

TEACHING MATH SKILLS



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Introduction

Knowledge in math skills is a necessity in today's world. Everyone encounters daily situations that require the use of math computations and applications, such as pricing in the supermarket and department stores, balancing a checkbook, interpreting ads on television, exchanging money with a cashier, checking the car's odometer, and helping with children's homework. The average adult is most likely skilled enough to handle the daily situations that require math knowledge. However, there are some adults who, for a variety of reasons, have never acquired even the basic fundamentals of math. Then, there are those adults who had completed math classes in their schooling but have now forgotten much of what they had learned. When these adults enter an ABE class, they will most likely be presented with math study plans. Whether their remediation will be a mere review or an extensive study, an effort should be made to teach those math skills that meet the needs of the students.

How can an ABE teacher determine the math skills that an individual student needs? Pre-testing with a standardized test is the tool most ABE teachers use to assess students' academic abilities and weaknesses. The most frequently used assessment instrument for adult students is the Test of Adult Basic Education (TABE), and it provides an individualized diagnostic profile for each student. This profile reveals mastery or non-mastery of specific skill areas, and this information can be used to prepare appropriate and meaningful study plans. In order to use this information wisely, the teacher should be familiar with the format of the TABE Math Subtests.

Understanding the TABE Math Format

The TABE objectives contain content that is considered relevant for students' educational growth. The Math Subtest has two sections, Mathematic Computations and Applied Mathematics. In the Mathematics Computations section, the examinee is required to perform basic computations in addition, subtraction, multiplication, and division with whole numbers, fractions, and decimals. Percents and integers are also included in some tests. The computational skills are those one encounters in everyday life, like following a recipe, dealing with money, and balancing a checkbook. In the Applied Mathematics section, the examinee must apply the basic math skills and use problem-solving strategies to solve real-world situations. The TABE objectives in this section include numeration, number theory, data interpretation, pre-algebra, algebra, measurement, geometry, computation in context, and estimation. These skill areas can also be included in other standardized tests that measure ability in math. However, since the TABE is used in most ABE classrooms, the teacher should be familiar with its particular math format.

After a student completes the TABE, the teacher can use the individual diagnostic profile to determine the academic remediation needed. For the math section, a student's profile might look like the following:

SUBTESTS	LEVEL/Form	NO/CORRECT	GR LEVEL
Math Computation	M7	13	3.9

OBJECTIVE	SCORE	MASTERY LEVEL	PERCENT
Adding Whole Numbers	4/4	+	100 %
Subtracting Whole Numbers	2/4	P	50 %
Multiplying Whole Numbers	3/5	P	60 %
Dividing Whole Numbers	3/4	+	70 %
Decimals	1/4	—	25 %
Fractions	0/4	—	0 %

INTERPRETATION:

There were 25 items on the Math Computations section.

- In Adding Whole Numbers, the student got 4 out of 4 correct, mastery level of 100 %. No remediation is needed.
- In Subtracting Whole Numbers, student got 2 out of 4 correct, mastery level of 50 %. Partial mastery. Needs review.
- In Multiplying Whole Numbers, student got 3 out of 5 correct, mastery level of 60 %. Partial mastery. Needs review.
- In Dividing Whole Numbers, student got 3 out of 4 correct, mastery level of 75 %. Can do some review.
- In Decimals, student got 1 out of 4 correct, mastery level of 25 %. Skill not mastered. Needs extensive remediation.
- In Fractions, student got 0 out of 4 correct, mastery level of 0 %. Needs complete re-teaching.

The Applied Mathematics profile for this student might be as follows:

SUBTEST	LEVEL/FORM	NO/CORRECT	GRADE LEVEL
Applied Math	M7	22	4.1

OBJECTIVE	SCORE	MASTERY LEVEL	PERCENT
Numeration	2/6	—	33 %
Number Theory	3/6	P	50 %
Data Interpret	5/9	P	55 %
Algebra	3/6	P	50 %
Measurement	2/6	—	33 %
Geometry	4/6	P	66 %
Comp in Context	2/6	—	33 %
Estimation	1/5	—	20 %

INTERPRETATION:

There were 50 items on the Applied Mathematics section.

- The student has not mastered any skills in this section.
- There are four partial mastery skill areas (Number Theory, Data Interpretation, Algebra, and Geometry) with low mastery level percents. Remediation is needed in all four areas.
- There are four non-mastery skill areas (Numeration, Measurement, Computation in Context, and Estimation). These areas need extensive remediation.

(NOTE: The math print materials should be at the student's reading grade level. Check the student's reading profile to obtain the reading grade level.)

The above profile reveals the student's weak areas in the two math sections. The math skills in the Mathematics Computation part are distinct in their descriptions. However, the skills in the Applied Mathematics do not provide enough information for the teacher to prepare a meaningful study plan. In order to select appropriate instructional materials for remediation, the teacher must be able to identify the "specific weak skills." This can be done with a "break down" of the skill areas. The following is a listing of the specific skills appropriate for ABE students in the Applied Mathematics section.

CATEGORY	SKILLS	CATEGORY	SKILLS
Numeration	Word Names Fractional Part Number Line	Measurement Geometry	Money Time Plane Figures
Number Theory	Equivalent Form Percent		Solid Figures Triangles
Data Interpret	Graph Table Chart Diagram Pre-Solution	Computation in Context	Similarity Parts of Circle Whole Numbers Decimals Fractions
Algebra	Function, Pattern Missing Element Num Sentence Equations	Estimation	Percent Reasonableness Rounding Estimation

In the case of the student whose individualized diagnostic profile was used as an example, the student needs a review in the specific skills listed in Number Theory, Data Interpretation, Algebra, and Geometry. The student needs extensive remediation in the specific skills listed in Numeration, Measurement, Computation in Context, and Estimation.

When using the TABE, it is important to correlate the remedial math assignments with the skill content measured by the test. For example, every level of the TABE measures the students' ability to interpret data. Therefore, lessons on graphics will enable the students to respond correctly to those test items.

Strategies for Teaching Math Skills

Most ABE teachers use the TABE's pre- and posttests to earn literacy completion points. If this is the case, then it is necessary to document each student's mastery of the specific skills included in the Math Subtests. This can be done by developing a form that lists the specific skills. The following is an example that can be used with group instruction to check those students who have covered the particular skills needed with fractions.

FRACTIONS	Student #1	Student #2	Student #3	Student #4
Introduction to Fractions				
Reducing Fractions				
Lowest Common Denominator				
Improper Fractions to Mixed Numbers				
Mixed Numbers to Improper Fractions				
Adding				
Subtracting				
Multiplying				
Dividing				

Group instruction can also take the form of cooperative learning, where students work together in groups. Each group is responsible for studying a particular topic and then sharing their findings with the entire class. The teacher acts as a facilitator, assigning topics and keeping order within the groups. Cooperative learning would be a good strategy to use with the Data Interpretation section of the Math Subtest. Simple assignments could be made as follows:

DATA INTERPRETATION (GRAPHS)		
Group Number	Assigned Graph	Presentation Date
Group #1	Pictograph	May 3
Group #2	Line Graph	May 4
Group #3	Bar Graph	May 5
Group #4	Circle Graph	May 6

Groups could also be assigned topics that require a larger range of study, similar to the following example.

DATA INTERPRETATION		
Group Number	Assignment	Presentation Date
Group #1	Graphs	May 3
Group #2	Tables	May 5
Group #3	Charts	May 10
Group #4	Diagrams	May 12

For individualized instruction, a study plan can be made for each student. Using the student's individualized diagnostic profile, the weak skill areas can be listed along with the instructional materials that provide lessons and practice in those areas. A math study plan could be similar to the following one, showing decimal assignments.

DECIMALS	ASSIGNMENTS	DATE	% SCORE
Introduction	Break to Math 2, pp. 34-38		
Compare/Round	Break to Math 2, pp. 39-41		
Add/Subtract	Break to Math 2, pp. 42-45		
Multiplication	Break to Math 2, pp. 48-51		
Division	Break to Math 2, pp. 52-57		
Word Problems	SV PreGED Math, pp.126-127, 136-137, 147		
Review	No.Power, Inter M, pp.63-64		
	Bldg Sks/TABE M pp.26-29		
Test	Skill Assess Mod DG, Test 14, pp. 7-8		

NOTE: The steps in preparing a complete study plan, like the one just shown, can be found in the resource guide titled "Applying TABE results in the ABE Classroom."

As stated, there are several strategies for teaching math skills, and the teacher can use a variety of techniques for instructional purposes.

Using Math Assessment Tools in the Classroom

When teaching math skills, an assessment tool should be used to determine whether or not the students have mastered the skills. This is usually accomplished with some sort of test. Whether using a teacher made test or a standardized test, the teacher should pay attention to the format that is being used. Some formats are easy to understand and follow, like the one below.

ADD:

$$\begin{array}{r} 420 + 216 = \end{array} \quad \begin{array}{r} 420 \\ +216 \\ \hline \end{array}$$

SUBTRACT

$$\begin{array}{r} 42 \\ -21 \\ \hline \end{array}$$

MULTIPLY:

$$\begin{array}{r} 25 \\ \times 2 \\ \hline \end{array}$$

The directions specifically state that the examinee should add, subtract, multiply, or divide the numbers. Also, the numbers are printed in vertical columns; this is the standard format for math computations. However, in the Math Computations part of the TABE, the numbers are printed horizontally as well as in columns. A ten-item test might look like the following:

Question #	Math Problem	Answer
1	$3 + 2 + 6 =$	
2	$13 \times 10 =$	
3	$251 - 150 =$	
4	$625 + 10 =$	
5	$6024 \div 6 =$	
6	$2613 - 535 =$	
7	$6 \times 0.6 =$	
8	$7 \div 6 =$	
9	$\frac{2}{3} + \frac{1}{3} =$	
10	$\frac{1}{2} \div \frac{1}{4} =$	

Therefore, the teacher must provide practice with both formats. The instruction should also include basic concepts about performing computations. For example, the adult students should know the symbols for adding, subtracting, multiplying, and dividing and that a " $7 \div 6 =$ " means "seven divided by six" and not "seven divided into six."

Most multiple choice math tests always have the correct answer listed as one of the choices. However, in the TABE Math Computations section, there are five choices; and one of them is "None of these." When students compute a math problem and their resulting answer is not among the choices, they assume their computation is incorrect. To prepare them for a TABE posttest, the students should have some practice with test items that have "None of these" as the correct choice. (Publishing companies have a great deal of instructional materials that contain test-taking practice with the TABE format. These will be listed later in the "Math Resources" section of this text).

Some Teacher Tips

By having some knowledge of the TABE's content, the ABE teacher can more easily help the students prepare for post-testing. The following tips involve math skills that can be found in the TABE subtests.

Importance of Speed: In order to get a good score on the Mathematics Computations section, the examinee must get almost all of the items correct. However, there is a big "time issue" with this section. The Math Computations (complete battery) has 25 items, and the examinee has just 15 minutes to complete the section. The Survey test has 15 items in this section with a time limit of nine minutes. This means the examinee has less than one minute (about 36 seconds) to complete each computation. Therefore, it is the teacher's task to not only teach the students how to do the computations correctly but to also do them quickly.

The E and M levels of TABE contain adding, subtracting, multiplying, and division of whole numbers, fractions, and decimals. The D level contains these skill areas – plus percents and integers. Once the students have mastered these math skills, they should practice computing them over and over again until they can do them in a short period of time. Speed is essential in this math section.

Specific Graphics: While the teacher should strive to enlighten the students with all types of graphics, it is important to know the specific graphics that are on each test form. The students should have lessons with the types of graphics they will encounter on the posttest. The following are the specific graphics found in the TABE Applied Mathematics Subtest.

Level E, Form 7	Ad with Prices – Charts – Diagram – Bar Graphs
Level E, Form 8	Bar Graphs – Itemized Bill – Street Map
Level M, Form 7	Diagram – Circle Graph – Itemized Bill – Mileage Map
Level M, Form 8	Tables – Recipe – Checkbook – Receipt
Level D, Form 7	Line Graph – Recipe – Time Zones – Distance Map – Bar Graphs – Ad with Percents
Level D, Form 8	Table – Charts – Circle Graphs – Map of Lakes

These graphics can be used in planning remediation. For example, if a student pre-tests with D7 and shows non-mastery in Data Interpretation, his study plan should include lessons with line and bar graphs (included on D7) and lessons with circle graphs (which will be encountered on D8).

Calculator Use: ABE students should be familiar with the calculator since it can be used in the Applied Mathematics Subtest. This section requires critical thinking and problem-solving skills, and most of the items involve several steps (math computations) to solve the problems. Even though the student may have acquired the math skills necessary to solve the problems, using a calculator makes the task easier. This math section allows one minute for each item, and the calculator will allow the examinee to use the time for critical thinking and problem solving instead of computational time. Although higher-level GED students must become familiar with a scientific calculator, a regular, easy-to-use calculator is sufficient for use in an ABE classroom.

Difficult Applied Math Skills: There are some math skills that seem to be trouble areas for most students. The classroom teacher should be aware of them and be prepared to give them extra attention when instructing students.

Estimating: There are some items in the Applied Mathematics section that require the examinee to calculate approximately the amount or extent of something. This calculation may involve “rounding” or making “educated guesses.” Students have difficulty with this task. They tend to compute the math problem with exact figures and then arrive at an exact answer – which will not be one of the item’s choices. When providing lessons on estimating, the teacher should emphasize that the correct choice will be an estimate and not an exact answer.

Measuring: Students will encounter several math problems that require measurement skills. They will have to determine the dimension, quantity, or capacity of something. Whether this involves length, weight, time, speed, or temperature, the student must be familiar with the tools used in measuring things. The tools will include rulers, yardsticks, clocks, scales, measuring cups and spoons, calendars, car odometers, thermometers, and tape measures. The student should have lessons that teach the use of these tools and how to identify the correct tool for the unit of measurement.

Word Problems: A word problem uses sentences to state a situation, contains numbers that may or may not be important, and asks the reader to use the numbers to solve a problem. Most students have difficulty with word problems. Since the Applied Mathematics section consists of mostly word problems, there should be some special attention given to this skill area. While many math textbooks include some lessons with word problems, there are instructional workbooks on the market that deal solely with this math skill. The instructions usually emphasize five steps needed to solve word problems: (1) decide what the question is asking, (2) decide the necessary information (numbers and labels), (3) decide what math operation should be used, (4) work out the problem, and (5) check to make sure the answer is a sensible one. Skills in estimating and using the calculator are beneficial in this math area.

Students should be given a great deal of practice solving word problems because mastering this skill area will not only help them with tests but will also help them in real-life situations.

Math Resources

There are a wide variety of instructional materials that provide lessons and practice with math skills. The Florida Adult Basic Education Practitioners Committee has developed some “ready made resources” that are available for educators teaching adult education in Florida. Other resources include the many instructional materials developed by publishing companies. Some of the noted ones used by ABE teachers throughout the state include the materials published by:

- PACE, which has simple math lessons in the form of modules.
- Steck-Vaughn’s Pre-GED Mathematics workbooks, and
- Contemporary’s Pre-GED Mathematics workbooks.

There are several publishing companies that have developed instructional math materials that specifically correlate to the TABE. These are excellent resources because they include the same math content that is found on the TABE, and they also provide test-taking practice in the same format. This is important for ABE teachers who use the TABE pre- and posttests to earn literacy completion points. These instructional materials include the following that are appropriate for ABE students:

- McGraw-Hill/Contemporary's Number Power – Introductory (E Level), Intermediate 1 (M Level), and Intermediate 2 (D Level).
- Steck-Vaughn's TABE Fundamentals in Mathematics Computations and Applied Mathematics – Levels E, M, and D.
- CTB/McGraw-Hill's Building Skills with TABE (Mathematics Computations and Applied Mathematics) Levels E, M, and D.
- Contemporary's Skill Assessment Modules in Math – Levels E, M, and D, with two forms at each level.

As the ABE teacher becomes familiar with the math resources available, the selection of instructional materials should be based on the needs of the students. The teacher is also encouraged to utilize a variety of teaching strategies in order to accommodate the learning styles of all the students in the class.