

Early Math Fluency CBM Probe: Missing Number

This introduction to the Missing Number probe provides information about the preparation, administration, and scoring of this Early Math CBM measure. Additionally, it offers brief guidelines for integrating this assessment into a school-wide 'Response-to-Intervention' model.

Missing Number: Description (Clarke & Shinn, 2004; Gersten, Jordan & Flojo, 2005)

The student is given a sheet containing multiple number series. Each series consists of 3-4 numbers that appear in sequential order. The numbers in each short series are selected to fall within a predefined range (e.g., no lower than 0 and no higher than 20). In each series, one number is left blank (e.g., '1 2 _ 4'). During a one-minute timed assessment, the student states aloud the missing number in as many response items as possible while the examiner records any Missing Number errors.

Missing Number: Preparation

The following materials are needed to administer Missing Number (MN) Early Math CBM probes:

- Student and examiner copies of a MN assessment probe. (**Note:** Customized MN probes can be created conveniently and at no cost using Numberfly, a web-based application. Visit Numberfly at <http://www.interventioncentral.org/php/numberfly/numberfly.php>).
- A pencil, pen, or marker
- A stopwatch

Missing Number: Directions for Administration

1. The examiner sits with the student in a quiet area without distractions. The examiner sits at a table across from the student.
2. The examiner says to the student:

"The sheet on your desk has sets of numbers. In each set, a number is missing."

"When I say, 'start,' tell me the name of the number that is missing from each set of numbers. Start at the top of this page and work across the page [demonstrate by pointing]. Try to figure out the missing number for each example.. When you come to the end of a row, go to the next row. Are there any questions? [Pause] Start. "

NOTE: If the student has difficulties with speech production, the examiner can give the student a pencil and use this alternate wording for directions: *"When I say, 'start, write in the number that is missing from each set of numbers."*

3. The examiner begins the stopwatch when the student reads the first number aloud. If the student hesitates on a number for 3 seconds or longer on a Missing Number item, the examiner says the correct number aloud and says, *"Go to the next one."* (If necessary, the

examiner points to the next number as a student prompt.)

4. The examiner marks each Missing Number error by marking a slash (/) through the incorrect response item on the examiner form.
5. At the end of one minute, the examiner says, "Stop" and writes in a right-bracket symbol (]) on the examiner form after the last item that the student had attempted when the time expired. The examiner then collects the student Missing Number sheet.

Missing Number: Scoring Guidelines

Correct MN responses include:

- Missing numbers read correctly
- Missing numbers read incorrectly but corrected by the student within 3 seconds

Incorrect MN responses include:

- Missing numbers read incorrectly
- Missing numbers read correctly after hesitations of 3 seconds or longer
- Response items skipped by the student

To calculate a Missing Number fluency score, the examiner:

1. counts up all MN items that the student attempted to read aloud and
2. subtracts the number of MN errors from the total number attempted.
3. The resulting figure is the number of correct Missing Number items completed. (MN fluency score).

Missing Number Probes as Part of a Response to Intervention Model

- **Universal Screening:** To proactively identify children who may have deficiencies in development of foundation math concepts, or 'number sense' (Berch, 2005), schools may choose to screen all kindergarten and first grade students using Missing Number probes. Those screenings would take place in fall, winter, and spring. Students who fall below the 'cutpoint' of the 35th percentile (e.g., Gersten, Jordan & Flojo, 2005) of the grade norms on the MN task would be identified as having moderate deficiencies and given additional interventions to build their 'number sense' skills.
- **Tier I (Classroom-Based) Interventions:** Teachers can create Missing Number probes and use them independently to track the progress of students who show modest delays in their math foundation skills.
- **Tier II (Individualized) Interventions.** Students with more extreme academic delays may be referred to a school-based problem-solving team, which will develop more intensive, specialized interventions to target the student's academic deficits (Wright, 2007). Missing Number probes can be used as one formative measure to track student progress with Tier II interventions to build foundation math skills.

Missing Number: Measurement Statistics

Test-Retest Reliability Correlations for Missing Number Probes		
<i>Time Span</i>	<i>Correlation</i>	<i>Reference</i>
13-week interval	0.79	Clarke & Shinn (2004)
26-week interval	0.81	Clarke & Shinn (2004)

Predictive Validity Correlations for Missing Number Probes		
<i>Predictive Validity Measure</i>	<i>Correlation</i>	<i>Reference</i>
Curriculum-Based Measurement Math Computation Fluency Probes: Grade 1 Addition & Subtraction (Fall Administration of MN Probe and Spring Administration of Math Computation Probe)	0.67	Clarke & Shinn (2004)
Woodcock-Johnson Tests of Achievement: Applied Problems subtest (Fall Administration of MNF Probe and Spring Administration of WJ-ACH subtest)	0.72	Clarke & Shinn (2004)
Number Knowledge Test	0.61	Chard, Clarke, Baker, Otterstedt, Braun & Katz.(2005) cited in Gersten, Jordan & Flojo (2005)

References

Chard, D. J., Clarke, B., Baker, S., Otterstedt, J., Braun, D., & Katz, R. (2005). Using measures of number sense to screen for difficulties in mathematics: Preliminary findings. *Assessment For Effective Intervention, 30*(2), 3-14.

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Gersten, R., Jordan, N.C., & Flojo, J.R. (2005). Early identification and interventions for students with mathematics difficulties. *Journal of Learning Disabilities, 38*, 293-304.

Berch, D. B. (2005). Making sense of number sense: Implications for children with mathematical disabilities. *Journal of Learning Disabilities, 38*, 333-339..

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