> <li>not timed</li> <li>not timed</li> </ul>
<b>4</b>	<ul style="list-style-type: none"> <li>Know from memory all products of two one-digit numbers up to 9x9 (0-9 times tables)</li> <li>Fluently multiply and divide whole numbers within 100.</li> <li>Add and subtract within 1,000,000 using a standard algorithm</li> <li>Find all factor pairs for a whole number in the range 1-100</li> <li>Multiply a whole number of up to four digits by a one-digit whole number, and multiply two two-digit numbers using strategies based on place value understanding and the properties of operations</li> </ul>	<ul style="list-style-type: none"> <li>20 problems/minute</li> <li>20 problems/minute</li> <li>not timed</li> <li>not timed</li> <li>not timed</li> </ul>
<b>5</b>	<ul style="list-style-type: none"> <li>Know from memory all products of two one-digit numbers up to 9x9 (0-9 times tables)</li> <li>Fluently multiply and divide whole numbers within 144 (0-12 times tables)</li> <li>Add and subtract within 1,000,000 using a standard algorithm</li> <li>Multiply multi-digit whole numbers using a standard algorithm</li> <li>Divide up to four-digit dividends by two-digit divisors using strategies based on place value, the properties of operations, and/or the relationship between multiplication and division.</li> <li>Add, subtract, multiply and divide fractions</li> <li>Perform operations with multi-digit decimals to hundredths</li> </ul>	<ul style="list-style-type: none"> <li>20 problems/minute</li> <li>20 problems/minute</li> <li>not timed</li> <li>not timed</li> <li>not timed</li> <li>not timed</li> <li>not timed</li> </ul>

# K-5 Computational Fluency Benchmarks by Trimester

Grade	Trimester 1	Trimester 2	Trimester 3
Kindergarten			Quickly and accurately knows most: <ul style="list-style-type: none"> <li>Addition and subtraction facts within 5 (may be demonstrated orally or written)</li> </ul>
First Grade	Quickly and accurately knows most: <ul style="list-style-type: none"> <li>Addition and subtraction facts within 5</li> </ul>	Quickly and accurately knows most: <ul style="list-style-type: none"> <li>Addition facts within 10</li> <li>Subtraction facts within 5</li> </ul>	Quickly and accurately knows most: <ul style="list-style-type: none"> <li>Addition and subtraction facts within 10</li> </ul>
Second Grade	Quickly and accurately knows most: <ul style="list-style-type: none"> <li>addition and subtraction facts within 10</li> </ul>	Quickly and accurately knows most: <ul style="list-style-type: none"> <li>Sums of doubles up to <math>9 + 9</math></li> <li>Addition and subtraction facts within 10</li> </ul>	Quickly and accurately knows most: <ul style="list-style-type: none"> <li>Addition and subtraction facts within 20</li> </ul>
Third Grade	Quickly and accurately knows most: <ul style="list-style-type: none"> <li>Addition and subtraction facts within 20</li> <li>Multiplication tables for 0, 1, 2, 5 and 10 (17-20 problems/ 1 minute)</li> </ul>	Quickly and accurately knows most: <ul style="list-style-type: none"> <li>Addition and subtraction facts within 20</li> <li>Multiplication tables 0-10 (17-20 problems/ 1 minute)</li> </ul>	Quickly and accurately knows most: <ul style="list-style-type: none"> <li>Addition and subtraction facts within 20</li> <li>Multiplication tables 0-10 (17-20 problems/ 1 minute)</li> <li>Fluently divide within 100 using relationship between multiplication and division or properties of operations</li> </ul>
Fourth Grade	Quickly and accurately	Quickly and accurately	Quickly and accurately

	<p>knows and applies most:</p> <ul style="list-style-type: none"> <li>• Multiplication and division facts within 100 (17-20 problems/ 1 minute)</li> </ul> <p>Student is able to:</p> <ul style="list-style-type: none"> <li>• Find all factor pairs for a whole number in the range 1-100</li> <li>• Determine whether a whole number, 1-100, is a multiple of a given one-digit number</li> <li>• Determine if a whole number, 1-100, is prime or composite</li> </ul>	<p>knows and applies most:</p> <ul style="list-style-type: none"> <li>• Multiplication and division facts within 100 (17-20 problems/ 1 minute)</li> </ul> <p>Student is able to:</p> <ul style="list-style-type: none"> <li>• Find all factor pairs for a whole number in the range 1-100</li> <li>• Determine whether a whole number, 1-100, is a multiple of a given one-digit number</li> <li>• Determine if a whole number, 1-100, is prime or composite</li> </ul>	<p>knows and applies most:</p> <ul style="list-style-type: none"> <li>• Multiplication and division facts within 100 (17-20 problems/ 1 minute)</li> </ul> <p>Student is able to:</p> <ul style="list-style-type: none"> <li>• Find all factor pairs for a whole number in the range 1-100</li> <li>• Determine whether a whole number, 1-100, is a multiple of a given one-digit number</li> <li>• Determine if a whole number, 1-100, is prime or composite</li> </ul>
Fifth Grade	<p>Quickly and accurately knows and applies most:</p> <ul style="list-style-type: none"> <li>• Multiplication and division facts within 144 (17-20 problems/ 1 minute)</li> </ul>	<p>Quickly and accurately knows and applies most:</p> <ul style="list-style-type: none"> <li>• Multiplication and division facts within 144 (17-20 problems/ 1 minute)</li> </ul>	<p>Quickly and accurately knows and applies most:</p> <ul style="list-style-type: none"> <li>• Multiplication and division facts within 144 (17-20 problems/ 1 minute)</li> </ul>

# How Can Parents Support Computational Fluency?

Parent support is important in helping your child achieve computational fluency. Computational fluency is the combination of not only being accurate, but also being efficient and flexible when working with numbers. These terms are explained in more detail in the definitions in the beginning of this guide.

Please feel free to access any of these resources to support your child. Many of these resources are free. Please note that these are not the only resources you may use. Basic flash cards remain a tried and true strategy!

## **Card Games**

Find Card Games in the *Resources* section of the K-5 Math online page, accessible on the school website under *Academics* or *Teaching and Learning* or by the links below.

K-2 Math Card Games: <https://docs.google.com/document/d/1js16FeaT-eN8zyQ6Dxu8TLDjgAQi0otMI6eZHNdl0Po/edit>

3-5 Math Card Games:  
[https://docs.google.com/document/d/1F\\_V1qSSjpZYtCZFN-JZGB6xl8DNRtEbS6ehlbiQoQA8/edit](https://docs.google.com/document/d/1F_V1qSSjpZYtCZFN-JZGB6xl8DNRtEbS6ehlbiQoQA8/edit)

## **Online**

<http://www.ixl.com/signin/pufsd>  
<http://www.factmonster.com/math/flashcards.html>  
<http://www.aplusmath.com/flashcards/>

Online Math Practice/Games (choose the grade and skill you want to focus on):

<http://www.softschools.com/math/games/>  
<http://www.fun4thebrain.com/index.html>  
<http://www.multiplication.com/games/all-games>  
<http://www.mathplayground.com/>  
<http://www.adaptedmind.com/gradelist.php>  
<http://www.sheppardsoftware.com/math.htm>



### **Free Apps (as of September 2016):**

- Math Flash Cards by Kings Apps : Addiiton (K-2)
- Sushi Monster by Scholastic (K-5)
- Math Puppy BINGO Challenge (K-5)
- 10 Frame Fill
- Math Climber (1-5)
- Times Table Galaxy (3-5)

### **Apps for Purchase:**

- Operation Math
- Math Flash Cards by Kings Apps (K-5)
- Motion Math: Hungry Fish by Motion Math (K-3; Addition and subtraction)
- Tic Tac Math by IPMG Publishing (K-5)
- Tic Tac Fractions by IPMG Publishing (3-5)
- Math Bingo by ABCya.com (K-5)
- Telling Time by My Turn Mobile (K-5)
- Coin Math by Recession Apps (K-5)
- Number Run (K-5)
- Fast Facts Audio Flash Cards (K-5, choose which operation you need)

### **Printable Resources (worksheets) Grades K – 5 :**

[math-aids.com](http://math-aids.com)

[mathfactscafe.com](http://mathfactscafe.com)

[themathworksheetsite.com](http://themathworksheetsite.com)

[superkids.com](http://superkids.com)

### **Resources for Purchase:**

- Flashmaster: by FlashMaster ([www.flashmaster.com](http://www.flashmaster.com))
- Math Minute Electronic Flash Card by eNASCO
- Rock'n Learn CD by eNASCO
- Math in a Flash – flashcards by eNASCO
- Skill Drill Flashcards by eNASCO
- Flash Cards by EAI Education
- Three sided flash cards EAI Education
- Personal Math trainer for Nintendo DS ([www.amazon.com](http://www.amazon.com))

## **Math Websites for Problem Solving Tasks**

[www.gregtangmath.com](http://www.gregtangmath.com) - While the games seem easy at first, they become much more challenging as the levels get harder and your time to solve becomes less. The resource section is also good. In Downloads, the Kakooma Puzzles and Espresso games are fun.

<https://www.youcubed.org/tasks/> Tasks from Jo Boaler are the best because they are multi-entry tasks and can be as difficult as a student chooses to dig. I especially like "nine colors".

<https://www.illustrativemathematics.org/content-standards> This website has many great challenges depending on the grade and strand you would like to work from.

<http://www.decimalsquares.com/dsGames/> Great for decimal practice! Enjoyable and many different levels/challenges could be selected.

<http://www.mathplayground.com/wordproblems.html> Check out the Various Concepts problems.

<http://www.collaborativemathematics.org/archive.html>

<https://emergentmath.com/my-problem-based-curriculum-maps/> Select a specific grade curriculum map. If you scroll down on the page, you will then find different tasks to try.