**TIER 1**

**Math Intervention Examples**

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| **TIER 1 Math Interventions:** |
| **Overall Skills are lower than grade level:** |
| -assess for level of instruction |
| -provide small group instruction on needed skills |
| **Difficulty remembering math facts:** |
| -separate facts into sets of fact families |
| -provide extra opportunities |
| -provide references to assist in fact calculation |
| -use manipulative objects |
| -practice flashcards with peer/volunteer |
| -use folding in technique for flashcard practice |
| -student self-check/correct practice sheets |
| **Difficulty attending to important details:** |
| -highlight operational signs/key words |
| -use vertical lines/graph paper for organization |
| -reduce the number of problems per page |
| -use a window overlay to isolate problems |
| -have student repeat directions to teacher |
| **Inability to read text for word problems:** |
| -align material with students reading level |
| -highlight key words in math problem |
| **Slow rate of completion:** |
| -reduce number of items to complete |
| -provide manipulatives |
| **Problems sequencing steps for computation:** |
| -consistent review of steps |
| -reference sheet kept at student desk |
| -use acronyms to remember steps |
| -color coding of steps |
| -use of manipulative objects |
| -use of calculator |
| **Failure to visualize concepts:** |
| -use simple, consistent language |
| -provide visual examples |
| -assess and explicitly teach concept terminology |
| **Difficulty solving word problems:** |
| -use concrete examples |
| -highlight key operational words |
| -have students restate problem |
| -use of calculator/manipulatives |
| **Other:** |
| -small group instruction |
| -individual assistance from teacher/volunteer |

**TIER 2 or 3**

**Math Intervention examples**

**Math Interventions:**

**Cover, Copy, and Compare: Increasing Math Fluency**

**Appropriate Grade Level:** Elementary and middle school students working on basic math facts.

**Brief Description:** Students learn a five-step procedure that gives them increased opportunities to respond to mathematics material and self-evaluate their responses. Cover, Copy, and Compare is an efficient strategy for increasing accuracy and speed in basic math facts, requires little student training or teaching time, and can be used with individuals, small groups, or entire classes.

**Materials Needed:**

* Training sheets of 10 math problems, with problems and answers listed down the left side of the paper, one per student, one to three sets per session
* Assessment sheets with the same math problems listed down the left side, without answers
* 3” by 5” index cards, one per student
* Stopwatch or watch with second hand for teacher (optional)
* Overhead projector and transparency example of training sheet (optional)

**Procedure:**

1. Evaluate how well students are currently doing by calculating percent correct scores on math worksheets for 5-10 days, counting the number of correct digits on problems, or administering Curriculum Based Mathematics Probes to the entire class or a selected group of students.
2. Give training sheets to students. If desired, use overhead projector displaying a transparency of a training sheet during the introductory session.
3. Conduct a training session:
   1. Silently read the first problem and the answer on the left side of the paper.
   2. Cover that problem and answer with an index card.
   3. Write the problem and answer from memory on the right side of the page.
   4. Uncover the problem and answer on the left side to check the written response.
   5. Evaluate the response.
   6. If the problem and answer are written incorrectly, repeat the procedure with that item before proceeding to the next item.
   7. Repeat this procedure with the rest of the problems on the sheet.
4. After demonstrating these steps on the chalkboard or with the overhead projector, have students complete one or more training sheets and provide corrective feedback as needed.
5. Daily or several times a week, provide students with sets of training sheets and have them follow the Cover, Copy, and Compare procedure.
6. Once or twice a week, administer the assessment sheets that correspond to the training sheets. If desired, time these assessment sessions.
7. When students reach mastery level on one set of problems, provide them with another set. Mastery level is defined as 90% or better accuracy and/or 40 digits correct per minute.
8. Evaluate the effectiveness of the intervention by repeating the first step and comparing the results.

**Comments/Tips:**

This strategy works best for basic math facts in addition, subtraction, multiplication, and division.

**Solving Word Problems Using Structured Organizers**

**Appropriate Grade Level:** Elementary and Middle School

**Brief Description:**

This intervention gives students better understanding of reading, interpreting, and solving word problems in mathematics. The use of structure organizers is first modeled by the teacher, students use the organizers on their own, and is phased out as students become more proficient.

**Materials Needed:**

* Structured Organizers for solving math word problems
* Transparency of structured organizer

**Procedure:**

Phase 1: Modeling the use of Structured Organizers

1. Display a word problem and a structured organizer to the entire class on the overhead projector. Hand out copies to the students. Have students complete their own copies as you call on individual students for responses and fill in the transparency.
2. Have students hand in their structured organizers and answer the word problem.

Phase 2: Checking student use of Structured Organizers

1. Have the students independently fill out the organizer for a new word problem.
2. Come back together as a whole class and fill out the organizer together, calling on students to answer the questions. Record responses on the organizer transparency and have students make any necessary corrections on their papers.

Phase 3: Independent Use of Structured Organizers

1. Give students new word problems and have them complete structured organizers while solving them. Do not have them respond as a group.

Phase 4: Maintenance

* 1. Have students complete word problems without giving them structured organizers to complete.

**Comments/Tips:**

This intervention uses elements of the Group Story Mapping intervention for reading comprehension.

**Sequence for Teaching Fractional Concepts**

**Appropriate Grade Level:** Elementary and Middle School

**Brief Description:** Suggestions for the progression in working with students on fractions and understanding concepts behind fractions.

**Materials Needed:**

* Fractional Models and Manipulatives
* Graph Paper

**Procedure:**

The student

1. Manipulates concrete models (e.g., manipulating fractional blocks and pegs)
2. Matches fractional models (e.g., matching halves, thirds, and fourths)
3. Points to fractional model when name is stated by another (e.g., the teacher says “half” and the student selects a model of “half” from several distractors)
4. Names fractional units when selected by another
5. Draws diagrams or uses manipulatives to represent fractional units
6. Writes fraction names when given fractional drawings
7. Uses fractions to solve problems

**Improving Math Performance with Explicit Timing**

**Appropriate Grade Level:** Elementary and middle school students working on basic math facts.

**Brief Description:** In order to increase fluency in basic math facts, math seatwork is timed in 30 minute intervals. Students will become more automatic in math facts and thus become more proficient in solving math problems. The use of explicit timing has been demonstrated to increase the rate of problems worked correctly while simultaneously maintaining very high levels of accuracy.

**Materials Needed:**

* Stopwatch or watch with second hand
* Kitchen timer with a bell
* Sets of math worksheets with 100 basic problems (addition, subtraction, etc.), with problems on one side only and sheets stapled together, one set per student per session

**Procedure:**

1. Assess the current math fluency of students by calculating the correct-problems-per-minute rate or accuracy scores on math worksheets for a selected group of students for 5 to 10 days.
2. At the beginning of a mathematics seatwork period, tell students that the work period is 30 minutes long (or the available number of minutes) and that you will be timing the period as a way of helping them improve their math performance.
3. Tell students that you will set the timer for the amount of time in the period, and that you will also be timing them with a stopwatch in 1-minute timings.
4. At the beginning of each timing, say: “Pencils up, ready, begin!” to signal students to begin working.
5. At the end of the 1-minute interval, say “Stop!” and have students draw a line after the last problem answered. Repeat this procedure throughout the 30-minute period until the last timing is completed.
6. When the 30-minute timer rings, announce that the work period is over. Teach students to stop when the timer rings, even if they are in the middle of a 1-minute timed period.
7. Evaluate the intervention by repeating the first step and comparing results.

**Comments/Tips:**

Because it is not possible to have 30 1-minute timings within a 30-minute period, the actual time available for students to work is always less than 30 minutes.

**Reciprocal Peer Tutoring to Improve Math Achievement Appropriate Grade Level: Elementary and Middle school**

**Brief Description:** The purpose of this intervention is to improve math performance and behavior during math instruction by means of peer tutoring, group rewards, and self-management procedures. Students monitor their academic progress in a group context, acting as instructional partners for each other, setting team goals, and managing their own group reward contingencies. Reciprocal peer tutoring has been demonstrated to improve not only math performance but also students’ perceptions of their own academic competence and self-control, and earns high satisfaction ratings from both teachers and students. The intervention takes approximately 30 minutes – 20 minutes for peer tutoring and 10 minutes for individual class drills and checking.

**Materials Needed:**

* Reinforcement Menus with activity rewards, one per student pair
* “Team Score Cards,” consisting of 3” by 5” index cards or sheets of paper, one per student pair per week
* Stickers for team score cards
* Flash cards with math problems printed on the front and the problem plus computational steps and answers printed on the back, one problem per card, one set of cards per student pair
* Sheets of paper divided into four sections: “try 1,” “try 2,” “help,” “try 3”
* Instructional prompt cards or sheets with specific instructions related to common mistakes in solving math problems, one per student pair
* Problem drill sheets with 10 or more problems, one per student per session
* Answer sheets for problem drill sheets, one per student per session (optional)

**Procedure:**

1. Assess students’ current level of math performance by calculating percent-correct scores on daily math drill sheets or weekly quizzes, administering Curriculum-Based Math Probes, and/or observing students’ behavior during math work periods.
2. Tell the students that they will be learning to work in teams to help each other do well in math.
3. Divide the class into pairs. Provide each pair with a Reinforcement Menu listing activity rewards. Help each pair select a reward for the day.
4. Meet weekly with each team to help the students select their team goal.
5. After each pair has chosen a team goal, have the pairs record their expected individual contribution to the team (individual goals), the sum of the individual goals (team goal), and their choice of a reward on the team score card.
6. Give a set of flash cards to each pair, and tell the students to choose who will act as “teacher” first.
7. Have the “teachers” hold up the flash cards for the students, and tell the students to work the problem on their worksheets in the section marked “try 1” while their teachers observe their work.
8. If the problem is solved correctly, the teachers praise the students and present the next problem. If the solution is incorrect, the teachers give students instructional prompts read from a prompt card and tell them to try again in the worksheet section marked “try 2.”
9. If the students do not solve the problem correctly on the second try, teachers help them by computing the problem in the “help” section of the worksheet. As teachers work the problem, they explain what they are doing at each step and answer students’ questions. Then the teachers tell the students to work the problem again in the “try 3” section. If teachers have trouble answering students’ questions, they can ask the classroom teacher for help.
10. After 10 minutes, signal the pairs to switch roles for a second 10-minute tutoring session.
11. During tutoring sessions, walk around the room supervising and identifying strategies “teachers” can use to help their students.
12. After the second tutoring session, give each student a problem drill sheet and have students work on their own for a fixed period of time, such as 7 to 10 minutes.
13. Have students switch papers with their team partner. Have them use an answer sheet to correct their partner’s work or provide the correct answers yourself as students check papers.
14. Have the pairs first determine their team’s total score by counting the number correct, and then have them compare their team score with their team goal to see if they have “won” (met their goal).
15. If a team wins, give the students a sticker to put on their score card for that day. After five wins, schedule a time when the team can engage in the previously selected reward activity.
16. Evaluate the intervention by repeating the first step and comparing results.

**Improving Math Performance with Reciprocal Peer Tutoring and Parental Involvement**

**Appropriate Grade Level:**

Elementary and Middle School

**Brief Description:** The purpose of this intervention is the improve math performance and classroom behavior by combining reciprocal peer tutoring with home-based rewards. Parents are invited to develop a system of home rewards to support their child’s academic performance. Compared with control groups, students participating in this intervention showed significantly greater gains on curriculum-based math measures and standardized math achievement tests and on teacher and student self-report measures of adjustment.

**Materials Needed:**

* Reinforcement Menus with activity rewards, one per student pair
* Introductory parent letter, one per student
* “Team Score Cards,” one per student pair per week
* Stickers for team score cards
* Flash cards with math problems printed on the front and the problems plus computational steps and the answers printed on the back, one problem per card, one set of cards per student pair
* Sheets of paper divided into four sections: “try 1,” “try 2,” “help,” “try 3”
* Instructional prompt cards or sheets with specific instructions related to common mistakes in solving math problems, one per student pair
* Problem drill sheets with 10 or more problems, one per student per session
* Answer sheets for problem drill sheets, one per student per session (optional)
* Reward Certificates to send home

**Procedure:**

* 1. Assess students’ current level of math performance by calculating percent-correct scores on daily math drill sheets or weekly quizzes, administering Curriculum-Based Math Probes, and/or observing students’ behavior during math work periods.
  2. Tell the students that they will be learning to work in teams to help each other do well in mathematics and that their parents will be invited to provide support and rewards in that effort.
  3. Send a letter to parents that provides information about the RPT intervention and invites them to consider several options for involvement.
  4. Divide the class into pairs. Provide each pair with a Reinforcement Menu listing activity rewards. Help each pair select a reward for the day.
  5. Meet weekly with each team to help the students select their team goal.
  6. After each pair has chosen a team goal, have the pairs record their expected individual contribution to the team (individual goals), the sum of the individual goals (team goal), and their choice of a reward on the team score card.
  7. Give a set of flash cards to each pair, and tell the students to choose who will act as “teacher” first.
  8. Have the “teachers” hold up the flash cards for the students, and tell the students to work the problem on their worksheets in the section marked “try 1” while their teachers observe their work.
  9. If the problem is solved correctly, the teachers praise the students and present the next problem. If the solution is incorrect, the teachers give students instructional prompts read from a prompt card and tell them to try again in the worksheet section marked “try 2.”
  10. If the students do not solve the problem correctly on the second try, teachers help them by computing the problem in the “help” section of the worksheet. As teachers work the problem, they explain what they are doing at each step and answer students’ questions. Then the teachers tell the students to work the problem again in the “try 3” section. If teachers have trouble answering students’ questions, they can ask the classroom teacher for help.
  11. After 10 minutes, signal the pairs to switch roles for a second 10-minute tutoring session
  12. During tutoring sessions, walk around the room supervising and identifying strategies “teachers” can use to help their students.
  13. After the second tutoring session, give each student a problem drill sheet and have students work on their own for a fixed period of time, such as 7 to 10 minutes.
  14. Have students switch papers with their team partner. Have them use an answer sheet to correct their partner’s work or provide the correct answers yourself as students check papers.
  15. Have the pairs first determine their team’s total score by counting the number correct, and then have them compare their team score with their team goal to see if they have “won” (met their goal).
  16. If a team wins, give the students a sticker to put on their score card for that day. After three wins, deliver the reward and give them reward certificates to take home to their parents. Parents are to sign the certificates and indicate the type of reward provided (if any) along with any additional comments.
  17. Remind students to return the reward certificates to you so that you can monitor the home-based rewards.
  18. Evaluate the intervention by repeating the first step and comparing results.

**Comments/Tips:**

This intervention can be modified for implementation in any academic subject that includes fact drills, such as spelling, reading vocabulary, history, and geography.

**Improving Math Completion Rates and Accuracy with Free Time**

**Appropriate Grade Level:**

Elementary and Middle School

**Brief Description:** The purpose of this intervention is to increase the accuracy and completion rates of mathematics class work with a group-oriented free-time contingency. This simple intervention requires no material resources or student training. Free time is made contingent on productivity in mathematics.

**Materials Needed:**

None

**Procedure:**

* 1. Assess students’ current level of math performance by calculating percent-correct scores on daily math drill sheets or weekly quizzes and/or administering Curriculum-Based Math Probes. Calculate the average percent correct rate for the class – this score is used in the intervention procedures.
  2. Tell the students they will be able to earn free time if the class correctly completes a specified average number of problems during each mathematics class work session.
  3. Set the free-time period from 5 to 15 minutes, depending on the length of the entire math period.
  4. Using the class average percent correct rate you calculated, select a criterion for assignment completion that is 5% higher.
  5. During the mathematics instructional period, set a fixed amount of time for work completion. At the end of that time, have students exchange papers for checking and report the number of problems completed correctly (without names) to you.
  6. Record these scores on the chalkboard and obtain a class average. Collect papers for spot checking and recording of individual grades.
  7. If the class average meets the criterion, praise the students for their hard work and award the free time. If not, encourage the students to try harder next time and continue with the math lesson.
  8. When the class has met the criterion for 5 consecutive days, increase it by several more percentage points. Continue to increase it gradually until students are performing at a 90% or better accuracy rate.
  9. Evaluate the intervention by repeating the first step and comparing results.

**Comments/Tips:**

One variation involves checking the papers yourself and awarding the free time earned (if any) on the following day.

Another variation is to divide the class into teams and award free time to teams whose average meets the criterion.

As with any intervention that targets academic productivity, assessing students’ ability to perform the assignments at the selected criterion level prior to implementation is essential.

**Math Centers**: Establish independent math centers in the classroom where individual or small groups of students can work for at least 15 minutes several times a week. Place folders labeled with the students name at each station so they can self-start the activity and store their own work. Set-up educational games, hands-on manipulatives like puzzles or sorting and counting pieces at the math centers. Group activities at a center could also include a timer and math skills worksheets. You can also laminate educational yet entertaining worksheets so they can be used repeatedly with wipe-off markers. Center activities review weakness areas in computation to bolster improving math skills.

**Explicit time drills -** Explicit time-drills are a method to boost students’ rate of responding on math-fact worksheets. The teacher hands out the worksheet. Students are told that they will have 3 minutes to work on problems on the sheet. The teacher starts the stop watch and tells the students to start work. At the end of the first minute in the 3-minute span, the teacher ‘calls time’, stops the stopwatch, and tells the students to underline the last number written and to put their pencils in the air. Then students are told to resume work and the teacher restarts the stopwatch. This process is repeated at the end of minutes 2 and 3. At the conclusion of the 3 minutes, the teacher collects the student worksheets. TIPS: Explicit time-drills work best on ‘simple’ math facts requiring few computation steps. They are less effective on more complex math facts. Also, a less intrusive and more flexible version of this intervention is to use time-prompts while students are working independently on math facts to speed their rate of responding. For example, at the end of every minute of seatwork, the teacher can call the time and have students draw a line under the item that they are working on when that minute expires.