

no. A-145



# space subtraction

instructional computing courseware  
for the **apple**® II computer



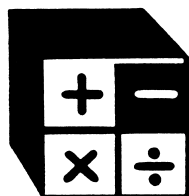
a product from the series  
**mastering math**



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# space subtraction

instructional computing courseware  
for the **apple**® II computer



a product from the series  
**mastering math**

This manual is compatible  
with  
the Space Subtraction diskette  
Version 1.x

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3490 Lexington Avenue North  
St. Paul, MN 55126

ISBN 0-87490-060-1

June 1985  
Latest Printing: October 1985

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## INTRODUCTION

Space Subtraction is designed for first- through third-grade students and focuses on whole number subtraction objectives commonly taught in these grades. Space Subtraction presents drills that reinforce and reward correct calculation of problems with an opportunity to play games. The problems presented do not involve regrouping. The programs are sequenced on the diskette according to the level of difficulty. The package keeps records of individual student performance, which are accessible through a Management Option.

Students can exit the program at any time by pressing the Escape (Esc) Key twice.

Space Subtraction is the fourth package in MECC's Mastering Math Series. Other packages are available for drill in whole number operations, as shown in the table below.

Three supplementary packages, Mastering Math Diagnostic System (No. A-149), Mastering Math Management System (No. A-150), and Mastering Math Worksheet Generator (No. A-151), are available for use with the entire series.

### MECC'S MASTERING MATH SERIES

Package Title	Grade Level	Operation	Types of Problems
1. Early Addition (No. A-788)	1-2	+	Addition facts and missing addends
2. Circus Math (No. A-109)	2-3	+	Addition problems with <u>no</u> regrouping
3. Addition Logician (No. A-125)	3	+	Addition problems with regrouping
4. Space Subtraction (No. A-145)	1-3	-	Subtraction facts and problems with <u>no</u> regrouping
5. Subtraction Puzzles (No. A-146)	3	-	Subtraction problems with regrouping
6. Multiplication Puzzles (No. A-147)	3-4	x	Multiplication facts, missing factors, <u>no</u> regrouping, and regrouping
7. Quotient Quest (No. A-148)	4	÷	Division facts, <u>no</u> remainders, and remainders

## BACKGROUND INFORMATION

Space Subtraction provides drill and practice on the whole number subtraction objectives shown in the following chart. Problems matching these objectives are grouped together into five programs in varying frequency and according to level of difficulty. Space Subtraction is based on a mastery concept. Each group of objectives has a mastery percentage level. If a student meets this mastery level, the student is ready to move on to the group of objectives found in the next program; if not, the student needs to repeat the program or receive more classroom instruction.

Records of student performance are kept so that the teacher can know whether the student has achieved mastery or needs additional help. You can view student records by accessing the Management Options menu. (See page 5.)

### WHOLE NUMBERS - SUBTRACTION ITEM FORMS\*

<u>Objective Number</u>	<u>Description</u>	<u>Sample Problem</u>
WS1*	Fact; single-digit number from a single-digit number	$\begin{array}{r} 7 \\ - 5 \\ \hline \end{array}$
WS2*	Fact; single-digit number from a two-digit number	$\begin{array}{r} 12 \\ - 6 \\ \hline \end{array}$
WS3*	Single-digit number from itself; answer always zero	$\begin{array}{r} 4 \\ - 4 \\ \hline \end{array}$
WS4*	Zero from a single-digit number	$\begin{array}{r} 7 \\ - 0 \\ \hline \end{array}$
WS5*	Zero from a two-digit number ( $n < 18$ )	$\begin{array}{r} 15 \\ - 0 \\ \hline \end{array}$
WS6*	Two-digit multiple of 10 from a two-digit multiple of 10	$\begin{array}{r} 80 \\ - 30 \\ \hline \end{array}$
WS7*	One-digit number from a two-digit number; horizontal; no regrouping	$96 - 2 = \underline{\quad}$
WS8*	Two-digit number from a two-digit number; no regrouping	$\begin{array}{r} 46 \\ - 15 \\ \hline \end{array}$

\*Whole Numbers - Subtraction Item Forms (WS #), COMPUTE Project, Minneapolis Public Schools, 1974.

## BACKGROUND INFORMATION (continued)

<u>Objective Number</u>	<u>Description</u>	<u>Sample Problem</u>
WS9*	Three-digit multiple of 100 from a three-digit multiple of 100	900 <u>- 300</u>
WS10*	Three-digit number from a three-digit number; no regrouping	866 <u>- 835</u>

### Objective Groupings

Space Subtraction has four programs at three different levels and a review program. The level numbers roughly correspond to grade levels. These are presented in order of difficulty from COSMIC CREATURE through SPACE MATCH. The review program, SHUTTLE TRIP, covers all of the objectives contained in the first four programs using a timed drill format.

Level 1 program	:	COSMIC CREATURE
Level 2 programs	:	BLAST OFF ZEMOON WALK
Level 3 program	:	SPACE MATCH
Review program	:	SHUTTLE TRIP

Each objective within a program is assigned a frequency percentage that indicates how often it will appear in the program. These are shown in the charts on the following page. For example, a student working on BLAST OFF receives drills on both Whole Number Subtraction Objectives WS2 and WS5, with 88 percent of the problems being of the WS2 type and 12 percent being of the WS5 type.

\*Whole Numbers - Subtraction Item Forms (WS #), COMPUTE Project, Minneapolis Public Schools, 1974.

## BACKGROUND INFORMATION (continued)

The chart below contains the following data:

- level and objective group number;
- the number of problems presented;
- the mastery level for the program;
- the objectives (with percentage of frequency);
- a brief description of the types of problems.

<p>1. COSMIC CREATURE (Level 1) Objective Group 1 25 problems      90% mastery</p> <table border="1"> <thead> <tr> <th>Obj.</th> <th>% Obj.</th> <th>Obj.</th> <th>% Obj.</th> </tr> </thead> <tbody> <tr> <td>WS1</td> <td>84</td> <td>WS3</td> <td>8</td> </tr> <tr> <td>WS4</td> <td>8</td> <td></td> <td></td> </tr> </tbody> </table> <p>Facts</p>	Obj.	% Obj.	Obj.	% Obj.	WS1	84	WS3	8	WS4	8			<p>4. SPACE MATCH (Level 3) Objective Group 1 20 problems      90% mastery</p> <table border="1"> <thead> <tr> <th>Obj.</th> <th>% Obj.</th> <th>Obj.</th> <th>% Obj.</th> </tr> </thead> <tbody> <tr> <td>WS6</td> <td>10</td> <td>WS7</td> <td>20</td> </tr> <tr> <td>WS8</td> <td>20</td> <td></td> <td></td> </tr> <tr> <td>WS9</td> <td>20</td> <td>WS10</td> <td>30</td> </tr> </tbody> </table> <p>Up to three-digit numbers; no regrouping</p>	Obj.	% Obj.	Obj.	% Obj.	WS6	10	WS7	20	WS8	20			WS9	20	WS10	30								
Obj.	% Obj.	Obj.	% Obj.																																		
WS1	84	WS3	8																																		
WS4	8																																				
Obj.	% Obj.	Obj.	% Obj.																																		
WS6	10	WS7	20																																		
WS8	20																																				
WS9	20	WS10	30																																		
<p>2. BLAST OFF (Level 2) Objective Group 1 25 problems      90% mastery</p> <table border="1"> <thead> <tr> <th>Obj.</th> <th>% Obj.</th> <th>Obj.</th> <th>% Obj.</th> </tr> </thead> <tbody> <tr> <td>WS2</td> <td>88</td> <td>WS5</td> <td>12</td> </tr> </tbody> </table> <p>Facts</p>	Obj.	% Obj.	Obj.	% Obj.	WS2	88	WS5	12	<p>5. SHUTTLE TRIP (Level 3) Review Program 20 problems      90% mastery</p> <table border="1"> <thead> <tr> <th>Obj.</th> <th>% Obj.</th> <th>Obj.</th> <th>% Obj.</th> </tr> </thead> <tbody> <tr> <td>WS1</td> <td>10</td> <td>WS2</td> <td>10</td> </tr> <tr> <td>WS3</td> <td>10</td> <td>WS4</td> <td>10</td> </tr> <tr> <td>WS5</td> <td>10</td> <td>WS6</td> <td>10</td> </tr> <tr> <td>WS7</td> <td>10</td> <td>WS8</td> <td>10</td> </tr> <tr> <td>WS9</td> <td>10</td> <td></td> <td></td> </tr> <tr> <td>WS10</td> <td>10</td> <td></td> <td></td> </tr> </tbody> </table> <p>Review</p>	Obj.	% Obj.	Obj.	% Obj.	WS1	10	WS2	10	WS3	10	WS4	10	WS5	10	WS6	10	WS7	10	WS8	10	WS9	10			WS10	10		
Obj.	% Obj.	Obj.	% Obj.																																		
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WS7	10	WS8	10																																		
WS9	10																																				
WS10	10																																				
<p>3. ZEMOON WALK (Level 2) Objective Group 2 24 problems      80% mastery</p> <table border="1"> <thead> <tr> <th>Obj.</th> <th>% Obj.</th> <th>Obj.</th> <th>% Obj.</th> </tr> </thead> <tbody> <tr> <td>WS6</td> <td>12</td> <td>WS7</td> <td>44</td> </tr> <tr> <td>WS8</td> <td>44</td> <td></td> <td></td> </tr> </tbody> </table> <p>One-digit or two-digit numbers; no regrouping</p>	Obj.	% Obj.	Obj.	% Obj.	WS6	12	WS7	44	WS8	44																											
Obj.	% Obj.	Obj.	% Obj.																																		
WS6	12	WS7	44																																		
WS8	44																																				

### Problem Generation

All problems are generated using random numbers rather than selected from a standard set of problems stored in the program. This ensures that each student will receive a unique lesson, regardless of how many times problems are generated for the same program.



## **BACKGROUND INFORMATION (continued)**

### Turn Sound On/Off

Sound is used in these programs to make the programs more appealing and to help motivate the student. Since sound can be distracting in some classroom situations, an option to turn the sound off is included. Students can be directed to turn the sound off by selecting Option 7 on the main menu.

### Management Options

You can use the Management Options by holding down the Control Key and pressing the A Key while viewing the main menu of Space Subtraction. When you press Control-A, the Management Options menu appears as shown in Figure 1.

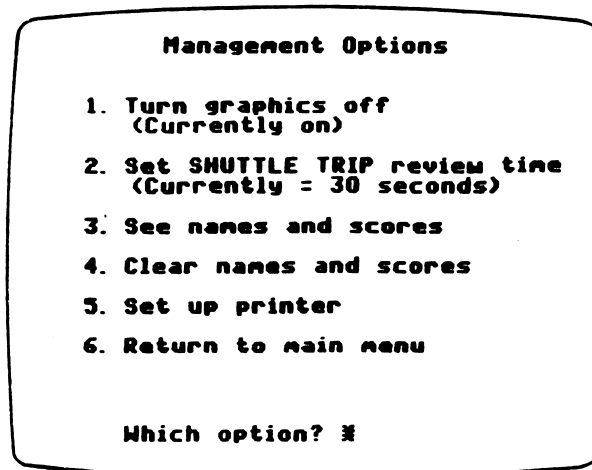


Figure 1

**Option 1:** "Turn Graphics Off/On" allows you to use the drills with or without graphic reinforcement. The graphics might be turned off for older students who are using the program remedially.

**Option 2:** "Set Review Time" allows you to change the approximate amount of time allowed for completing each problem. SHUTTLE TRIP reviews objectives covered by the first four programs and is the only timed drill. Your diskette is currently set to allow 30 seconds for each problem. If the graphics have been turned off by Option 1, this drill is not timed.

**BACKGROUND INFORMATION (continued)**

**Option 3:** "See Names and Scores" allows you to view the records of individual students. When you access Option 3, a message tells you how many records have been entered (Figure 2).

```

100 records can be saved.
6 records have been entered.
When you reach 100 the oldest
records will be dropped.

Press SPACE BAR to continue
    
```

Figure 2

NAME	NUMBER	LEVEL	GROUP	SCORE	DATE	MASTERY
Benson, Pat	3	2	2	24	16	NO
Benson, Pat	2	2	1	25	25	YES
Benson, Pat	1	1	1	25	23	YES
Nelson, Chris	3	2	2	24	23	YES
Nelson, Chris	2	2	1	25	24	YES
Nelson, Chris	1	1	1	25	23	YES

Press SPACE BAR to continue

Figure 3

Then the report (Figure 3) indicates that, in whole number subtraction, Pat Benson has mastered Level 1, Group 1 and Level 2, Group 1 (COSMIC CREATURE and BLAST OFF), but has failed to master Level 2, Group 2 (ZEMOON WALK). Chris Nelson has progressed through the first three programs and should be ready for Level 3, Group 1 (SPACE MATCH). The records are in reverse order of entry, so you can view the most recent records on the first frame. An R in the Group column indicates the review program (SHUTTLE TRIP). The Number column refers to the program numbers (1-5) shown on the main menu.

This report can be printed if a printer is available. There is room on the diskette for 100 student records, which allows about 20 students to do all five programs and have their records retained on the diskette. Once the 100-record limit is reached, the records entered earliest are deleted as new ones are entered.

**Option 4:** "Clear Names and Scores" allows you to erase the student records from the diskette when a class has finished using the programs. You cannot delete individual records.

**Option 5:** "Set Up Printer" allows you to set up a printer to print the student records. See Appendix B for instructions on the use of this printer option.

**Option 6:** Returns you to the main menu.

## USE IN AN INSTRUCTIONAL SETTING

### Preparation

Students need to be assigned Space Subtraction programs that are appropriate to their skill level. Space Subtraction does not teach subtraction, but simply presents drills on whole number subtraction. Classroom instruction in the subtraction objectives covered by the program is necessary before students are drilled on these objectives. The "Background Information" section contains information necessary to match your students' abilities with an appropriate drill. The Mastering Math Diagnostic System (No. A-149) can also be used to aid in placing students.

Since these programs are drills, the students probably need to use the computer individually. This may require some scheduling.

### Using the Programs

Students should use only those drills you have selected for them, based on their classroom preparation. Students need to know the facts or know how to do the calculations required in order to achieve mastery in the objective group covered by the program they are using. (See "Background Information.")

If a student uses a program and does not achieve the mastery level, the final frame suggests that he or she try the drill again. If a student does achieve mastery, the message suggests trying the next program, which covers the next objective group.

The student records will help you to discover where your students are having difficulty. You can view the students' records by pressing Control-A when on the main menu frame. This gives you the Management Options menu. One option allows you to view your students' records. (See "Background Information.") If a student has not achieved mastery, you may want to give that child some additional instruction. The diskette will hold up to 100 student records, after which the oldest record will be dropped.

The programs are organized according to level of difficulty for whole number subtraction objectives covered in Grades 1-3: 1) COSMIC CREATURE, 2) BLAST OFF, 3) ZEMOON WALK, 4) SPACE MATCH, and 5) SHUTTLE TRIP.

SHUTTLE TRIP presents a review drill over all the objectives covered in the first four programs. It is the only timed drill. Some students do not perform well when pressured by a timed drill. A Management Option, accessed by pressing Control-A when on the main menu frame, allows you to set the approximate amount of time allowed to complete each problem. You might want to adjust this time for individual students.

SHUTTLE TRIP could be used as a pretest, in which case you should extend the time limit for response and perhaps turn off the graphics. If students achieve mastery of SHUTTLE TRIP, they may be too advanced to benefit from the previous four programs.

**DESCRIPTION**

COSMIC CREATURE drills on whole number subtraction facts. After each group of five problems, the student can create a creature from outer space by choosing various body parts.

Curriculum Area:    Arithmetic  
                           Subject Area:    Subtraction  
                           Topic:        Whole Number Subtraction  
                           Type:        Drill and Practice  
                           Grade Level:    1  
                           Classroom Use:    Individual

**LEARNING OBJECTIVES**

After using this courseware, the student will have received practice in:

- subtracting a single-digit number from a single-digit number (facts);
- subtracting a single-digit number from itself;
- subtracting zero from a single-digit number.

COSMIC CREATURE (Level 1)					
Objective Group 1					
25 problems			90% mastery		
Obj.	%	Obj.	%	Obj.	%
WS1	84	WS3	8	WS4	8
Facts					

# C O S M I C   C R E A T U R E

## PROGRAM PREVIEW

COSMIC CREATURE is the first in a series of whole number subtraction drills (Figure 1). Twenty-five problems are presented using the format shown in Figure 2.

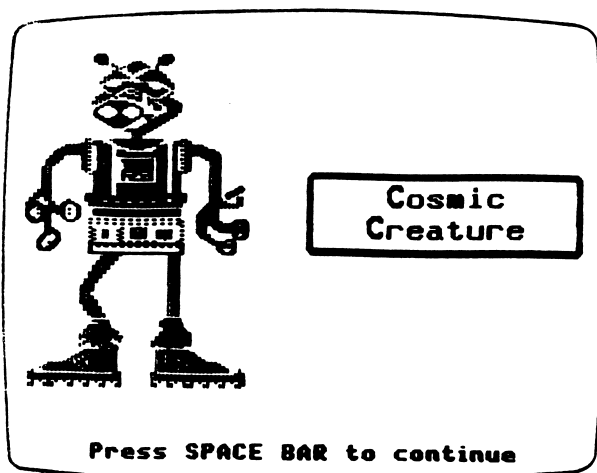


Figure 1

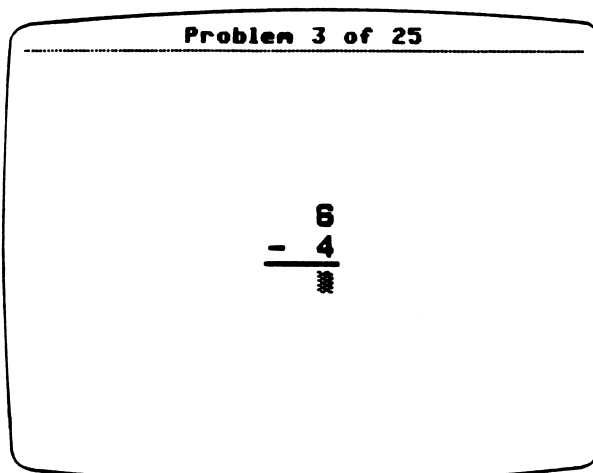


Figure 2

After every five problems, students can choose another body part for their COSMIC CREATURE (Figure 3). The final screen shows their completed creature (Figure 4).

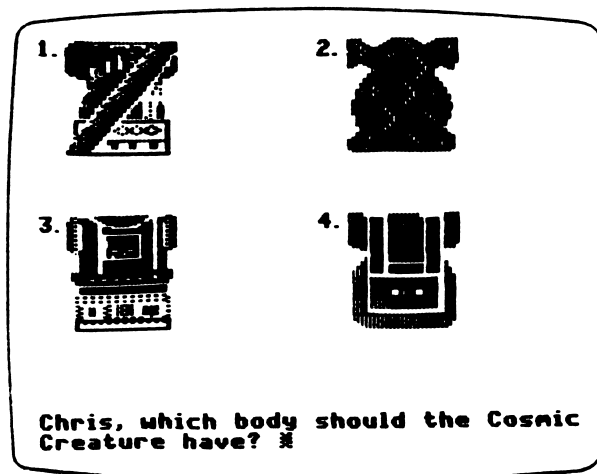


Figure 3

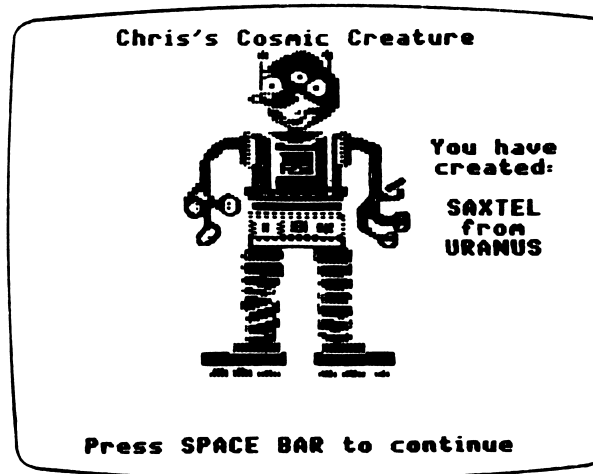


Figure 4

**PROGRAM PREVIEW (continued)**

Students are given two opportunities to answer a problem correctly (Figure 5). If they answer incorrectly on the second try, help is provided (Figure 6). The problem must be answered correctly before proceeding to the next problem.

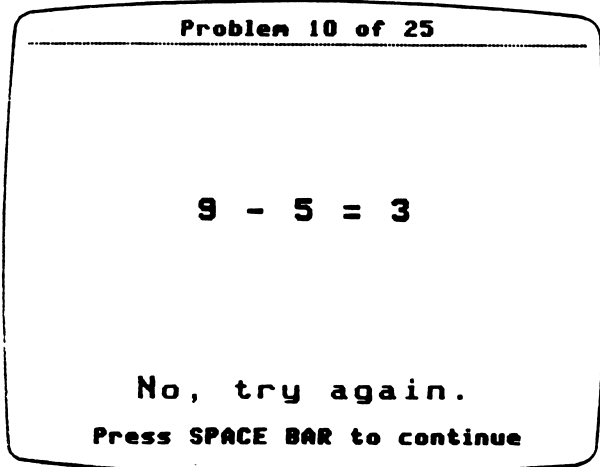


Figure 5

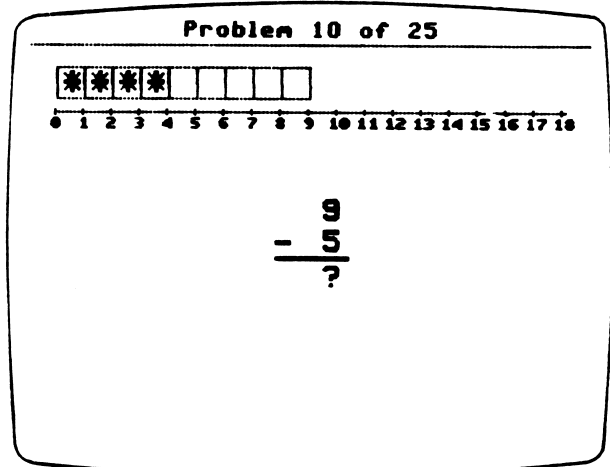


Figure 6

Students receive a scoring frame at the end of a lesson. They are congratulated if they score at or above the mastery level (Figure 7). If they scored below the mastery level, they are encouraged to repeat the program (Figure 8).

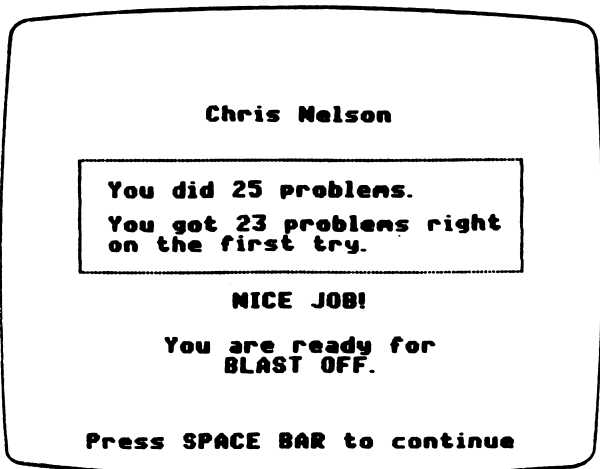


Figure 7

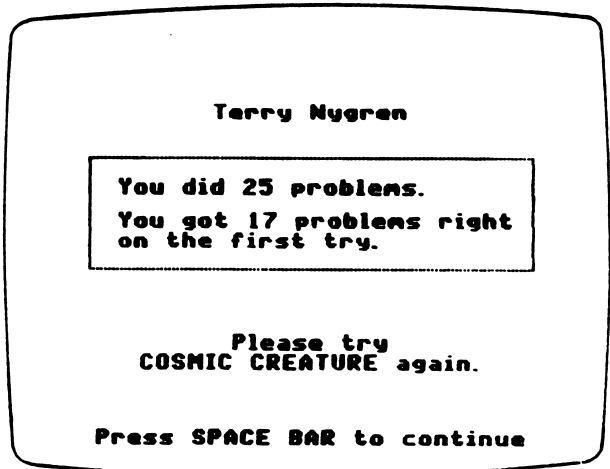


Figure 8

**DESCRIPTION**

BLAST OFF drills on whole number subtraction facts. When a problem is answered correctly on the first try, a portion of a space mission is completed.

Curriculum Area:    Arithmetic  
                           Subject Area:    Subtraction  
                           Topic:        Whole Number Subtraction  
                           Type:        Drill and Practice  
                           Grade Level:    2  
                           Classroom Use:    Individual

**LEARNING OBJECTIVES**

After using this courseware, the student will have received practice in:

- subtracting a single-digit number from a two-digit number (facts);
- subtracting zero from a two-digit number.

BLAST OFF (Level 2)			
Objective Group 1			
25 problems		90% mastery	
Obj.	%	Obj.	%
WS2	88	WS5	12
Facts			

**PROGRAM PREVIEW**

BLAST OFF is the second in a series of whole number subtraction drills (Figure 1). Twenty-five problems are presented using the format shown in Figure 2.



Figure 1

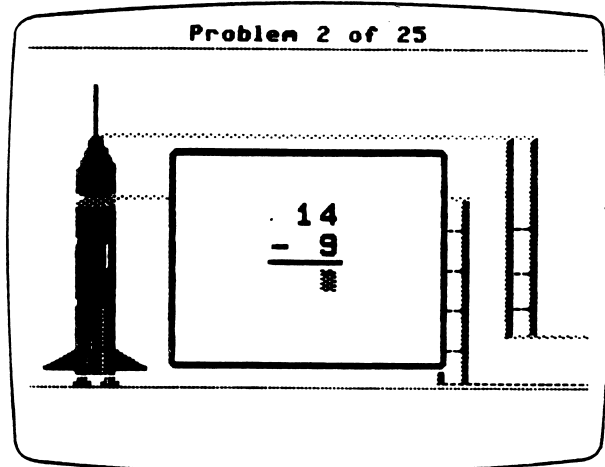


Figure 2

After each right answer on the first try, a portion of a space mission is completed (Figure 3). If mastery is reached, the rescue sequence will also be seen (Figure 4).

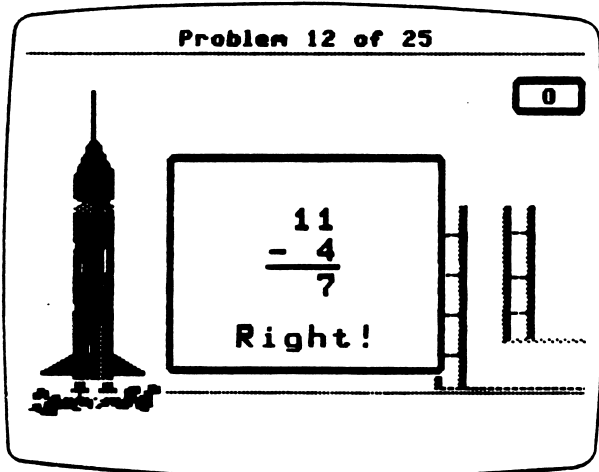


Figure 3

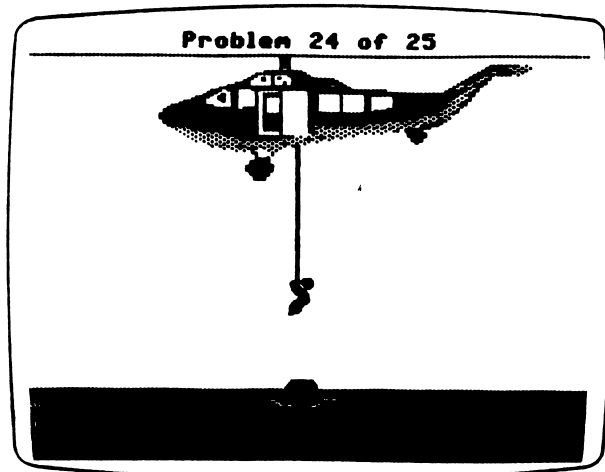


Figure 4



**PROGRAM PREVIEW (continued)**

Students are given two opportunities to answer a problem correctly (Figure 5). If they answer incorrectly on the second try, help is provided (Figure 6). The problem must be answered correctly before proceeding to the next problem.

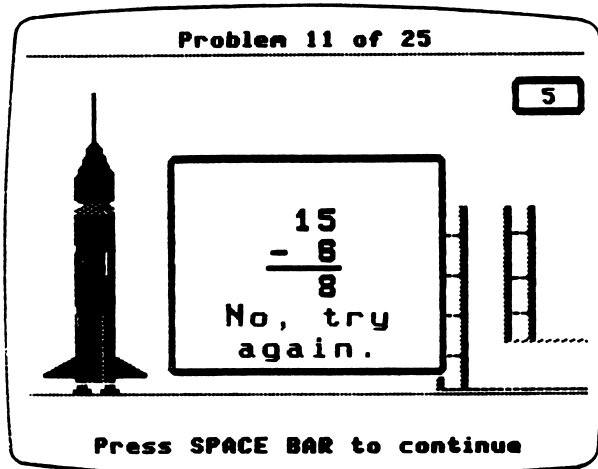


Figure 5

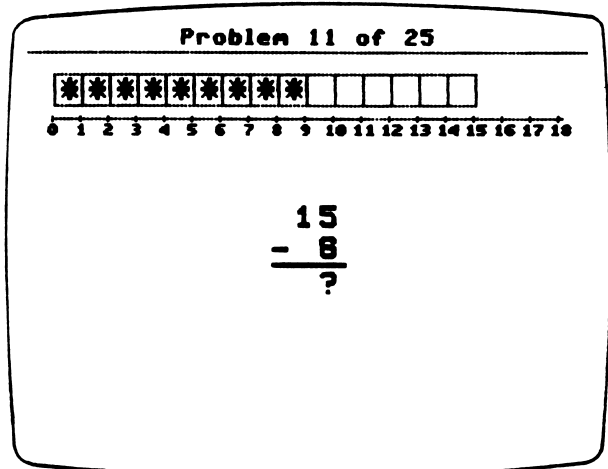


Figure 6

Students receive a scoring frame at the end of a lesson. They are congratulated if they score at or above the mastery level (Figure 7). If they scored below the mastery level, they are encouraged to repeat the program (Figure 8).

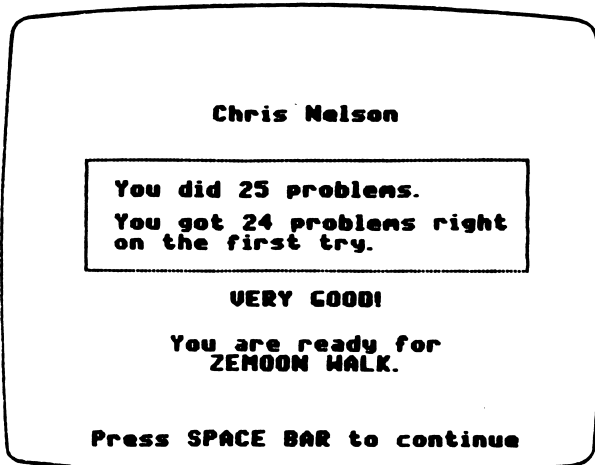


Figure 7

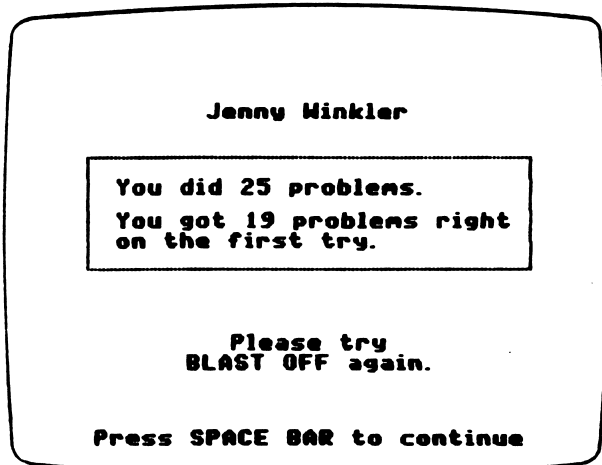


Figure 8

**DESCRIPTION**

ZEMOON WALK drills on whole number subtraction problems with one- or two-digit numbers. After each group of five problems, the student can play a game of ZEMOON WALK. The object of the game is to estimate the coordinate of a safe landing place on the moon.

Curriculum Area: Arithmetic  
 Subject Area: Subtraction  
 Topic: Whole Number Subtraction  
 Type: Drill and Practice  
 Grade Level: 2  
 Classroom Use: Individual

**LEARNING OBJECTIVES**

After using this courseware, the student will have received practice in:

- subtracting a two-digit multiple of 10 from a two-digit multiple of 10;
- subtracting a single-digit number from a two-digit number in a horizontal format;
- subtracting a two-digit number from a two-digit number with no regrouping.

ZEMOON WALK (Level 2)					
Objective Group 2					
24 problems			80% mastery		
Obj.	%	Obj.	%	Obj.	%
WS6	12	WS7	44	WS8	44
one-digit or two-digit numbers; no regrouping					

# Z E M O O N   W A L K

## PROGRAM PREVIEW

ZEMOON WALK is the third in a series of whole number subtraction drills (Figure 1). Twenty-four problems are presented using the format shown in Figure 2.

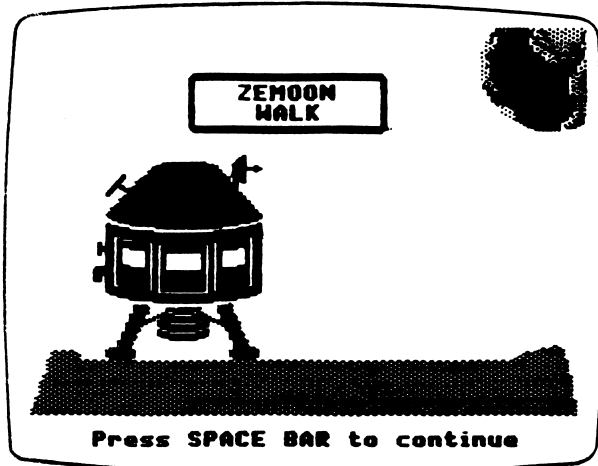


Figure 1

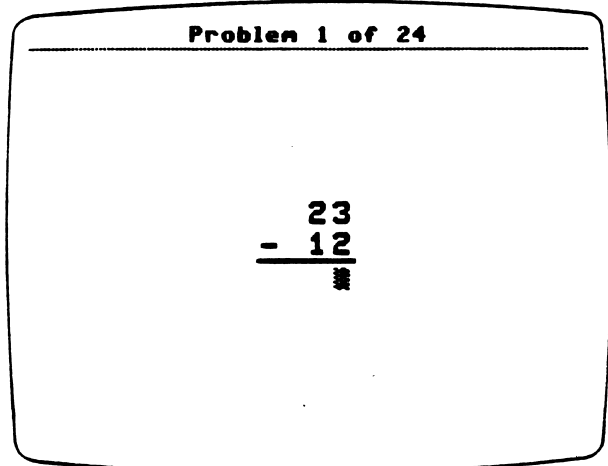


Figure 2

After every eight problems, students can try to land Zebug safely on the moon (Figure 3). The game is based on estimation skills, using the endpoints shown to aid in landing the spaceship safely (Figure 4).

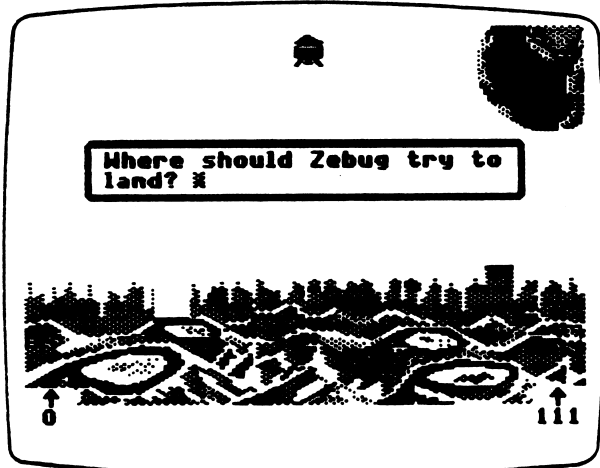


Figure 3

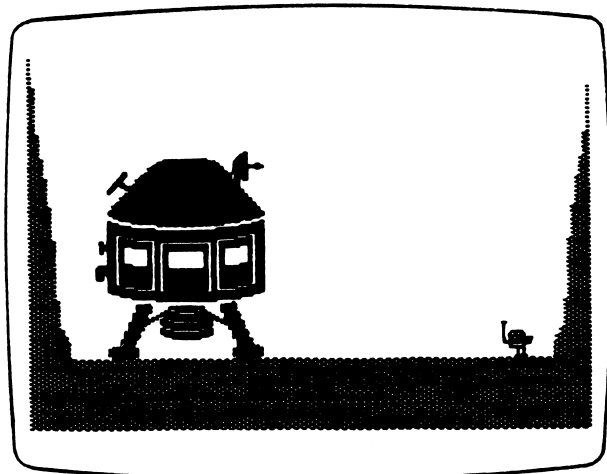


Figure 4

**PROGRAM PREVIEW (continued)**

Students are given two opportunities to answer a problem correctly (Figure 5). If they answer incorrectly on the second try, help is provided (Figure 6). The problem must be answered correctly before proceeding to the next problem.

**Problem 22 of 24**

---

$$\begin{array}{r} 45 \\ - 22 \\ \hline 24 \end{array}$$

**No, try again.**  
**Press SPACE BAR to continue**

Figure 5

**Problem 22 of 24**

---

$$\begin{array}{r} \boxed{45} \\ - \boxed{22} \\ \hline \boxed{?3} \end{array}$$

Figure 6

Students receive a scoring frame at the end of a lesson. They are congratulated if they score at or above the mastery level (Figure 7). If they scored below the mastery level, they are encouraged to repeat the program (Figure 8).

**Chris Nelson**

**You did 24 problems.**  
**You got 23 problems right**  
**on the first try.**

**VERY GOOD!**

**You are ready for**  
**SPACE MATCH.**

**Press SPACE BAR to continue**

Figure 7

**Pat Benson**

**You did 24 problems.**  
**You got 16 problems right**  
**on the first try.**

**Please try**  
**ZEMOON WALK again.**

**Press SPACE BAR to continue**

Figure 8

**DESCRIPTION**

SPACE MATCH drills on whole number subtraction problems with numbers of up to three digits. After each group of five problems, the student can play a game of SPACE MATCH, which involves trying to match "space" words or symbols.

Curriculum Area: Arithmetic  
 Subject Area: Subtraction  
 Topic: Whole Number Subtraction  
 Type: Drill and Practice  
 Grade Level: 3  
 Classroom Use: Individual

**LEARNING OBJECTIVES**

After using this courseware, the student will have received practice in:

- subtracting a one-digit number from a two-digit number in a horizontal format;
- subtracting a two-digit number from a two-digit number with no regrouping;
- subtracting a three-digit number from a three-digit number with no regrouping.

SPACE MATCH (Level 3)					
Objective Group 1					
20 problems			90% mastery		
Obj.	%	Obj.	%	Obj.	%
WS6	10	WS7	20	WS8	20
WS9	20	WS10	30		
up to three-digit numbers; no regrouping					

**PROGRAM PREVIEW**

SPACE MATCH is the fourth in a series of whole number subtraction drills (Figure 1). Twenty problems are presented using the format shown in Figure 2.

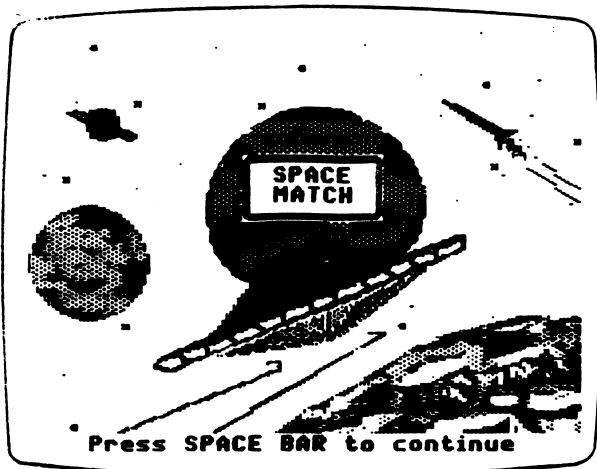


Figure 1

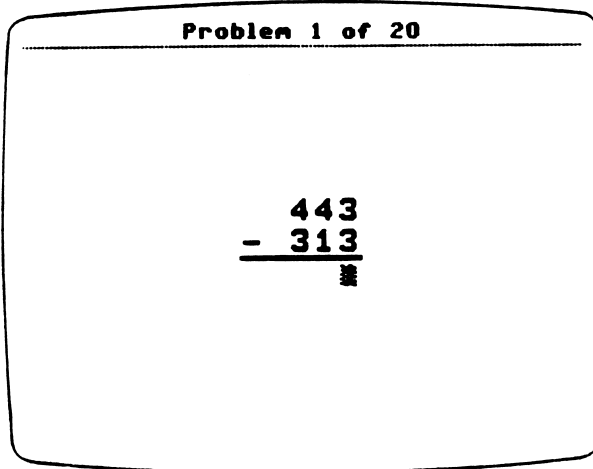


Figure 2

After every five problems, students can play a game of SPACE MATCH (Figure 3). The game involves trying to match various "space" words, planet names, or planet symbols (Figure 4).

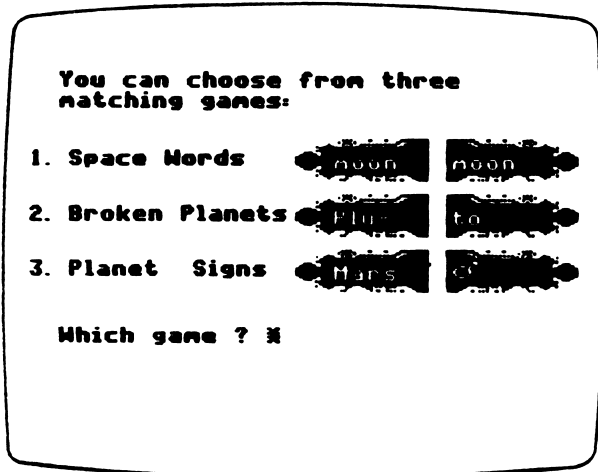


Figure 3

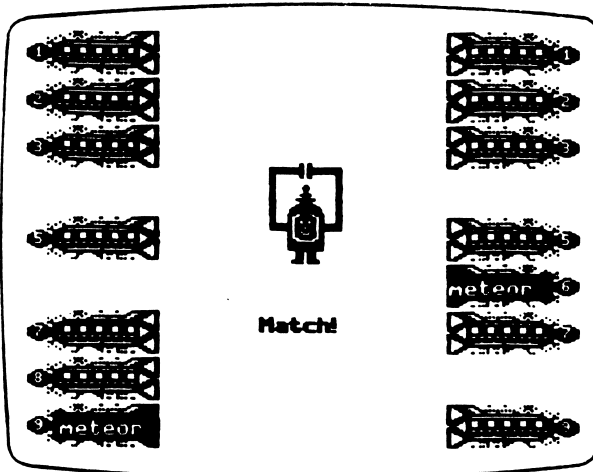


Figure 4

**PROGRAM PREVIEW (continued)**

Students are given two opportunities to answer a problem correctly (Figure 5). If they answer incorrectly on the second try, help is provided (Figure 6). The problem must be answered correctly before proceeding to the next problem.

**Problem 18 of 20**

---

$$\begin{array}{r} 327 \\ - 214 \\ \hline 114 \end{array}$$

**No, try again.**  
Press **SPACE BAR** to continue

Figure 5

**Problem 18 of 20**

---

$$\begin{array}{r} 327 \\ - 214 \\ \hline \boxed{?}3 \end{array}$$

Figure 6

Students receive a scoring frame at the end of a lesson. They are congratulated if they score at or above the mastery level (Figure 7). If they scored below the mastery level, they are encouraged to repeat the program (Figure 8).

**Terry Merwin**

**You did 20 problems.  
You got 19 problems right  
on the first try.**

**VERY GOOD!**  
You are ready for  
**SHUTTLE TRIP.**

Press **SPACE BAR** to continue

Figure 7

**Sam Johnson**

**You did 20 problems.  
You got 14 problems right  
on the first try.**

Please try  
**SPACE MATCH** again.

Press **SPACE BAR** to continue

Figure 8

**DESCRIPTION**

SHUTTLE TRIP reviews all of the objectives covered in the preceding programs in a timed drill format. Graphic reinforcement is provided by a trip aboard the Space Shuttle. The amount of time allowed to complete each problem can be set by using a Management Option (see page 5). If the graphics are turned off, this drill is not timed.

Curriculum Area: Arithmetic  
 Subject Area: Subtraction  
 Topic: Whole Number Subtraction  
 Type: Drill and Practice  
 Grade Level: 3  
 Classroom Use: Individual

**LEARNING OBJECTIVE**

After using this courseware, the student will have received practice in:

- answering problems for all of the objectives covered in this package within a given time limit.

SHUTTLE TRIP (Level 3)					
Review Program					
20 problems			90% mastery		
Obj.	%	Obj.	%	Obj.	%
WS1	10	WS2	10	WS3	10
WS4	10	WS5	10	WS6	10
WS7	10	WS8	10	WS9	10
WS10	10				
Review					



# SHUTTLE TRIP

## PROGRAM PREVIEW

SHUTTLE TRIP is the review drill for this collection of programs (Figure 1). It presents twenty problems of the types used in previous drills. For each problem answered correctly within the given time limit, the shuttle moves closer to completing a full mission (Figure 2).

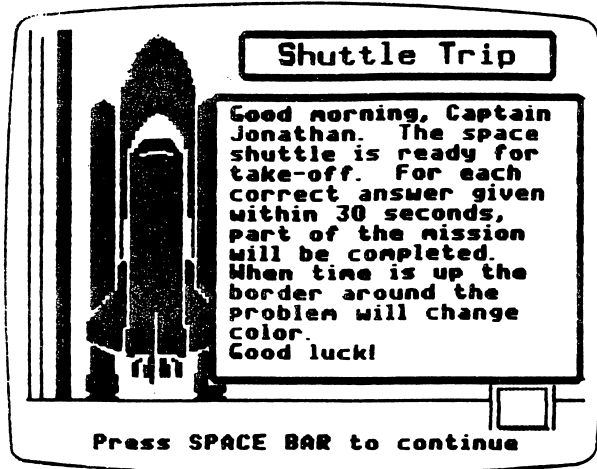


Figure 1

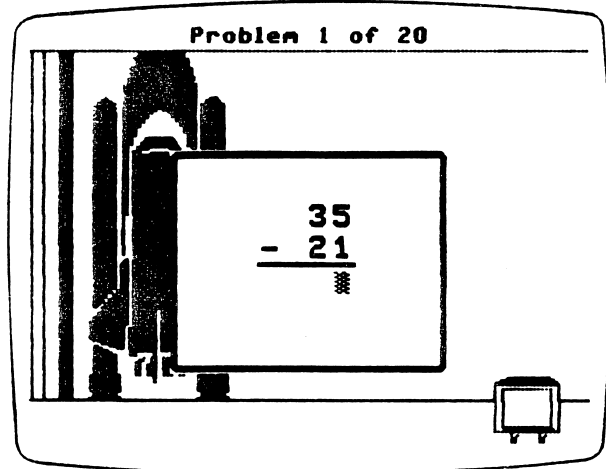


Figure 2

To move the shuttle, the student must answer the problem correctly within (x) seconds (Figure 3). The time (x) is set by a Management Option (see page 5). The default value for (x) is set at 30 seconds. The shuttle will complete the mission if mastery is achieved. If a perfect score is obtained, the crew receives a warm greeting (Figure 4).

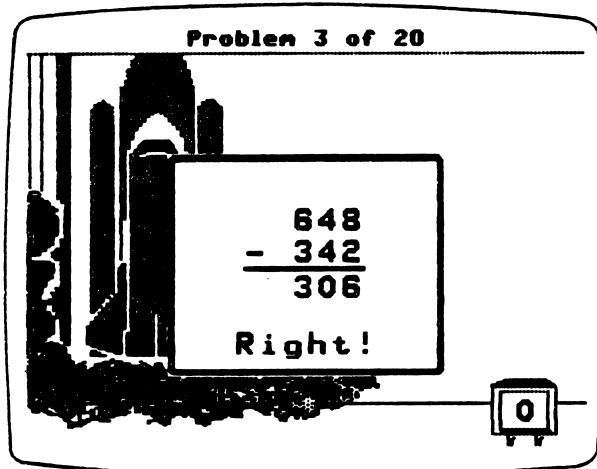


Figure 3

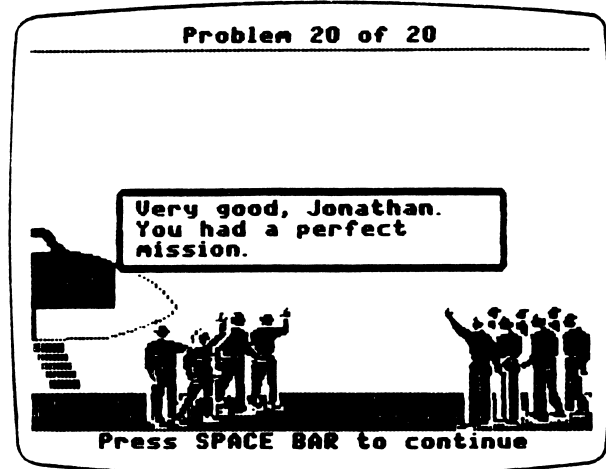


Figure 4

PROGRAM PREVIEW (continued)

Students are given as many chances as needed to answer a problem correctly within the time allotted (Figure 5). If they answer incorrectly after the allotted time has run out, help is provided (Figure 6). The problem must be answered correctly before proceeding to the next problem.

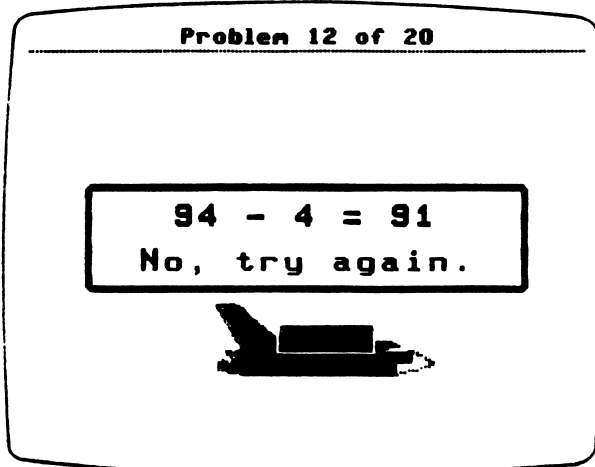


Figure 5

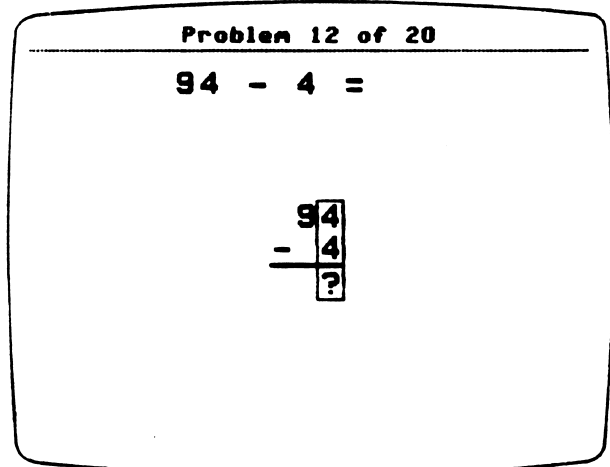


Figure 6

Students receive a scoring frame at the end of a lesson. They are congratulated if they score at or above the mastery level (Figure 7). If they scored below the mastery level, they are encouraged to repeat the program (Figure 8).



Figure 7

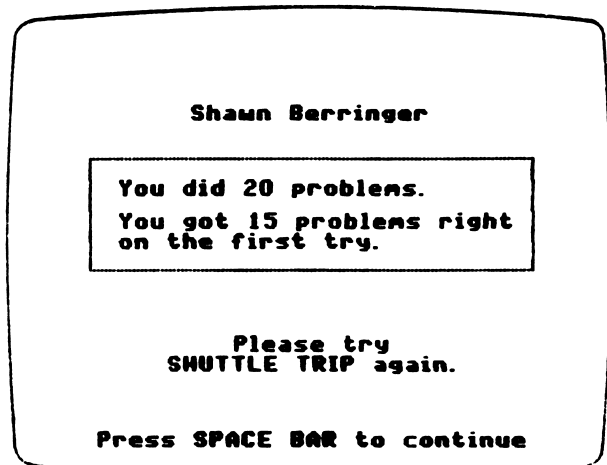


Figure 8

## APPENDICES

## CREDITS

Space Subtraction was produced by a MECC development team that included Craig Solomonson, H. Bill Way, Charolyn Kapplinger, Paul Wenker, Charles Haberman, Jay Miller, and Jon Clauson. Craig Solomonson was the Project Coordinator.

Space Subtraction problem generation, sequencing, and scoring algorithms are taken from the MECC timeshare program Arithmetic Drill and Practice, which was based on an earlier package called Compute. The Compute programs were developed by the Minneapolis Public Schools under a grant from the Minnesota Council on Quality Education.

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### TO THE READER:

MECC has made every effort to ensure the instructional and technical quality of this courseware package. Your comments—as user or reviewer—are valued and will be considered for inclusion in any future version of the product. Please address comments to:

MECC Courseware Development  
3490 Lexington Avenue North  
St. Paul, MN 55126

## USING A PRINTER WITH THIS COURSEWARE

A printer is required or may be used with this product. To connect your printer to an Apple II, II Plus, or //e computer, you will need the appropriate printer card (called an interface card) inserted into a slot (usually slot number 1 or 2) in the computer. To connect an Apple //c computer, use the printer port on the back of the computer. (The Apple //c contains the equivalent of a serial interface card in slot 1.)

**This product is initially set to work with an Apple Parallel card, an Apple Serial card, or an Apple Communications card located in either slot 1 or slot 2. If you have this setup, you do not need to do anything further.**

If your printer uses a different setup than described above or if you need or want to enter special printing commands, you will need to use the "Printer Support" option contained on the diskette.

Depending on which MECC software you are using, you can select the "Printer Support" option from the main menu or from the Management Options menu. (The Management Options menu is accessed by pressing Control-A while viewing the main menu. To press Control-A, hold down the Control Key and press the letter A.) You will then see the Printer Support menu as shown in Figure 1.

**Option 1, "Check current printer settings,"** shows the current printer settings.

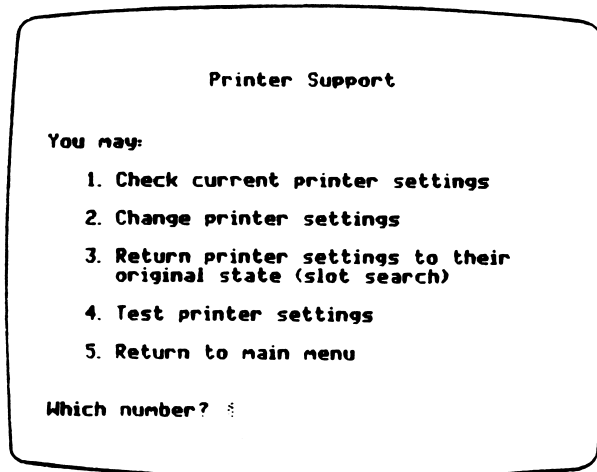


Figure 1

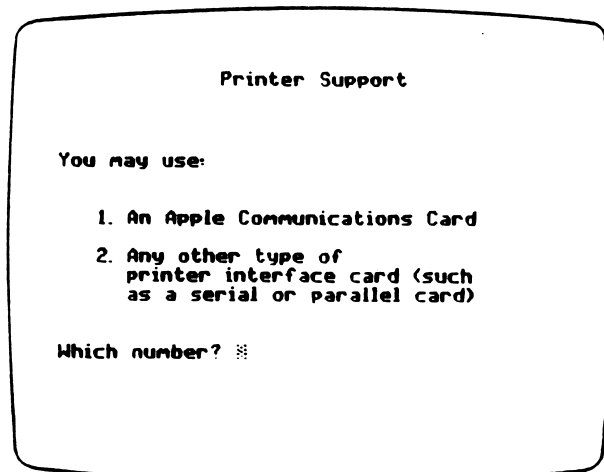


Figure 2

**Option 2, "Change printer settings,"** enables you to change the printer settings. To do this, you will first need to identify the type of printer card you are using (Figure 2). If you are using an Apple Communications card, specify the printer speed and the slot number. If you are using any other type of printer card, specify the slot number and whether your printer requires special commands.

Special commands enable certain types of printers to operate and also permit special printing formats. These commands are listed in your manufacturer's printer or interface card manual. To illustrate, Figure 3 below shows the special command you could enter to produce compressed printing on an Apple Dot Matrix, Apple Imagewriter, or Apple Scribe printer. Figure 4 shows the special command you could enter to produce compressed printing on most Epson printers. Press the Return Key after entering a special command. The CHR\$(n) command will be translated into its corresponding character on the screen. You may then enter another command or simply press Return to end.

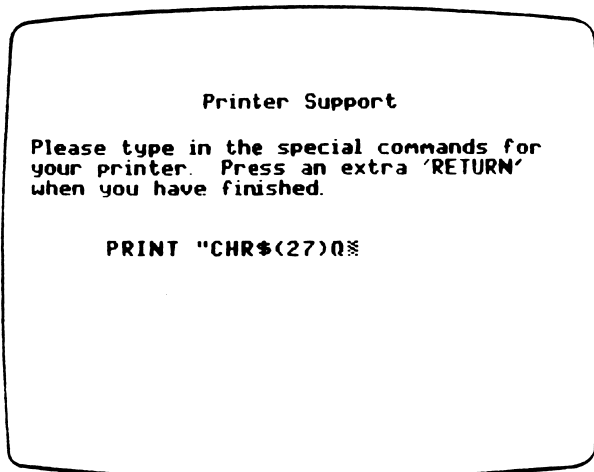


Figure 3

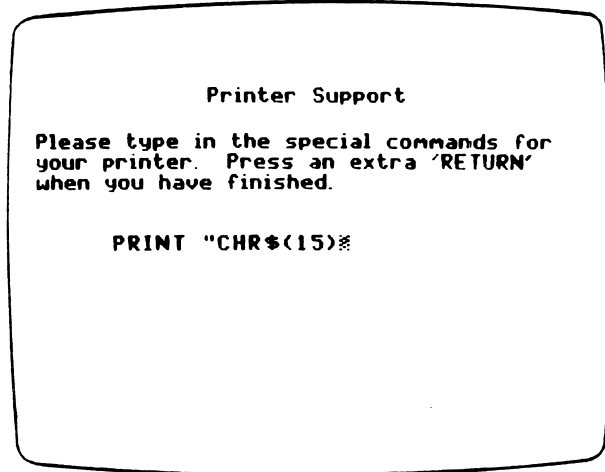


Figure 4

The chart below shows other frequently used special commands for the Apple Dot Matrix and Imagewriter printers.

Pica (10cpi) CHR\$(27)N	Elite (12cpi) CHR\$(27)E	Bold  CHR\$(27)!
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After you have made the necessary changes to the printer settings, you will be asked to specify the type of printer you are using. This information will be displayed when Option 1, "Check current printer settings," is selected.

**Option 3**, "Return printer settings to their original state (slot search)," tells the program to search slots 1 and 2 for a printer card and that no special commands will be used.

**Option 4**, "Test printer settings," prints out all the keyboard characters. If these characters do not appear, check to see whether you have connected your printer correctly or check your printer or interface card manual for special commands.

**Note:** Once the new printer settings have been established, the standard slot-searching routine will not be used. Instead, the computer will use the slot and any special commands you have specified.

The commands are saved on the diskette and are permanent until you use the "Printer Support" option again to change the printer settings.

## MECC SERVICES

MECC is an organization established in 1973 to assist Minnesota schools in implementing educational computing. MECC provides a variety of services to education, including 1) development and distribution of instructional computing courseware; 2) in-service training for educators and development of materials for conducting training; and 3) educational computing assistance through newsletters and equipment purchase contracts. MECC's knowledge and expertise in the educational computing field comes from more than fifteen years of working with and providing leadership for thousands of educators on a daily basis.

- **MECC Educational Computing Catalog**  
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- **MECC Network Newsletter**  
Published regularly throughout the school year, MECC's newsletter focuses on MECC activities, services, and products. To obtain, write or call indicating your interest in the *MECC Network* newsletter.

**For information on all the above items, use the MECC General Information telephone number: 612/481-3500.**

- **Help Line**  
If you have any problems using MECC software:
  - 1) make note of the *name* and *version number* of the product;
  - 2) note the *brand* and *model* of the equipment involved, as well as the type of *printer card* used if the problem concerns a printer;
  - 3) write or call the Help Line to describe the problem (612/481-3660).

**MECC**  
**3490 Lexington Avenue North**  
**St. Paul, MN 55126**  
**(General Information: 612/481-3500)**