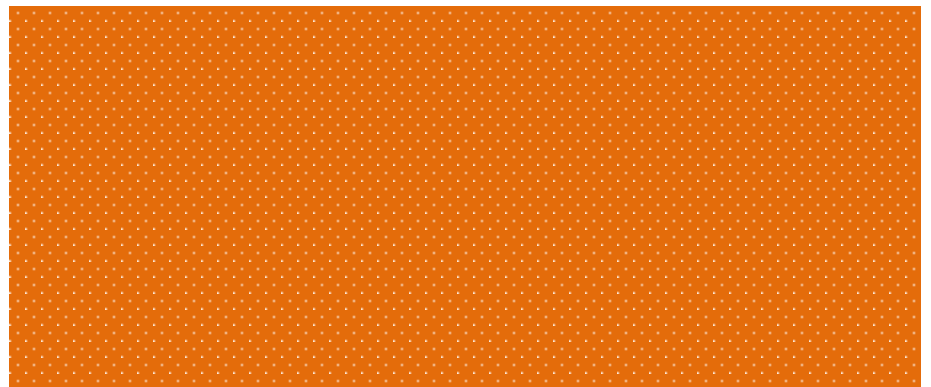
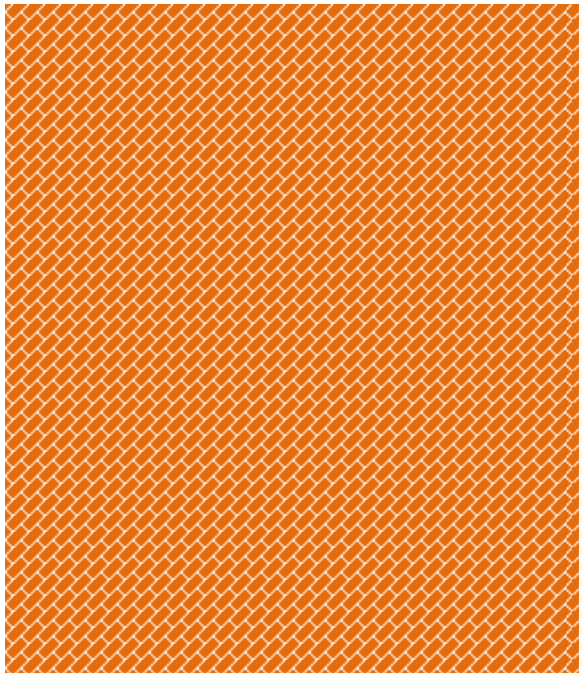


Math Two-a-day

Intervention Manual



This manual is designed to serve as a guide for the implementation of a school-wide Tier 1 math intervention called Math Two-a-days. Math Two-a-days is intended to enhance students' math calculation skills by increasing levels of fluent responding to math stimuli. The remainder of this manual consists of components that are either necessary to the process or warrant consideration.

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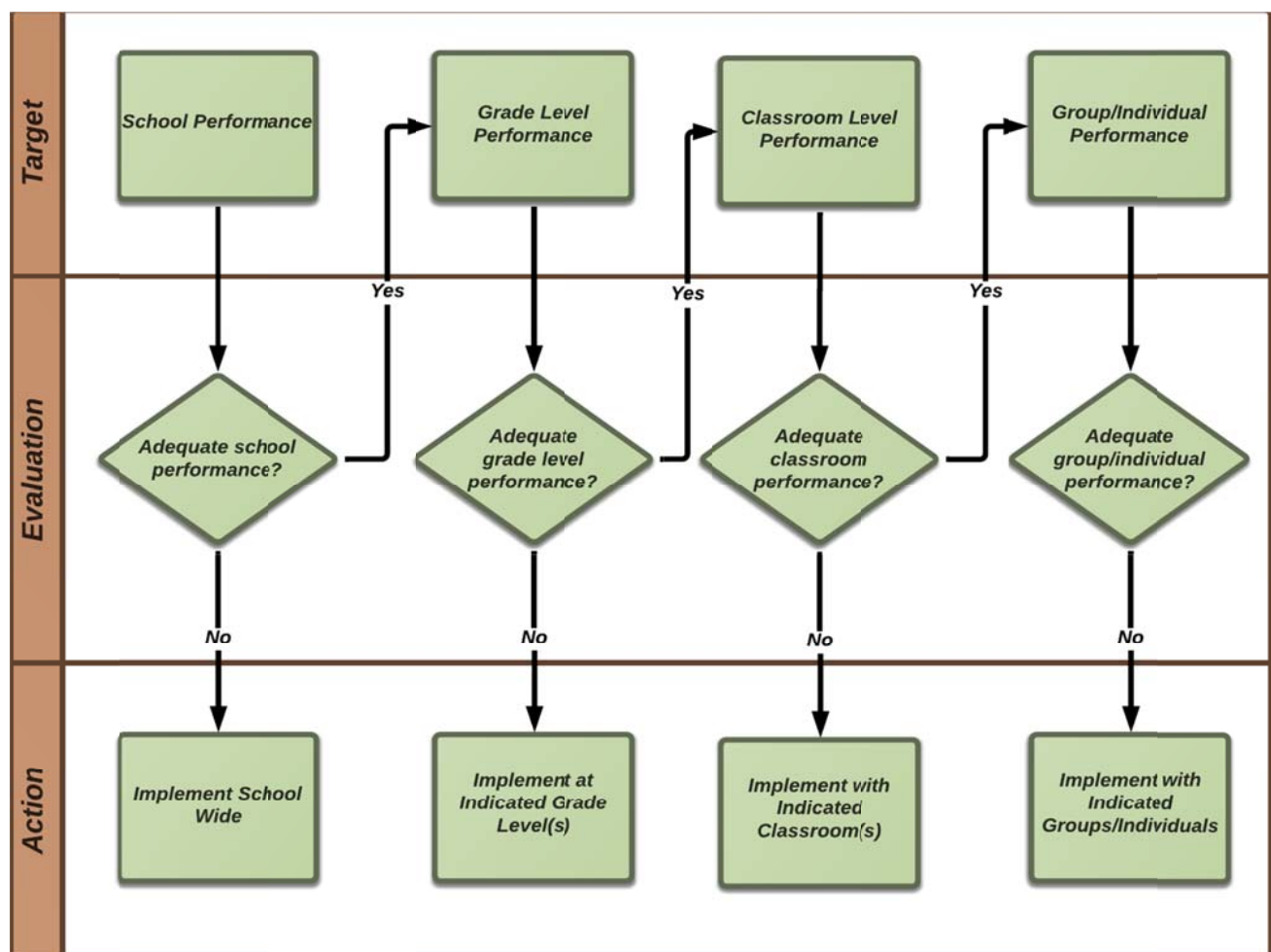
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Determination of Need

Determining the Focus of the Project

While the purpose of this manual is to guide the implementation of Math Two-a-days at the school-wide Tier 1 level, it can easily be modified to meet needs at other levels or Tiers. Therefore, prior to implementation, it is important to determine the student body's needs in order to most effectively allocate resources and time. Consider the diagram below.



As represented by the above diagram, participation in Math Two-a-days can be considered at the school-wide, grade-wide, class-wide, and group/individual targeted levels. The decision to participate (or implement Math Two-a-days) at any of the four levels can be facilitated by evaluating performance at each level beginning with Tier 1 school-wide evaluation.

What qualifies for “adequate” performance must be determined beforehand. This will vary depending on district standards and the relationship of these standards to more broad outcomes such as state testing data. Some examples of data schools can use to evaluate performance include state test results, benchmarking data, curriculum-based assessment, etc. Whatever math fluency performance data is chosen will serve as the baseline for decision-making. Within the Math Two-a-days program students must obtain scores of at least forty digits correct in one minute to have mastered a skill. This criterion is consistent with the research base supporting forty digits correct as adequate to produce retention, generalization, and maintenance of calculation skills.

Skill Scope and Sequence

Identify Scope and Sequence

Scope and **Sequence** refers to the range (scope) of skills to be taught and the order (sequence) in which they will be taught. Prior to implementing the program a scope and sequence should be developed to guide implementation. The scope and sequence should be articulated with sufficient detail so there is little chance for confusion with regards to what will be covered and in what order. For example, addition sums to 9 and subtraction from 9 may be the broad scope for first grade students, but this scope could be broken down into several different variations. This could begin with single-digit addition, sums to 6, and expand this to include sums up to 9 once the

previous skill is mastered. For every grade level receiving the intervention a scope of skills to be covered must be identified.

Math Two-a-days is designed to accompany a school's existing curriculum through the use of single-skill probe sets, which can be modified and sequenced as needed to meet a wide range of needs (see [Differentiation](#)). Students will begin working on the first single-skill probe set identified for their particular grade. Progression from skill to skill and differentiation within grades/classrooms will follow based on student performance.

An example scope and sequence of skills is provided below to aide educators in determining initial and subsequent skills for each grade.

Math Two-a-day Skill Scope and Sequence by Grade

Grade	1 st	2 nd	3 rd	4 th	5 th
Skill	Number writing	Sums to 9	Sums to 18	2x2 Sums	2x2 Sums *rgrp
	Missing Number	Sub from 10	Sub from 20	2x2 Sums *rgrp	2x2 Sub *rgrp
	Sums to 6	Sums to 18	2x2 Sums	2x2 Sub	Mult to 81
	Sums to 9	Sub from 20	2x2 Sums *rgrp	2x2 Sub *rgrp	Div from 81
	Sub from 6	2x2 Sums	2x2 Sub	Mult to 81	Mult 2x1
	Sub from 9	2x2 Sums *rgrp	2x2 Sub *rgrp	Div from 81	Mult 2x2
		2x2 Sub	Mult to 81	Mult 2x1	Mixed method
		2x2 Sub *rgrp	Div from 81	Mult 2x2	

* rgrp = regrouping

Identify and Secure Resources Required

Materials Needed

To administer Math Two-a-days, you will need copies of the following:

- Intervention Protocol (description of the steps in the administration process)
- Probe sets or worksheets for each skill/student and corresponding answer keys for each teacher
- Intervention Data Recording Sheets

You will also need:

- Timer, clock, or watch to monitor administration time
- Folders for students

When making the decision about how and where the probes will be printed, it is important to consider the amount of printing needed for Math Two-a-days. To better illustrate this, consider the number of kids participating and multiply that number by 10. This is the number of probes needed for one week. Also, teachers will need to print the probes for their respective classes on Thursday or Friday so they can have them ready for Monday morning. If the school is equipped with enough printers, paper, ink, and room to support this, a schedule could be made for printing times to better organize the process. Otherwise, outside sources should be considered for printing purposes. Teachers could submit an “order” consisting of the probes they’ll need the following week to the data manager(s) who then print (or have a company print) the orders. There are a number of ways this process can be conducted. It is important that the school choose the method that best matches their resources.

Identify Individuals Responsible for Implementation

For the purpose of ensuring that every student has the same or similar opportunity to benefit from Math Two-a-days, and to enhance the internal validity of the intervention, some aspects of the intervention must be tightly controlled. The most efficient way to accomplish this is to identify specific “jobs” or duties that can be consistently and solely performed by individuals best-suited for the task.

Listed below are necessary duties for successful implementation, separated by the individuals estimated to be in the best positions for fulfillment of them.

School Administrative Staff

Support from school administrators (principal, assistant principal, etc.) is key for the success of Math Two-a-days. With so many individuals involved in the process, it is essential that school leaders actively provide support, encouragement, and feedback to those involved. This can be achieved through scheduling regular meetings, being available in an office for certain blocks of time, casually open communication, etc.

Because administrators are authority figures, they are in the perfect position for providing praise and encouragement. They are similarly well-placed for providing the directives and supports needed by some to conduct the intervention with integrity. So, compatible with their position as head(s) of the school, administrative staff will conduct integrity evaluations.

Integrity evaluations

Math Two-a-days is an evidence-based, or empirically validated, intervention. While it has been demonstrated as effective, as with all interventions, Math Two-a-days must be delivered with integrity in order to achieve positive results. Integrity refers to the degree to which the intervention is carried out with adherence to its design features.

To evaluate the integrity of this intervention, administrators are required to randomly “spot-check” classrooms, which includes filling out an integrity sheet while observing a classroom during implementation. These observations should be conducted in a manner that provides the most information about the group(s) receiving the intervention. For Tier 1 school-wide implementation, it is recommended that

integrity be evaluated for at least 25% of individuals receiving the intervention. Administrators will choose a different classroom in a different grade to observe each time, rotating the classrooms randomly for each grade. An example integrity sheet is provided in Appendix 1.

Support Personnel

As stated previously, some aspects of the intervention have to be tightly controlled to ensure students' get an equal opportunity/experience and increase the intervention's internal validity. Any number of things are likely to impact a student's performance of a skill, not the least of which includes the directions that student is provided. Differences in administration-style would likely influence the intervention's results. To add assurance that the intervention is conducted with integrity, and to reduce variability, the instructions for the intervention should be provided to everyone by the same person and at the same time.

Announcing

The easiest way to accomplish this would be to announce the instructions over the school's speaker system. Because administrators will be busy conducting integrity evaluations, someone else (secretary, teaching assistant, volunteer, etc.) will have to read the instructions, ideally the same person (or two people) daily. The instructions to be read can be found on the "Daily Intervention Protocol – Announcer" in Appendix 2.

Keeping efficiency in mind, inserting Math Two-a-days into an existing routine, like the morning announcements, increases the chances that this new routine will be accepted and minimizes the disruption of instructional time. In addition, freeing teachers of the responsibilities of administering the instructions and timing, teachers are now able to watch and encourage their students participating in the intervention.

Timing

The announcer can also be the “timer,” who is responsible for making sure the students have the same amount of time (2 two-minute timings; four minutes total) everyday to participate.

Data Management

The data manager(s) will compile and maintain records of the data obtained by the teachers. They will also use the data to contribute to the school-wide incentive plan, if applicable.

Teachers

Math Two-a-days provides teachers with access to valuable information regarding student progress to more effectively meet their instructional needs. Instructions for Teachers during implementation can be found on the “Daily Intervention Protocol – Teacher” in Appendix 3. In addition, teachers are also responsible for a few essential tasks necessary for implementation and decision making.

These tasks include:

- Ensuring each student has a folder with his/her name on it
- Disseminating the folders to and collecting them from the students daily
- Walking around the classroom, encouraging each student to actively participate for the duration of the intervention
- Monitoring the students’ performance by collecting the appropriate data each week
 - Detailed in the next section titled “Scoring”
- Submitting students’ performance data each week to the data managers

- Ordering/printing new probe sets each week based on students' performance the previous week
- Emptying and refilling each student's folder with the correct content every week

Decision rules for evaluating data

Student performance data should be evaluated each week. This evaluation is conducted by examining student scores and results in a student continuing to practice the current skill, advancing to the next skill, or backtracking to the previous skill. Other modifications to participation in Math Two-a-days should be deemed necessary and agreed upon by the classroom teacher, administrators, and the student's parents.

Accuracy and Fluency

Accuracy refers to the percentage of responses made correctly out of all responses made. This is obtained from the ratio of problems answered correctly to the total number of problems answered. How proficient in a skill is a student who responds with 100% accuracy, while having responded to only three items? What if a student could respond to every item, but only accurately respond to 60% of items?

Fluency takes this one step further to include time as a factor. It refers to the speed with which accurate responses are made. Fluency allows evaluators to make meaningful judgments about proficiency when it is required that a response be both *accurate* and *automatic*.

Both performance measures are considered meaningful when evaluating a student's academic skills and both are used to report scores on Math Two-a-day probes.

Scoring

Though used previously and often, a brief description of terms may ease understanding of the scoring process. Here, “**data**” refers to the product obtained from students participating in Math 2-a-days. This data consists of student scores, reported as digits correct per minute (DCPM). DCPM are calculated by summing the digits a student has written correctly in response to the math problems on a math worksheet (these worksheets are what is referred to as “probes”) and dividing this by the number of minutes the student was given to complete the probe.

This **sum** is made up of the total number of correct digits in a student’s written answer. Therefore, each single-digit response that is correct is recorded as one digit correct. When an answer consists of two or more digits, each digit is treated separately. Example: $2+8=\underline{11}$. This answer is incorrect, however, one digit (the “1” in the tenths place) is still correct, therefore the student would receive one digit correct for this answer.

Once the sum of total digits correct for the first probe has been obtained, it is divided by “2” (because the student was given 2 minutes to complete the probe) to yield the student’s DCPM score. This process is completed for two probes each week, one probe from Tuesday and one probe from Thursday. These two DCPM scores will be recorded on the data recording sheets, examples of which are provided in Appendix 4.

Decision-making

Once a student obtains a score of 40 or more DCPM twice in a row, the student can be moved up to the **next skill**. If a student is performing at a level of 19 DCPM or less, consider moving him or her back to the **previous skill**.

- Performance level guidelines:
 - Frustration = 0-19 DCPM
 - Instruction = 20-39 DCPM

- Mastery = 40+ DCPM

Differentiation

For those students who are observed to be struggling or otherwise not responding positively to the intervention, there are several ways to differentiate implementation. Some students may require additional motivation to participate/performance their best. Other students may respond better to a reduced set size, which could be provided to them by simply restricting the range of problems that appear on each page (i.e. restrict the scope from sums to 6 to sums to 4). Other examples for differentiating implementation include extending the time a student is provided to complete a page, distributing the practice, etc.

Goals and Incentives

Incentives are items or events that can be used as rewards for appropriate behaviors or for reaching goals.

Goal Setting

When setting the goal, make sure that it is possible for the students to reach in a reasonable amount of time. Goals should be set at a level that permits the students to access rewards at reasonable intervals.

Why use goals and incentives?

Goals and incentives are used to provide encouragement, milestones to work towards, and feedback regarding progress and success. They are also used as motivators to increase and maintain student effort.

Goals and incentives can be used at the individual, classroom, grade-wide, and/or school wide level. Goals and incentives must also be consistent and progress towards goals should be presented visually so the students can track their progress.

The following includes some ways in which scores can be monitored at each level as well as some examples for possible incentives.

Individual

- Monitor by using self-graphing
- Goal in classroom might be 40 DCPM (moving on to the next skill)
 - Example incentives:
 - Candy
 - Sticker
 - Computer time
 - Certificate for skill completion

Classroom-wide

- Monitor using visual presentation (e.g., miniature thermometer)
- Goal is based on cumulative weekly total
 - Examples of incentives:
 - Popcorn day
 - Pizza day
 - Candy
 - Extra free time

Grade-wide

- Monitor using visual presentation (e.g., miniature thermometer)
- Goal is based on cumulative weekly total
 - Examples of incentives:
 - Popcorn day
 - Pizza day
 - Extra free time

School-wide

- Monitor using visual presentation (e.g., miniature thermometer)
- Goal based on cumulative weekly total
 - Examples of incentives:
 - Extra recess
 - Spirit day (e.g., hat day, pajama day)

If the goal involves total number of digits correct each week:

- On Fridays, count how many digits your class, grade, or school obtained and record that number
- Update the visual presentation of the data so the students can see growth and how far away they are from their reward

Appendix 1.

Integrity Evaluation Protocol

Classroom _____ Date _____ Start Time _____ End time _____

Initial in the space provided when the intervention implementer completes a step. You may also participate in steps 3 and 5.

1. Pass out the Math Two-a-day folders to students and instruct them to take out the worksheets for the day and write their name and date at the top of the page.

STEP 1 COMPLETED _____

2. Announcer reads the following directions: “Good [morning, afternoon] students! It’s time for Math Two-a-days! Please make sure you have the correct folder and your worksheets are pulled out and ready to go! You will have 2 minutes to complete as many problems as you can. Make sure to try every problem, but if you come to one you don’t know, mark an ‘X’ through it and move on to the next one. (Pause) Is everyone ready? Begin! ”

STEP 2 COMPLETED _____

3. Walk around the room to make sure students are completing the worksheets correctly and to give encouragement if needed.

STEP 3 COMPLETED _____

4. After 2 minutes, the announcer reads the following directions: “Stop. Put your pencils down and turn to the next page. You will have 2 more minutes to complete as many problems as you can. Ready? Begin.”

STEP 4 COMPLETED _____

5. Repeat step 3.

STEP 5 COMPLETED _____

6. After 2 minutes, the announcer reads the following directions: “Stop. Put your pencils down. Place your worksheets in your folder.”

STEP 6 COMPLETED _____

7. Gather the folders.

STEP 7 COMPLETED _____

Appendix 2.

Daily Intervention Protocol – Announcer.

Daily Intervention Protocol - Announcer

Announcers will read aloud from the script. Enthusiasm is encouraged.

1. Make sure you have a stopwatch or other timing device and prepare by setting it for 2 minutes.
2. Before starting the timer, read the following directions:
“Good [morning, afternoon] students! It’s time for Math Two-a-days! Please make sure you have the correct folder and your worksheets are pulled out and ready to go! You will have 2 minutes to complete as many problems as you can. Make sure to try every problem, but if you come to one you don’t know, mark an ‘X’ through it and move on to the next one.” (Pause) “Is everyone ready? ...Begin!”
3. Immediately start the timer. Allow for 2 minutes to pass.
4. After the 2 minutes, read the following directions: “Stop. Put your pencils down and turn to the next page. You will have 2 more minutes to complete as many problems as you can.” (Pause). “Ready? ...Begin!”
5. Repeat step 3.
6. After the 2 minutes, read the following directions: “Stop. Put your pencils down. Place your worksheets in your folder and have a great day!”

Appendix 3.

Daily Intervention Protocol – Teacher.

Daily Intervention Protocol - Teacher

Teachers will carry out the steps as directed below. The Announcer's script is provided so that teachers may read the directions if necessary.

1. Pass out the Math Two-a-day folders to students and instruct them to take out the worksheets for the day and write their name and date at the top of the page.
2. *Announcer reads the following directions:* "Good [morning, afternoon] students! It's time for Math Two-a-days! Please make sure you have the correct folder and your worksheets are pulled out and ready to go! You will have 2 minutes to complete as many problems as you can. Make sure to try every problem, but if you come to one you don't know, mark an 'X' through it and move on to the next one." (Pause). "Is everyone ready? ...Begin!"
3. Walk around the room to make sure students are completing the worksheets correctly and to give encouragement if needed.
4. After 2 minutes, *the announcer reads the following directions:* "Stop. Put your pencils down and turn to the next page. You will have 2 more minutes to complete as many problems as you can." (Pause). "Ready? ...Begin!"
5. Repeat step 3.
6. After 2 minutes, *the announcer reads the following directions:* "Stop. Put your pencils down. Place your worksheets in your folder and have a great day!"
7. Gather the folders.

Example Data Recording Sheet

Page/#1

[illegible]