



How To: Improve Proficiency in Math-Facts Through a Self-Administered Folding-In Technique

Students should develop automatic recall of basic math-facts in the elementary grades. Math-fact mastery permits students to shift valuable cognitive capacity away from simple calculations toward higher-level problem-solving (Gersten, Jordan, & Flojo, 2005; National Mathematics Advisory Panel, 2008). An important goal for schools, then, is to ensure that students are proficient in math-facts by the end of grade 5 (Kroesbergen & Van Luit, 2003) to better prepare them for the demanding middle-school math curriculum. Teachers, however, may have difficulty finding instructional time and adult support to deliver math-fact interventions to students.

One solution to this intervention-resource problem is the math-fact self-administered folding-in intervention (math-fact SAFI: Hulac, Dejong, & Benson, 2012). This approach trains students to take charge of their own intervention to acquire and develop fluency in math-facts. Using flash cards, the student reviews math-facts with immediate performance feedback, engages in repeated practice to correct errors, and records on a running log those math-facts that have been mastered. An additional advantage of this intervention is that it has been shown to be effective with middle-school students.

Preparation.

In preparation for this intervention, the teacher creates or obtains the following materials:

- *Math-fact flash cards.* The entire collection of math-facts to be mastered are written onto flash-cards. One fact is written on each card, with the math-fact appearing on the front and the correct answer appearing on the back. For example, multiplication math-facts for 0 through 10 would require 121 flash cards to cover all possible number combinations for this fact-set. Tip: Students can be given a master set of math-facts with answers (e.g., on the blackboard or on a handout) and directed to create their own math-fact cards.
- *Math-Facts SAFI: Student Checklist.* The student receives a copy of this checklist (attached) containing the essential steps of the self-administered intervention. The teacher can use this same checklist to observe the student and evaluate the integrity of the math-fact SAFI.
- *Dry-Erase Board, Markers, and Eraser.* The student uses the dry-erase board to record all answers in the session.
- *Student Log: Mastered Math-facts.* This recording-form (attached) is used by the student to log any math-facts mastered during the intervention.

In preparation for this intervention, the teacher also meets with the student to:

- *inventory those math-facts the student already knows.* The teacher reviews all math-fact cards with the student. The teacher shows each card to the student for 3 seconds. If the student responds correctly to the math-fact, the teacher sorts that card into the "known" stack. If the student answers incorrectly or hesitates for 3 seconds or longer, the teacher sorts the card into the "unknown" stack. The teacher then puts rubber bands around the "known" and "unknown" stacks for student use as outlined below.
- *train the student in the steps of the math-fact SAFI.* Using the intervention materials and *Math-Facts SAFI: Student Checklist*, the teacher trains the student to implement the intervention.



Procedure. Below are the steps the student follows in each session to implement the math-fact self-administered folding-in technique. (NOTE: Because the student is the interventionist, the steps are written as student directions):

1. Start with the daily stack of cards from the last session. Or create a new "daily stack" by taking 7 cards from your weekly "known" stack and 3 cards from your weekly "unknown" stack and shuffling them.
2. Take the first card from the top of the daily stack and place it flat on the table.
3. Read the math-fact on the card and write the answer on the dry-erase board **within 3 seconds**.
4. Turn the card over and compare the answer that you wrote to the answer on the card.
5. If your answer is correct, sort that card into a "daily known" pile. If your answer is incorrect, sort that card into a "daily unknown" pile--then practice by writing the math-fact and correct answer on your dry-erase board **three times in a row**.
6. Continue until you have answered all 10 daily cards. Then look at the daily "known" and "unknown" card stacks. If all daily cards are in the "known" stack, draw a star in the bottom left corner of your dry-erase board.
7. Shuffle the 10 cards in the daily card deck.
8. Continue reviewing all 10 cards in the daily deck as explained in steps 2-7 until you have drawn three stars in the bottom left corner of the dry-erase board. (In other words, continue until you have answered all 10 cards without error in a single run-through and have accomplished this feat a total of three times in the session.)
9. When you have earned 3 stars, consider the entire daily stack to be "known" cards. So it's now time to update the daily deck.
10. Take any 3 cards from your current daily 10-card deck and transfer them to the weekly "known" deck. Then, on the *Student Log: Mastered Math-facts* form, record the math-facts and current date for the 3 cards that you transfer. Congratulations! These now count as mastered math-facts!
11. Next, take 3 cards from the weekly "unknown" stack and add them to your current daily deck to bring it back up to 10 cards.
12. Begin reviewing the daily stack again (as outlined in steps 2-7) until your time runs out.
13. Before ending the session, place rubber-bands around the weekly "known" and "unknown" decks and the daily stack that you are currently working on. Also, be sure that your *Student Log: Mastered Math-facts* form is up-to-date.

References

- 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.
- Hulac, D. M., Dejong, K., & Benson, N. (2012). Can students run their own interventions?: A self-administered math fluency intervention. *Psychology in the Schools, 49*, 526-538.
- Kroesbergen, E., & Van Luit, J. E. H. (2003). Mathematics interventions for children with special educational needs. *Remedial and Special Education, 24*, 97-114.
- National Mathematics Advisory Panel. (2008). *Foundations for success: The final report of the National Mathematics Advisory Panel*. U.S. Department of Education: Washington, D.C.



Math-Facts SAFI: Student Checklist (Hulac, Dejong, & Benson, 2012).	
Carried Out?	Intervention Step
__Y __N	1. Start with the daily stack of cards from the last session. Or create a new "daily stack" by taking 7 cards from your weekly "known" stack and 3 cards from your weekly "unknown" stack and shuffling them.
__Y __N	2. Take the first card from the top of the daily stack and place it flat on the table.
__Y __N	3. Read the math-fact on the card and write the answer on the dry-erase board within 3 seconds.
__Y __N	4. Turn the card over and compare the answer that you wrote to the answer on the card.
__Y __N	5. If your answer is correct, sort that card into a "daily known" pile. If your answer is incorrect, sort that card into a "daily unknown" pile--then practice by writing the math-fact and correct answer on your dry-erase board three times in a row.
__Y __N	6. Continue until you have answered all 10 daily cards. Then look at the daily "known" and "unknown" card stacks. If all daily cards are in the "known" stack, draw a star in the bottom left corner of your dry-erase board.
__Y __N	7. Shuffle the 10 cards in the daily card deck.
__Y __N	8. Continue reviewing all 10 cards in the daily deck as explained in steps 2-7 until you have drawn three stars in the bottom left corner of the dry-erase board. (In other words, continue until you have answered all 10 cards without error in a single run-through and have accomplished this feat a total of three times in the session.)
__Y __N	9. When you have earned 3 stars, consider the entire daily stack to be "known" cards. So it's now time to update the daily deck.
__Y __N	10. Take any 3 cards from your current daily 10-card deck and transfer them to the weekly "known" deck. Then, on the <i>Student Log: Mastered Math-facts</i> form, record the math-facts and current date for the 3 cards that you transfer. Congratulations! These now count as mastered math-facts!
__Y __N	11. Next, take 3 cards from the weekly "unknown" stack and add them to your current daily deck to bring it back up to 10 cards.
__Y __N	12. Begin reviewing the daily stack again (as outlined in steps 2-7) until your time runs out.
__Y __N	13. Before ending the session, place rubber-bands around the weekly "known" and "unknown" decks and the daily stack that you are currently working on. Also, be sure that your <i>Student Log: Mastered Math-facts</i> form is up-to-date.



Student Log: Mastered Math-facts

Student: _____ School Yr: _____ Classroom/Course: _____

Directions to the Student: Record any math-facts that you are transferring to the 'known' weekly stack.

Item 1: _____ Date: ___/___/___

Item 2: _____ Date: ___/___/___

Item 3: _____ Date: ___/___/___

Item 4: _____ Date: ___/___/___

Item 5: _____ Date: ___/___/___

Item 6: _____ Date: ___/___/___

Item 7: _____ Date: ___/___/___

Item 8: _____ Date: ___/___/___

Item 9: _____ Date: ___/___/___

Item 10: _____ Date: ___/___/___

Item 11: _____ Date: ___/___/___

Item 12: _____ Date: ___/___/___

Item 13: _____ Date: ___/___/___

Item 14: _____ Date: ___/___/___

Item 15: _____ Date: ___/___/___

Item 16: _____ Date: ___/___/___

Item 17: _____ Date: ___/___/___

Item 18: _____ Date: ___/___/___

Item 19: _____ Date: ___/___/___

Item 20: _____ Date: ___/___/___

Item 21: _____ Date: ___/___/___

Item 22: _____ Date: ___/___/___

Item 23: _____ Date: ___/___/___

Item 24: _____ Date: ___/___/___

Item 25: _____ Date: ___/___/___

Item 26: _____ Date: ___/___/___

Item 27: _____ Date: ___/___/___

Item 28: _____ Date: ___/___/___

Item 29: _____ Date: ___/___/___

Item 30: _____ Date: ___/___/___

Item 31: _____ Date: ___/___/___

Item 32: _____ Date: ___/___/___

Item 33: _____ Date: ___/___/___

Item 34: _____ Date: ___/___/___

Item 35: _____ Date: ___/___/___

Item 36: _____ Date: ___/___/___

Item 37: _____ Date: ___/___/___

Item 38: _____ Date: ___/___/___

Item 39: _____ Date: ___/___/___

Item 40: _____ Date: ___/___/___

Item 41: _____ Date: ___/___/___

Item 42: _____ Date: ___/___/___

Item 43: _____ Date: ___/___/___

Item 44: _____ Date: ___/___/___

Item 45: _____ Date: ___/___/___

Item 46: _____ Date: ___/___/___

Item 47: _____ Date: ___/___/___

Item 48: _____ Date: ___/___/___



Student Log: Mastered Math-facts

Directions to the Student: Record any math-facts that you are transferring to the 'known' weekly stack.

Item 49: _____ Date: __/__/__	Item 75: _____ Date: __/__/__
Item 50: _____ Date: __/__/__	Item 76: _____ Date: __/__/__
Item 51: _____ Date: __/__/__	Item 77: _____ Date: __/__/__
Item 52: _____ Date: __/__/__	Item 78: _____ Date: __/__/__
Item 53: _____ Date: __/__/__	Item 79: _____ Date: __/__/__
Item 54: _____ Date: __/__/__	Item 80: _____ Date: __/__/__
Item 55: _____ Date: __/__/__	Item 81: _____ Date: __/__/__
Item 56: _____ Date: __/__/__	Item 82: _____ Date: __/__/__
Item 57: _____ Date: __/__/__	Item 83: _____ Date: __/__/__
Item 58: _____ Date: __/__/__	Item 84: _____ Date: __/__/__
Item 59: _____ Date: __/__/__	Item 85: _____ Date: __/__/__
Item 60: _____ Date: __/__/__	Item 86: _____ Date: __/__/__
Item 61: _____ Date: __/__/__	Item 87: _____ Date: __/__/__
Item 62: _____ Date: __/__/__	Item 88: _____ Date: __/__/__
Item 63: _____ Date: __/__/__	Item 89: _____ Date: __/__/__
Item 64: _____ Date: __/__/__	Item 90: _____ Date: __/__/__
Item 65: _____ Date: __/__/__	Item 91: _____ Date: __/__/__
Item 66: _____ Date: __/__/__	Item 92: _____ Date: __/__/__
Item 67: _____ Date: __/__/__	Item 93: _____ Date: __/__/__
Item 68: _____ Date: __/__/__	Item 94: _____ Date: __/__/__
Item 69: _____ Date: __/__/__	Item 95: _____ Date: __/__/__
Item 70: _____ Date: __/__/__	Item 96: _____ Date: __/__/__
Item 71: _____ Date: __/__/__	Item 97: _____ Date: __/__/__
Item 72: _____ Date: __/__/__	Item 98: _____ Date: __/__/__
Item 73: _____ Date: __/__/__	Item 99: _____ Date: __/__/__
Item 74: _____ Date: __/__/__	Item 100: _____ Date: __/__/__