Whole Numbers

Practice

PLATO

EDUCATIONAL SOFTWARE

CONTROL DATA

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WHOLE NUMBERS: Practice

PLATO® EDUCATIONAL SOFTWARE

Printed in the United States of America

Adapted From:

PINBALL

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PREFACE

WHOLE NUMBERS: Practice is a PLATO Educational Software package. The computer activity is called PLATO Pinball and is referred to as Pinball or the Pinball activity in this manual. It is available for use on APPLE II Plus®, ATARI 800®, and TEXAS INSTRUMENTS 99/4A® microcomputers.

Pinball is designed to support elementary and junior high math curricula. It provides interactive drill and practice on whole number facts from 0 through 10 using a pinball game format. Students must answer addition, subtraction, multiplication, and division problems accurately in an allotted amount of time. Each correct answer adds to the student's cumulative score.

The package contains one or more flexible disks and a support manual. The disk(s) contain the Pinball computer activity and its playing instructions. The manual contains an introduction to Pinball, lesson flow and teaching strategies, sample worksheets, and supplementary activities.

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TEXAS INSTRUMENTS 99/4A is a trademark of Texas Instruments, Incorporated.

CONTENTS

I. EQUIPMENT CONFIGURATION AND LOADING INSTRUCTIONS

EQUIPMENT CONFIGURATION

In order to run a PLATO computer-based activity, one of the following microcomputer systems is necessary:

1. An APPLE II Plus with the following:
   a. TV or a monitor
   b. 48K memory
   c. Disk drive and controller
   d. DOS 3.3 operating system
2. An ATARI 800 with the following:
   a. TV or a monitor
   b. 48K memory
   c. Disk drive and controller
   d. DOS 2 operating system

3. A TEXAS INSTRUMENTS 99/4A with the following:

   a. TV or a monitor

   b. 32K memory expansion

   c. Disk drive and controller

   d. PLATO Interpreter Cartridge*

LOADING THE MICROCOMPUTER

The Pinball activity is contained on a flexible disk that must be inserted into the disk drive. Figure 1 shows a disk and a disk drive.

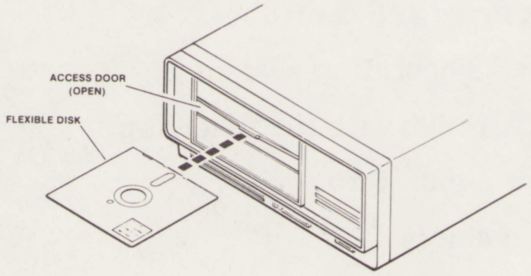

Figure 1. Disk and Disk Drive

To load the Pinball activity into the computer, follow the instructions for your microcomputer.

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*See the distribution information.

APPLE II PLUS

1. Make sure the APPLE II Plus is off.
2. Insert the disk into the disk drive (see figure 1) and close the door of the disk drive.
3. Turn on the APPLE II Plus microcomputer.
4. The title page for Pinball will appear on the screen.

ATARI 800

1. If the BASIC Computing Language (left cartridge) has not been removed, you must remove it.
2. Make sure that both the ATARI 800 computer and the ATARI 810 Disk Drive are turned off.
3. Turn on the ATARI 810 Disk Drive and wait for the busy light to go out.
4. Insert the disk into the disk drive (see figure 1) and close the door of the disk drive.
5. Now, turn on the ATARI 800 computer.
6. The title page for Pinball will appear on the screen.

TEXAS INSTRUMENTS 99/4A

1. Connect the pieces according to the manufacturer's instructions and plug everything into the AC.
2. Turn on the switches in the following order:
   a. Disk drive
   b. Disk controller
   c. RAM expansion
   d. CPU
   e. Monitor or TV
3. Insert the PLATO Interpreter Cartridge into the CPU. The Texas Instruments standard display will appear on the screen.
4. Press any key.
5. Follow the prompts that appear on the screen to insert the disk and start the lesson.
6. The title page for Pinball will appear on the screen.

II. PUBLISHER'S NOTE

Control Data Publishing Company offers the opportunity to supplement core math curricula with math activity packages. Parents and teachers can use these PLATO microcomputer-based support activities to reinforce concepts taught in the classroom.

The following 16 major topics have been identified as representative of most elementary school arithmetic programs.

1. Numeration - Whole Numbers
2. Addition - Whole Numbers
3. Subtraction - Whole Numbers
4. Multiplication - Whole Numbers
5. Division - Whole Numbers
6. Problem Solving
7. Fractions
8. Decimals
9. Ratio
10. Proportion
11. Percent

12. Geometry
13. Measurement
14. Graphs
15. Probability
16. Integers

The **WHOLE NUMBERS: Practice** package can be used as a component in most standard arithmetic curricula. It provides practice on the basic mathematical operations of addition, subtraction, multiplication, and division. Control Data Publishing is working toward a comprehensive coverage of topics in elementary mathematics and other subject matter areas.

III. ACTIVITY PACKAGE SUMMARY

Description: **Whole Numbers: Practice** is a PLATO educational software package. It contains the Pinball interactive computer-based activity and a support manual.

Objective: **Whole Numbers: Practice** is designed to improve basic number facts skills, stressing speed and accuracy.

Activity: The Pinball activity has an animated pinball game format designed to motivate students to practice basic number facts from 0 to 10. The student's goal is to answer as many problems as possible in an allotted amount of time, and thereby, to accumulate as many total points as possible.

Manual: The support manual supplements the computer-based activity with the following material:

Lesson flow	The lesson flow describes the steps in the Pinball activity. It includes the features and scoring method.
Strategies	Pinball is primarily an individualized motivational learning aide. It encourages self-motivation as the student tries to keep improving speed and accuracy in order to accumulate higher point totals. Optional related activities can be integrated into group practice and competition.
Student materials	The student materials include five sample worksheets and a sample record-keeping sheet. The intended audience for this material is intermediate grade level students.

IV. INTRODUCTION TO PINBALL

Pinball is designed to be an educationally sound learning tool that increases basic number fact skills in an environment of fun, excitement, and challenge. Using a pinball game format, the activity challenges students to accumulate points by rapidly answering basic addition, subtraction, multiplication, and division problems presented in random order in different areas of the screen monitor.

There are five separate rounds in each Pinball activity, one round for each separate operation and one of mixed problems. An animated ball moves around the screen. When it touches one of four circled problems, the student must quickly type in the correct answer. As the ball moves from problem to problem, the time given the student to enter the answer becomes shorter and shorter.

The Pinball activity is performed at the microcomputer by individual students. The challenge to the student is to keep the ball moving by answering the problems correctly in the allotted time. If a student

takes too long before answering, the ring containing that problem is removed from the activity. After the student has lost three rings, the ball moves off the screen and the student moves on to the next round with a new ball.

Points are scored for each correct answer. A Hall of Fame keeps track of the ten highest total scores.

Stimulating visual feedback and encouragement is constantly provided by the computer.

The Pinball activity can be integrated into large and small group activities. Sample worksheets provide suggestions for related classroom assignments. Individual and group record-keeping charts are optional activities.

While much of the material in this text is intended for classroom use, it is also applicable for a student's use at home, alone or under supervision.

PURPOSE

- To help students improve their basic addition, subtraction, multiplication, and division skills
- To help students increase their speed and accuracy with basic number facts
- To help teach students to quickly distinguish between operations

CONCEPTS

- Basic addition facts
- Basic subtraction facts
- Basic multiplication facts
- Basic division facts
- Operations distinction

V. LESSON FLOW

LESSON

When the Pinball activity begins, the student may choose to see the rules first or to begin playing immediately. The rules are as follows:

1. There are five rounds per game.
2. In each round, a ball bounces around the screen, and points are accumulated for answering the arithmetic problems.
3. Each round has different kinds of problems (addition, subtraction, multiplication, and division). The last round has mixed problems.
4. The student has only a few seconds to answer a problem. When a problem is answered correctly, the time limit gets a little shorter.
5. If time permits, the student gets three tries for each problem.
6. The student must try to answer the problems accurately as quickly as possible.

There are five rounds in the Pinball activity. When the activity begins, four large rings appear on the

screen. Each ring has a point count. There is one worth 20 points, one worth 30 points, one worth 40 points, and one worth 50 points. The first round has addition problems inside the rings. The second round has subtraction problems, the third has multiplication problems, the fourth has division problems, and the fifth has mixed problems.

At the beginning of each round, a ball appears in the upper right corner of the screen. The student activates the ball, problems are written inside each ring, and the ball moves to the upper left ring to begin the round.

The student must type in the answer to the problem. If the correct answer is given, the point count is added to the total score, and the ball moves to another ring. Each time it lands next to one of the large rings, the computer writes a new problem. The movement of the ball from ring to ring is randomly determined. The accumulated score is recorded at the top of the screen.

If a student sees that the answer is incorrect, three tries to correct it are allowed. If the correct answer is not given in three tries, or if the allotted time runs out, the message NO, TIME'S UP! appears, and the correct answer (circled) appears beneath the problem. The light in that ring is turned off, and the ring is no longer active in that round.

When a student's time has expired on three out of the four rings, the student answers the problem in the last ring, the ball moves down to the bottom of the screen and the student moves on to the next ball or operation.

After the fifth round, the game is over and the total score for all five rounds is shown in the register.

SCORING AND RECORDKEEPING

The computer keeps track of the student's cumulative total score as the game progresses. The challenge to the student is to continue to improve his or her scores in succeeding games. This should motivate students to want to play Pinball over and over again, thereby continually drilling on the basic number facts.

Pinball lends itself to competition among equal achievers. The sample scoresheet in the Student Materials section suggests a record-keeping method for a group of students or an entire class, if appropriate.

The Pinball activity contains a Hall of Fame that keeps a record on the disk of the ten top scores for the activity. If a student's final score is one of the ten highest scores, the student has his or her initials and score entered into the Hall of Fame. When a student's score qualifies, a screen display appears telling the student how to enter the record into the Hall of Fame.

Students may view the Hall of Fame at the beginning or end of the Pinball activity by pressing the proper key as indicated in the index.

Teachers have the option of deleting records from the Hall of Fame. Instructions for performing this function are contained in the Disk Management section of this manual. It is recommended that in a school environment only teachers perform this function.

INTEGRATION

Pinball can be used as part of the math curriculum for any class studying basic number facts or as a drill to help students achieve the speed and accuracy necessary for moving into more advanced concepts. It can be used as a flash-card-type drill or as an incentive for performance.

The sample worksheets and suggested activities provide group exercises in basic number facts. Pinball can be integrated into art and math class activities and also into recreational activities. If desired, competitive activities are also an option. The suggested activities are discussed in the Teaching Strategies section of this manual, and the sample worksheets are part of the Student Materials section.

VI. TEACHING STRATEGIES

The strategies included in this text are for use in assisting the teacher to integrate Pinball into classroom activities. These strategies may be used to introduce Pinball to a class, to provide drill and practice on basic operations, and to provide related activities.

These strategies are intended to be samples and suggestions. Expanded activities derived from the imaginations of students and teachers are heartily encouraged as a means of stimulating and motivating students in their basic number facts practice.

PREREQUISITES

Students who know basic number facts operations can participate in the Pinball activity. The quicker a student's answer recall for operations from 0 to 10, the more successful that student will be at Pinball. In addition, the student must be able to understand the instructions that appear in the lesson and must know how to use the computer.

CLASSROOM STRATEGIES

Pinball may be assigned to individuals or introduced as a group activity.

Large Groups

The format and challenge of Pinball can be integrated into classroom activities. Timed practice drills may be part of a math class. The sample worksheets provide sets of problems which may be used in a timed practice drill. Making a record-keeping display may be integrated into an art activity. Personal or class performance records can be maintained.

Small Groups

Equal achievers may compete against one another, or students may form teams and keep track of group totals in the activity. Two or three students may form a team in which one member plays a round, the next member plays the second round, and so forth.

Individuals

Pinball may be used as a privilege or an incentive for students who complete required assignments. It may be used as a tutor for students with a special need for one-on-one drill. It may be used as a reinforcement activity where all students take turns practicing skills taught in the classroom.

SAMPLE ACTIVITY STRATEGIES

The following sample activities may be used to introduce Pinball to a class and to present the students with a challenging drill that should encourage them to answer problems as quickly as possible. These activities may be used singly or as an integrated series.

Classroom Preparation—Math Activities

Purpose:

- To introduce Pinball and to present a challenging math practice drill

Materials:

- Worksheets
- A pen or pencil for each student
- A stop watch or clock with a second hand

Activity 1—Timed Drill:

Sample Narrative: "Students, we have a new computer math activity called Pinball. It's very much like a real pinball game except that to keep each ball active, you must answer basic math problems correctly as quickly as possible. The better you do,

the more points you will get in the game. But before you play the actual computer game, we're going to have a few practice drills to make sure you're prepared to play."

"I'm going to pass out a worksheet. It will have 10 addition (or subtraction, multiplication, division, or mixed) problems on it. I want you to keep these face down on your desk until I give the signal. When I say "begin", turn the worksheet over and begin answering the problems as quickly as you can. After _____ seconds (to be determined by the teacher according to class capability, for example, 25 seconds), I will say "stop". We'll then correct the papers together to see how fast and how accurate you were."

Activity 2—Math Relay:

Sample Narrative: "Now students, we're going to divide up into teams and have a relay race with number fact problems. Each row of five students will be a team. This time I'm going to hand a worksheet face down to the last person in a row, but you all must have your pencils ready. When I say "begin", the last student in each row will answer the first two problems and then pass the worksheet to the next person in the row who will work the next two problems and so on. When the person in the front has answered the last two problems, he or she will bring

the worksheet up to my desk. The first team's worksheet on my desk is the winner. Of course, we'll have to verify that all the answers are correct first. If they are not, the next row with all the correct answers will be the winners."

Variation on Math Relay

Hand each student a separate worksheet with four or five problems on it. Give the first person in each row a pencil to be used by that row. When the first person finishes the worksheet, the pencil is passed to the next person in the row, and so on, until all the students' worksheets are complete.

CLASSROOM ART ACTIVITY

Purpose:

- To give each student a means of recording his or her scores on Pinball and to integrate the Pinball activity into an art class

Materials:

- Construction paper
- Crayons
- Scissors
- Contrasting pieces of construction paper 3/4 by 4 inches

Activity:

1. Hand out a piece of construction paper to each student.
2. Have the students design and color a pinball game on the sheet.
3. At the top of the sheet of paper, have the students cut two small vertical slits approximately 1 inch long and 3 inches apart.
4. Take the smaller piece of contrasting paper and have each student write his or her best score on it.
5. Have the students insert the smaller piece of paper into the slots to form a score board.
6. As the students improve their scores, they can remove the old score and replace it with the new one.

The teacher may want to verify the student's scores by having the students cross check one another's performance.

VII. STUDENT MATERIALS

The following section contains worksheets that can be used alone or in group activities. Also included are student record sheets.

Teachers are encouraged to copy these worksheets or to use them as models for developing their own activities. Each worksheet contains directions and space for the student's name, the date, and the student's score.

The record sheet can be posted on the bulletin board. The teacher should determine the minimum number of points for each level. An example might be 1800 points for novices, 2400 for pros, and 3000 for experts. The points can best be determined by the teacher who will know what totals to expect from the students.

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Worksheet 1

Addition Problems - Timed Drill

Name: _____ Date: _____

Directions: Answer these addition problems.

1. 3 + 5 = _____
2. 7 + 0 = _____
3. 7 + 8 = _____
4. 9 + 9 = _____
5. 4 + 1 = _____
6. 8 + 4 = _____
7. 6 + 2 = _____
8. 3 + 3 = _____
9. 9 + 4 = _____
10. 10 + 1 = _____
11. 3 + 7 = _____
12. 8 + 6 = _____

SCORE: _____

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Worksheet 2

Subtraction Problems - Timed Drill

Name: _____ Date: _____

Directions: Answer these subtraction problems.

1. 7 - 2 = _____
2. 9 - 7 = _____
3. 10 - 4 = _____
4. 17 - 9 = _____
5. 4 - 1 = _____
6. 13 - 5 = _____
7. 13 - 8 = _____
8. 18 - 9 = _____
9. 9 - 5 = _____
10. 8 - 3 = _____
11. 16 - 7 = _____
12. 7 - 6 = _____

SCORE: _____

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Worksheet 3

Multiplication Problems - Timed Drill

Name: _____ Date: _____

Directions: Answer these multiplication problems.

1. $4 \times 4 =$ _____
2. $7 \times 8 =$ _____
3. $5 \times 3 =$ _____
4. $6 \times 4 =$ _____
5. $6 \times 7 =$ _____
6. $3 \times 2 =$ _____
7. $4 \times 8 =$ _____
8. $9 \times 7 =$ _____
9. $7 \times 0 =$ _____
10. $3 \times 1 =$ _____
11. $8 \times 8 =$ _____
12. $3 \times 9 =$ _____

SCORE: _____

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Worksheet 4

Division Problems - Timed Drill

Name: _____ Date: _____

Directions: Answer these division problems.

1. $56 \div 7 =$ _____
2. $8 \div 2 =$ _____
3. $40 \div 4 =$ _____
4. $0 \div 6 =$ _____
5. $49 \div 7 =$ _____
6. $32 \div 4 =$ _____
7. $24 \div 6 =$ _____
8. $21 \div 7 =$ _____
9. $72 \div 8 =$ _____
10. $7 \div 1 =$ _____
11. $45 \div 9 =$ _____
12. $36 \div 9 =$ _____

SCORE: _____

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Worksheet 5

Mixed Problems - Timed Drill

Name: _____ Date: _____

Directions: Answer these division problems.

1. $6 \times 3 =$ _____
2. $7 - 2 =$ _____
3. $4 + 9 =$ _____
4. $17 - 8 =$ _____
5. $54 \div 6 =$ _____
6. $9 \times 5 =$ _____
7. $21 \div 3 =$ _____
8. $4 + 7 =$ _____
9. $4 \times 7 =$ _____
10. $16 - 9 =$ _____
11. $6 \times 6 =$ _____
12. $3 + 5 =$ _____

SCORE: _____

STUDENT RECORDS

PINBALL NOVICES _____ Points		
Student	Score	Date

STUDENT RECORDS

PINBALL EXPERTS _____ Points		
Student	Score	Date

STUDENT RECORDS

PINBALL PROS _____ Points		
Student	Score	Date

Permission is granted to instructors to copy and distribute this record-keeping sheet for instructional purposes only.

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VIII. ANSWER KEY

Worksheet 1:

1. 8
2. 7
3. 15
4. 18
5. 5
6. 12
7. 8
8. 6
9. 13
10. 11
11. 10
12. 14

Worksheet 2:

1. 5
2. 2
3. 6
4. 8
5. 3
6. 8
7. 5
8. 9
9. 4
10. 5
11. 9
12. 1

Worksheet 3:

1. 16
2. 56
3. 15
4. 24
5. 42
6. 6
7. 32
8. 63
9. 0
10. 3
11. 64
12. 27

Worksheet 4:

1. 8
2. 4
3. 10
4. 0
5. 7
6. 8
7. 4
8. 3
9. 9
10. 7
11. 5
12. 4

Worksheet 5:

1. 18
2. 5
3. 13
4. 9
5. 9
6. 45
7. 7
8. 11
9. 28
10. 7
11. 36
12. 8

IX. DISK MANAGEMENT

The Hall of Fame can be accessed by users. This option allows teachers to delete one or more records from the Hall of Fame.

If this manual is available to students, it is recommended that teachers remove this section to avoid inappropriate changes to the records.

At the end of a unit or a school year, the Hall of Fame can be cleared for use by a new group of students. Also, the teacher may want to selectively delete initials and scores in the event that one student is dominating the Hall of Fame or a student whose record appears in the Hall of Fame is no longer a member of the group or class using the WHOLE NUMBERS package.

The disk management option only allows deletion of records. Users will not be able to replace entries. A new entry will be allowed the next time the activity is used.

DELETING ENTRIES FROM THE HALL OF FAME

The function for deleting Hall of Fame entries is initiated by pressing the proper key as indicated in the index for the Pinball activity. When this key is

pressed, a screen display appears indicating that the disk management function is available, a password must be entered. That password is:

REPMUB

This is bumper spelled backwards.

When the password is typed correctly, it does not appear on the screen. Instead, a random number of X's appear to indicate entry.

If the correct password is entered, the teacher chooses from two options:

1. Delete one record at a time
2. Delete all records

If option 1 is selected, the Hall of Fame appears. The teacher enters the number of the record to be deleted and presses the indicated key to highlight that record for removal. If an error was made, the return key can be pressed to leave the records as they appear and allow for correction. More than one record can be highlighted for removal during this operation.

When all the records to be deleted have been highlighted, the indicated key is pressed to erase the record(s) and exit the disk management function.

Reordering of the numbers is handled by the computer.

If the option 2 is selected, the Hall of Fame appears with a message to press the proper key to erase all of the records. When the key is pressed, a second message appears asking if all the records are really to be deleted. The teacher must enter either Y (yes) or N (no) and then press the key a second time to complete deletion. The Hall of Fame will then be cleared of all records. The exit key is pressed to return the title page display to the screen.

INFORMATION ON ADDITIONAL PRODUCTS

BASIC NUMBER FACTS

Practice in basic numbers including addition without carrying, subtraction without borrowing, and multiplication/division with single digits. A "Speedway" format allows children to "race" against time to build up their speed in these math areas. Designed for elementary students or any student requiring practice with basic whole number operations.

FRACTIONS

Practice locating fractions on a number line. Students are challenged to "burst" balloons by "throwing" darts at the correct location on the number line. Balloons may be burst in any order, on a trial-and-error basis, until none are left. The exercise may be carried out with or without negative numbers. The difficulty adjusts to the student's performance. Designed for elementary math students.

DECIMALS

Practice locating decimal numbers on the number line. Children are challenged to "burst" balloons by "throwing" darts at the correct location on the number line. Numbers are entered on a trial-and-error basis. Difficulty adjusts to the student's performance. Designed for elementary math students.

FRENCH VOCABULARY BUILDER

Students are given a basic vocabulary of 500 words including useful verbs, number words, words commonly used in traveling, shopping, in restaurants, or in the home. The format of either "hangperson" or "pyramid building" in structured groups of related words provides students with context and similarity clues to help them increase their proficiency. Designed to supplement introductory-level and refresher courses.

SPANISH VOCABULARY BUILDER

Students are given a basic vocabulary of 500 words including useful verbs, number words, words commonly used in traveling, shopping, in restaurants, or in the home. The format of either

"hangperson" or "pyramid building" in structured groups of related words provides students with context and similarity clues to help them increase their proficiency. Designed to supplement introductory-level and refresher courses.

GERMAN VOCABULARY BUILDER

Students are given a basic vocabulary of 500 words including useful verbs, number words, words commonly used in traveling, shopping, in restaurants, or in the home. The format of either "hangperson" or "pyramid building" in structured groups of related words provides students with context and similarity clues to help them increase their proficiency. Designed to supplement introductory-level and refresher courses.

COMPUTER LITERACY-INTRODUCTION

This lesson is a foundation for a full curriculum in computer literacy or simple programming. It gives a brief introduction to the history, uses, and issues surrounding computers in today's society presented in a friendly, nonintimidating manner with touches of humor and simple supportive graphics. Designed for junior or senior high and vocational school students.

PHYSICS - ELEMENTARY MECHANICS

This is a problem-solving lesson in the elementary mechanics of physics. Students are shown a physical problem and an initial budget of $25. They must "purchase" missing pieces of information required to answer the problem correctly. Once enough information is gathered, the student calculates the answer. The objective is to request the least amount of necessary information to understand the problem, thus "spending" the least amount of money. The emphasis is on understanding the problem, rather than just supplying the correct answers. Designed for senior high physics students.

These lessons have been designed for use by students at specific grade levels, but you don't have to be a student to enjoy these lessons as refresher exercises, skill building tools, or recreation.

NOTES

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