

## Progress Monitoring: Scoring Mathematics Computation Probes

Est. Time: 30 Minutes

### Objective

Learn how to use two different methods to score mathematics progress monitoring computation probes.

### Overview

**Progress monitoring** is a type of formative assessment in which student learning is evaluated on a regular basis to provide useful feedback about performance to both students and teachers. Though there are a number of methods for monitoring a student's progress, the most widely used is **general outcome measurement (GOM)**, sometimes referred to as **curriculum-based measurement (CBM)**. CBM consists of the frequent administration (e.g., once per month, every two weeks) of brief probes or tests, which includes sample items from every skill taught across the academic year. In mathematics, teachers should administer two types of probes:

- Computation probes — Measures students' procedural knowledge (e.g., the ability to add fractions)
- Concepts and applications probes — Assesses conceptual understanding of mathematics or students' ability to apply mathematics knowledge (e.g., to make change from a purchase)

This activity will focus on scoring computational probes.

**Scoring:** Following their administration, the probes are scored. In general, scoring a computation probe is simply a matter of determining how many problems the student has solved correctly. In the case of elementary students, teachers have the additional option of scoring computation probes according to the number of digits correct. However, this scoring method is not recommended at the secondary level. To ensure that the probes are easily comparable between classes and throughout the school, teachers should make certain to score them in the same way. Below is an example of a computation probe scored using both methods. For illustrative purposes, we chose an elementary probe to demonstrate how to score according to number of problems correct and number of digits correct.

## Progress Monitoring: Scoring Mathematics Computation Probes

### Number of Correctly Answered Problems

Name: Rashid Date: 10/27/XXXX

<del>X</del> $\begin{array}{r} 64 \\ + 57 \\ \hline 111 \end{array}$	<del>X</del> $\begin{array}{r} 82 \\ + 99 \\ \hline 171 \end{array}$	<del>X</del> $\begin{array}{r} 99 \\ - 71 \\ \hline 28 \end{array}$	4. $\begin{array}{r} 24 \\ \times 7 \\ \hline 1428 \end{array}$
<del>X</del> $\begin{array}{r} 49 \\ + 33 \\ \hline 712 \end{array}$	6. $\begin{array}{r} 15r2 \\ 5 \overline{)77} \\ \underline{5} \\ 27 \\ \underline{25} \\ 2 \end{array}$	7. $\begin{array}{r} 66 \\ + 23 \\ \hline 89 \end{array}$	8. $\begin{array}{r} 12 \\ \times 4 \\ \hline 48 \end{array}$
9. $\begin{array}{r} 59 \\ - 36 \\ \hline 23 \end{array}$	<del>X</del> $\begin{array}{r} 15 \\ \times 7 \\ \hline 735 \end{array}$	11. $\begin{array}{r} 12r5 \\ 7 \overline{)89} \\ \underline{7} \\ 19 \\ \underline{14} \\ 5 \end{array}$	12. $\begin{array}{r} 65 \\ - 33 \\ \hline 32 \end{array}$
13. $\begin{array}{r} 24 \\ 4 \overline{)96} \\ \underline{8} \\ 16 \\ \underline{16} \\ 0 \end{array}$	14. $\begin{array}{r} 34 \\ - 13 \\ \hline 21 \end{array}$	15. $\begin{array}{r} 71 \\ \times 3 \\ \hline 213 \end{array}$	16. $\begin{array}{r} 4r5 \\ 7 \overline{)33} \\ \underline{28} \\ 5 \end{array}$

### Number of Digits Correct

Name: Rashid Date: 10/27/XXXX

1. $\begin{array}{r} 64 \\ + 57 \\ \hline 111 \end{array}$	2. $\begin{array}{r} 82 \\ + 99 \\ \hline 171 \end{array}$	3. $\begin{array}{r} 99 \\ - 71 \\ \hline 28 \end{array}$	4. $\begin{array}{r} 24 \\ \times 7 \\ \hline 1428 \end{array}$
5. $\begin{array}{r} 49 \\ + 33 \\ \hline 712 \end{array}$	6. $\begin{array}{r} 15r2 \\ 5 \overline{)77} \\ \underline{5} \\ 27 \\ \underline{25} \\ 2 \end{array}$	7. $\begin{array}{r} 66 \\ + 23 \\ \hline 89 \end{array}$	8. $\begin{array}{r} 12 \\ \times 4 \\ \hline 48 \end{array}$
9. $\begin{array}{r} 59 \\ - 36 \\ \hline 23 \end{array}$	10. $\begin{array}{r} 15 \\ \times 7 \\ \hline 715 \end{array}$	11. $\begin{array}{r} 12r5 \\ 7 \overline{)89} \\ \underline{7} \\ 19 \\ \underline{14} \\ 5 \end{array}$	12. $\begin{array}{r} 65 \\ - 33 \\ \hline 32 \end{array}$
13. $\begin{array}{r} 24 \\ 4 \overline{)96} \\ \underline{8} \\ 16 \\ \underline{16} \\ 0 \end{array}$	14. $\begin{array}{r} 34 \\ - 13 \\ \hline 21 \end{array}$	15. $\begin{array}{r} 71 \\ \times 3 \\ \hline 213 \end{array}$	16. $\begin{array}{r} 4r5 \\ 7 \overline{)33} \\ \underline{28} \\ 5 \end{array}$

As you can see, the different methods of scoring yield very different results. If we score this probe using the number of correctly answered problems, the score is 11 (problems correct). Conversely, were we to use the number of digits correct, the score would be 32.

### For Your Information

- Typically, addition, subtraction, and multiplication problems should be scored from RIGHT to LEFT. By scoring from right to left, the teacher will be sure to note incorrect digits in the place-value columns. However, division problems should be scored LEFT to RIGHT.
- If the student does not use a traditional algorithm to arrive at a solution, but instead uses a partial algorithm (e.g., partial sums, partial products) then addition, subtraction, multiplication, and division problems should be scored from LEFT to RIGHT.

## Progress Monitoring: Scoring Mathematics Computation Probes

### Activity

Note: This probe is an alternate version of the probe Rashid was administered earlier (on page 2). It contains equivalent but different items.

1. Score the probe below according to the *number of correctly answered problems*.

Name: Rashid Date: 11/12/XXXX

<p>1. <math display="block">\begin{array}{r} 21 \\ \times 8 \\ \hline 168 \end{array}</math></p>	<p>2. <math display="block">\begin{array}{r} 83 \\ - 62 \\ \hline 21 \end{array}</math></p>	<p>3. <math display="block">\begin{array}{r} 21 \\ 4 \overline{)84} \\ \underline{8} \\ 4 \\ 4 \\ \hline 0 \end{array}</math></p>	<p><del>4.</del> <math display="block">\begin{array}{r} 23 \\ + 48 \\ \hline 611 \end{array}</math></p>
<p>5. <math display="block">\begin{array}{r} 47 \\ + 61 \\ \hline 108 \end{array}</math></p>	<p><del>6.</del> <math display="block">\begin{array}{r} 37 \\ \times 5 \\ \hline 1535 \end{array}</math></p>	<p>7. <math display="block">\begin{array}{r} 79 \\ - 43 \\ \hline 36 \end{array}</math></p>	<p>8. <math display="block">\begin{array}{r} 12 \\ 5 \overline{)60} \\ \underline{5} \\ 10 \\ 10 \\ \hline 0 \end{array}</math></p>
<p>9. <math display="block">\begin{array}{r} 57 \\ - 25 \\ \hline 32 \end{array}</math></p>	<p><del>10.</del> <math display="block">\begin{array}{r} 64 \\ \times 4 \\ \hline 2416 \end{array}</math></p>	<p>11. <math display="block">\begin{array}{r} 14r4 \\ 6 \overline{)88} \\ \underline{6} \\ 28 \\ 24 \\ \hline 4 \end{array}</math></p>	<p><del>12.</del> <math display="block">\begin{array}{r} 88 \\ + 33 \\ \hline 1111 \end{array}</math></p>
<p>13. <math display="block">\begin{array}{r} 13r5 \\ 7 \overline{)96} \\ \underline{7} \\ 26 \\ 21 \\ \hline 5 \end{array}</math></p>	<p>14. <math display="block">\begin{array}{r} 89 \\ - 24 \\ \hline 65 \end{array}</math></p>	<p><del>15.</del> <math display="block">\begin{array}{r} 34 \\ + 37 \\ \hline 611 \end{array}</math></p>	<p>16. <math display="block">\begin{array}{r} 41 \\ \times 9 \\ \hline 369 \end{array}</math></p>

## Progress Monitoring: Scoring Mathematics Computation Probes

### Activity [CONT]

2. Score the probe below according to the *number of digits correct*.

Name: Rashid Date: 11/12/XXXX

1.	$\begin{array}{r} 21 \\ \times 8 \\ \hline 168 \end{array}$	2.	$\begin{array}{r} 83 \\ - 62 \\ \hline 21 \end{array}$	3.	$\begin{array}{r} 21 \\ 4 \overline{) 84} \\ \underline{8} \\ 4 \\ \underline{4} \\ 0 \end{array}$	4.	$\begin{array}{r} 23 \\ + 48 \\ \hline 1611 \end{array}$
5.	$\begin{array}{r} 47 \\ + 61 \\ \hline 108 \end{array}$	6.	$\begin{array}{r} 37 \\ \times 5 \\ \hline 1835 \end{array}$	7.	$\begin{array}{r} 79 \\ - 43 \\ \hline 36 \end{array}$	8.	$\begin{array}{r} 12 \\ 5 \overline{) 60} \\ \underline{5} \\ 10 \\ \underline{10} \\ 0 \end{array}$
9.	$\begin{array}{r} 57 \\ - 25 \\ \hline 32 \end{array}$	10.	$\begin{array}{r} 64 \\ \times 4 \\ \hline 256 \end{array}$	11.	$\begin{array}{r} 14r4 \\ 6 \overline{) 88} \\ \underline{6} \\ 28 \\ \underline{24} \\ 4 \end{array}$	12.	$\begin{array}{r} 88 \\ + 33 \\ \hline 121 \end{array}$
13.	$\begin{array}{r} 13r5 \\ 7 \overline{) 96} \\ \underline{7} \\ 26 \\ \underline{21} \\ 5 \end{array}$	14.	$\begin{array}{r} 89 \\ - 24 \\ \hline 65 \end{array}$	15.	$\begin{array}{r} 34 \\ + 37 \\ \hline 61 \end{array}$	16.	$\begin{array}{r} 41 \\ \times 9 \\ \hline 369 \end{array}$

## Progress Monitoring: Scoring Mathematics Computation Probes

### Questions/Discussion Topics

1. Compare the results of the probes that you scored using the two different methods. Now, discuss some of the potential advantages and disadvantages of each scoring method.

When scored by the number of correctly answered problems, the student scores 11. When scored by number of digits correct, the student scores 32. Teachers who score using the number of correctly answered problems might find slight improvements difficult to detect. However, using that method requires more skill and can be more time consuming, whereas scoring by the number of correctly answered problems is often easier and quicker to accomplish. Consider this analogy: When we're preparing to mail a small box or package, it is much more accurate to use a postal scale than it is to use a scale for measuring the weight of a person. The postal scale is more sensitive to small changes in weight. Similarly, scoring by digits can indicate slight improvements in performance.

2. Compare the two probes that you just scored for Rashid. Do you notice any pattern in the types of errors he is making?

When Rashid needs to regroup for addition and multiplication, he fails to do so. Instead, he adds or multiplies the numbers in the ones column and then writes his answer underneath. He then proceeds to perform the calculation for the numbers in the tens column and writes the answer to the left of what he has just recorded. If Rashid's teacher were to conduct an error analysis of Rashid's probes, she would be able to catch this right away and reteach the correct procedure.