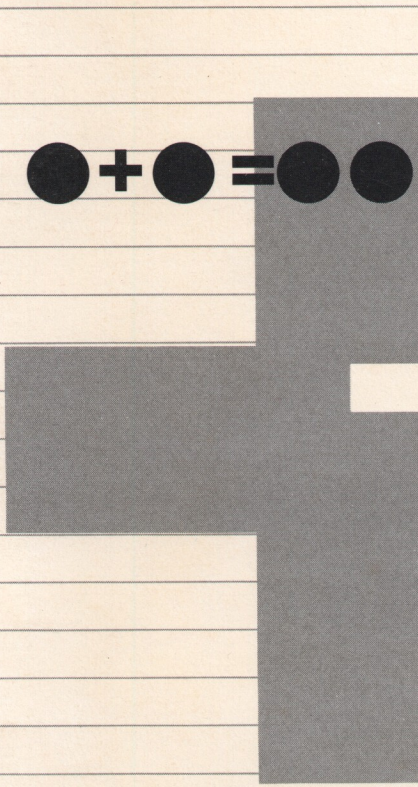
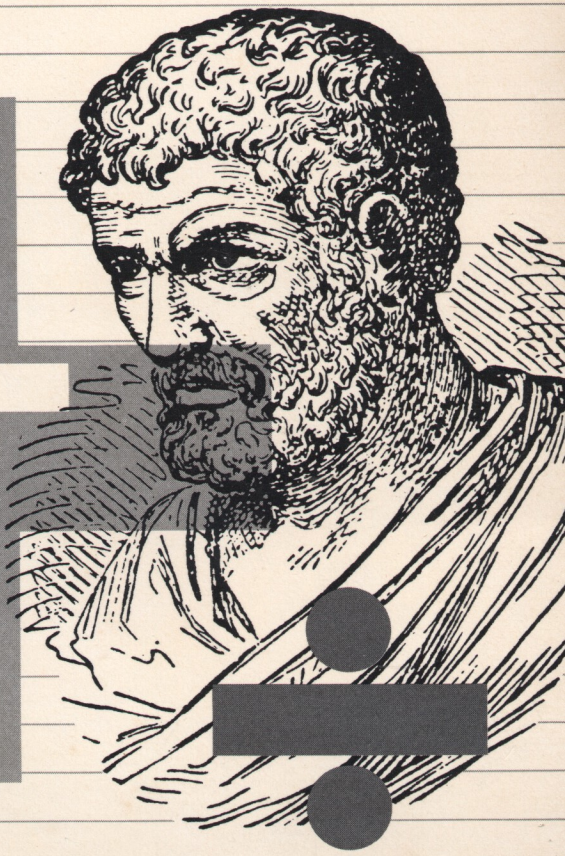
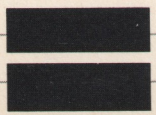
Basic Arithmetic





ATARI®
LEARNING SYSTEMS



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Using This Program At Home

Many ATARI® Learning Systems program manuals were originally designed for use by teachers in the classroom. The programs themselves, however, are no less engaging and instructive for "independent learners"—children, students, and adults—working at home.

Every manual includes a "Getting Started" section that explains how to load the program into your computer system quickly and easily. Since many basic prompts and other instructions are displayed right on your screen, that's all you'll need to begin learning and exploring with most ATARI Learning Systems programs. But whether you're a parent, a tutor, or a home learner teaching yourself, it's a good idea to look through the teaching materials in your manual. You're likely to find important details on using the program, valuable supplementary information on its subject matter, and some creative ideas for getting the most educational and entertainment value out of your ATARI Learning Systems program.

Introduction

This module, *Basic Arithmetic*, consists of this guide and a diskette containing six computer programs that provide practice in arithmetic skills. The programs were designed for use at the elementary level but could also provide remedial work for older students. None of these programs is a tutorial—they all require that students understand the concepts involved before using the program.

The programs Base Ten, Math Game, and Speed Drill provide practice on basic arithmetic operations. Base Ten drills on multiplication of multiples of 10 and decimals, as well as basic multiplication facts. Math Game and Speed Drill provide exercises in all four arithmetic operations with whole numbers.

Round and Estimate involve rounding whole numbers and using rounded numbers to estimate answers to arithmetic exercises. Estimate includes problems using percent.

Change allows the student to role-play a cashier and practice giving correct change.

Two programs, Base Ten and Speed Drill, have teacher options. A description of the teacher option and instructions for its use are included in the Background Information for each program.

Handout pages in this manual may be duplicated for use with students.

Index to Programs on Diskette

Base Ten

A timed drill in game format on multiplying whole numbers 0–9, multiples of 10, or decimals; a teacher option is available

Change

A drill on making change when given a purchase price and the amount paid

Estimate

A timed drill on estimating answers to addition, subtraction, multiplication, division, and percent exercises using whole numbers

Math Game

A drill in a contest format on the four basic operations, using whole numbers—with consideration of age and ability

Round

A drill on rounding whole numbers to the nearest ten, hundred, or thousand

Speed Drill

A timed drill on the four basic operations, using whole numbers—with difficulty level determined by the teacher; a teacher option is available

Steps for loading Basic Arithmetic Program

1. With your computer turned off, turn on your television set or monitor and disk drive. Wait for the busy light on the disk drive to go out.

2. If your computer is *not* equipped with built-in ATARI BASIC, insert an ATARI BASIC cartridge in the cartridge slot (the left cartridge slot on the ATARI 800® computer).

3. Insert the Basic Arithmetic diskette in your disk drive (disk drive 1, if you have more than one drive) and close the disk drive door or latch.

4. Turn on your computer. As your disk drive goes to work, you'll hear a beeping sound while the first part of the program loads into your computer. After several moments, a title screen will appear on your screen, followed by a menu.

Because your computer loads portions of the program as you use them, you must leave the Basic Arithmetic diskette in your disk drive while using the program.

Always press **RETURN** to confirm your response to a question. Before pressing **RETURN**, you may usually change your response; just use the **DELETE BACK SPACE** key to delete your original response, then type in the new response.

To return to the program menu, hold down the **ESC** key. When the question Do you want to try again? appears, type **N** and press **RETURN**.

For access to any teacher options on the diskette, press **CTRL** and **A** simultaneously.

Base Ten

Multiplication Practice

Specific Topic:	Multiplication
Type:	Drill and Practice
Reading Level:	2.9 (Spache)
Grade Level:	3–6

Description

Base Ten provides a timed drill in a game format. The choice of multiplication exercises includes whole numbers (0–9), multiples of 10, and decimals. The teacher selects the type of problems and the time limit by using a Teacher Option.

Objectives

- To recall the basic facts of multiplication
- To compute, using whole numbers less than 10,000
- To perform basic operations, using decimals
- To mentally multiply and divide by 10, 100, 1000
- To enjoy doing mathematics at ability level
- To use map directions in planning a course

Base Ten

Background Information

Base Ten provides three different types of timed multiplication drills in a game format. The students move a spaceship from the starting point toward Base Ten through a random assortment of obstacles on a galactic chart. The spaceship moves when the student correctly answers a multiplication problem within the time limit.

At the beginning of the game, the spaceship is located in the lower left corner of the playing field. Base Ten is in the lower right corner.

The obstacles include:

 Black holes

 Vapor clouds

 Danger zones

 Asteroids

There is always a clear, direct path to Base Ten around the outside of the playing field. Other paths may be shorter but will contain obstacles.

Each obstacle produces a different result, based on an assigned probability.

Obstacles	Results
Black Holes	90% chance ship transported to new location 10% chance ship destroyed
Danger Zones	100% chance ship destroyed
Vapor Clouds	50% chance lost in vapor cloud; must do more problems to get ship released 50% chance pass through safely
Asteroids	50% chance caught in asteroids; must do more problems 40% chance pass through safely 10% chance ship destroyed

The movement of the spaceship is determined by what direction the students choose, how long it takes to answer the problem, and whether the answer is correct.

Before each turn, the students specify the direction in which they want the ship to move. In this way the program reinforces the students' knowledge of the four map directions (north, south, east and west).

The faster the students answer the multiplication problem, the farther the spaceship will travel. The maximum distance on one turn in four squares.

Students who don't answer within the time limit, or who answer incorrectly, have a second chance. If the second answer is correct, the spaceship remains in the same place. If the second answer is wrong, the spaceship moves backward, and two turns are added to the score.

If on the *first* problem both answers are incorrect, the ship remains blocked at the starting point.

When the ship hits the boundary of the playing field or a blocking obstacle, it is blocked and that turn is over. The program ends when the ship either is destroyed or reaches Base Ten.

If the ship reaches Base Ten, the player's name is entered and the list of "Base Ten Top Officers" is shown. This contains the names and scores of the students who reached Base Ten in the fewest turns. If the current player has a lower score than the players on the list, the new name and score are entered into the list, and those officers with higher scores move down on the list. The students' names remain on the diskette and are shown after each use of the program. You may erase the list by using the Teacher Option.

Since the ship's movement depends on the time limit allowed, the time limit for each problem should be geared to the particular type of problem, as well as the individual student. The basic facts problems probably require less time (perhaps 10 to 15 seconds) than do the other types. The decimal problems require a longer time, perhaps 30 seconds or more. The time limit and the type of problem are specified by the teacher in the Teacher Option; description follows.

This program makes extensive use of sound. You may wish to adjust the volume control on the television, depending on the location of the computer—for example, in a classroom, a media center, or a computer lab.

Teacher Option

A teacher option allows you to delete the names listed as "Top Officers" at the end of the game. It also allows you to determine the type of problems and the time limit.

To use the Teacher Option, follow the steps outlined below:

1. Be certain the diskette does *not* have a write-protect sticker. When the menu appears on the screen, type Control A (press CTRL while typing A). The title "Teacher Options" will appear.
2. Select the Base Ten option.

3. Choose one of the options listed on the screen:

   Option 1: See the file of names and scores. This option allows you to see the current list of "Base Ten Top Officers" that's shown at the end of the game.

   Option 2: Clear the file of student names and scores. After you select this option, the disk drive will operate for a short time, then the message "The file has been cleared" will appear. This means that the file (or list) of the names of the highest-scoring students is erased, so that a new group of students can try for the highest scores.

   Option 3: See the current time limit and type of problems. This option allows you to see the time limit and type of problems currently being used in Base Ten.

   Option 4: Change the time limit and type of problems. When this option is selected, the following question appears:
   Would you like multiplication with
   1. Basic facts
   2. Multiples of ten
   3. Decimals

   Option 5: Return to menu.
   Basic facts are problems using whole numbers from 0 through 9, such as 6 x 7. Multiples of 10 use numbers that are the product of a single digit and a positive power of 10, such as 80 x 700. The decimal problems involve the product of a single

digit and a negative power of 10, such as .06 x .4.

Type the number of the kind of problems desired, then press **RETURN**.

Next the question is asked:

How many seconds would you like to allow for each problem?

Allow a longer response time for the more difficult problems. Consider the students' abilities and the time required to enter the answer at the keyboard. For example, basic facts might use 10–20 seconds; multiples of ten, 20–30 seconds; and decimals, 30 or more seconds.

Type in a number and press **RETURN**.

The disk drive will operate briefly, then the message will appear:

Your selections have been recorded.

This means that your choices for type of problem and time limit have been recorded on the diskette. The program Base Ten will use only that type of problem and that time limit until you again use the Teacher Option to change them.

Use in an Instructional Setting

Preparation

Students should already know the concepts and multiplication methods needed for the type of problems with which they'll be working. They should know the process well enough to be able to answer within the given time limit.

When using Base Ten to practice multiplication of basic facts, students should understand multiplication as repeated addition and should be in the process of memorizing the basic facts.

When using Base Ten to practice multiplying multiples of 10, students should understand place value and the effect of multiplying by 10 (adding a zero on the right of the given number).

When using Base Ten to practice multiplying decimals, students must understand the meaning of decimal notation and have experience in correctly placing the decimal point in the answers to multiplication problems.

Using the Program

Base Ten was designed for use by individual students. Be certain that the students can successfully answer the problems within the time limit a large percentage of the time, so that they won't become discouraged. Consider the time necessary to enter the numbers from the keyboard after the student knows the answer.

The game is designed to encourage students to encounter some obstacles. In this way, students will work more multiplication problems than are necessary to reach Base Ten in the minimum number of turns. If students choose a path that follows the perimeter of the playing field, they won't encounter any obstacles. But the shortest path to Base Ten may involve entering a Black Hole and risking being transported forward or being destroyed.

Students can use Handout 1, Base Ten Score Sheet, to record their scores. You might post the list of Base Ten Top Officers appearing at the end of the program as a motivational device.

Base Ten Score Sheet

Name _____

Class _____ Date _____

Type of multiplication: Basic Facts — Multiples of 10 — Decimals
(circle one)

Date: _____ Score: _____

Result: Ship landed at Base Ten _____
Ship was destroyed _____

Type of multiplication: Basic Facts — Multiples of 10 — Decimals
(circle one)

Date: _____ Score: _____

Result: Ship landed at Base Ten _____
Ship was destroyed _____

Type of multiplication: Basic Facts — Multiples of 10 — Decimals
(circle one)

Date: _____ Score: _____

Result: Ship landed at Base Ten _____
Ship was destroyed _____

Type of multiplication: Basic Facts — Multiples of 10 — Decimals
(circle one)

Date: _____ Score: _____

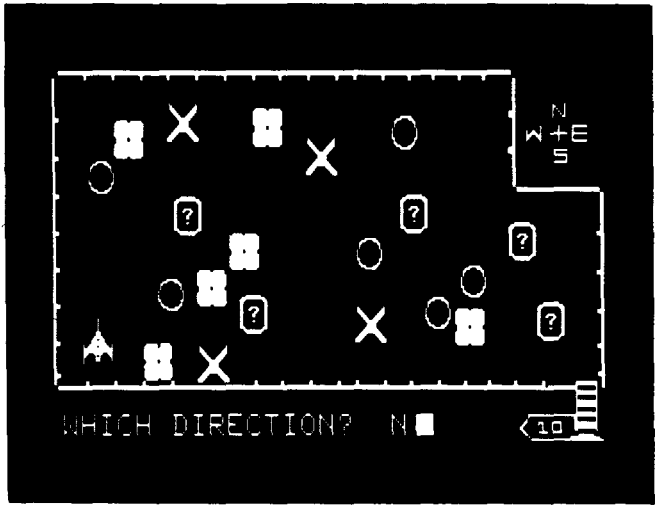
Result: Ship landed at Base Ten _____
Ship was destroyed _____

Type of multiplication: Basic Facts — Multiples of 10 — Decimals
(circle one)

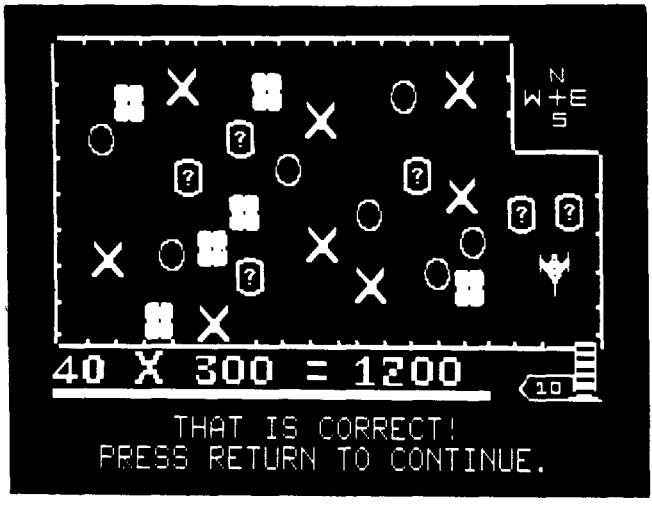
Date: _____ Score: _____

Result: Ship landed at Base Ten _____
Ship was destroyed _____

Sample Runs



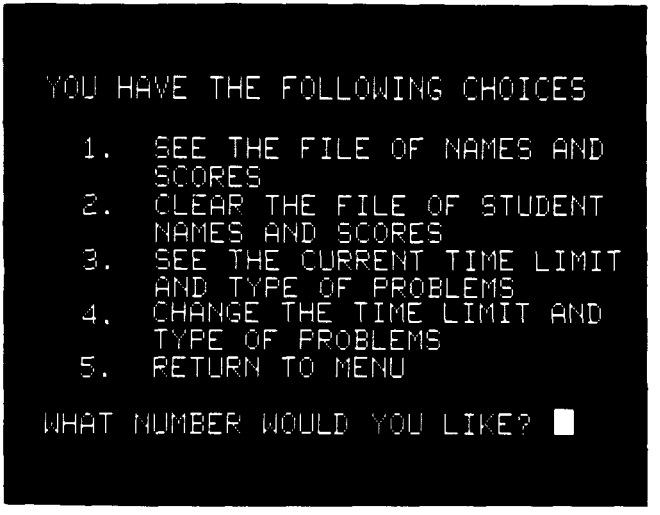
Students try to guide the spaceship from the starting point to land at Base Ten by correctly answering multiplication problems.



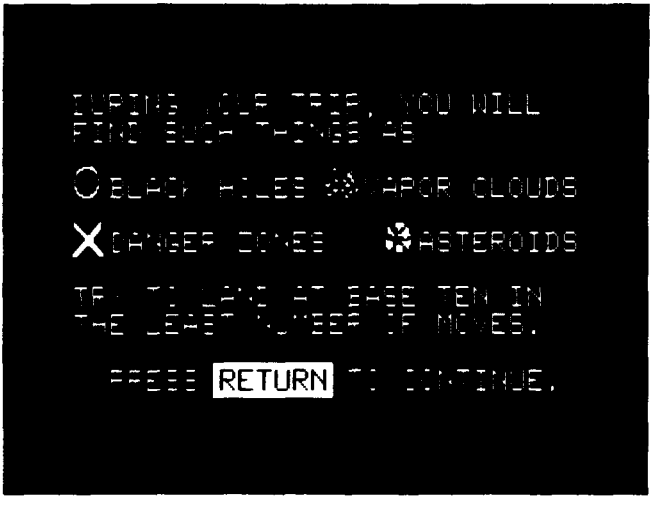
The problems may involve multiplication of basic facts, multiples of 10, or decimals.

Examples of Screen Output

Sample Runs



The teacher option allows you to delete the list of top scorers that is shown at the end of the program, or specify the type of problems and time limit.



Instructions describe the obstacles the spaceship might encounter. Many students intentionally encounter obstacles, thereby answering more multiplication problems.

Examples of Screen Output

Change

Practice in Making Correct Change

Specific Topic:	Arithmetic, consumer education
Type:	Drill and Practice
Reading Level:	3.8 (Spache)
Grade Level:	3–5

Description

This program provides a drill on the procedure for making change. Students are given the cost of the items purchased and the amount of money offered as payment. They determine the correct change using the fewest coins and bills.

Objectives

- To determine the correct change, given an amount of money offered for a purchase, and the cost of the purchase
- To practice proper money-handling techniques

Background Information

The Change program provides practice in making change using the fewest possible coins and bills, when the cost of the item being purchased and the amount given to pay for that item are given. The computer randomly generates the cost of an item and the amount of cash presented for payment. The correct answer is based on returning change to a customer, using the fewest coins and/or bills.

Students should be taught to "count back" a customer's change when entering the number of pennies, nickels, dimes, and so forth. (Discourage students from subtracting the cost of an item from the amount given to pay for it.) The "count back" method adds the value of the coins and bills being returned to the cost of the item being purchased, until the amount of money given by the customer is reached.

The student specifies the number of problems to be worked. For each problem, the student is given the item's cost, the amount of the payment, and a graphic of a cash register change drawer. The student enters the number of pennies, nickels, dimes, quarters, fifty-cent pieces, $1 bills, $2 bills, $5 bills, $10 bills, and $20 bills used in returning the customer's change. The highest denomination used in this program is a $20 bill.

Beginning with the pennies box, the student enters the number of pennies needed and presses **RETURN**. This procedure is repeated for each successive type of coin or bill. The student may skip over boxes in the change drawer by pressing the left arrow key, which automatically places a zero in that box.

If the answer is correct, the computer will give the student a positive response. If the answer is incorrect, the student decides whether to try the problem again or see the correct answer. The student may try again as many times as desired.

If the answer is correct but there's a more efficient way of distributing coins, this will be

stated. Then the student may try again or see a better answer. Change should be returned using the fewest coins and bills. An exception to using the fewest coins is the use of the fifty-cent piece; because fifty-cent pieces aren't always available today, students may use either a fifty-cent piece or two quarters in returning change. The program assumes that the drawer contains an unlimited number of each type of coin or bill.

Use in an Instructional Setting

Preparation

The students need to know the monetary value of coins—for example, dimes, nickels, quarters. They need to know how many of each type of coin it takes to equal a dollar.

Explain and demonstrate the correct method of making change, counting from the amount of the purchase up to the amount given for payment. Use Handout 2, Steps In Making Change, in this discussion. Be certain students understand the concept of closest multiple of a number. For example, beginning from 27¢, the closest multiple of 5¢ is 30¢.

Using the Program

Demonstrate the use of the program to the class by doing one or two problems together. Handout 3, Change Worksheet, can be used to introduce the program to the class if a large-screen television isn't available to demonstrate the program. Students can write in the boxes just as they'll type answers into the computer.

They may need to be reminded to type in the *number* of the coins, not their value—for example, 2 dimes, not 20¢. Point out that students can change their answers as many times as they wish, and that the program lets them change the number of coins or bills selected. Have students use the program individually or in pairs.

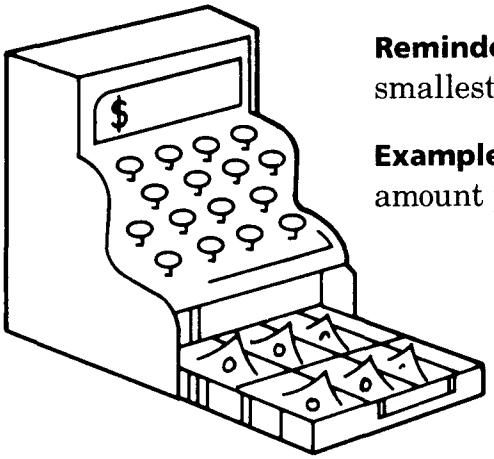
Follow-up

- Discuss alternate methods of giving change other than the one presented in Change. Discuss the advantages and disadvantages of each.
- Have students report on the monetary systems of other countries.
- Visit a local bank or have any numismatists in the class display and discuss their coin collections.
- Start a "store" in the classroom so students can role-play clerk and customer.
- Discuss the implications of cash registers that automatically tell the cashier the correct change for each transaction, and those that automatically give the coins to the customer. Is there still a need to be able to make change by hand? Does the machine figure out the change the same way a person does?

Steps in Making Change

Name _____

Class _____ Date _____



General rule: Start with the cost of the item and count up to the amount presented for payment.

Reminder: In making change, try to return the smallest number of coins and bills.

Example: The cost of an item is 32¢ and the amount presented for payment in $10.

Coins

1. ____ How many *pennies* are needed to get to the closest multiple of 5¢?

2. ____ How many *coins* are needed to get to the closest multiple of 25¢?

3. ____ What is needed to get to the closest dollar?

Bills

4. ____ How many $1 bills? (No more than 4)

5. ____ How many $5 bills? (0 or 1)

6. ____ How many $10 bills? (0 or 1)

7. ____ How many $20 bills?

Reminder: Use the smallest possible number of coins and bills.

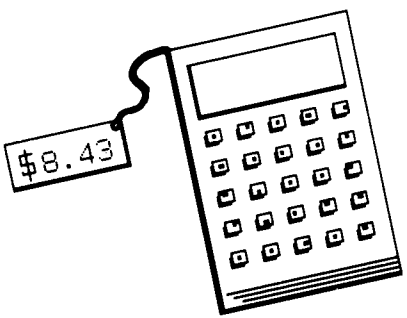
Worksheet

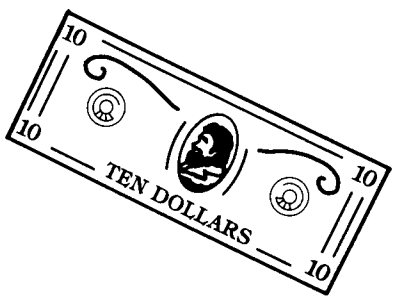
Name _____

Class _____ Date _____

1. $8.43 is the cost of the item.
   $10.00 is the amount given to pay for this purchase.

2. $3.07 is the cost of the item.
   $5.00 is the amount given to pay for this purchase.





$20	$10	$5	$2	$1
50¢	25¢	10¢	5¢	1¢

Make the Correct Change

Write the *number* of each kind of coin or bill in the boxes of the cash register shown above.

Change

Sample Runs

```
THIS PROGRAM HELPS YOU PRACTICE
MAKING CORRECT CHANGE.

PRETEND YOU ARE A CHECK-OUT
CLERK IN A STORE.

YOU WILL BE SHOWN:
- THE COST OF THE ITEMS
  PURCHASED.
- THE MONEY GIVEN TO PAY FOR
  THEM.

  PRESS RETURN TO CONTINUE.
```

The student is asked to role-play a cashier in a store.

```
$30.07 IS THE COST OF THE ITEM.
$35.07 IS THE AMOUNT GIVEN TO
       PAY FOR THIS PURCHASE.

| $20 | $10 | $5 | $2 | $1 |
|---|---|---|---|---|
| 50¢ | 25¢ | 10¢ | ? 5¢ | 1¢ |

MAKE THE CORRECT CHANGE.
HOW MANY NICKELS?
```

The screen displays a cash register change drawer and randomly selected purchase price and amount offered in payment. The program then asks for the number of coins and bills needed to make change, beginning with pennies.

Examples of Screen Output

Estimate

Estimating Answers to Problems

Specific Topic:	Estimation
Type:	Drill and Practice
Reading Level:	3.7 (Spache)
Grade Level:	4–6

Description

This drill program is designed to improve student ability to estimate answers to arithmetic exercises. Students select from addition, subtraction, multiplication, division, and percent problems and also determine the level of problem difficulty. The drills are timed.

Objectives

- To compute with whole numbers less than 10,000
- To estimate answers to arithmetic exercises
- To estimate answers quickly
- To calculate the approximate percentage of numbers
- To estimate the result of an arithmetic problem within one order of magnitude
- To recognize the difference between estimated results and a computed result

Estimate

Background Information

This program drills on arithmetic estimating skills. Five drills are available. Within each drill, students can select the difficulty of the problems, the time allotted to enter the answer, and the number of problems.

($\approx$ means "approximately equal to")

Drills and Corresponding Types of Problems

Addition	For example:
1. 2-digit plus 2-digit	$21+48\approx21+50$ or 71
2. 3-digit plus 3-digit	$379+421\approx379+400$ or 779
3. 4-digit plus 4-digit	$4820+1234\approx4820+1000$ or 5820
4. Mixture of all three	

Subtraction	For example:
1. 2-digit minus 2-digit	$59-31\approx59-30$ or 29
2. 3-digit minus 2- or 3-digit	$371-59\approx371-60$ or 311
3. 4-digit minus 3- or 4-digit	$7805-671\approx7805-700$ or 7105
4. Mixture of all three	

Estimate

Multiplication	For example:
1. 1-digit times 2-digit	$8 \times 17 \approx 160$
2. 2-digit times 2-digit with product less than 1,000	$21 \times 36 \approx 800$
3. 2-digit times 2-digit with product greater than 1,000	$74 \times 57 \approx 4200$
4. Mixture of all three	

Division	For example:
1. 3-digit divided by 1-digit	$508/4 \approx 125$
2. 3-digit divided by 2-digit with quotient less than 1,000	$426/71 \approx 60$
3. 4-digit divided by 2-digit with quotient greater than 1,000	$3936/41 \approx 100$

Percent	For example:
1. 1, 10, and 50 percent	10% of 241 is about 24
2. Integer percents from 1 to 10	2% of 280 is about 6
3. Percents that are multiples of 10, 25 or 75	25% of 17 is about 4
4. A mixture of all three	

Levels of Tolerance in Estimating

Addition or Subtraction

Round the second number, then add or subtract.

1. Within 5 for the 2-digit option; for example, if the problem is

$$\begin{array}{r} 27 \\ +34 \\ \hline 61 \end{array} \text{ rounds to } \begin{array}{r} 27 \\ +30 \\ \hline 57 \end{array}$$; the computer will accept 56 to 66.

2. Within 50 for the 3-digit option
3. Within 500 for the 4-digit option

Estimate

Multiplication

1. Round the 2-digit number and multiply times the 1-digit number.
2. Round both 2-digit numbers and multiply.

Division

1. Round the 3-digit number and divide by the 1- or 2-digit number in 3-digit problems.
2. Round the 4-digit number and divide by the 2-digit number in the 4-digit problems.

Estimate

Use in an Instructional Setting

Preparation

Students need to be able to round whole numbers. They also need to be able to compute with whole numbers using the operation (addition, subtraction, multiplication, or division) they've chosen.

For the percent exercises, students need to understand the concept of percent and know the procedure for computing with simple percents, such as 10%, 25%, 50%.

Using the Program

Decide with the student the type of problem, the number of problems to be done, and the time allowed for each problem. Use Handout 4, Estimate Score Sheet, to record these decisions. Circle the numbers the student must enter to choose the type of problems desired.

This is a timed drill. Be sure to start the student with a time allowance long enough to avoid feelings of frustration or anxiety. After the student has gained confidence in working the problems, gradually decrease the time interval to increase the speed of calculation.

Students may record their scores on the lower half of Handout 4.

Follow-up

- Discuss the circumstances under which estimation is appropriate and/or necessary. When is it inappropriate or misleading?
- Discuss how estimation skill can be helpful in judging whether an "exact" answer to an exercise is reasonable.
- Hold a class tournament with teams composed of a recorder (to keep score), a timer (to watch the time limit of 5 or more minutes per group), and a typist (to enter answers into the computer). Have each group attempt 30 problems within the time limit. Group members can jointly decide on the correct answer.

Estimate Score Sheet

Name _____

Time limit: _____ No. of problems: _____

Types of Problems

Addition

1. ___ Mixture
2. ___ 2-digit
3. ___ 3-digit
4. ___ 4-digit

Subtraction

1. ___ Mixture
2. ___ 2-digit
3. ___ 3-digit
4. ___ 4-digit

Multiplication

1. ___ 1-digit × 2-digit
2. ___ 2-digit × 2-digit product less than 1000
3. ___ 2-digit × 2-digit product greater than 1000
4. ___ Mixture

Division

1. ___ 3-digit by 1-digit
2. ___ 3-digit by 2-digit
3. ___ 4-digit by 2-digit
4. ___ Mixture

Percent

1. ___ 1, 10, and 50%
2. ___ 1 – 10%
3. ___ 10, 25, 75%
4. ___ Mixture

My Scores

Date: _____
Number tried: _____
Number correct first try: _____
Number correct second try: _____

Date: _____
Number tried: _____
Number correct first try: _____
Number correct second try: _____

Date: _____
Number tried: _____
Number correct first try: _____
Number correct second try: _____

Date: _____
Number tried: _____
Number correct first try: _____
Number correct second try: _____

Sample Runs

```
You may choose problems in:

  1. Addition
  2. Subtraction
  3. Multiplication
  4. Division
  5. Percentages

What is your choice? ■
```

Students choose the drill and the number of seconds allowed.

```
You may choose the size of the
numbers.

 1. 1 digit times 2 digits
 2. 2 digits times 2 digits
    with the product less than
    1000
 3. 2 digits times 2 digits
    with the product greater
    than 1000
 4. A mixture of all of these

What is your choice? ■
```

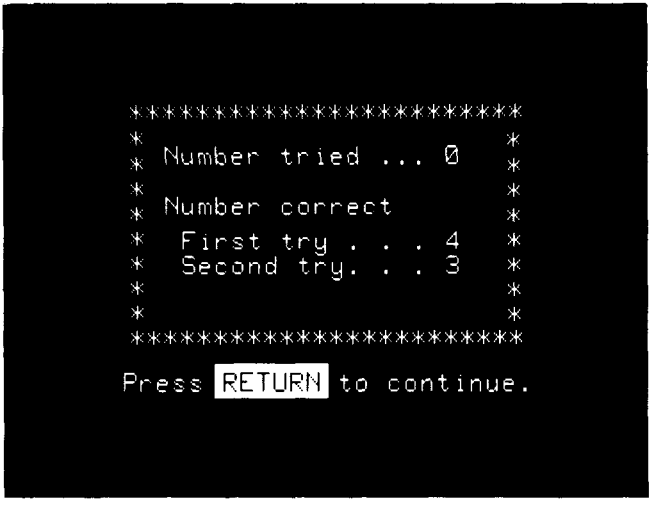
Students also choose the difficulty of problems.

Examples of Screen Output

Sample Runs

Example of multiplication option, 1-digit × 2-digits. Students are presented with a problem. If their response is correct in the time allowed, they receive a positive response. If incorrect, they get a second try. If incorrect on the second try, they're given the correct answer.

At the end of the lesson, students are given a summary score of how well they did. They should copy these summaries onto their score sheets.



Examples of Screen Output

Math Game

Skill Building in Mathematics

Specific Topic:	Basic facts, regrouping
Type:	Drill and Practice
Reading Level:	3.3 (Spache)
Grade Level:	2–6

Description

Students participate individually or in groups in an arithmetic contest that presents random drills. The level of problem difficulty is set to be appropriate to the age and ability of the player.

Objectives

- To recall the basic facts of addition, subtraction, multiplication, and division
- To compute with whole numbers less than 10,000
- To participate in a game, having an equal chance to win because of compensation for age and ability level
- To increase speed in calculating
- To enjoy doing mathematics at ability level

Math Game

Background Information

In Math Game, students compete against each other in addition, subtraction, multiplication, and division problems. Speed and accuracy determine how well they score. Up to 35 players can compete at one time. Players determine the number of problems to be solved from a maximum of 50. Students enter their names, ages, and level of problem difficulty. Each operation has nine levels.

Problem difficulty depends on both the age and ability level—that is, an older student asking for level 4 will receive more difficult problems than a younger student asking for level 4. If students ask for level 1, they'll always receive one-digit (basic fact) problems.

Examples of problems in Math Game

Addition	**Level 1**	**Level 5**	**Level 9**
Age 5	3 + 6	24 + 14	70 + 25
Age 8	7 + 5	31 + 26	47 + 46
Age 12	7 + 2	34 + 17	83 + 49
Age 30	6 + 5	99 + 32	135 + 29
Subtraction	**Level 1**	**Level 5**	**Level 9**
Age 5	12 − 9	12 − 11	86 − 35
Age 8	10 − 7	69 − 31	64 − 22
Age 12	14 − 8	35 − 21	74 − 50
Age 30	14 − 9	77 − 5	33 − 29
Multiplication	**Level 1**	**Level 5**	**Level 9**
Age 5	5 × 3	9 × 2	14 × 5
Age 8	3 × 4	9 × 11	16 × 9
Age 12	6 × 8	16 × 20	23 × 17
Age 30	7 × 3	45 × 48	64 × 75

Division	Level 1	Level 5	Level 9
Age 5	9/3	24/6	54/6
Age 8	18/6	49/7	391/17
Age 12	24/8	304/16	432/16
Age 30	15/3	504/21	1343/17

Students answer problems as quickly and accurately as they can. The time taken to answer and the number of tries determine the scores. Bonus points are added according to the *total* time, age, level, and percentage of correct answers. At the end of the drill, the computer prints out the highest score and the name(s) of the player(s) who earned that score.

The score for each problem is a number from 0 to 50. It is determined by a formula that subtracts points for the number of seconds required to respond, and for incorrect answers.

$$\text{Score} = 50 - \frac{\text{number of seconds} + 30 \times \text{number incorrect} + 10.5}{2}$$

The students are allowed about 30 seconds to answer before a "time is up" message is printed and they're asked to try again. The students are given three tries on each problem. If their answers are incorrect on all three tries, the score for that problem is zero.

A bonus score is calculated using another formula, which takes into account the player's age and the level of difficulty, as well as the number of correct answers.

$$\text{Bonus} = 20\left(\begin{matrix}\text{total}\\ \text{problems}\end{matrix}\right) - 20\left(\frac{\text{number of tries} - \text{total problems}}{\text{total problems}}\right) + 5\,(\text{difficulty level}) - \text{age}$$

Math Game

Use in an Instructional Setting

Preparation

Since this is a drill program, students should have learned the concepts and methods involved before using this game. You'll need to determine the appropriate level of difficulty for each individual student and record this information on Handout 5, Math Game Score Sheet.

Multiplication and division problems in the greater difficulty levels may require the use of pencil and paper or calculators. For example, 17 × 35 = ... in level 9 multiplication, or 972/36 = ... in level 9 division.

The problems are displayed in a horizontal format, and the digits of the answer must be entered in order, beginning with the digit farthest to the left. For example, 7 + 8 = ...; enter 1, then 5.

Students may need to be reminded to press **RETURN** immediately after entering their answers, to use up as little time as possible.

Using the Program

The top part of Handout 5, Math Game Score Sheet, is filled in by the teacher, and the bottom half is for students to use in recording their scores.

This program is designed for individual or group use. A group of students may play Math Game and keep track of their final scores on the score sheet. You may want to post final scores to determine an overall class champion.

Follow-up

- Hold a classroom tournament, with individual students or teams competing against one another
- Use the level 9 problems for practice in using hand calculators. The computer generates the problems; the student keys in the numbers on the calculator, views the answer, and enters it into the computer for verification. Two students might work as a team—one at the computer keyboard, the other using the calculator. In this way students learn to use appropriate technology for arithmetic problems that are too complicated to work "in one's head."

Math Game Score Sheet

Name _____

Age: _____ Level: _____

Name	Age	Level

Game 1

Name	Bonus	Total

Game 2

Name	Bonus	Total

Game 3

Name	Bonus	Total

Game 4

Name	Bonus	Total

Math Game

Sample Runs

```
Player #1 JENNIFER

How old are you?  10

What level of problems do
you want? ■

 1= EASY . . . . 9= HARD
```

Students enter their names and ages, and select difficulty levels.

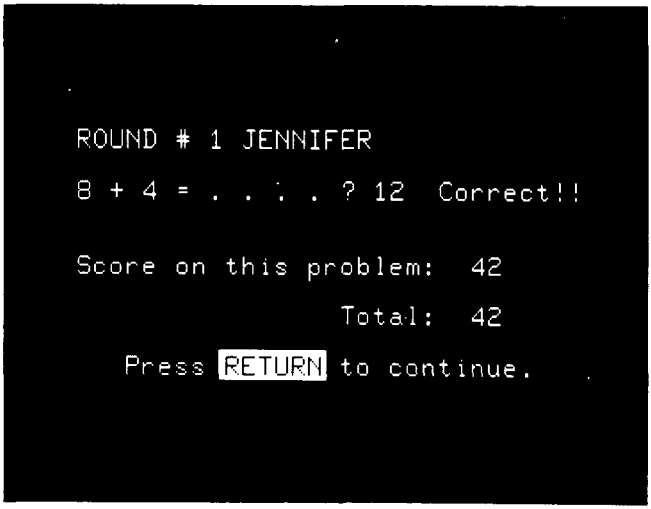
```
You may choose problems in:

  1. Addition
  2. Subtraction
  3. Multiplication
  4. Division
  5. A mixture

What is your choice? ■
```

Students choose problems from addition, subtraction, multiplication, division, or a random mixture.

Examples of Screen Output

Math Game

Sample Runs



The computer keeps score according to the difficulty of the problem and the speed with which the student answered it.

At the end of the round, scores are given. These may be copied onto the score sheet.

Examples of Screen Output

Round

Rounding Off Numbers

Specific Topic:	Rounding, estimating
Type:	Drill and Practice
Reading Level:	2.7 (Spache)
Grade Level:	4–6

Description

This program provides a drill on the procedure of rounding numbers. The number must be rounded to the nearest ten, nearest hundred, or nearest thousand.

Objective

- To round whole numbers to the nearest 10, 100, 1000

Round

Background Information

Students choose to practice rounding to tens, hundreds, or thousands, or to have a random mixture of these problems. They specify the number (1–99) of problems they'll work. Numbers in the thousands must be rounded to the nearest thousand, numbers in the hundreds to the nearest hundred, and numbers in the tens to the nearest ten.

At the end of each session the computer informs the students of the number correct on the first try and the number correct on the second try. This drill is *not* timed.

If the answer is incorrect, the student is told whether it's too large or too small, and is asked to try again. For example, given the number 734 and instructions to round to the nearest hundred, if the student's response is 730, the message "too large, try again" appears. If the second response is also incorrect, the program gives the answer.

The rule used when numbers are halfway between the two rounded numbers is to round up—for example, 55 rounds to 60, 250 rounds to 300.

Round

Use in an Instructional Setting

Preparation

Students need to understand the concept of rounding numbers. They need to be able to identify place value names in the decimal number system (tens, hundreds, and so forth) and to read whole numbers less than 10,000.

A discussion of the benefits of rounding numbers could provide motivation. You might list situations in which rounded numbers are useful or even essential—for example, determining the reasonableness of results, checking calculator work, or estimating the total amount of purchases.

Using the Program

Decide with the student the type and number of problems to be done. Record this information on Handout 6, Round Score Sheet. The students can also record their scores on the score sheet. Students might work individually or in pairs, taking turns at the keyboard.

Follow-up

- Use the program Estimate, which combines rounding skills with computation.
- Discuss situations in which rounded numbers are necessary or useful. Examples might include population figures, the distance to the sun, and federal budget figures. Rounded numbers are often used on graphs.
- What kinds of numbers *can't* be rounded? Examples might include phone numbers, various identification numbers, prices, and scientific data.
- How can one decide whether a number has been rounded? Discuss the small probability of the population being exactly 10,000, for example. Is a person exactly 10 years old for very much of the time?

Round Score Sheet

Name _____

Class _____ Date _____

Date: _____
Problem type: Tens
Hundreds
Thousands
Mixture
Number of problems _____
Number correct first try _____
Number correct second try _____

Date: _____
Problem type: Tens
Hundreds
Thousands
Mixture
Number of problems _____
Number correct first try _____
Number correct second try _____

Date: _____
Problem type: Tens
Hundreds
Thousands
Mixture

Date: _____
Problem type: Tens
Hundreds
Thousands
Mixture

Number of problems _____
Number correct first try _____
Number correct second try _____

Number of problems _____
Number correct first try _____
Number correct second try _____

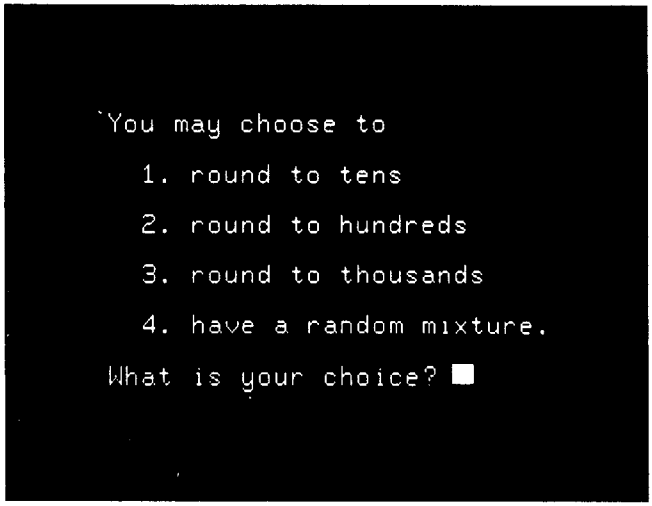
Date: _____
Problem type: Tens
Hundreds
Thousands
Mixture
Number of problems _____
Number correct first try _____
Number correct second try _____

Date: _____
Problem type: Tens
Hundreds
Thousands
Mixture
Number of problems _____
Number correct first try _____
Number correct second try _____

Date: _____
Problem type: Tens
Hundreds
Thousands
Mixture
Number of problems _____
Number correct first try _____
Number correct second try _____

Date: _____
Problem type: Tens
Hundreds
Thousands
Mixture
Number of problems _____
Number correct first try _____
Number correct second try _____

Sample Runs



Students choose to round off to tens, hundreds, or thousands, or select a random mixture.

Students choose the number of problems to be presented. With each problem they have two chances to answer correctly. If the second try is incorrect, the computer supplies the best answer.

Examples of Screen Output

Speed Drill

Developing Speed in Math Skills

Specific Topic:	Basic facts
Type:	Drill and Practice
Reading Level:	3.4 (Spache)
Grade Level:	2–6

Description

This program provides drills on addition, subtraction, multiplication, and division problems using whole numbers. Students choose the operation and the number of problems. The teacher determines the range of numbers used and the time limit.

Objectives

- To recall the basic facts of addition, subtraction, multiplication, and division (numbers 0–9)
- To compute with whole numbers less than 10,000
- To improve speed of computation while maintaining accuracy

Speed Drill

Background Information

Speed Drill is a drill and practice program on operations with whole numbers. Students choose addition, subtraction, multiplication, or division problems and the number (1 to 30) of problems they'll work.

The Teacher Option enables the instructor to specify the numbers used in Speed Drill exercises and the time limit for the student's response.

To use the Teacher Option, follow the steps outlined below:

1. Be certain the diskette does *not* have a write-protect sticker. When the menu appears on the screen, type Control A (press CTRL while typing A). The title "Teacher Options" will appear.
2. Select the Speed Drill option.
3. Read the instructions on the screen.
4. Make any desired changes in the addition exercises. Enter the minimum and maximum values for each of the two numbers in the exercises. Both minimums and maximums must be nonnegative.

   For example:
   Minimum 1 = 0, Maximum 1 = 100
   Minimum 2 = 0, Maximum 2 = 10

   The first number would lie in the range 0–100, the second would be in the range 0–10.

The exercises might include:

55	79	12	7
+9	+3	+5	+1

5. To change the length of time allowed for each response, type in a new number of seconds. Ten seconds requires a reasonably prompt response. When using a specific drill for the first time, students should be given longer to respond. Some students may need virtually unlimited time to respond—for example, 60 seconds.

6. After you've made changes, you'll again see the current values and may make further changes. If no changes are desired, type "No."

7. Continue to the subtraction section, making any desired changes, then on to multiplication and division.

In subtraction problems, the top number is determined by Min1 and Max1, the bottom number by Min2 and Max2. Example:

NUMBER1
− NUMBER2.

In division problems the divisor is determined by Min1 and Max1, the dividend by Min2 and Max2.

Example: NUMBER1 ÷ NUMBER2.

These changes are stored on the diskette and will remain in effect the next time the diskette is used. The only way to specify different numbers or a different time limit is to use this Teacher Option again.

Examples of setting the number limits:

To drill on basic facts, set the limits for both numbers at 0–9.

To drill on two-digit addition without regrouping, use the first (top) number limits of 20–24 and second number limits of 0–5 or 10–15.

To drill on two-digit subtraction without regrouping, use first (top) number limits of 45–49 and second number limits of 0–5 or 20–25.

At the end of the program, the student's score is given, and the number correct on the first and second tries is rated.

Speed Drill

Use in an Instructional Setting

Preparation

Students must know basic arithmetic facts, understand place value, and be able to apply procedures for regrouping. This program is not a tutorial; it doesn't teach these concepts.

Students should be told that this is a timed drill. The problems are presented in a vertical format. The underlined question mark indicates which digit of the answer is to be entered first.

For example:
$$\begin{array}{r} 8 \\ \times\ 7 \\ \hline \underline{?}? \end{array}$$
Enter 5, then 6

In addition and multiplication problems involving basic facts—that is, sums or products of numbers 0–9—the tens digit is entered before the ones digit. Otherwise the ones digit is entered first.

It's recommended that students have short practice sessions at the computer to familiarize themselves with the procedure for entering answers.

Using the Program

Handout 7, Speed Drill Score Sheet, is provided for students to record their scores. You can use the top half of the worksheet to specify the kind of problems on which students will be working.

Use care in determining the speed of the drill for each student. Some students enjoy the challenge of "beating the clock," while others quickly become frustrated, and still others are totally unable to work under timed conditions. Be certain that the student can achieve a reasonable level of success at the speed chosen.

It may be convenient to use separate diskettes for different levels of difficulty of this program.

Students might compete against themselves to try to improve their scores. Or you might set up a class tournament for a particular operation and level of difficulty.

Speed Drill Score Sheet

Name _____

Class _____ Date _____

Types of Problems

Addition Subtraction Multiplication Division

Type of problems _____	Type of problems _____
Number of problems _____	Number of problems _____
Number correct first try _____	Number correct first try _____
Number correct second try _____	Number correct second try _____

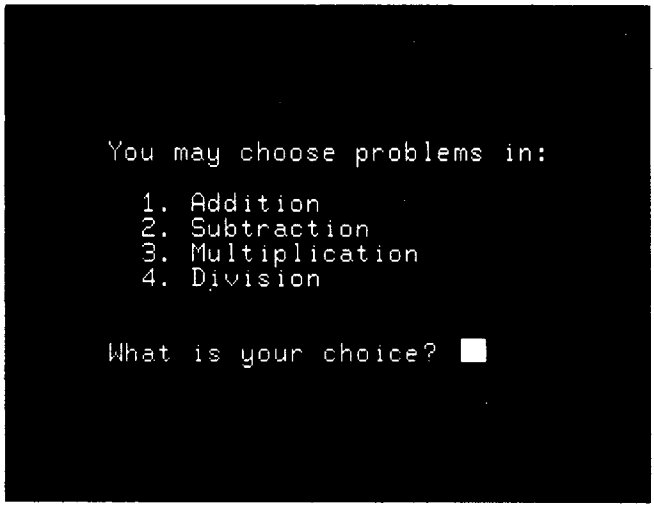
Type of problems _____	Type of problems _____
Number of problems _____	Number of problems _____
Number correct first try _____	Number correct first try _____
Number correct second try _____	Number correct second try _____

Type of problems _____
Number of problems _____
Number correct first try _____
Number correct second try _____

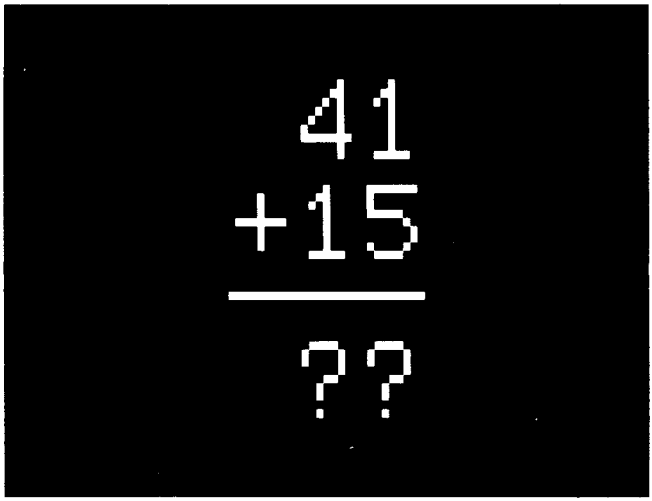
Type of problems _____
Number of problems _____
Number correct first try _____
Number correct second try _____

Speed Drill

Sample Runs



Students choose the type of math problem and the number of problems they'll work.



Problems include addition, subtraction, multiplication, and division. They're presented in a vertical format.

Examples of Screen Output

Speed Drill

Sample Runs

```
If, for example:

  MIN1   MAX1   MIN2   MAX2   SEC

   9      9      0      9     10

The student might get problems
such as 9 + 2, 9 + 4, or 9 + 0
and would get 10 seconds to
answer the problem.

   Press RETURN to continue.
```

Teachers can use the teacher option (type CTRL A from the menu) to set the range numbers in the problems and the time limit.

```
          MULTIPLICATION

 MIN1   MAX1   MIN2   MAX2   SEC

  0      9      0      9     10

 Do you want any changes? ■
```

The program will provide practice on basic facts by setting the limits of the numbers to 0 and 9.

Examples of Screen Output

Basic Arithmetic Diskette

The ATARI Computer programs in the *Basic Arithmetic* module were converted from MECC programs for the Apple II microcomputer in *Elementary Volume 1* and *Elementary Volume 4*.

The ATARI Learnings Systems Basic Arithmetic program was developed by the Minnesota Education computing consortium. Programming revisions were done by Greg Ricke, MECC. Screen layout revisions were designed by Lois Edwards, MECC. Other authors and programmers involved were:

Base Ten

Mike Fish, MECC, and Marge Kosel, MECC, designed and programmed Base Ten.

Change

This program was originally written by Carol Hepper for a National Science Foundation grant at Wayne State University, Detroit, Michigan. Will Jokela added graphics. Tony Prokett, MECC, converted Change to the ATARI computer.

Estimate

Two program by Larry Hatfield, University of Georgia, and three programs by Chuck Lund, St. Paul Schools, were combined and modified by MECC staff to create Estimate. Conversion to the ATARI computer was done by Mike Boucher.

Math Game
The original program was contributed to MECC by C. Neuenshworder of Thief River Falls, Minnesota. MECC staff modified the program. Will Jokela, MECC, converted the program for use with the ATARI computer.

Round
This program was obtained from the University of Minnesota MERITS SYSTEM. Mike Boucher, MECC, converted it to the ATARI computer.

Speed Drill
This program was created by Linda Borry, MECC. A teacher option was added and the program was converted for use on the ATARI computer by Lance Allred and Marge Kosel, MECC.

This manual was prepared by Lois Edwards, MECC, based on materials written and designed for other versions of these programs by Shirley Keran, MECC, which in turn included material from the book *Elementary...My Dear Computer*, developed by Marge Kosel and Geraldine Carlstrom for Timeshare Computing. Teachers from throughout the state of Minnesota contributed ideas to that effort.

Every effort has been made to ensure the accuracy of the product documentation in this manual. However, because we are constantly improving and updating our computer software and hardware, Atari, Inc. is unable to guarantee the accuracy of printed material after the date of publication and disclaims liability for changes, errors or omissions.

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