NCSM 2011 Conference

Learning from Students’ Written Work: A Guide for Professional Development Grades K–6

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Middle School Math Reasoning Inventory (MSMRI)

Funded by the Bill & Melinda Gates Foundation
Middle School Math Reasoning Inventory (MSMRI)

Tool for assessing numerical understanding and skills

Web-based formative/diagnostic assessment to provide teachers information and insights into the numerical understanding and skills of their incoming middle school students
Overview of ASSESSMENT

Focus Areas

• Conceptual Understanding
• Number Sense
• Written Computation
Number Sense

• understands relationships, properties, and procedures

• is able to explain and justify one’s actions on numbers

• is able to use strategies appropriately and efficiently
Learning Mathematics

Conceptual Understanding

Number Sense

Withdrawing
Assessment

Focus Areas
- Conceptual Understanding
- Number Sense
- Written Computation

Domain
- Whole Numbers
  - Section Interview
  - Section Paper & Pencil

Domain
- Fractions
  - Section Interview
  - Section Paper & Pencil

Domain
- Decimals
  - Section Interview
  - Section Paper & Pencil
Development Process

- **Development** by the author team
- **Tryouts** by “trusted teachers” (Math Solutions consultants)
- **Piloting** by “philosophically aligned teachers”
- **Field Testing** by unknown teachers who may or may not be philosophically aligned
- **Implementation** (widespread scaling up)
Session Overview

- Watch and discuss a sample interview
- Watch additional interviews
- Discuss other aspects of interviewing and watch additional video clips
  - Response Choices
  - Strategies and Notes
  - Appropriate situations for follow-up prompts
Amber

1000 – 3
1000 – 998
99 + 17
100 – 18
15 + ? = 200

School Bus problem: There were 295 students. School buses hold 25 students. How many buses are needed?
1000 – 3

This is not in the current assessment.
1. **Question 1**

I'm going to show you some problems one at a time. Try to figure out the answers in your head. The first problem is 1000 minus 998.

1000 - 998 =

2. **Answer**

- Correct (2)
- Incorrect [ ]
- Self-correct (2)
- Did Not Answer

3. **Strategy**

How did you figure out the answer?

- Used standard algorithm to subtract
- Counted up from 998
- Added 998 + 2
- Added 98 + 2 and applied to 998 + 2
- Gave other reasonable explanation
- Guessed, could not explain, or gave faulty explanation

**Notes**

[Blank field]
Question 2
What is the answer to 99 plus 17?

99 + 17 =

Answer
- Correct (116)
- Incorrect
- Self-correct (116)
- Did Not Answer

Strategy
- How did you figure out the answer?
  - Counted on by 1s
  - Used standard algorithm to add
  - Added 99 + 1 and then 100 + 16
  - Added 90 + 10, 9 + 7, and then 100 + 16
  - Added 99 + 10 and then 109 + 7
  - Gave other reasonable explanation
  - Guessed, could not explain, or gave faulty explanation

Notes

End interview
Save and Exit
1. Question 3
   What is the answer to 100 minus 18?
   
   \[ 100 - 18 = \]

2. Answer
   - Correct (82)
   - Incorrect
   - Self-correct (82)
   - Did Not Answer

3. Strategy
   How did you figure out the answer?
   - Counted back by 1s
   - Used standard algorithm to subtract
   - Added up from 18 to 100 (e.g., 18 + 2, then 20 + 80)
   - Subtracted 20 and then added 2
   - Subtracted 10 and then subtracted 8
   - Gave other reasonable explanation
   - Guessed, could not explain, or gave faulty explanation

Notes

1. Question 4

15 plus what number equals 200?

15 + ___ = 200

2. Answer

- Correct (185)
- Incorrect
- Self-correct (185)
- Did Not Answer

3. Strategy

- Used standard algorithm to subtract
- Used alternate strategy to subtract (e.g., 200 - 10, then 190 - 5)
- Added up (e.g., 15 + 85, then 100 + 100)
- Gave other reasonable explanation
- Guessed, could not explain, or gave faulty explanation

4. Notes

End interview
Save and Exit
Question 13

Here's a word problem. There are 295 students. School buses hold 25 students. How many buses are needed to fit all the students? Figure it out in your head or use paper and pencil. ("If student answer is unclear, ask, "How many buses are needed?)

Answer

- Correct (12 buses)
- Incorrect
- Self-correct (12 buses)
- Did Not Answer

Strategy

- How did you figure out the answer?
  - Explained why 12 buses are needed
  - Did not explain why 12 buses are needed

Notes
99 + 17 Response Choices

- Correct (116)
- Incorrect (______)
- Self corrected (116)
- Did not answer
Which of these strategies did Alex use to reason?

- Counted on by 1s
- Used standard algorithm to add
- Added 99 + 1 and then 100 + 16
- Added 90 + 10, 9 + 7, and then 100 + 16
- Added 99 + 10 and then 109 + 7
- Gave other reasonable explanation
- Guessed, did not explain, or gave faulty explanation
100 − 18
100 – 18 Response Choices

● Correct (82)

○ Incorrect (______)

○ Self corrected (82)

○ Did not answer
Alex: Strategy for 100 – 18

- Counted back by 1s
- Used standard algorithm to subtract
- Added up (e.g., $18 + 2$, then $20 + 18$)
- Subtracted 20 and then added 2
- **Subtracted 10 and then subtracted 8**
- Gave other reasonable explanation
- Gessed, did not explain, or gave faulty explanation
More about Response Choices, Strategies, and Notes
Sometimes more than one strategy choice seems to apply
An example with Amber

\[ \frac{1}{2} + \frac{2}{3} \]

Is the answer greater or less than 1?
Strategy Choices—$1/2 + 2/3$
How did you decide?

- Converted to common denominators
- Explained that $2/3$ is greater than $1/2$ so answer must be greater than $1$
- Converted to decimals or percents
- Described a visual or physical model
- Gave other reasonable explanation
- Guessed, did not explain, or gave faulty explanation
Chase

\[ \frac{7}{8} + \frac{11}{13} \]

Which of these is the best estimate?

\( \frac{1}{2} \quad 1 \quad 2 \quad 8 \)
Strategy Choices—$\frac{7}{8} + \frac{11}{13}$

How did you decide?

- Rounded one or both fractions to 1, then added
- Analyzed choices and chose one that seemed most reasonable
- Gave other reasonable explanation
- Guessed, did not explain, or gave faulty explanation
DJ

3.9 x 4.75

Which of these is the best estimate?
5, 10, 20, or 30
Strategy Choices—3.9 x 4.75
How did you decide?

- Used standard algorithm to multiply
- Rounded and then multiplied
- Gave other reasonable explanation
- Guessed, did not explain, or gave faulty explanation
Common Core Math Trajectories

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