CBMmath-Process™

Scoring Guide

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Introduction to *CBMmath Process*™ from *FastBridge Learning*™

The research behind Curriculum-Based Measurement (CBM) for the purposes of assessing students' math computation skills has existed for well over three decades. Researchers from a variety of institutions nationally have contributed to what the education field knows today about CBM for mathematics. Through each iteration, researchers and teachers have gained important knowledge about what works well and what improvements can be made to efficiently and accurately assess students' computation skills to inform instruction. We believe *FastBridge Learning*'s *CBMmath Process*™ offers the latest in the lineage of these research-based assessments. These tools are designed to better meet the needs of teachers while still offering the measurement properties needed to accurately assess and monitor student performance over time.

FastBridge Learning™ **develops the next-generation solution.** Researchers and educators at *FastBridge Learning*™ took a fresh look at the various methods created by authors nationally for CBMmath. The Research and Development team determined that a problem with prior iterations available in the market was in the intent and purpose of the tools themselves. CBM for mathematics was previously attempting via a single measure to assess both students' automaticity in computing math, along with their skills in the primary process (steps) of completing math computation problems. These are two discrete skills and thus the *FastBridge Learning*™ research team determined it would be more effective to design a CBM assessment for mathematics that addressed these two critical skills independently. This is available via the *FastBridge Learning*™ suite of CBMmath tools that include *CBMmath Automaticity*™, *CBMmath Concepts & Applications*™ (*CBMmath CAP*™) and *CBMmath Process*™. These *FastBridge Learning*™ CBMmath tools cover the full range of elementary and middle school math skills. Specifically, these tools provide several significant improvements:

1. By assessing automaticity as a distinct assessment, it:
   a. Reduces teacher scoring time (the *CBMmath Automaticity*™ measure is completed online)
   b. Reduces student testing time (*CBMmath Automaticity*™ is completed online in just a few minutes)
   c. Allows teachers to differentiate between students who need skill development in automaticity, process, or both
   d. Allows for the sensitivity needed to effectively monitor student progress as they develop specific skills pertaining to automaticity
2. By assessing the applied use of multiple math skills, *CBMmath CAP*™ provides information for teachers about how well students can use their math skills for different problem types
3. By assessing mathematics computation process as a distinct assessment, *CBMmath Process*™:
   a. Allows teachers to focus on what primary processes (steps) students do and do not know when completing math problems
   b. Allows for the sensitivity needed to effectively monitor student progress as they develop specific skills pertaining to the process of completing computation problems

As a result, *FastBridge Learning*™ offers schools the next generation of CBMmath assessments for Automaticity, Concepts and Applications, as well as ath Process. All three of these measures have national norms and benchmarks available through the *FastBridge Learning*™ website.

Overview of *CBMmath*™

CBMmath from *FastBridge Learning*™ is divided into three distinct measures:

1. ***CBMmath Automaticity*™ (Levels 1-3):**
    a. Evaluates the degree to which the basic facts and operations are accurate and automatic (fluent)
    b. Consists of a General Outcome Measure (GOM) per grade level and benchmark period for universal screening, plus optional multiple and single-skill subtests for further diagnostic purposes
    c. Computer administered for up to four (4) minutes

2. ***CBMmath Concepts & Applications*™ (CAP) (Levels K-8)**
    a. Evaluates a student's skills for solving complex and multi-step math problems
    b. May be used for screening and progress monitoring
    c. Completely online administration and scoring
    d. Scores are in the same scale as aMath scores so teachers may compare aMath (Adaptive Math) and CBMmath CAP scores easily

3. ***CBMmath Process*™ (Levels 2-6):**
    a. Evaluates the degree to which the primary processes (steps) in a multi-step problem are completed with accuracy
    b. Consists of a General Outcome Measure (GOM) per grade level and benchmark period for universal screening plus optional multiple and single-skill subtests for further diagnostic purposes
    c. This assessment is administered via paper-pencil and scored online
    d. The assessment is limited to 10 minutes for 2nd and 3rd grade assessments and 15 minutes for 4th through 6th grade assessments

Together, these tools are used to screen and monitor students' basic math fact skills, problem solving process, and applied use of math skills. They serve as useful complements to *FastBridge Learning*'s *aMath*™ which is used to assess broad math skills.

CBMmath Automaticity™ Scoring

All *CBMmath Automaticity*™ administrations are completed online in *FastBridge Learning*™ and scored automatically. Teachers do not have to manually score any of *CBMmath Automaticity*™.

CBMmath CAP™ Scoring

All *CBMmath CAP*™ administrations are completed online in *FastBridge Learning*™ and scored automatically. Teachers do not have to manually score any of *CBMmath CAP*™.

CBMmath Process™ Scoring

All *CBMmath Process*™ administrations are completed by students using paper-and-pencil. After the students complete the assessment, the teacher scores it using the scoring key found online in *FastBridge Learning*™.

Research to Results™

There are two ways to score *CBMmath Process*^{TM} and these are used according to whether the assessment is for screening or progress monitoring.

- Universal Screening = Rapid scoring
- Progress Monitoring = Error analysis scoring

Details for each method are found in the following sections.

CBMmath Process^{TM}: Rapid Scoring Guide

Rapid scoring is designed to help teachers score completed CBMmath Process assessments when they are used for benchmark screening. The rapid scoring procedure involves awarding 0%, 50%, or 100% of available problem points for each problem completed. Only those math problems that are attempted are scored. Each attempted problem is scored as follows:

Description	Number of Errors	Points
Correct	No errors	100% of possible points
Mostly Correct	2 or less minor errors	50% of possible points
Incorrect	More than 2 errors	0% of possible points

Minor errors are those that involve steps toward solving the problem but not the basic setup or method of solution. Examples of minor errors are:

- Within problem computation mistake
- Not rounding a final division remainder

Teachers must exercise judgment with regard to what is a minor error for a given student. Considerations when scoring minor errors include what math skills the student has been taught and those on which s/he has demonstrated mastery in the past.

The rationale for this scoring procedure is that for screening purposes, students who get most of the problems correct or mostly correct are not at risk for math problems. In contrast, those who get many, or most, problems as mostly correct or incorrect might need additional math instruction or intervention. This scoring method is a rapid way to identify which students may need help.

After students complete the paper-and-pencil version of the *CBMmath Process*^{TM} assessment, the teacher can conduct rapid scoring by using the scoring key in *FastBridge Learning*^{TM}. To do this, the teacher:

1. Logs in to *FastBridge Learning*^{TM}
2. Opens the *CBMmath Process*^{TM} assessment screen for the selected class
3. Compares each student's completed *CBMmath Process*^{TM} pages with the online scoring key
4. Marks each problem as Correct, Mostly Correct, or Incorrect
5. Submits test score in *FastBridge Learning*^{TM}

Research to Results^{TM}

FastBridge Learning™ includes an easy rapid-scoring color system to assist with scoring the problems. This system uses the colors red, yellow and green to indicate the student's score on each problem. For example, here is a second grade problem with the color code shown:

$$\begin{array}{r} 80 \\ -67 \\ \hline 13 \end{array}$$

(3/3) ●

The problem shows the correct answer, as well as three circles of different colors. The colors represent the possible rapid scores:

- Green = 100% of points
- Yellow = 50% of points
- Red = 0 points

Here is a second grade CBMmath Process assessment using Rapid Scoring:

| « Cancel | Clear All | Hide Directions | Submit » | Submit & Next Student » | Next Student » |

Directions

Preparation

Timing

Begin Test

Rapid Scoring

Error Analysis Scoring

Scoring Details

Scoring Errors

| « Prev Item | Next Item » |

| Mark Last Item |

Add note

Test date: 01/16/2017

Strategies/Errors   Hide

- ☐ Error Types Were Coded
- ☑ Error Type Not Coded
- ☐ Problem Set-up Error
- ☐ Primary Process Error
- ☐ Addition Error
- ☐ Subtraction Error
- ☐ Multiplication Error
- ☐ Division Error
- ☐ Primary Operations Error
- ☐ Place Holder/Value Error
- ☐ Remainder Error
- ☐ Regrouping/carrying Error
- ☐ Blank/Skip Items
- ☐ Unknown

G2GOM_P

$$\begin{array}{r} 17 \\ +5 \\ \hline 22 \end{array}$$ (5/5) ●
$$\begin{array}{r} 54 \\ -8 \\ \hline 46 \end{array}$$ (5/5) ●
$$\begin{array}{r} 68 \\ +25 \\ \hline 93 \end{array}$$ (5/5) ●
$$\begin{array}{r} 80 \\ -67 \\ \hline 13 \end{array}$$ (5/5) ●

$$\begin{array}{r} 84 \\ +7 \\ \hline 91 \end{array}$$ (5/5) ●
$$\begin{array}{r} 63 \\ -7 \\ \hline 56 \end{array}$$ (5/5) ●
$$\begin{array}{r} 13 \\ +48 \\ \hline 61 \end{array}$$ (5/5) ●
$$\begin{array}{r} 38 \\ -19 \\ \hline 19 \end{array}$$ (5/5) ●

$$\begin{array}{r} 36 \\ +5 \\ \hline 41 \end{array}$$ (5/5) ●
$$\begin{array}{r} 20 \\ -3 \\ \hline 17 \end{array}$$ (5/5) ●
$$\begin{array}{r} 32 \\ +59 \\ \hline 91 \end{array}$$ (5/5) ●
$$\begin{array}{r} 21 \\ -15 \\ \hline 6 \end{array}$$ (5/5) ●

| Possible Score | 60 | Attempted Score | 0 | Actual Score | 0 |

| « Cancel | Clear All | Submit test » |

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To score the following item, the teacher clicks on the color for the points awarded. For the above example, if the student's answer was:
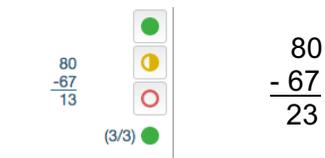
$$
\begin{array}{r}
80 \\
- 67 \\
\hline
23
\end{array}
$$

The teacher could award 50% of possible points. This is because the correct answer is 13 and the student made an error when subtracting in the tens column. The student should have reduced the 8 to a 7 after borrowing 10 ones to compute the result of zero minus 7. The student did that calculation right, but then neglected to recognize the borrow in the tens column.

To score the item, the teacher clicks on the color of circle for the points awarded. In this case, the teacher would click on the yellow half-filled circle to show half of the points awarded.

This problem is worth 3 points, and the student received 2 of 3 points. This would be coded as yellow in the system, because the student made less than 2 errors when solving the problem.

It is also possible to code the students' errors when using the Rapid Scoring method. There is a box to the right of the scoring matrix with error types listed. The teacher can choose whether to code the errors or not. When including codes, the teacher clicks on each error type made on the assessment.

After scoring all the items, the teacher then clicks on **"Mark Last Item"** and then "**Submit test.**" The student's score will be recorded in *FastBridge Learning*™, and the teacher can score the next student.

Strategies/Errors — Hide

- ☑ Error Types Were Coded
- ☐ Error Type Not Coded
- ☐ Problem Set-up Error
- ☐ Primary Process Error
- ☐ Addition Error
- ☐ Subtraction Error
- ☐ Multiplication Error
- ☐ Division Error
- ☐ Primary Operations Error
- ☐ Place Holder/Value Error
- ☐ Remainder Error
- ☐ Regrouping/carrying Error
- ☐ Blank/Skip Items
- ☐ Unknown

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CBMmath Process™: Error Analysis Scoring Guide

Error analysis scoring is designed to help teachers score completed *CBMmath Process*™ assessments when they are used for progress monitoring. The error analysis scoring method for *CBMmath Process*™ involves analyzing every student answer and assigning an error code to all errors. *FastBridge Learning*™ includes 13 different math error types that can be assigned to each problem. Below is a list of all error codes.

For any problems that the student gave the exact right answer, the teacher does not click on any error codes and all possible points are awarded.

For problems with errors, the teacher will select one or more types of errors from the list provided. To indicate an error type, the teacher clicks on the box for the specific math problem and then clicks on the error type made in the box on the right side of the screen. With this method, it does not matter if 2 or less errors were made. It is the total number of errors that matter.

The rationale for the error analysis scoring method is that when a student displays significant math difficulties, the teacher needs to know the exact nature of the student's math problems. Such understanding comes from coding all student errors. After coding all student errors, the teacher clicks on **"Mark Last Item"** and "**Submit test.**" The student's score will be recorded in *FastBridge Learning*™, and the teacher can score the next student.

Scoring Errors	Hide
C+ Calculation-Addition	**C-** Calculation-Subtraction
Cx Calculation-Multiplication	**Cï¿½** Calculation-Division
R/C Regrouping/Carrying	**RE** Remainder error
PP Primary Process	**PH/V** Place Holder/Value
PO Primary Operation	**U** Unknown
S Skipped	**PSI** Problem Setup Incorrectly
WO Wrong Operation	

« Prev   Next »

Mark Last Item

Add note

Test date: 06/14/2017

Here is an example of the error analysis method used for a fourth grade student:

In this example, the student made errors on problems 1, 3, and 5.

1: The student's answer was 1439 so 1 point was deducted.

3: The student's answer included a remainder of 3 so 1 point was deducted

5: The student's answer was 66 and showed that the 2 in 520 was not converted to a 1 when 10 was borrowed for the one's column so 1 point was deducted

Error Analysis Scoring Method Rules

Points:

- The student receives all possible points for each item correctly answered. Point values vary depending on the item type.
- Points are deducted for each error that is made in a process (step).
- All final correct answers are correct, regardless of how they are written or calculated.

Errors:

- **IMPORTANT:** If a student makes any errors in calculation, each step that was conducted in error is marked. In multi-step problems, if an error is made in one or more steps, you will notice subsequent calculations are impacted by the original error and thus differ from the answer key. Keep scoring the problem anyway. This assessment emphasizes whether or not students demonstrated each isolated step correctly.

Example:

Student's answer   Correct answer

$$337$$
$$+ \ \underline{485}$$
$$712$$

$$337$$
$$+ \ \underline{485}$$
$$822$$

The student in this example made a **Regrouping or Carrying Error**. This resulted in an answer of 712, rather than 822. The <u>only deduction</u> made was for the regrouping/carrying error because the rest of the calculation **steps** were completed properly.

Please see below for additional examples of common student errors. Blue numbers and symbols indicate marks made by the student. Red numbers and symbols indicate errors. If the student completes a problem with error(s) not provided in these examples, the teacher must use best judgment.

Scoring Errors   Hide

C+ Calculation-Addition	**C-** Calculation-Subtraction
Cx Calculation-Multiplication	**Ci¿½** Calculation-Division
R/C Regrouping/Carrying	**RE** Remainder error
PP Primary Process	**PH/V** Place Holder/Value
PO Primary Operation	**U** Unknown
S Skipped	**PSI** Problem Setup Incorrectly
WO Wrong Operation	

« Prev   Next »

Mark Last Item

Add note

Test date: 01/16/2017

Error Explanations ▶

- **Calculation-addition error (C+):** A student made an error in adding two numbers; a student wrote an incorrect answer for an addition problem. This includes addition errors made in all items involving addition, including multi-step multiplication items.
  - *Example:* 5 + 7

$$5$$
$$+ \ \underline{7}$$
$$11$$

In this example, the student incorrectly added 5+7. The correct answer is 12.

- **Calculation-subtraction error (C-):** A student made an error in subtracting two numbers; a student wrote an incorrect answer for a subtraction problem. This includes subtraction errors made in all items involving subtraction, including multi-step division items.
  - *Example:* 7 - 5

$$7$$
$$- \ \underline{5}$$
$$3$$

In this example, the student incorrectly subtracted 7-5. The correct answer is 2.

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A very common subtraction error is when a student fails to regroup and tries to subtract the smaller number from the larger number, like in the example below:

    o *Example:* 115 - 9

       115
       - 9
       ───
       114

In this case, it is both a regrouping error (because the student did not borrow from the ten's column) and a subtraction error (because the calculation is not correct).

- **Calculation-multiplication error (Cx):** A student made an error in multiplying two numbers; a student wrote an incorrect answer for a multiplication problem.
  - *Example:* 5 x 7

        5
      x 7
      ───
      30

In this example, the student incorrectly multiplied 5 x 7. The correct answer is 35.

- **Calculation-division error (C÷):** A student made an error in dividing two numbers; a student wrote an incorrect answer for a division problem.
  - *Example:* 12 ÷ 6

      12 ÷ 6 = 3

In this example, the student incorrectly divided 12/6. The correct answer is 2.

- **Regrouping or Carrying error: (R/C)** A student made an error in adding numbers with a sum greater than 10 or subtracting numbers with a difference less than 0; the student made an error in "borrowing" from the next placeholder to solve the subtraction problem or "carrying" a number to the next placeholder to solve the addition problem.
  - *Addition Example:* 25 + 37

       25
      + 37
      ───
      52

In this example, the student did not carry the 1 from 5 + 7 = 12 to the tens place. The correct answer is 62.

  - *Subtraction Example:* 35 - 27

       35
      - 27
      ───
      18

In this example, the student "borrowed" from the tens place to complete 15 - 7 but did not correctly regroup the tens place afterwards. The correct answer is 8.

- **Remainder error: (RE)** A student made an error in a division problem in regards to the remainder; the remainder in the solution is incorrect.
  - *Example:* 10 ÷ 3

    10 ÷ 3 = 3 R3

In this example, the student did not correctly calculate the remainder. The correct answer is 3 R1. The most common remainder errors are 1) when the remainder is larger than the divisor, 2) when the remainder is left off the answer, or 3) when the student continues to calculate past the end of the dividend. Please note, if the student subtracted incorrectly resulting in an incorrect remainder, that is usually a Calculation Subtraction error. It would only be a remainder error if one of the three scenarios above also occurred, in which case it would be both a subtraction and a remainder error.

- **Primary Process error (PP):** The student missed one or more primary processes (steps) used to solve the problem.
  - *Example:* 4.8 x 3.6

    4.8
    x 3.6
    2.88

In this example, the student did not finish the problem. This type of error is worth 2 points, because it makes it difficult to know whether or not the student might have been able to complete some other processes of the problem. Primary Process is used most often when a student did not complete a problem.

- **Place Holder/Maintain Value error: (PH/V)** A student made an error in maintaining place value or using a place holder in calculating a multiplication or division item. This also includes failure to maintain correct decimal places or forgetting to include a decimal.
  - *Example 1:* 610 x 34

    610
    x 34
    2404
    + 1803
    4207

In the first example, the student did not maintain place value. The second line of the student work should read "18030", but the final digit was left off. The correct answer is 20,740.
  - *Example 2:* 2.14 x 1.63

    2.14
    + 1.63
    377

In the second example, the student did not include the decimal in the answer.
  - *Example 3:* 4.65 – 2.22

    4.65
    - 2.22
    24.3

The third example contains a decimal in the incorrect position.

- **Primary Operation error (PO):** The student used the wrong operation at the first step in the problem, thus resulting in an incorrect solution.
    o *Example:* 52 x 48

           52
        x 48
         100

In this example, the student added instead of multiplied. In this case, the subsequent correct steps to solve the multiplication problem were not attempted because the primary process was wrong.

- **Unknown error (U)**: The nature of the student's error cannot be specifically identified or coded.

- **Skipped (S):** The student left the item blank and did not attempt to solve the item.

- **Problem Setup Incorrectly (PSI):** The student rewrote the problem incorrectly.
    o *Example:* 3.54 – 1.6
      was rewritten to be 354-16 = 338

In this example, the student rewrote the problem without taking into account the decimal points and values.

- **Wrong Operation error: (WO)** A student made an error due to misreading a primary operation sign and performing a different operation than specified in the item. This type of error does not include secondary operation signs (e.g., addition within a multi-step multiplication problem or subtraction within a multi-step division problem).
    o *Example:* 7 + 3

          7
        + 3
          4

In this example, the student misread the addition sign and subtracted 7-3 instead of adding 7+3. The correct answer is 10.

Please note that if a student is completing a problem like a 3-digit by 3-digit subtraction problem and reverses the sign for one of the subtraction calculations, this would be a Subtraction error, not a Wrong Operation error. It would only be a Wrong Operation error if the entire problem was added rather than subtracted.

Online Scoring

To score items online, first click on the applicable problem. Then from the list of errors in the Scoring Errors column on the right, click the type of errors the student made. The score for each item will be reduced by each type of error that is selected. The error type will be listed in red in the box. To unmark an error type, click the error box on the right a second time and it will be removed from the box and the score will be increased by the appropriate amount. Not all errors are available for all problems. The potential errors will be shown in white once you have clicked on the problem. Below are the point values the student loses for each type of error:

- Calculation Addition = 1 point
- Calculation Subtraction = 1 point
- Calculation Multiplication = 1 point
- Calculation Division = 1 point
- Regrouping/Carrying = 1 point
- Remainder Error = 1 point
- Primary Process = 2 points
- Place Holder/Value = 1 point
- Primary Operation = All points
- Unknown = All points
- Skipped = All Points
- Problem Setup Incorrectly = 1 point
- Wrong Operation = 1 point

If the student did not complete all items in the time allotted, please grade the last item the student worked on and then click "**Mark Last Item.**" Doing so will make all of the remaining items worth zero points.
When you have completed grading the form, please click "**Submit Test**" to submit the assessment.

If you have additional questions about scoring guidelines for the CBMmath assessments in FAST™, please contact FastBridge Learning's School Support Team at help@fastbridge.org.