



## **Basic Algebra Shape-Up Series**

Math levels 6 - 9

Complete program: 17 Units

### Basic Algebra Shape-Up – Set 1 (Units 1-7)

Algebraic Approach to Multiplying and Dividing (Unit 1)

Algebraic Approach to Adding and Subtracting (Unit 2)

Formulas for Finding Interest (Unit 3)

Creating Formulas from Tables (Unit 4)

Probability - Making Predictions (Unit 5)

Percent Increase and Decrease (Unit 6)

Using Ratios and Proportions (Unit 7)

### Basic Algebra Shape-Up – Set 2 (Units 8-17)

Introducing Integers (Unit 8)

Adding Integers (Unit 9)

Subtracting Integers (Unit 10)

Multiplying and Dividing Integers (Unit 11)

Two Step Integer Problems (Unit 12)

Simplifying Algebraic Expressions (Unit 13)

Multiplying and Dividing Monomials (Unit 14)

Evaluating Algebraic Expressions (Unit 15)

Solving Multi-step Equations (Unit 16)

Equations with Grouping Symbols (Unit 17)

For details about each unit, see the Content section on page 4

For teaching suggestions see page 7

Evaluation version - Set 1: Unit 1

Evaluation version - Set 2: Unit 13

Tracks work for two students.

Windows 98/Me/NT/2000/2003/XP

8 MB RAM, 120 MB hard disk space required

This program requires a minimum screen resolution of 800 by 600 pixels.

The program builds on the skills and concepts in Pre-Algebra Shape-Up. Students further their algebraic thinking and become confident working with equations. In Set 1, word problems challenge students to relate familiar situations to formulas and equations. In Set 2, students are introduced to integers, algebraic expressions, and solving algebraic equations. Each skill is introduced by a step-by-step tutorial for a sample problem and is concluded by a portfolio in which the student is asked to write a paragraph explaining the skill. The program contains 800 problems and 2,100 questions.

Designed for middle school, this program can be used as well by remedial students in 8<sup>th</sup> and 9<sup>th</sup> grades as well as older students. It is useful for mixed level classes. Each lesson is self-directing and self-correcting. The computer gives step-by-step help in solving problems.

The program helps students to:

- learn to think algebraically
- understand equations
- break problems into small steps
- learn the relationship between words and numbers
- learn what operations to use
- accelerate rate of learning through constant interaction

Interaction helps:

- see which number to choose
- understand why an answer is correct
- identify where they need help
- clarify their math thinking by using words to express their thoughts and ideas on specific math subjects
- increase their familiarity with common math terminology

The program also helps by:

- introducing students to algebraic subjects by using straightforward language
- providing an opportunity for students to clarify their thinking about math subjects by writing about them
- presenting a step-by-step coach for each type of problem
- giving students immediate feedback

We suggest that students have pencils and paper handy throughout the program. An on screen calculator is available in the program. Teachers may turn it off. See the TPM section of this guide.

A diagnostic test at the beginning of each unit lets the student assess his skills. The diagnostic ends when a student misses a question.

Following the unit tutorial, students do a round of sequential questions that reinforces the concepts presented in the tutorial. They will be asked in step-by-step fashion, to answer questions about the following: the EVIDENCE (numbers needed to solve the problem); the STRATEGY (words that indicate the method to use to find the answer); the OPERATION (the mathematical method to arrive at the answer to the problem); the MATHEMATICAL RELATIONSHIPS (the ideas needed to understand how to solve the problem) and the SOLUTION (the answer to the problem). Students will then clarify their thinking about these math subjects by WRITING PARAGRAPHS about them.

Each lesson is self-directing and self-correcting. Students receive graphic rewards. Following each round on the summary screen is a Print option, which generates a progress-to-date report. Student scores are kept in a management system that allows teachers to view and print reports.

For logging on instructions, see the Logging on and Class Management section of this guide. Versions are available for stand-alone, network, or home use.

### **PROGRAM DESCRIPTION**

Each unit of the program contains four Main Menu parts: Tryout, Warm-up, Workout, and Finals. Summary screens follow each round of each part of the Main Menu. The Print option shows the student's progress to date, not just the results of an individual round.

**TRYOUT:** The Tryout helps the student find the right problems to work on. Because the Tryout helps to assess the student's skills, he does not get any sounds or graphic rewards until he has completed it. The bar at the bottom of the screen will show how much of the Tryout has been completed. When the student has finished, a summary screen will show how he did. Stars show the number of problems passed. A

check shows that the student has done an excellent job. 'Print' will show how he did in a progress-to-date report.

**WARM-UP:** The student will have a chance to practice one skill per round. A step-by-step coach shows the student how to do a sample problem. When answering questions the student may easily refer to the coach at any time. The numbered steps in the coach match the numbered steps in the questions. Sounds and graphic rewards are available.

Students need to get 70% in each of three problems in order to pass a round. After the student has passed a round he is given a writing portfolio question relating to the topic he has just been working on. He is asked to write a paragraph to share his thoughts and ideas about the topic. His work will automatically be saved and printed as part of his end of round summary.

There are three different writing questions for each topic. A student who needs additional writing practice on a particular topic may return to the Warm-up. By repeating the Warm-up, a student will be able to try additional writing questions. Starting a Warm-up topic again will reset his score for that topic.

The scores shown on the screen are only for the current round. 'Print' will show how the student did in the current round as well as his progress to date.

**WORKOUT:** The student will need to play at least 4 rounds to pass the Workout. There will be a mixed practice of skills in each round. He gets a star for each problem passed. When he accumulates enough stars, he gets a check. The bar at the bottom of the screen first shows how far along the student is in the Workout and then indicates how far along he is in the round he is doing.

At the end of each round the student will see a star for each problem passed. Red stars show the problems passed for the current round. In the next round these will change to gray, and there will be new red stars for the most recently passed problems. The scores shown on the screen are only for this round. 'Print' will show how the student did in this round as well as his progress to date.

Note: both the Warm-up and Workout will stop students who miss either step 1 or step 2 from continuing. If it's not the last problem in the round, they will be given a new problem instead. Teachers who observe students having repeated difficulty with step 1 or step 2 may wish to refer them back to the coach.

**FINALS:** The student will be tested on the same skills but with some different problems from those used in the Tryout. The bar at the bottom of the screen will show how much of the Finals have been completed. When the student has finished, a summary screen will show how he did. Stars show the number of problems passed in each pool. A check shows that the student has done an excellent job. 'Print' will show how he did in all the parts of the program.

**Targeted Workout (follows the Finals):** If the student has NOT passed one or more skills in the Finals, he is prompted to do this optional exercise and then repeat the Finals.

### LOGGING ON AND CLASS MANAGEMENT

There are two options for adding student names to the record database.

- Teacher controlled – appropriate for most schools. Names added with the Teacher Program Manager (TPM) Set Up Student Names functions. See the Teacher Program Manager section of the guide.
- Student controlled – for home users and for mature students. Names added at the Logon Screen.

The program opens to a Log on screen with all previously entered class codes and student names. Students must select their class code in order to see the list of students in their class. They then click on their name to begin the program. If the program is in student controlled mode and students are logging on for the first time, they select their class code, click the New Student icon, and fill in their name on the form that appears on the screen.

The evaluation version of the program permits entry of only two student names. When a third name is entered, the first one will be deleted. The stand-alone version for one station contains record keeping for 42 students. Other School versions permit entry of as many names as disk space allows. When disk space is filled, the name that was entered first will be deleted.

### **SCORING**

Students may print out their scores at the end of round progress-to-date screen. Teachers may view detailed scoring in the Teacher Program Manager.

### **TEACHER PROGRAM MANAGER**

All Merit Software applications utilize a centralized student record keeping/management system utility program called Teacher Program Manager (TPM). For more information about class management, scoring, and other program features see the Teacher Program Manager manual. It can be printed out from a Merit Software CD or from this link on the Internet:

[http://meritsoftware.com/Teacher\\_Program\\_Manager.pdf](http://meritsoftware.com/Teacher_Program_Manager.pdf)

Here are the program features the teacher may customize for the students using the Program options menu in the TPM.

1. Hide/Show Sound
2. Hide/Show Graphics
3. Control which program parts are active

## **CONTENT OF BASIC ALGEBRA SHAPE-UP SERIES**

### **UNIT 1**

Algebraic Approach to Multiplying and Dividing

Algebraic approach to multiplication word problems

Introducing algebraic approach to solving simple word problems. Using variables and structuring equations

Algebraic approach to division word problems

Introducing algebraic approach to solving simple word problems. Using variables and structuring equations

### **UNIT 2**

Algebraic Approach to Adding and Subtracting

Algebraic approach to addition word problems

Introducing algebraic approach to solving simple word problems. Using variables and structuring equations

Algebraic approach to subtraction word problems

Introducing algebraic approach to solving simple word problems. Using variables and structuring equations

### **UNIT 3**

Formulas for Finding Interest

Formulas – interest earned and interest paid

Simple interest-word problems for learning  $I=PRT$  formula, using decimals to replace percent amounts, solving for variable using formula

Formulas – total balance or total owed (simple interest)

Simple interest-application of  $I=PRT$  formula in word problems, using decimals to replace percent amounts, adding principle, solving for variable using formula

**UNIT 4**

Creating Formulas from Tables

Creating Formulas from tables - A

Understanding tables - Finding data and structuring

Creating formulas from tables - B

Understanding tables - Finding data and structuring

**UNIT 5**

Probability - Making Predictions

Using proportions to make predictions

Word Problems: solving for larger amount based on sample amount by making proportions through setting up ratios, translating word problems into equations

Predicting the number of successful outcomes

Probability: word problems setting up ratios based on chance-spinners, dice, coin toss, translating word problems into equations

**UNIT 6**

Percent Increase and Decrease

Using proportions to find percent of increase

Proportions: introduction to increase and decrease in word problems, translating word problems into equations

Using proportions to find percent of decrease

Proportions: introduction to increase and decrease in word problems, translating word problems into equations

**UNIT 7**

Using Ratios and Proportions

Using proportions to solve scale drawing problems

Proportions: scales on maps, relationship between models to actual lengths, using proportion to structure equations

Using proportions to find measurements of similar shapes

Ratios and Proportion Word Problems: measurement of triangles and rectangular shapes, using proportion to structure equations

**UNIT 8**

Introducing Integers

Locating numbers on a number line

Integers-Using number lines to locate numbers, identifying like and unlike signs

Counting on a number line

Integers-Using number lines to locate numbers, identifying like and unlike signs, relating number lines to equations

**UNIT 9**

Adding Integers

Adding integers with like signs

Introduction to sum of absolute values, combining like-signed integers, seeing the problem as an equation

Adding integers with unlike signs

Absolute value, sum of unlike-signed integers, seeing the problem as an equation

**UNIT 10**

Subtracting Integers

Subtracting integers on number line

How integers with like and unlike signs are subtracted, seeing the problem as an equation  
Subtracting integers by using addition  
How integers with like and unlike signs are subtracted, seeing the problem as an equation

**UNIT 11**

Multiplying and Dividing Integers

Multiplying integers

How integers with like and unlike signs are multiplied, examining parts of an equation

Dividing integers

How integers with like and unlike signs are divided, examining parts of an equation

**UNIT 12**

Two Step Integer Problems

Solving two-step problems - Multiplying and dividing

Introducing order of operations for integer problems, deciding how to solve an equation

Solving two-step problems - adding and subtracting

Introducing order of operations for integer problems, deciding how to solve an equation

Two step problems - addition, subtraction, multiplication, division

Mixed practice order of operations for integer problems, deciding how to solve an equation

**UNIT 13**

Simplifying Algebraic Expressions

Simplifying expressions with like terms

Understanding algebraic terms, arranging terms by descending power of exponents, recognizing like terms, combining like terms

Removing grouping symbols from expressions

How to simplify expressions by distributing

**UNIT 14**

Multiplying and Dividing Monomials

Multiplying monomials

How to multiply monomials that contain exponents

Dividing monomials

How to divide monomials that contain exponents, negative exponents

**UNIT 15**

Evaluating Algebraic Expressions

Evaluating expressions - A

Replacing variables with numbers, following the order of operations

Evaluating Expressions - B

Evaluating expressions that contain parentheses, replacing variables with numbers, following the order of operations

Evaluating expressions - C

Evaluating expressions that contain exponents, replacing variables, following the order of operations

**UNIT 16**

Solving Multi-step Equations

How to solve equations using two or more operations

Explaining systematic approach to solving multi-step equations

Solving equations using two or more operations

Practice following systematic approach to solving multi-step equations

**UNIT 17**

Solving Equations with Parentheses

How to solve equations that contain parentheses

Explaining systematic approach to solving equations that contain parentheses  
Solving equations that contain parentheses  
Practice following systematic approach to solving equations that contain parentheses.

### **SUGGESTIONS FOR USING THIS PROGRAM**

For best results we recommend that students use the program 20 to 30 minutes a session, two to three times a week, for six to eight weeks in conjunction with other methods of instruction. Program usage should be paced to allow students sufficient time between sessions to absorb the material.

Start out with Merit's *Tryouts* to see where students need math help most.

Discuss problem areas with students.

Supplement Merit software with workbooks so students have a chance to practice skills in a variety of contexts.

Return to the software; have students try Merit *Warm-up* and/or *Workout* sections.

Follow up each software session by asking students what new things they have learned. What new questions do they have?

Follow up each session by having students keep a list of important math words and phrases they have learned. Ask students to work in small groups, explaining their math terms to other students.

Have students print scores received for completing software *Warm-up* and *Workout* sections. Later, discuss these scores with students. Are they pleased with their progress? What seems easier to them? What needs more practice?

Relate math skills being practiced with *Basic Algebra Shape Up* to material in the classroom.

Practice integer problems by taping a very large number line to the floor. Give students a simple integer problem and ask them to work in pairs, writing out the steps for solving the problem. Next, have all students gather in a circle, with one student volunteer standing at "zero." Finally, ask other students to take turns telling the student how many strides to take, and in which direction, in order to solve the problem.

Practice integer problems by having students work in pairs. Give each pair a problem from a text and the steps for solving their problem in a mixed-up order. Next, ask each pair to sort out the right order. Then have them write sentences explaining what is going on in every step. Finally, have them share their conclusions with other students.

Practice algebraic word and/or formula problems by having students work in pairs. Give each pair a word problem from a text. Ask students to list phrases from the problem indicating the strategy needed to find the answer. Next, have them list what operation(s) and equation(s) are needed to solve the problem. Finally, have each pair solve the problem and share what they did with other students.

Practice proportion problems by having students observe their surroundings, i.e., compare the length of a desk with the length of a wall, the diagonal of a book with the diagonal of a room, a diagram of the school with the actual size of the school.

Return to the software and let students try Merit's *Finals*, to help prepare for and de-mystify standardized tests.

Follow up software units with written post-tests.

Compare students' software results with gains on standardized test scores.

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