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IDENTIFIERS *PLATO; Programmed Logic for Automatic Teaching Operations

ABSTRACT

This catalog presents brief descriptions of all lessons developed by the PLATO project for community colleges and adult education. One hundred six lessons are available for computer-based use. Topics range from elementary arithmetic to function theory and trigonometry. For each of these lessons, this catalog presents the title, code name, author, and a description of the lesson. Lesson descriptions include notations of grade and subject area, amount of student time and computer space needed, a statement of the lesson objectives, and a delineation of the lesson sequence. For most lessons, sample computer displays are pictured. Three programs which allow students to comment upon lessons and teachers to gain information concerning student progress are also provided. (SD)

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# CATALOGUE OF

# PLATO MATHEMATICS LESSONS

## for Community Colleges

## and Adult Education

compiled by

Louis V. DiBello
Tamar Abeliovich Weaver
Keith Bailey

Community College Mathematics Group

November 1975

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ACKNOWLEDGEMENTS

We thank R. T. Gladin, photographer, Coordinated Sciences Laboratory, and W. Wilson, graphic specialist, Computer-based Education Research Laboratory, for their help in the preparation of this catalogue.

We offer special thanks to Sibyl Pellum, typist, for her competence and patience in general, and for the fine work she has done on this catalogue.

We also wish to thank the individual lesson authors who provided written descriptions of their lessons.

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# INTRODUCTION

## The Community College Mathematics Project

It would take many pages to mention each person who has been involved in the development and implementation of the PLATO Community College Mathematics courseware. In most cases, the initial authoring of a PLATO lesson has been followed by cooperative review procedures involving instructors and PLATO staff, and by the collection and analysis of usage and lesson data. Special recognition is due to the following persons who have served as lesson authors, programmers and/or reviewers:

| | |
|---|---|
| Peter Ash | Kennedy-King College, Chicago |
| Dan Anderson | Parkland College, Champaign |
| Keith Bailey | CERL, Urbana |
| Robert Baillie | CERL, Urbana |
| Dick Bennett | Parkland College, Champaign |
| James Bowery | Regional Health Resource Center, Urbana |
| Rose Brown | Kennedy-King College, Chicago |
| Steve Brayndick | Malcolm X College, Chicago |
| Donald Cohen | CERL, Urbana |
| Ruth Chabay | CERL, Urbana |
| Louis DiBello | CERL, Urbana |
| Sharon Dugdale | CERL, Urbana |
| Jerry Glynn | CERL, Urbana |
| Frances Kennedy | CERL, Urbana |
| David Kibbey | CERL, Urbana |
| David Lassner | CERL, Urbana |
| Ben Lathan | Kennedy-King College, Chicago |
| Errol Magidson | Kennedy-King College, Chicago |
| LaVerne McFadden | Parkland College, Champaign |
| Allan Meers | Wright College, Chicago |
| Richard Neapolitan | Wright College, Chicago |
| Gary Peltz | Malcolm X College, Chicago |
| Carrol Steve Robinson | Chicago Urban Skills Institute, Chicago |
| Shin Saito | Malcolm X College, Chicago |
| Bonnie A. Seiler | CERL, Urbana |
| Noa Shinderman | Malcolm X College, Chicago |
| Donald Shirer | Valparaiso University, Valparaiso, IN |
| Martin Siegel | CERL, Urbana |
| Dan Sleator | CERL, Urbana |
| Paul Thompson | Parkland College, Champaign |
| Charles Weaver | CERL, Urbana |
| Tamar A. Weaver | CERL, Urbana |
| Mitsuru Yamada | Malcolm X College, Chicago |

This project is part of the Community College Project directed by Daniel Alpert and coordinated by Pauline Jordan. It is the responsibility of the Community College Mathematics Group at CERL, Urbana, under the direction of Louis V. DiBello, to coordinate the development and implementation of the courseware, to collect and interpret formative data on the lessons,

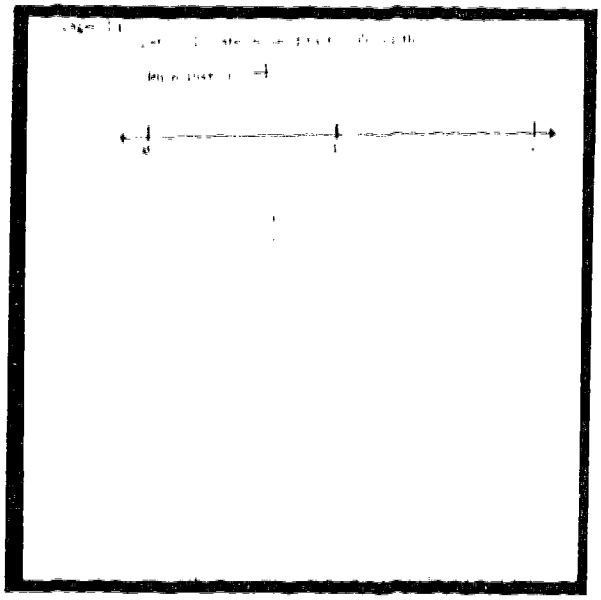
and to keep the individual authors informed of the results of the data analyses. It is the responsibility of the individual authors to make needed revisions, to keep the lessons in working order, and to provide for the collection of data in their lessons. Usage of the mathematics lessons is facilitated by the PLATO site coordinators, Errol Magidson of Kennedy-King College, Mitsuru Yamada of Malcolm X College, Richard Neapolitan of Wright College, Elise Spencer Gorun and Carroll Steve Robinson of the Chicago Urban Skills Institute and Robert Grandey of Parkland College.

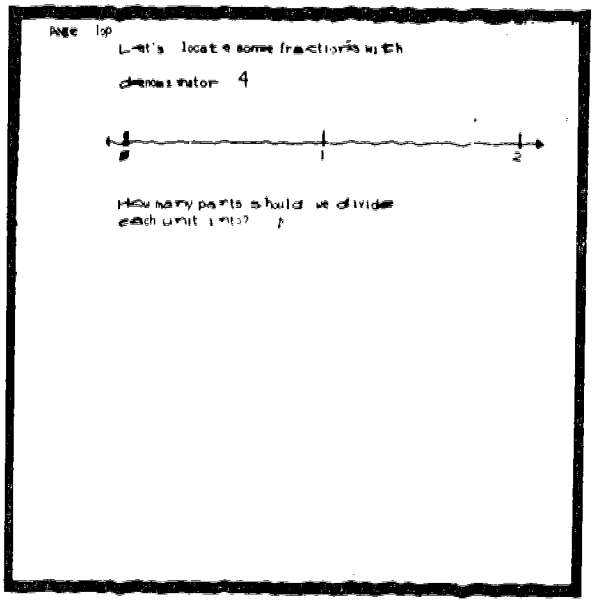
## This Catalogue

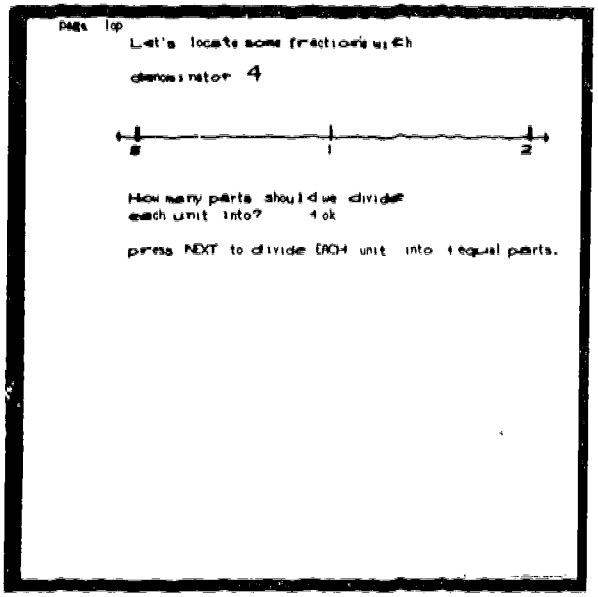
This catalogue contains short descriptions of the PLATO lessons that are available under the Community College Mathematics Project. It should serve instructors as a guide for incorporating PLATO courseware into their teaching activities. On-line access to these lessons is available through the PLATO lesson "mathcc", which provides an updated index to all community college mathematics lessons, as well as an indication of their current status.

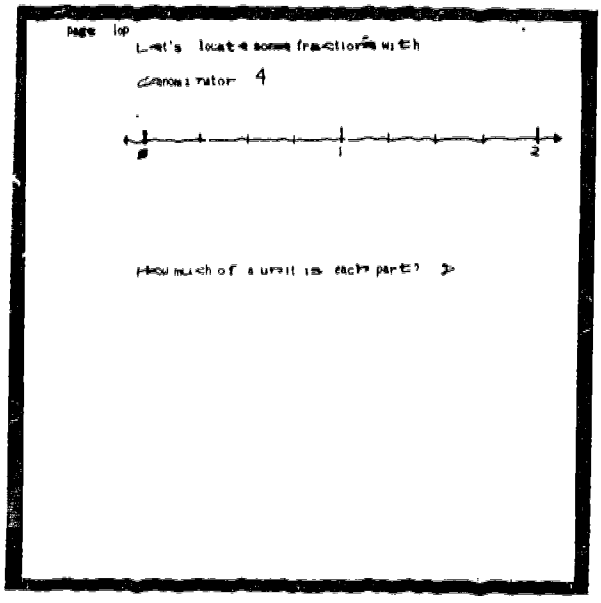
In an attempt to provide a clearer idea of what these PLATO lessons are, we have included photographs of varian prints of selected screen displays. In many cases, screen displays in PLATO lessons are built up in a sequence of steps. New text or graphic parts of a display are often added after the student has responded to a question or otherwise indicated he is ready to proceed. To illustrate this process, and to show some of the interactive capabilities of the PLATO system, we have selected one frame from the fraction lesson "rfrac". Each stage in the development of the final screen display has been varian printed and photographed below. The reader should keep in mind that the varian prints presented in the body of this catalogue usually represent an intermediate stage in the dynamic development of the screen displays.

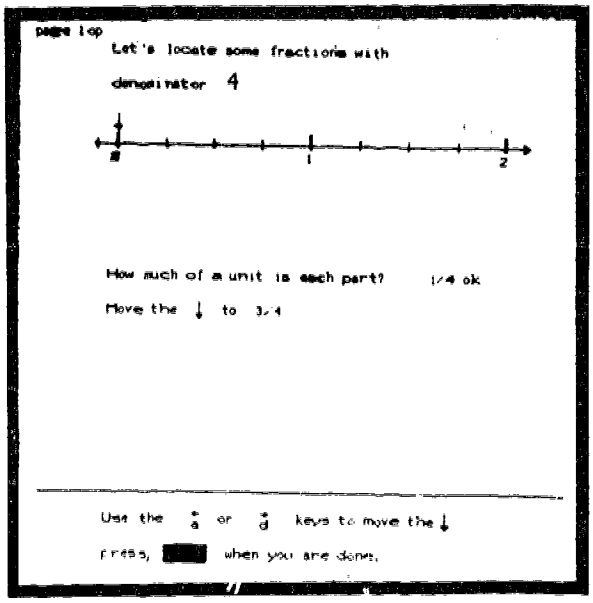
The varian prints below and on the next page show the steps involved in one exercise activity in the fraction lesson "rfrac". In the first four steps, the student's attention is directed to the correspondence between the denominator and the way in which the number line is divided.



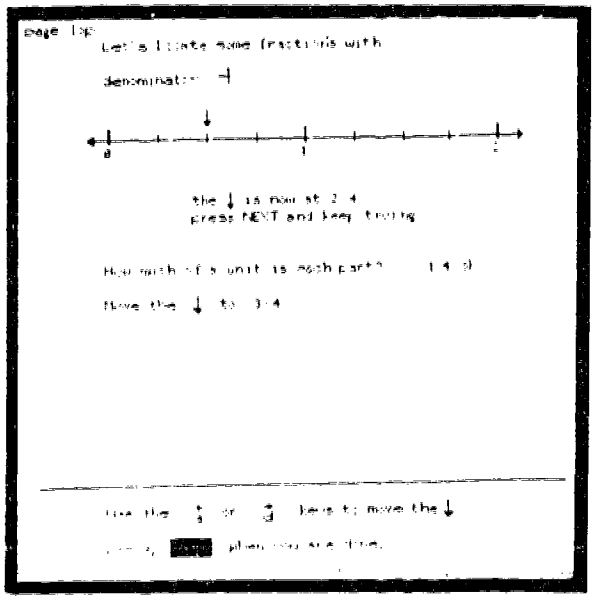


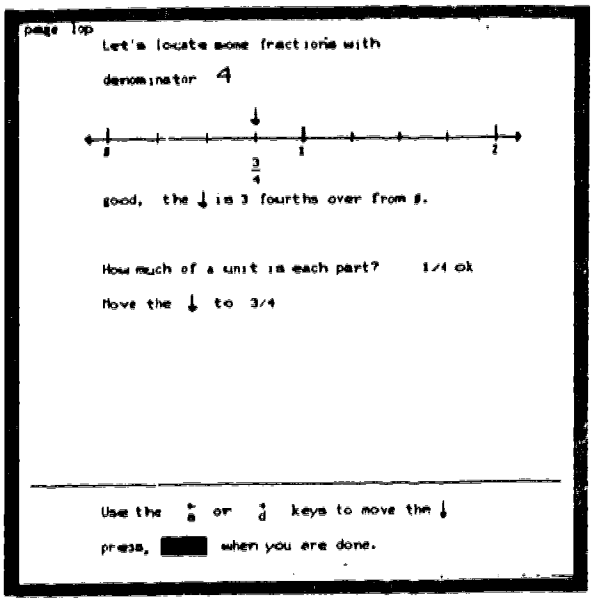






Now the student is asked to move a pointer to 3/4. (Instructions are given at the bottom of the page.)




When the student has moved the pointer and pressed LAB, he is given the current location of the pointer. Here, the pointer is at 2/4 instead of 3/4 so he must try again.

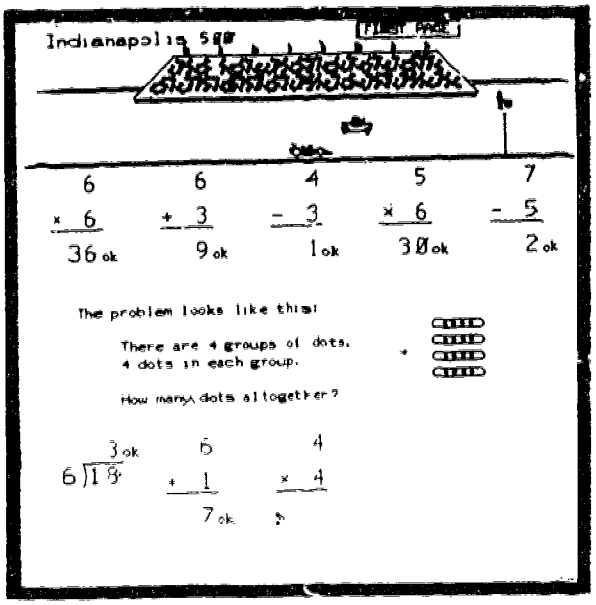


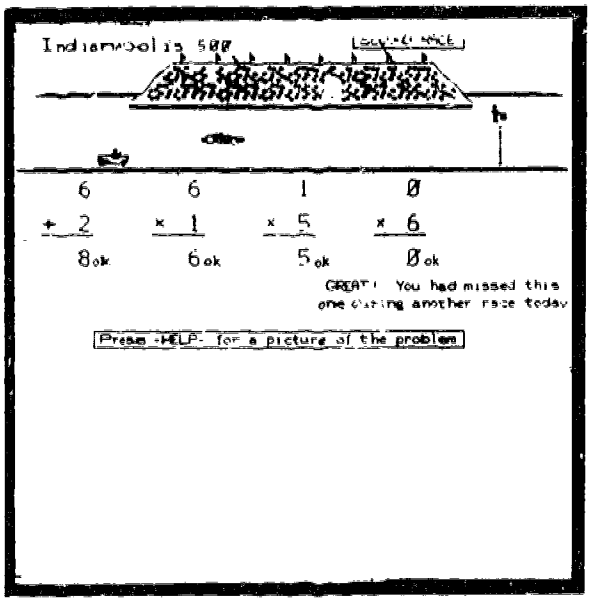

Now the pointer was correctly moved to 3/4. The point was then labeled. Next, the student would be asked to move the pointer to another fraction with denominator 4.

LESSON DESCRIPTIONS

File Name: speedway
Speedway

Author: Bonnie Anderson Seiler, Elementary Math Group, CERL




Objective:
Student quickly and accurately answers one-digit addition, subtraction, multiplication, and division problems.

Description:
1. Game format. The student works ten problems (for each "race") and wins if he beats his previous time.
2. Missed problems are repeated and difficulty level is adjusted according to performance.

Grade Level: Basic mathematics

Student Time: open

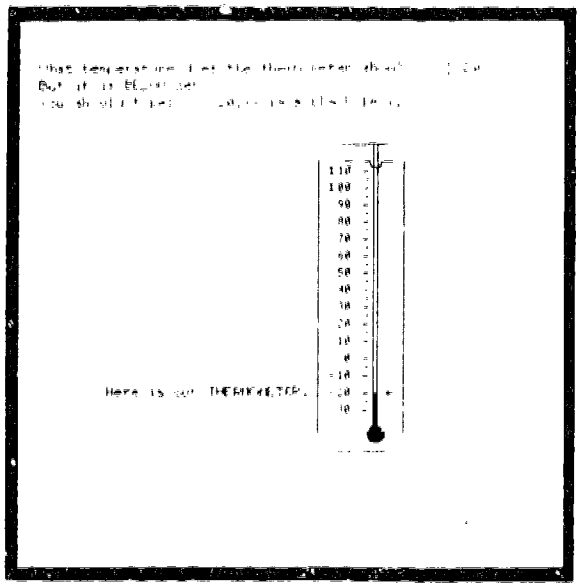
Subject Area: Arithmetic

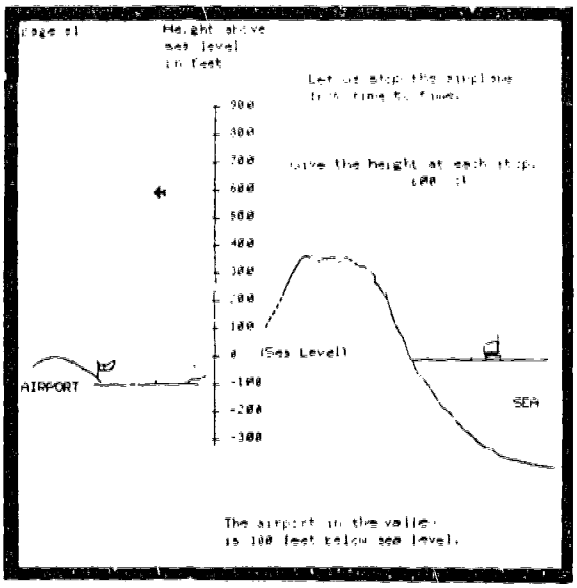
ecs: 6020

Special Notes:
The student is provided graphs and charts of his performance which he can use to decide where he needs more practice.

File Name: signex
Introduction -- Thermometer, Sea Level

Author: Tamar Abeliovich Weaver, CERL






Objective:

1. To present a quick and easy introduction to the number line and signed numbers by using temperature and sea level.

Description:

1. A pretest gives the student the chance to skip all or part of the lesson.
2. There are two sections: 1) temperature and 2) sea level. In each section the student sees a number scale (a thermometer in section 1 and a sea level scale in section 2) and answers several easy questions on reading scale values and differences between scale values.

Grade Level: Basic mathematics

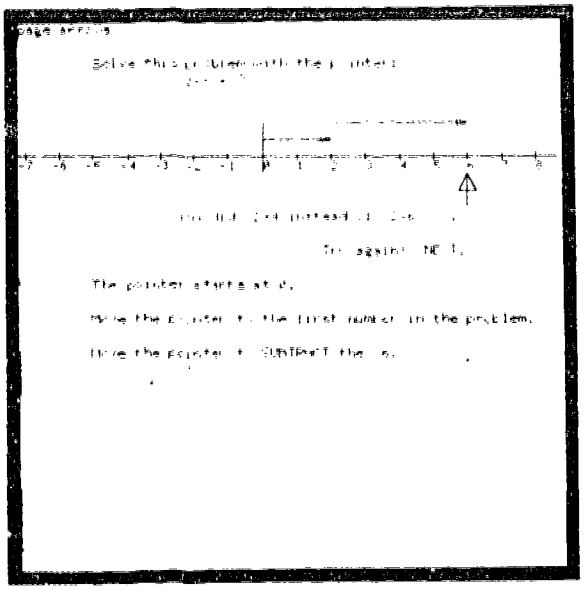
Student Time: 5 - 10 minutes

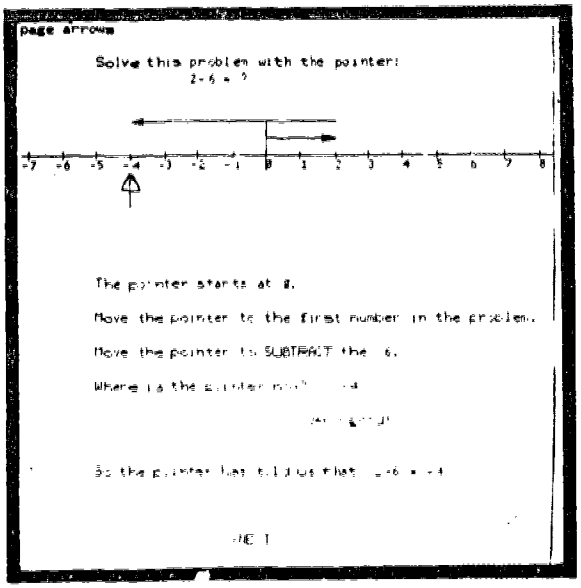
Subject Area: Arithmetic

ecs: 1880

File Name: signum
Adding and Subtracting on the Number Line

Author: Tamar Abeliovich Weaver, CERL






Objectives:
1. To introduce the number line and the negative numbers.
2. To teach order on the number line.
3. To teach a number line model of adding and subtracting signed numbers.
4. To present practice problems on adding and subtracting signed numbers.

Description:
1. A pretest lets the student skip all or part of the lesson.
2. After a short introduction to the number line, the student is taught to move a pointer along the number line. The negative numbers are introduced as points that are integral distances to the left of 0.
3. Order on the number line is introduced (as -2 > -5).
4. Then the student is taught a number line model of adding and subtracting signed numbers. This arithmetic model is used to introduce each new type of signed number problem. Once each type is introduced, the student is given problems of that type until he can answer them correctly without help. The help consists of either stepping the student through with the number line model, or presenting a diagram of the problem on the number line.

Grade Level: Basic mathematics

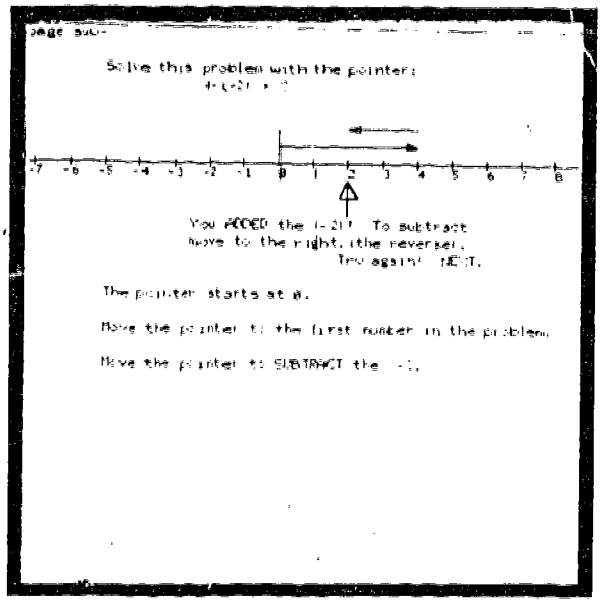
Student Time: 45 minutes

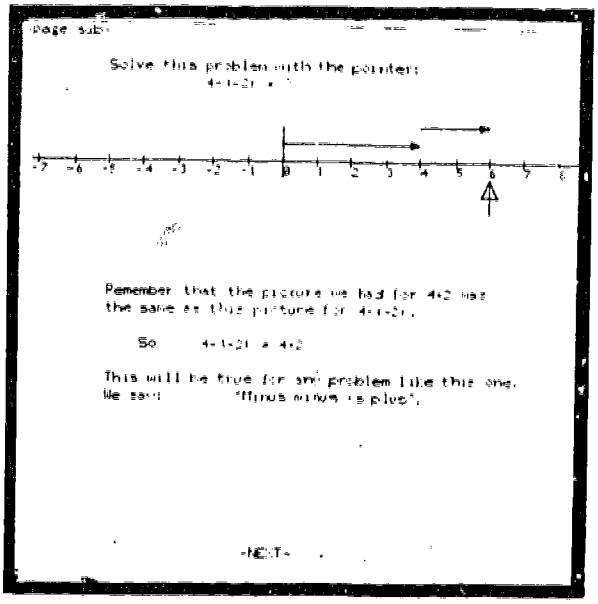
Subject Area: Arithmetic

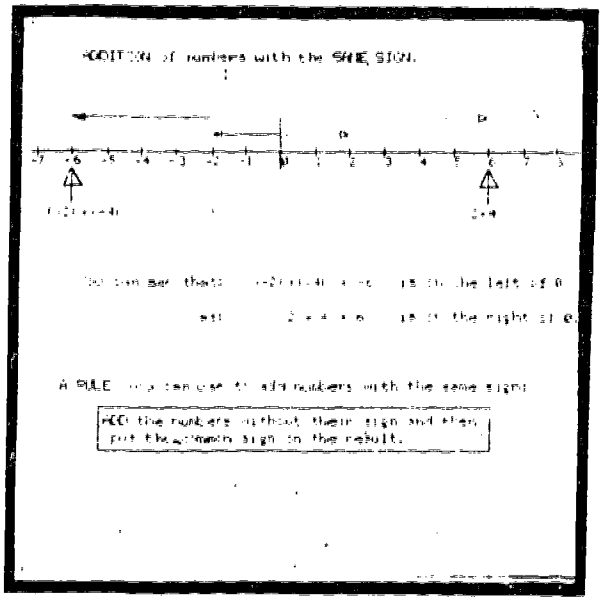
ecs: 5787

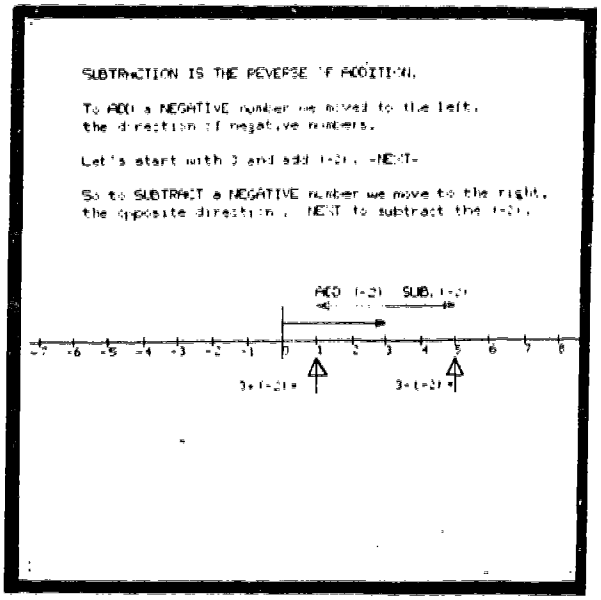
File Name: signum
Adding and Subtracting on the Number Line

Author: Tamar Abeliovich Weaver, CERL



File Name: signadd
Addition of Signed Numbers

Author: Tamar Abeliovich Weaver, CERL

Objectives:
1. To introduce the number line and the negative numbers.
2. To teach order on the number line.
3. To teach a number line model of adding signed numbers.
4. To present practice problems on adding signed numbers.

Description:
1. A pretest lets the student skip all or part of the lesson.
2. After a short introduction to the number line, the student is taught to move a pointer along the number line. The negative numbers are introduced as points that are integral distances to the left of Ø.
3. Order on the number line is introduced (as $-2 > -5$).
4. Then the student is taught a number line model of adding signed numbers. This arithmetic model is used to introduce each new type of signed number problem. Once each type is introduced, the student is given problems of that type until he can answer them correctly without help. The help consists of either stepping the student through with the number line model, or presenting a diagram of the problem on the number line.

Grade Level: Basic mathematics
Student Time: 35 minutes

Subject Area: Arithmetic
ecs: 5880

Special Notes:
1. This lesson contains the parts of lesson "signum" that involve addition.
2. The sequence of lessons "signadd" and "signsub" is equivalent to lesson "signum", but the order of presentation of the topics is different.
3. Refer to the description of lesson "signum" for several screen displays that also occur in lesson "signadd".

File Name: signsub
Subtracting Signed Numbers

Author: Tamar Abeliovich Weaver, CERL

Objectives:
1. To teach a number line model of subtracting signed numbers.
2. To present practice subtracting and adding signed numbers.

Description:
1. A pretest lets the student skip all or part of the lesson.
2. The student is taught a number line model of subtracting signed numbers. The student gets exercises until he can do them without any help.
3. The help consists of either stepping the student through with the number line model, or presenting a diagram of the problem on the number line.

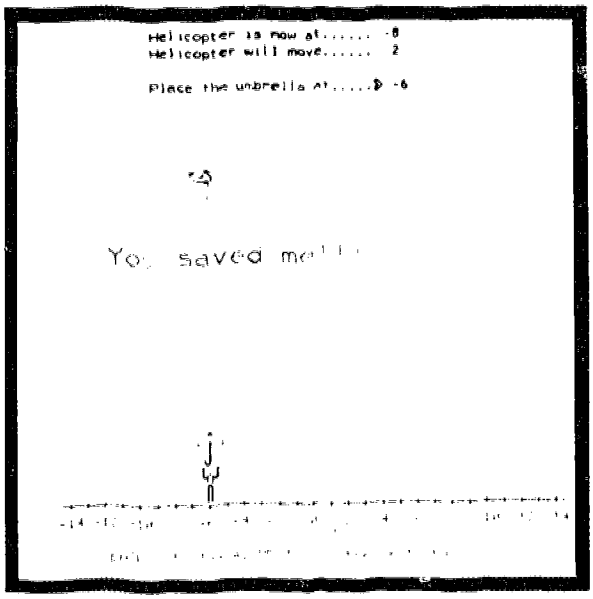
Grade Level: Basic mathematics
Student Time: 25 minutes

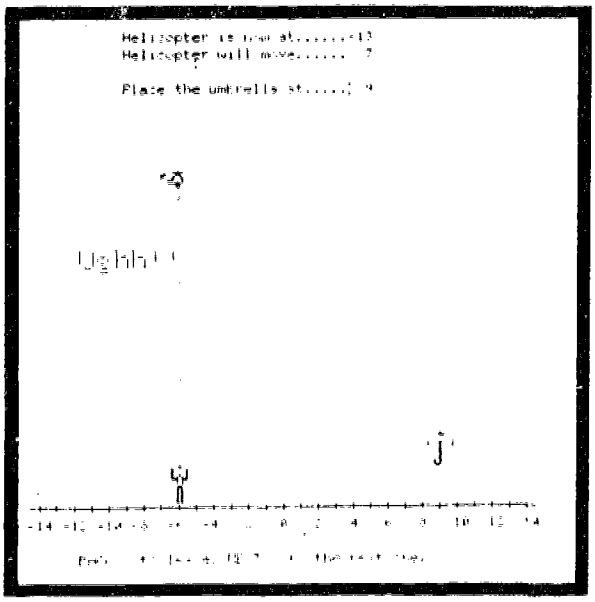
Subject Area: Arithmetic
ecs: 4800

Special Notes:
1. This lesson should be preceeded by lesson "signadd".
2. The sequence of lessons "signadd" and "signsub" is equivalent to lesson "signum", but the order of presentation of the topics is different.
3. Refer to the description of lesson "signum" for several screen displays that also occur in lesson "signsub".

File Name: ccegg
Eggdropper

Author: Mitsuru Yamada, Malcolm X College




Objective:
To provide practice in addition and subtraction of signed numbers.

Description:
The student specifies a move for a helicopter along the number line, or specifies the location of an umbrella on the number line. In both cases the helicopter drops an egg. Its target is a man on the number line.

Grade Level: Basic mathematics

Student Time: 5 - 10 minutes

Subject Area: Arithmetic

ecs: 742

File Name: signprac
Exercises -- Adding and Subtracting

Author: Tamar Abeliovich Weaver, CERL

Objective:

To provide drill practice in adding and subtracting signed numbers and a posttest for these skills.

Description:

1. Randomly generated problems in adding and subtracting signed numbers are given. The student must answer seven in a row correctly on first or second try. For help, the number line model prepared in lesson "signum" is used when the student calls for it.
2. A drill with "eggdropper" on the number line involves adding and subtracting signed numbers.
3. To finish the lesson the student has to go through a posttest for adding and subtracting signed numbers.
4. The student can choose any of the three sections in any order, and as often as he likes.

Grade Level: Basic mathematics

Student Time: 30 minutes

Subject Area: Arithmetic

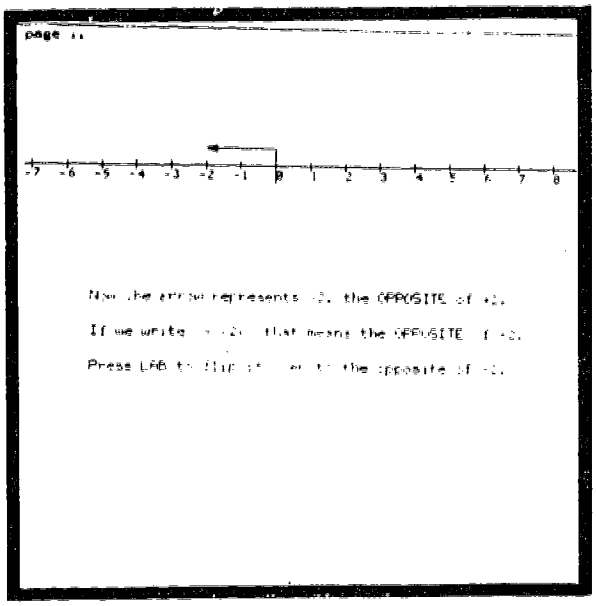
ecs: 3923

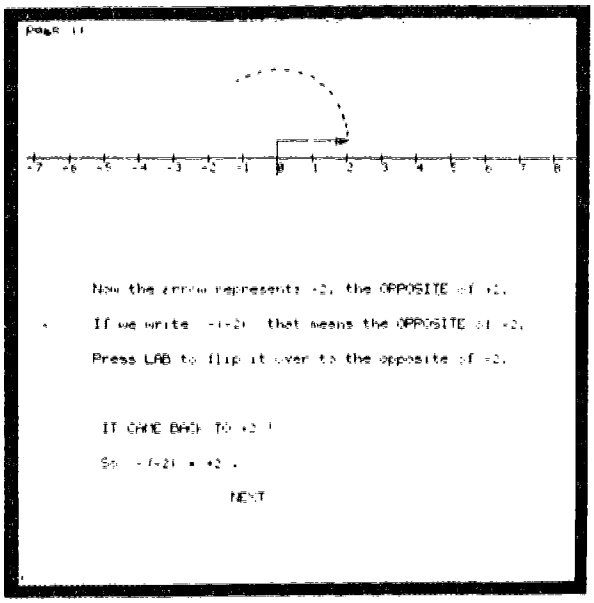
Special Notes:

This lesson should be used after lesson "signum".

File Name: signmult
Double Signs (Flipping) and Multiplication (Patterns)

Author: Tamar Abeliovich Weaver, CERL






Objectives:
1. To provide a concrete visual model for getting rid of double signs.
2. To provide a simple introduction to the rules for multiplying signed numbers.

Description:
There are two sections:

a. Flipping: The student is given an arrow on the number line that represents a signed number. He can press LAB to flip the arrow about the origin and he is taught that this represents minus the original signed number. By using this flipping model the student is required to answer questions like -(+3) = ? and -(-2) = ?, etc.

b. Patterns: The student fills in the answers to:

| | | |
|---|---|---|
| 2 × 2 = | | 2 × (-2) = |
| 1 × 2 = | | 1 × (-2) = |
| 0 × 2 = | and then | 0 × (-2) = |
| (-1) × 2 = | | (-1) × (-2) = |
| (-2) × 2 = | | (-2) × (-2) = |

These patterns provide an easy introduction to the rules (negative) × (positive) = (negative) and (negative) × (negative) = (positive).

Grade Level: Basic mathematics

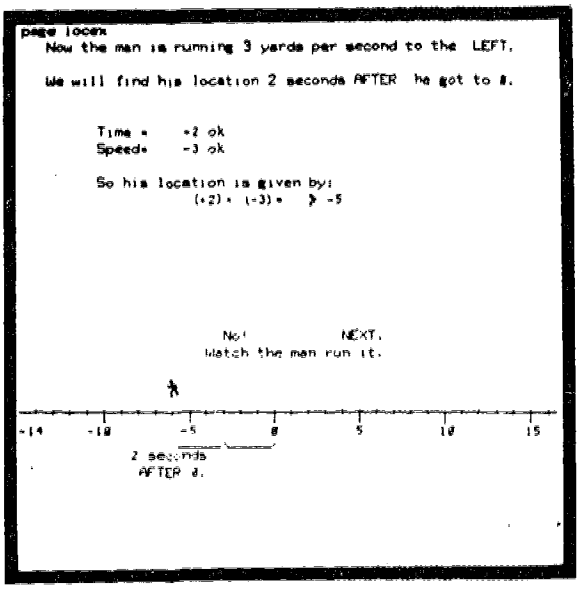
Student Time: 15 minutes

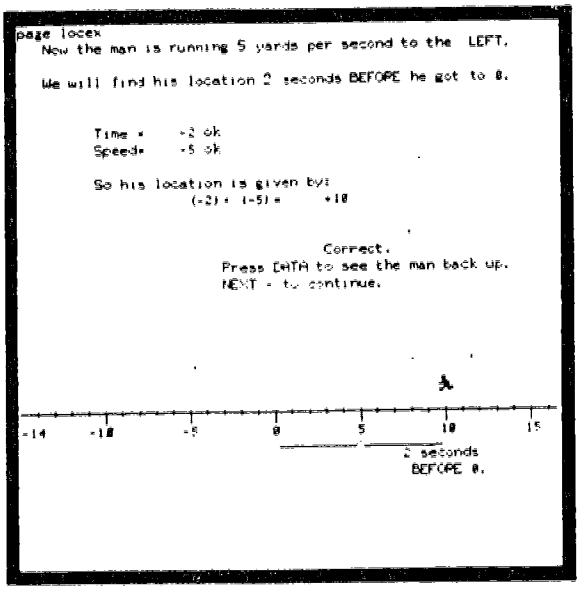
Subject Area: Arithmetic

ecs: 2370

File Name: run
Multiplication (using the running man)

Author: Tamar Abeliovich Weaver, CERL




Objective:

1. To teach multiplication of signed numbers by using a concrete visual model.

Description:

1. A pretest lets the student skip parts of the lesson.
2. A model of a man running along the number line is used to teach multiplication of signed numbers. His speed is positive or negative according to whether he runs to the right or left; his time is positive or negative according to whether it is after or before 0, and his position is interpreted as the product of speed and time.
3. Once the multiplication problems are introduced by using this model, more problems are presented without the model, and the model is used for help if the student needs it. The student works problems of each type until he can answer without asking for help.

Grade Level: Basic mathematics

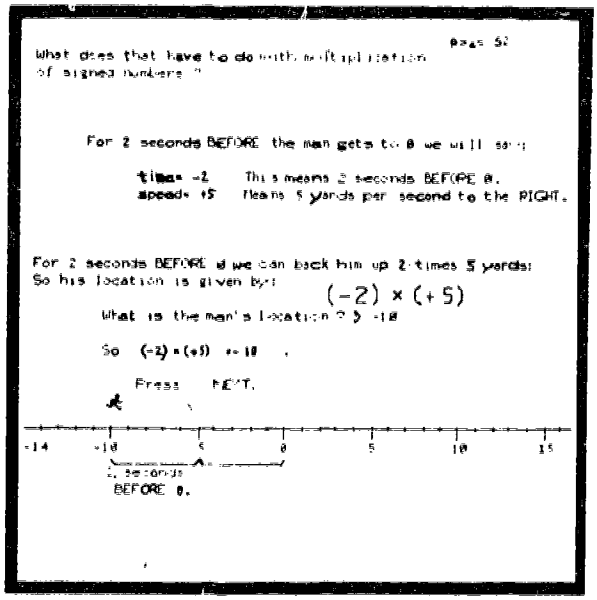
Student Time: 45 minutes

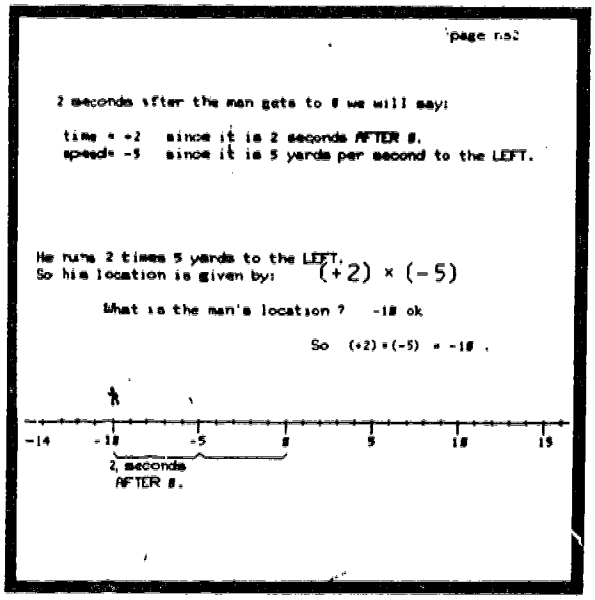
Subject Area: Arithmetic

ecs: 4677

File Name: run
Multiplication (using the running man)

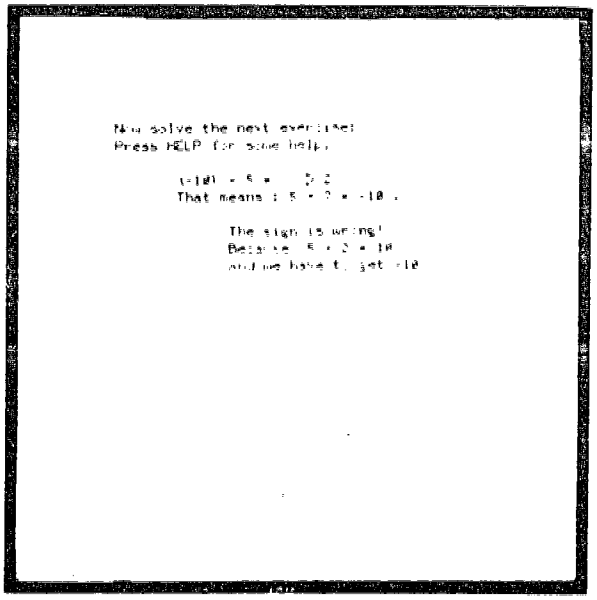
Author: Tamar Abeliovich Weaver, CERL

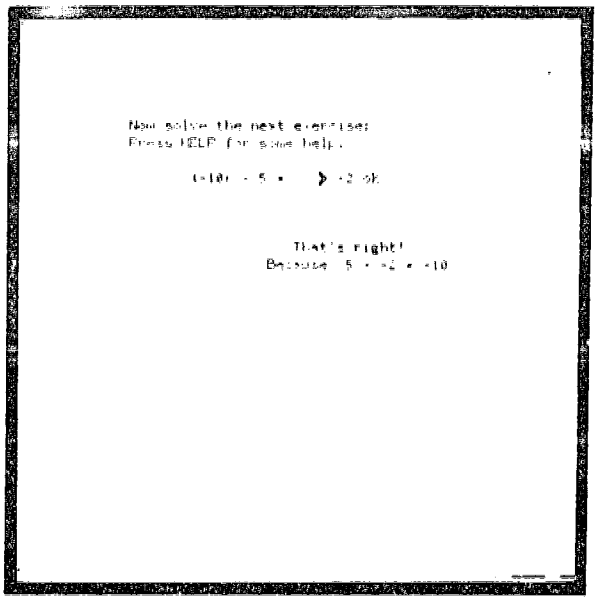


File Name: divide
Division of Signed Numbers

Author: Tamar Abeliovich Weaver, CERL




Objective:

To present an introduction and practice on division of signed numbers.

Description:

1. Division is introduced as the inverse operation of multiplication, and multiplication is used as a check.
2. Sign rules for division are given as the same as those for multiplication.
3. As a help sequence, the student is sent to the section of lesson "run" that provides practice in finding the factors that yield a given product.

Grade Level: Basic mathematics

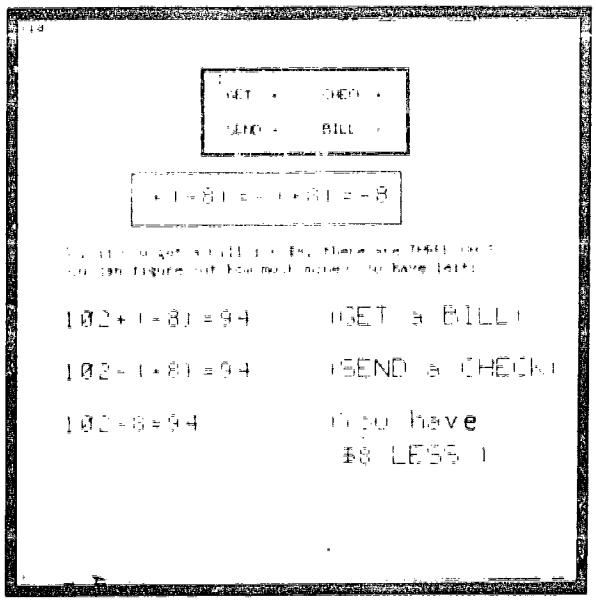
Student Time: 10 minutes

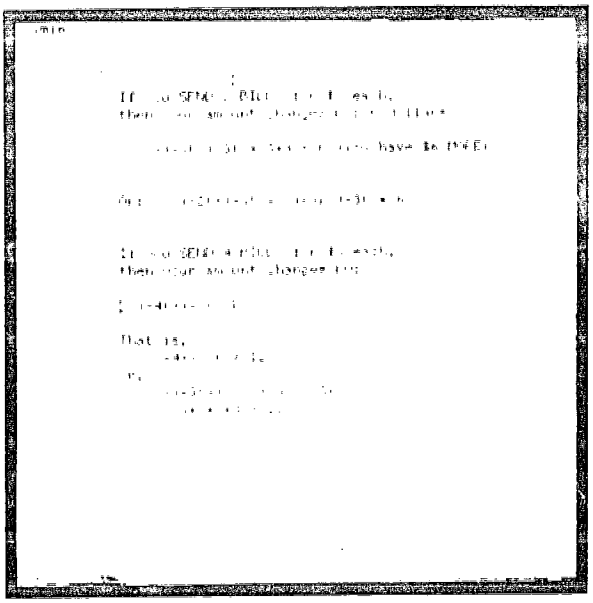
Subject Area: Arithmetic

ecs: 580

File Name: bank (jumps out to bank2)
Addition, Subtraction, and Multiplication of Signed Numbers.

Authors: Donald Cohen and Jerry Glynn, Elementary Math Group, CERL
modified by Tamar Abeliovich Weaver and Robert Baillie, CERL



Objective:
To teach arithmetic of signed numbers and provide practice in adding and multiplying signed numbers.

Description:
1. There are five sections:
   a. Introduction -- checks and bills
   b. Adding signed numbers
   c. Addition exercises
   d. Multiplying signed numbers
   e. Multiplication exercises
2. In these lessons signed number arithmetic is modeled by sending or receiving checks or bills.
3. In sections b and d each arithmetic problem is associated with a story problem involving checks and bills.
4. In sections c and e a sequence of arithmetic problems without the money stories is given.

Grade Level: Basic mathematics

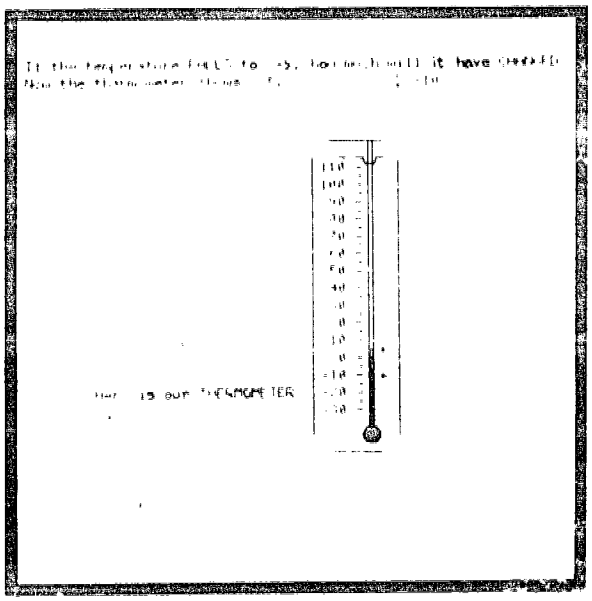
Student Time: 60 minutes

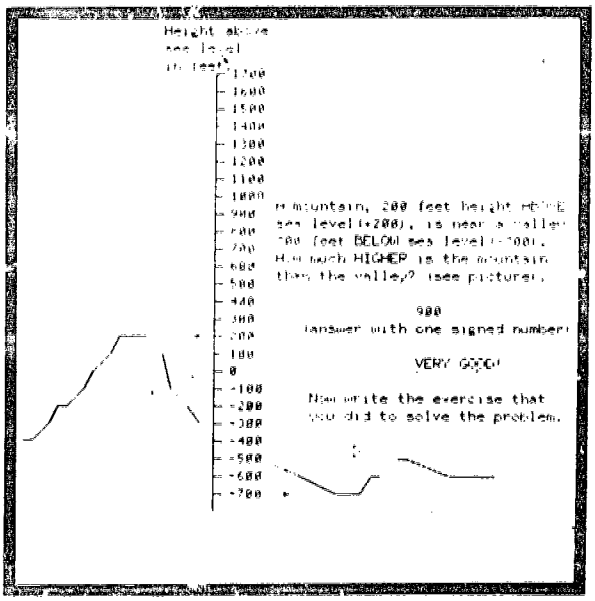
Subject Area: Arithmetic

ecs: bank 3481
bank2 1990

File Name: wordp
Signed Number Word Problems on Temperature and Sea Level

Author: Tamar Abeliovich Weaver, CERI






Objective:
To practice word problems involving subtraction of signed numbers.

Description:
1. There are two types of problems:
   a. Temperature Changes
   b. Sea Level Differences
2. The student sees the picture of the problem and as feedback he sees what his response looks like.

Grade Level: Basic mathematics

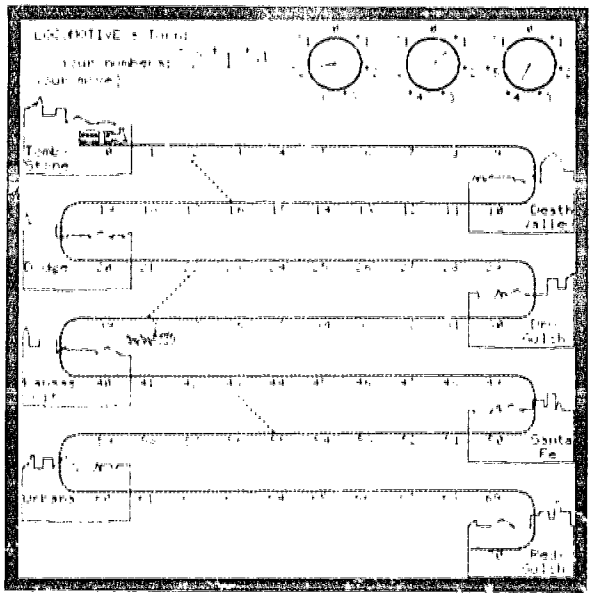
Student Time: 15 minutes

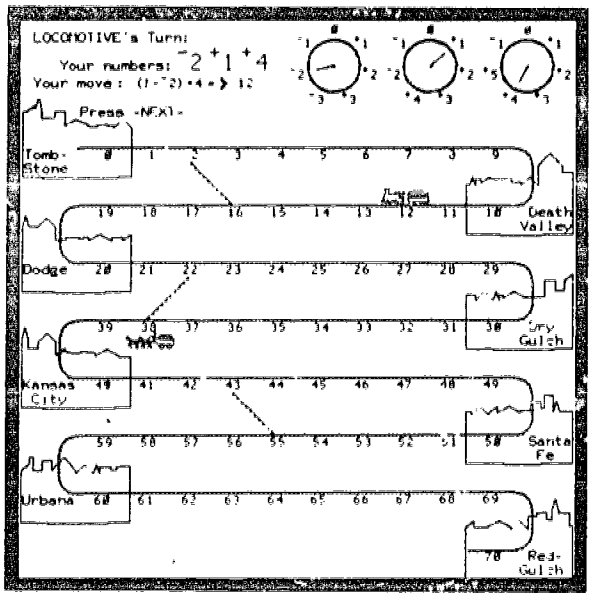
Subject Area: Arithmetic

ecs: 1736

File Name: west2
Signed Numbers Game -- West

Author: Bonnie Anderson Seiler, CERL Elementary Math Group






Objective:

To provide practice in a game format in combining signed numbers by using the four arithmetic operations with or without parentheses.

Description:

1. The game consists of a race between a stage coach and a locomotive. The student plays against another student or against PLATO.
2. Moves are made by combining three signed numbers using the four arithmetic operations.

Grade Level: Basic mathematics

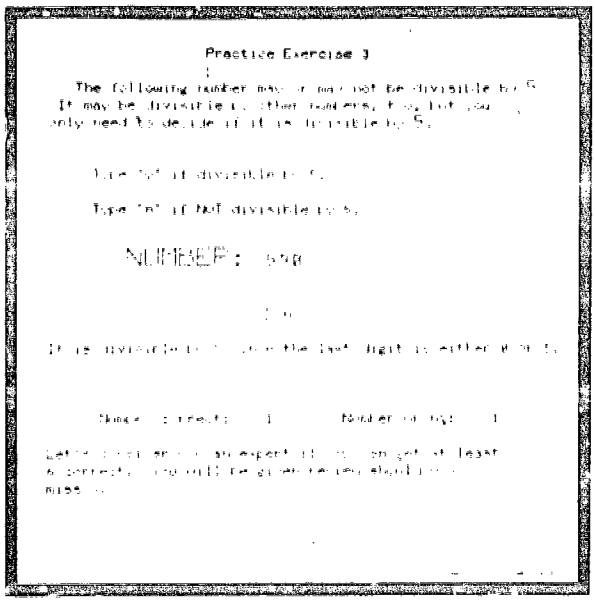
Student Time: 15 minutes

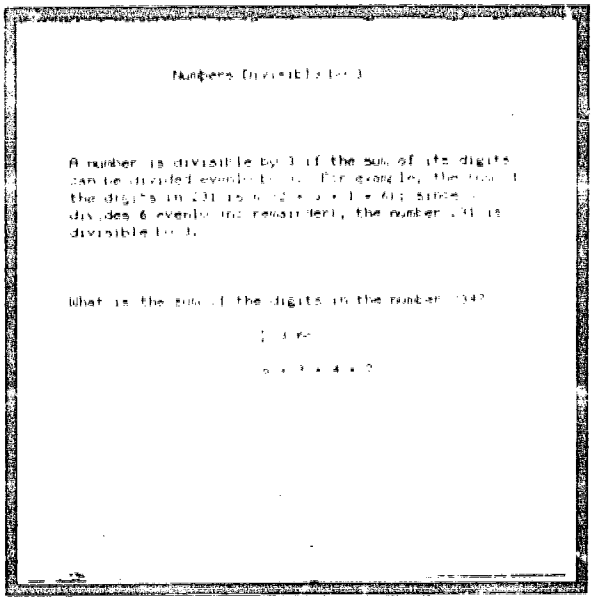
Subject Area: Arithmetic

ecs: 5700

File Name: divr
Divisibility Rules/Reducing Fractions

Author: Errol Magidson, Kennedy-King College




Objectives:

1. To teach the student the rules for divisibility by 2, 3, 5, 10, 4, 6, 9 and to drill the student in their use.
2. To teach the student to use these divisibility rules in reducing fractions.

Description:

There are eight sections:

a. Numbers divisible by 2
b. Numbers divisible by 3
c. Numbers divisible by 5
d. Numbers divisible by 10
e. Reducing fractions quickly
f. Numbers divisible by 4
g. Numbers divisible by 6
h. Numbers divisible by 9

Grade Level: Basic mathematics

Student Time: 60 minutes

Subject Area: Arithmetic

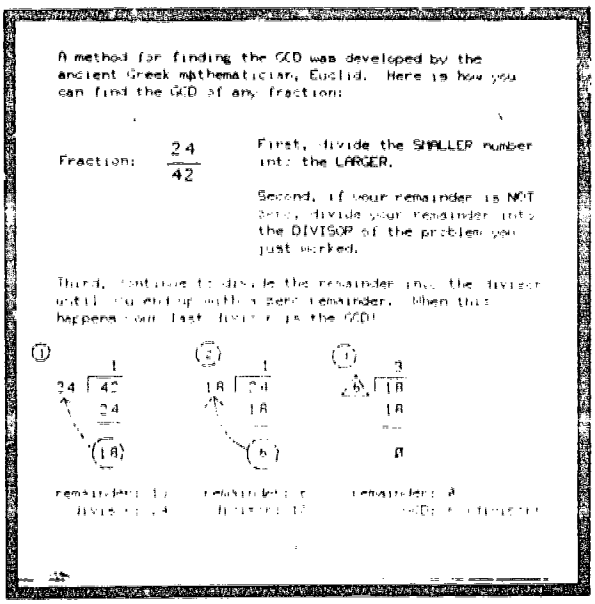
ecs: 4118

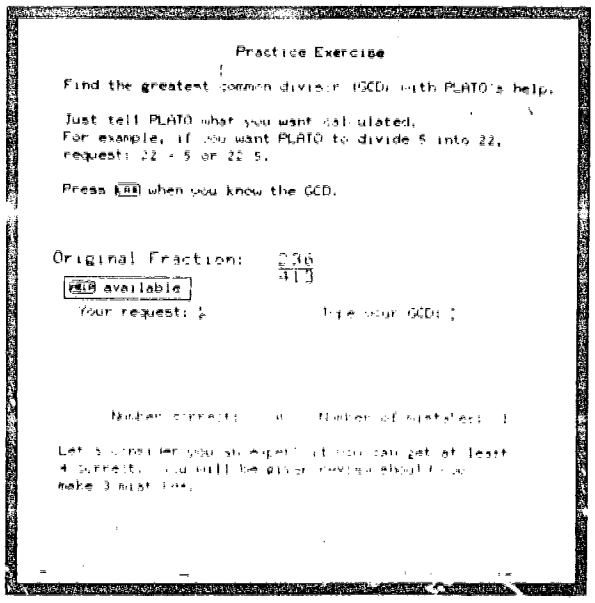
Special Notes:

Optional topic: Finding the Greatest Common Divisor

File Name: gcd
Finding the Greatest Common Divisor

Author: Errol Magidson, Kennedy-King College




Objective:
The student will be able to find the greatest common divisor of any fraction so he can reduce it when possible.

Description:
1. Introduction
2. PLATO reduces student-constructed fractions
3. Practice exercise/test

Grade Level: Basic mathematics

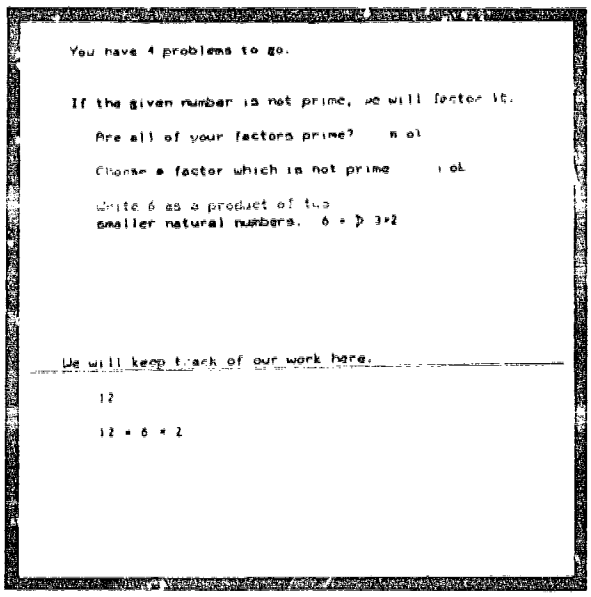
Student Time: 60 minutes

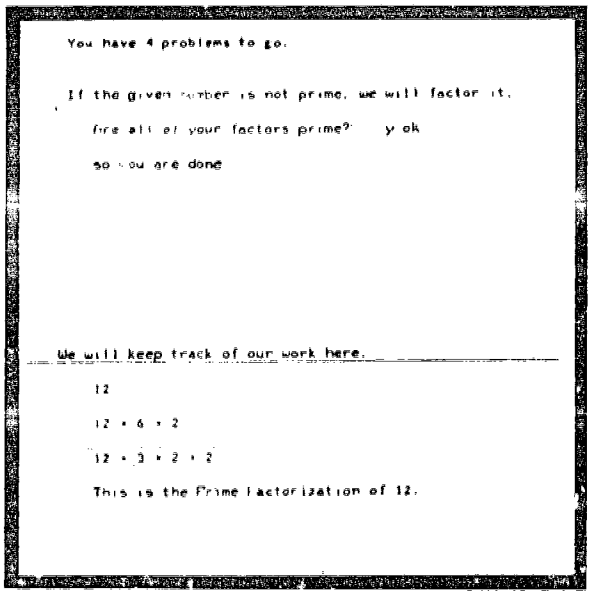
Subject Area: Arithmetic

ecs: 2141

File Name: primefac
Prime Factorization of Whole Numbers

Author: Keith Bailey, CERL




Objective:

To teach how to find the prime factorization of natural numbers and to teach the definition of prime numbers.

Description:

1. (section a) Definition of factor with exercises.
2. (section b) Definition of prime.
3. (section c) The student is stepped through the process of finding prime factorizations.
4. (section d) The student is asked to give the prime factorization and can use several steps.
5. (section e) Quiz over the above topics. The student must pass this quiz to complete the lesson.
6. (section f) The student can choose any natural number from 2 to 10,000 and the prime factorization will be given to him.

Grade Level: Elementary algebra

Student Time: 35 minutes

Subject Area: Algebra

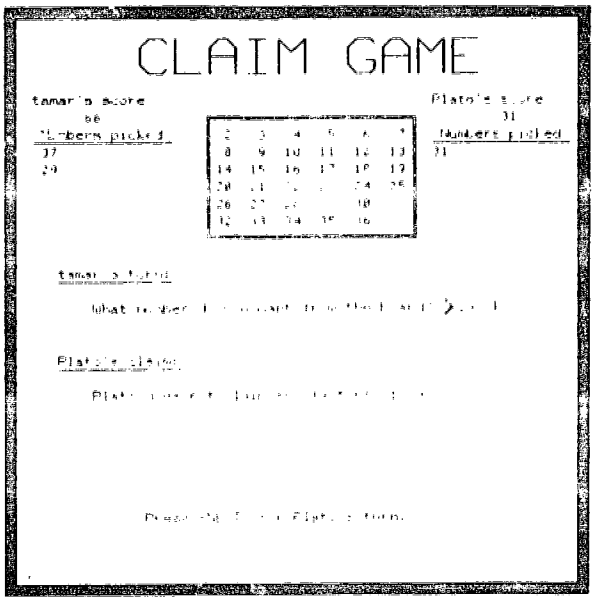
ecs: 3170

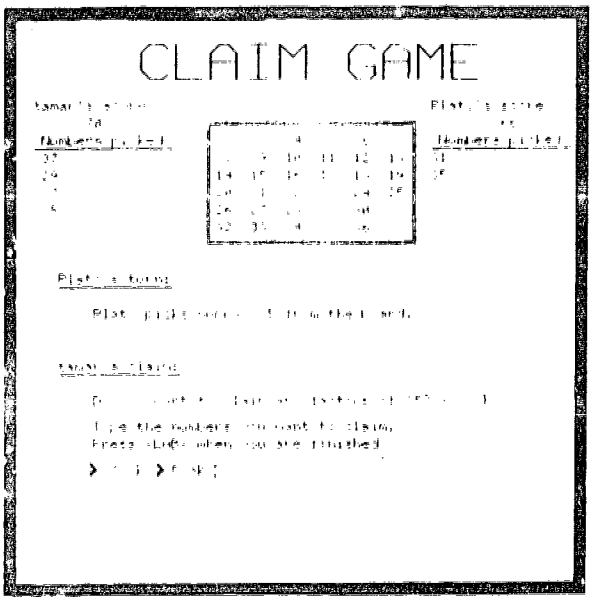
Special Notes:

Each section can be accessed from an index. If the student fails the quiz, appropriate sections for review are noted on this index.

File Name: claim
Claim Game

Authors: Charles Weaver, CERL, and Bonnie Anderson Seiler, CERL




Objective:
To practice factoring natural numbers.

Description:
1. The game is for two players either two friends or a student against PLATO. The two players take turns picking numbers from the board (see figures above). As each number is picked, it is removed from the board and added to the player's score.
2. His opponent may then increase his own score by CLAIMing the numbers on the board that are factors of the original number. When all numbers have been removed from the board, the player with the highest score wins.

Grade Level: Basic mathematics

Student Time: 15 minutes

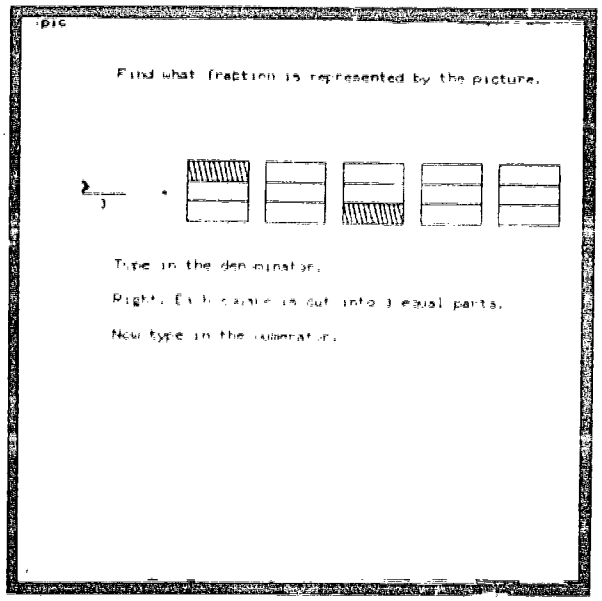
Subject Area: Arithmetic

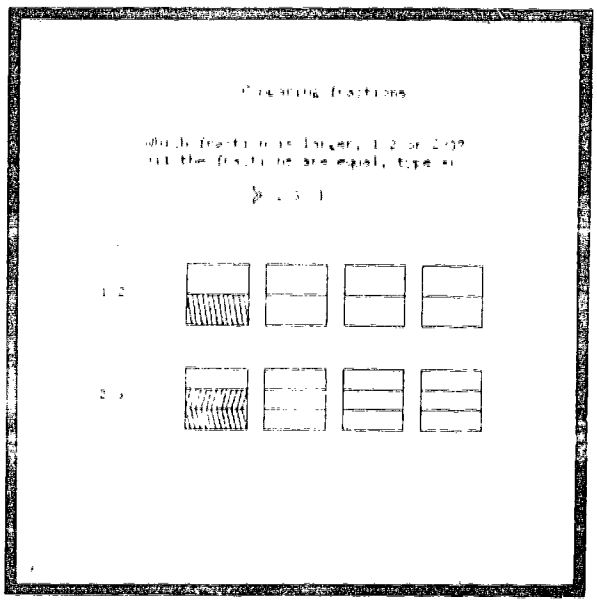
ecs: 2272

Special Notes:
PLATO plays poorly against poor players.

File Name: frint
Introduction to Fractions

Author: Keith Bailey, CERL



Objective:

To introduce the concept of a fraction and to teach the distinction between the numerator and denominator of a fraction.

Description:

1. The student is taught to represent a fraction by divided and shaded squares -- e.g., to represent 4/5, divide each square in the group into five equal parts and shade four of the equal parts.
2. The student is asked to represent a given fraction and also to give the fraction represented by a given picture of shaded squares.
3. Once this representation has been learned, the student uses it to compare fractions and to add fractions with like denominators.

Grade Level: Basic mathematics

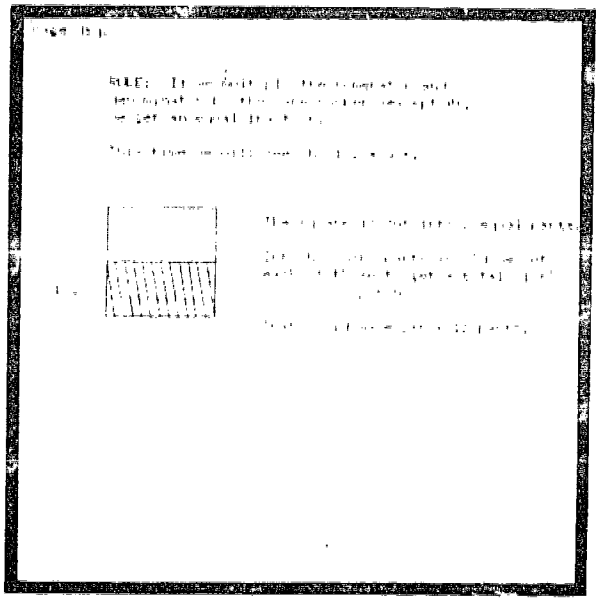
Student Time: 60 minutes

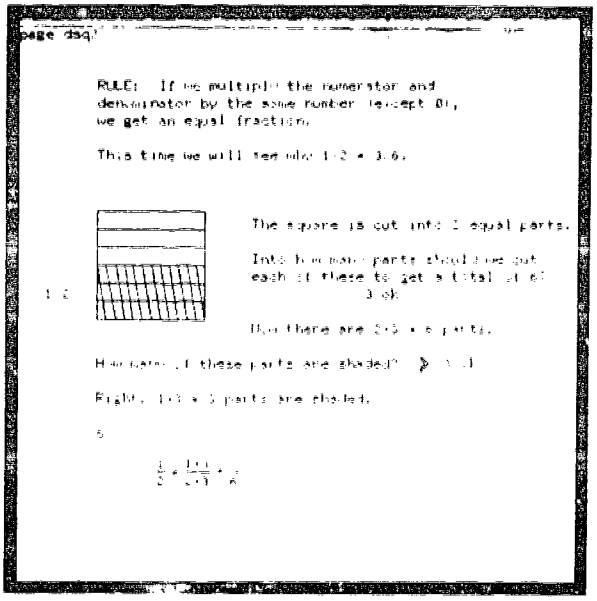
Subject Area: Arithmetic

ecs: 3194

File Name: frdrill
Equal Fractions

Author: Keith Bailey, CERL






Objective:
To provide instruction in writing equal fractions.

Description:
1. The rule $\frac{n}{d} = \frac{n \times c}{d \times c}$ is derived by multiplying $\frac{n}{d}$ by $\frac{c}{c}$, a fraction equal to 1. This rule is drilled in several different ways, then the student builds a table of common fraction equalities such as 1/2 = 2/4, 1/3 = 2/6, etc.
2. The notion of factor is introduced and used for reducing fractions.
3. A drill is given in which the student is asked to write a fraction with a given denominator equal to a given fraction -- e.g., 2/3 = ?/12.

Grade Level: Basic mathematics

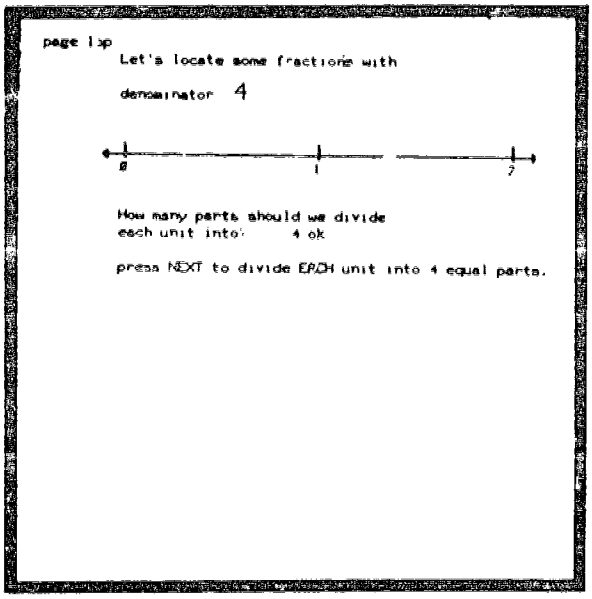
Student Time: 60 minutes

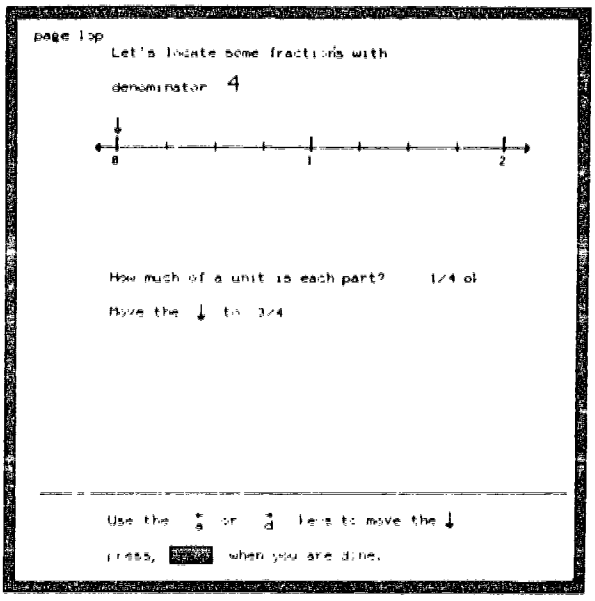
Subject Area: Arithmetic

ecs: 4236

File Name: rfrac
Fractions on the Number Line

Author: Keith Bailey, CERL




Objectives:

1. To teach how to locate fractions on the number line.
2. To show how this model can be used for comparing fractions, determining equivalent fractions, converting improper fractions to mixed numbers.
3. To demonstrate the relationship between division and fractions.

Description:

1. (sections a - e) The number line is introduced and, for a given fraction, the student is asked how to subdivide each unit length and then move a pointer to locate the fraction. Given a subdivided numberline, the student is asked to use a fraction to give the location of the pointer.
2. (section f) A labeled numberline for a certain denominator is given. The student is asked to move the pointer to locate fractions whose denominators are multiples of the first denominator.
3. (section g) The student can choose two denominators and the corresponding labeled number lines are shown for comparison.
4. (section h) For an improper fraction on the number line, the student is asked to give the corresponding mixed number.
5. (section i) The relationship between division and fractions is demonstrated.

Grade Level: Basic mathematics

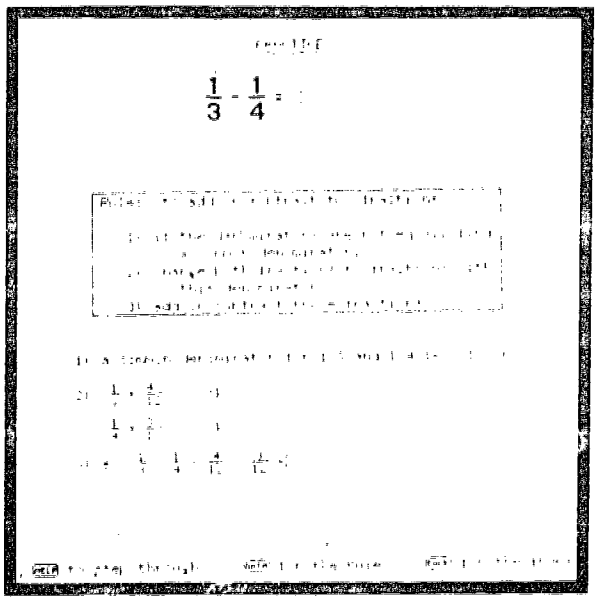
Student Time: 40 minutes

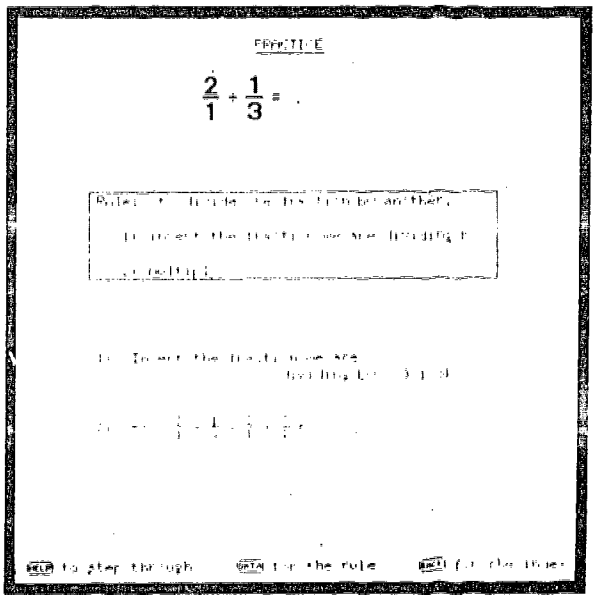
Subject Area: Arithmetic

ecs: 3707

File Name: fracprac
Exercises -- Arithmetic Operations on Fractions

Author: Keith Bailey, CERL
programmed by David Lassner, CERL






Objective:
To provide drill practice and checkup quiz on the four arithmetic operations on fractions.

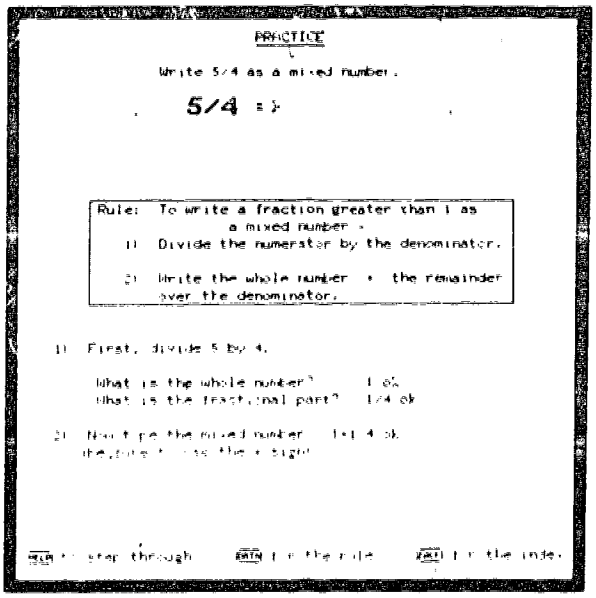
Description:
1. There are six sections:
   a. Addition of Fractions with Like Denominators
   b. Subtraction of Fractions with Like Denominators
   c. Multiplication of Fractions
   d. Division of Fractions
   e. Addition and Subtraction of Any Fractions
   f. Mixed Exercises
2. Each section has three options:
   a. Instruction: a brief statement of the appropriate rule, and a typical problem of the given type that the student is stepped through.
   b. Practice: five problems of the given type -- at any time the student can press DATA to get the rule on the screen or HELP to step through his problem.
   c. Checkup: a quiz of six problems. The student has mastered the section if he answers five correctly out of six.

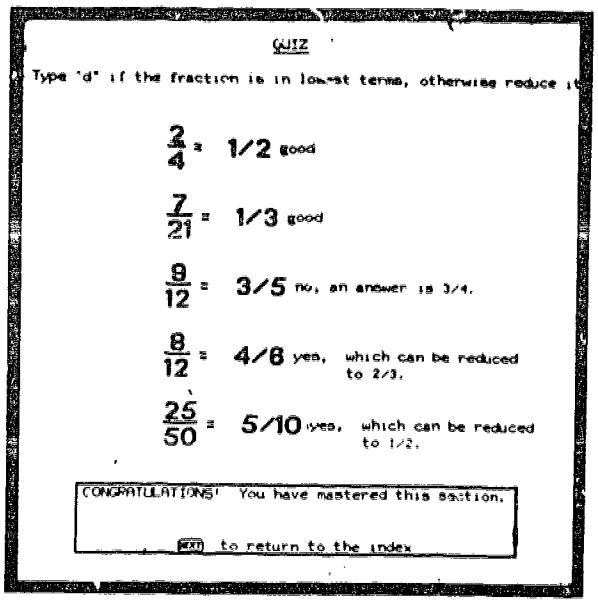
Grade Level: Basic mathematics
Student Time: 60 minutes

Subject Area: Arithmetic
ecs: 3446

File Name: fracfun
Exercises -- Equal Fractions; Mixed Numbers

Author: Keith Bailey, CERL
programmed by David Lassner, CERL




Objective:

To provide drill practice and checkup quiz in reducing fractions, writing equal fractions and mixed number conversions.

Description:

1. There are three sections:
   a. Reducing Fractions
   b. Writing an Equal Fraction
   c. Mixed Number Conversions
2. Each section has three options:
   a. Instruction: a brief statement of the appropriate rule, and a typical problem of the given type which the student is stepped through.
   b. Practice: five problems of the given type -- at any point the student can press DATA to get the rule on the screen, or HELP to step through the given problem.
   c. Checkup: a quiz of six problems. The student has mastered the section if he gets five correct out of the six.

Grade Level: Basic mathematics

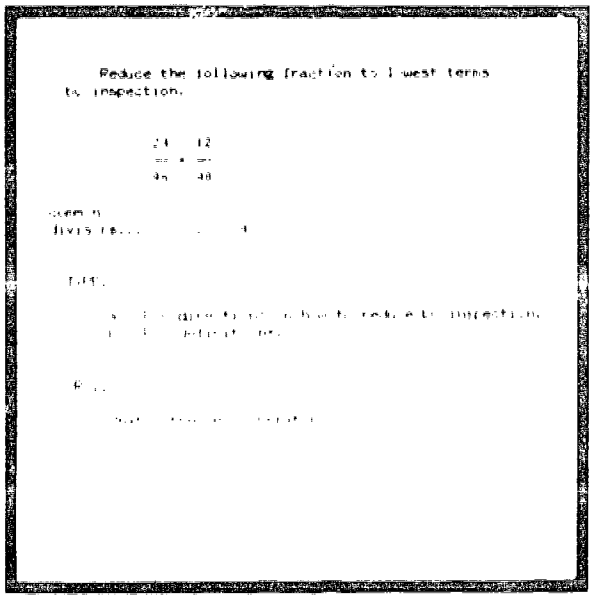
Student Time: 15 minutes

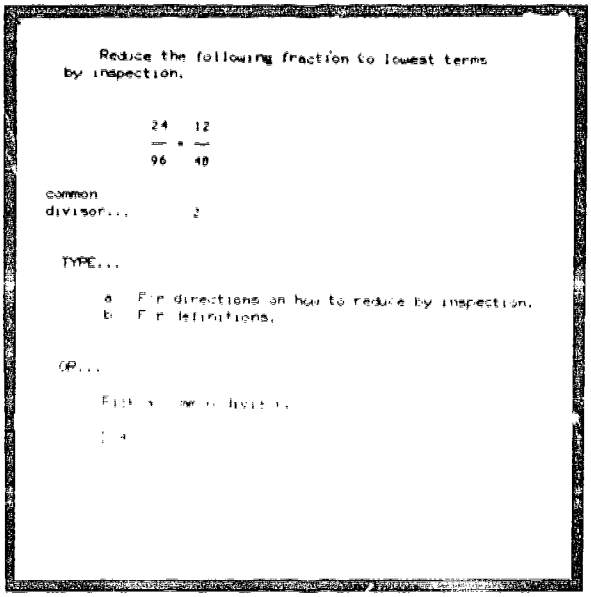
Subject Area: Arithmetic

ecs: 3887

File Name: reduce
Exercises -- Reducing Fractions

Author: Mitsuru Yamada, Malcolm X College




Objective:
To provide practice in reducing fractions.

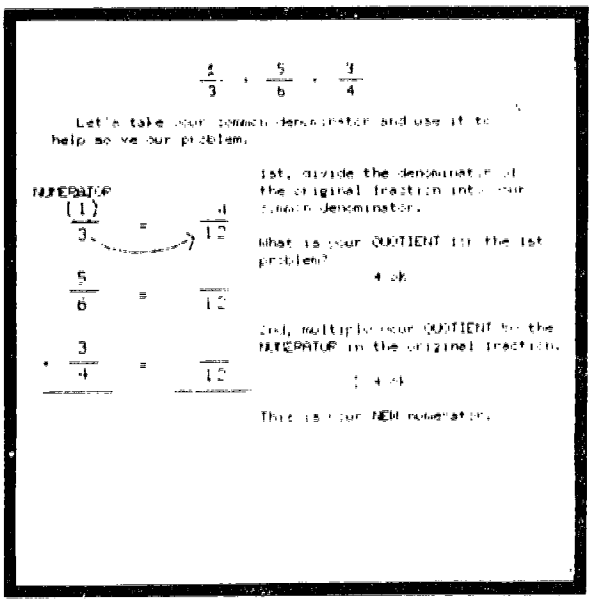
Description:
1. There are two sections:
   a. PLATO selects the fraction to be reduced.
   b. The teacher selects the fraction to be reduced.
2. In both sections, once the fraction is given, the student is asked to name a common divisor of the numerator and denominator, then to reduce the fraction by that divisor. Definitions of terminology are available by pressing DATA.
3. The student may work as many problems as he wants in either section.

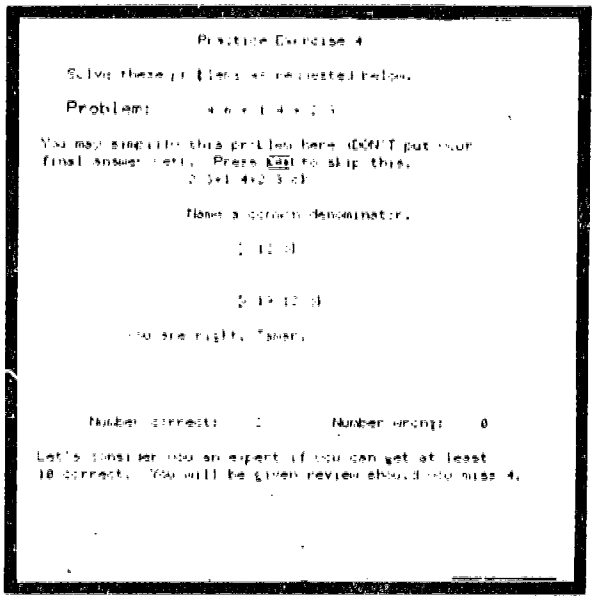
Grade Level: Basic mathematics
Student Time: 30 minutes

Subject Area: Arithmetic
ecs: 1650

File Name: lcd
Adding and Subtracting Fractions with Unlike Denominators

Author: Errol Magidson, Kennedy-King College




Objective:

To teach the student how to add or subtract fractions with unlike denominators.

Description:

1. There are four sections:
   a. Steps to Finding a Solution
   b. Finding a Common Denominator
   c. Finding the New Numerators
   d. Having PLATO solve student-constructed problems
2. Pre- and posttest are available.

Grade Level: Basic mathematics

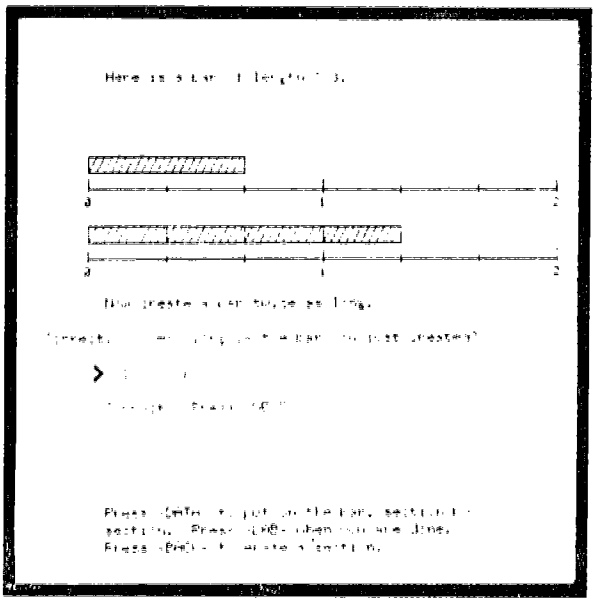
Student Time: 40 minutes

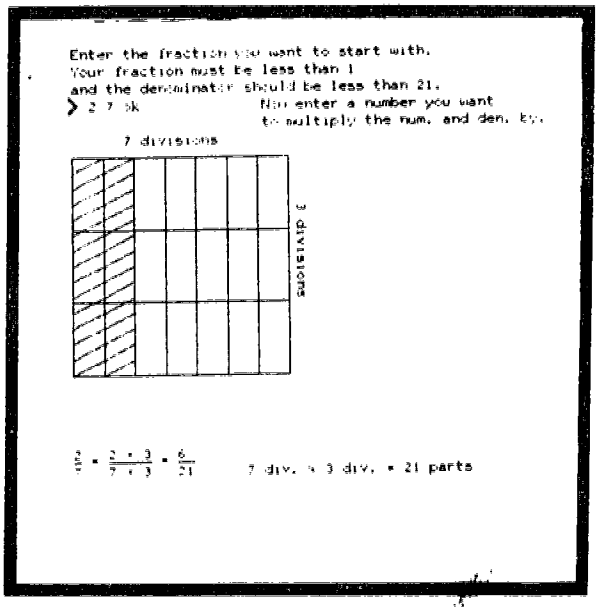
Subject Area: Arithmetic

ecs: 5006

File Name: frac2
Graphic Experiments with Fractions

Author: Keith Bailey, CERL






Objective:

To use squares, rectangles, and the number line to develop an understanding of fractions.

Description:

1. (section a) A divided square is used to show equivalent fractions.
2. (section e) Lists of equivalent fractions are generated for the student's choice of two fractions. This can be used for finding common denominators.
3. (section f) The student is asked to subdivide unit lengths on the number line so that a bar can be measured.
4. (sections b, c, d, g) The student uses the number line to draw and measure rectangular bars.

Grade Level: Basic mathematics

Student Time: open

Subject Area: Arithmetic

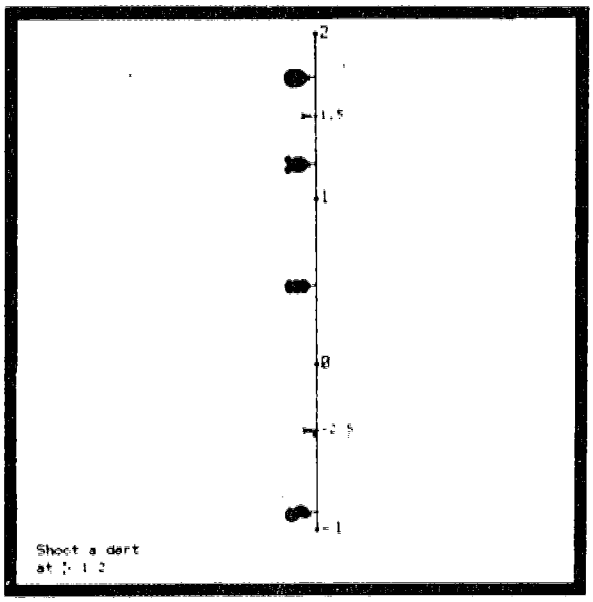
ecs: 2984

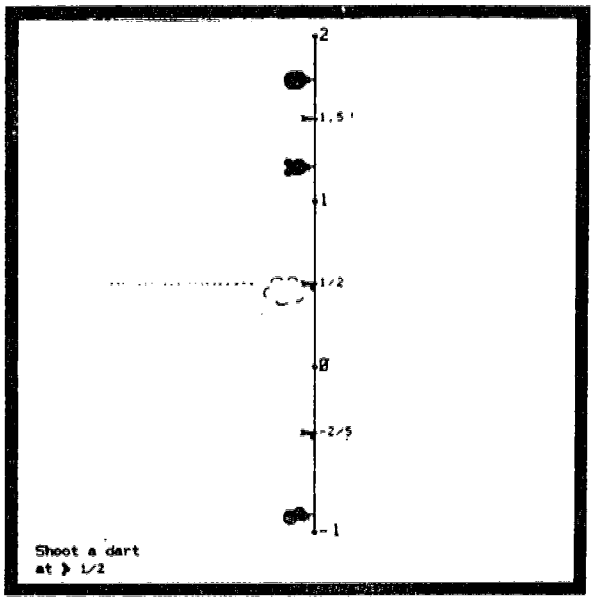
Special Notes:

This lesson is not ready for classroom use and is only intended for pilot testing some ideas.

File Name: darts
Dart Game

Authors: Sharon Dugdale, David Kibbey, Elementary Math Group, CERL




Objective:
To provide practice in locating fractions on the number line.

Description:
1. A vertical number line with several balloons at different locations is displayed. Only integer points on the line are labeled.
2. The student enters a fraction or expression and a dart is shot to that location. If any part of the balloon is touched by the dart, the balloon "bursts."
3. The student's task is to break all the balloons.

Grade Level: Basic mathematics

Student Time: open-ended

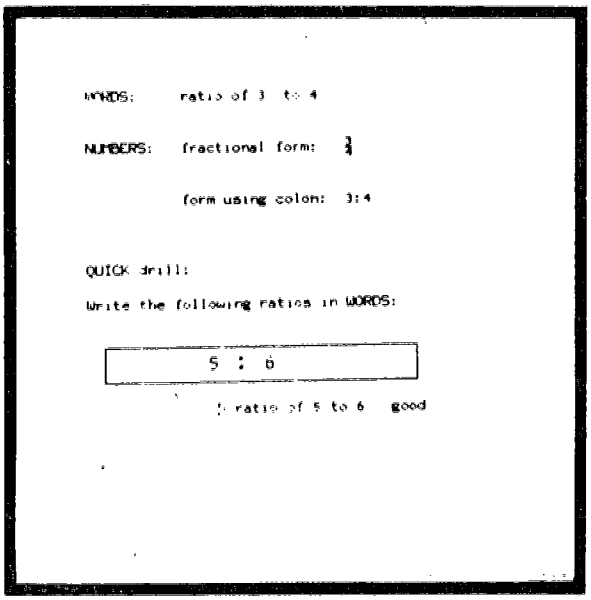
Subject Area: Arithmetic

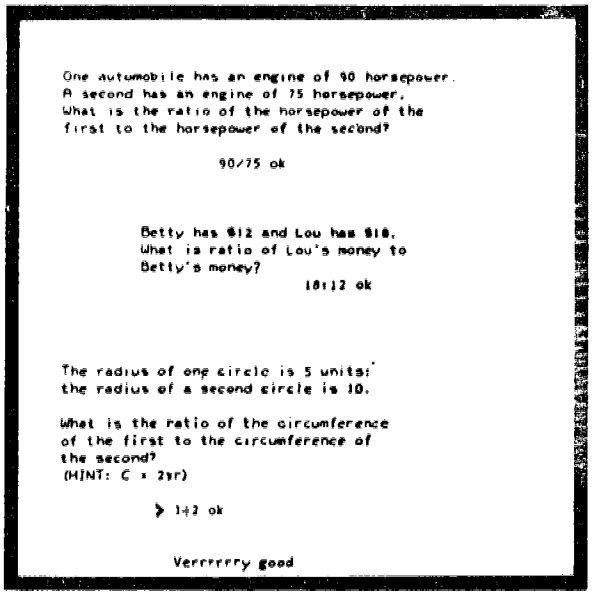
ecs: 4935

Special Notes:
The number line and the size of the balloons vary depending on the performance of the student.

File Name: ratios
Introduction to Ratios

Author: Barbara Lederman, Community College Math Group




Objective:
To provide a short introduction to ratios.

Description:
Introduction to ratios: notation, terminology, writing ratios, expressing ratios in lowest terms.

Grade Level: Basic mathematics
Student Time: 10 minutes

Subject Area: Arithmetic
ecs: 2800

File Name: dec
Decimal Skills: Introduction

Author: Errol Magidson, Kennedy-King College

Objective:

To provide an overall rationale, set of objectives and index to lessons dec1, dec2, dec3, dec4, and ckbk.

Description:

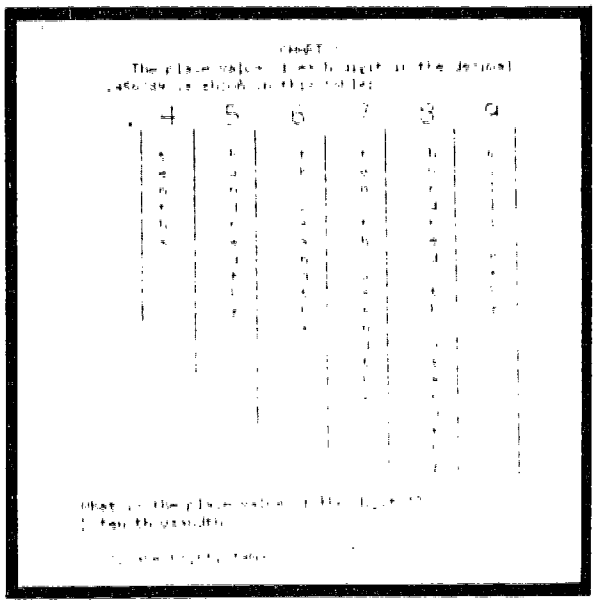
This lesson contains four sections:

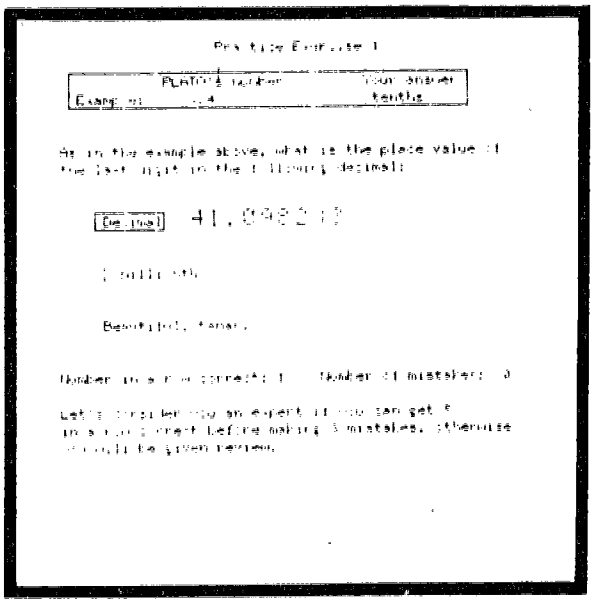
a. Rationale for decimals lessons
b. Lesson objectives
c. Definition of "decimal"
d. The index for the decimal lessons

| | | | |
|---|---|---|---|
| Grade Level: | Basic mathematics | Student Time: | 10 minutes |
| Subject Area: | Arithmetic | ecs: | 1500 |

File Name: dec1
Reading and Writing Decimals

Author: Errol Magidson, Kennedy-King College





Objective:

1. To enable the student to read and write decimals using place and point methods.

Description:

1. There are five major sections:
   a) Introduction
   b) Reading the place value chart
   c) Relationship between place value and fractional size
   d) Reading decimal numbers (place and point methods)
   e) Writing a decimal number
2. In addition there are pre- and posttests in this lesson.
3. Each section has instruction and exercises.

Grade Level: Basic mathematics

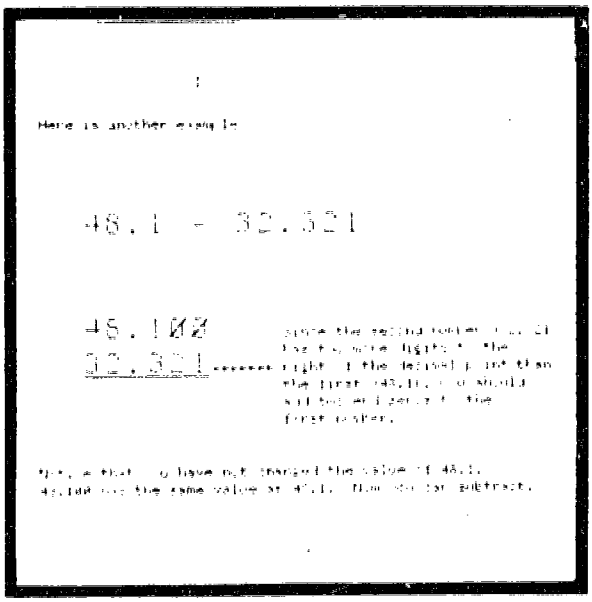
Student Time: 60 minutes

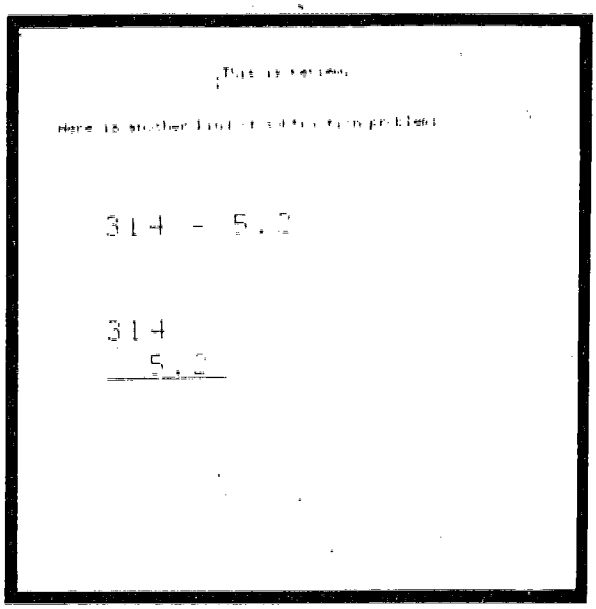
Subject Area: Arithmetic

ecs: 5712

File Name: dec2
Adding and Subtracting Decimals

Author: Errol Magidson, Kennedy-King College




Objective:
To enable students to add and subtract decimals.

Description:
1. There are three major sections:
   a. Lining up decimals for adding and subtracting
   b. Adding decimals
   c. Subtracting decimals
2. In addition, there are pre- and posttests.
3. Each section has instruction and exercises.

Grade Level: Basic mathematics

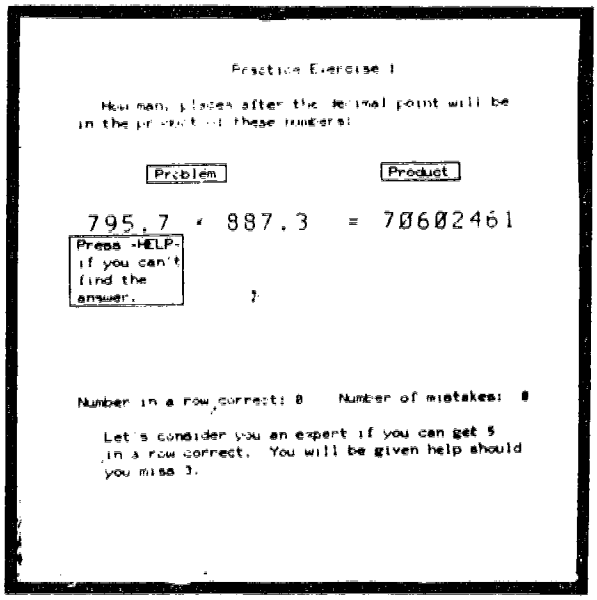
Student Time: 60 minutes

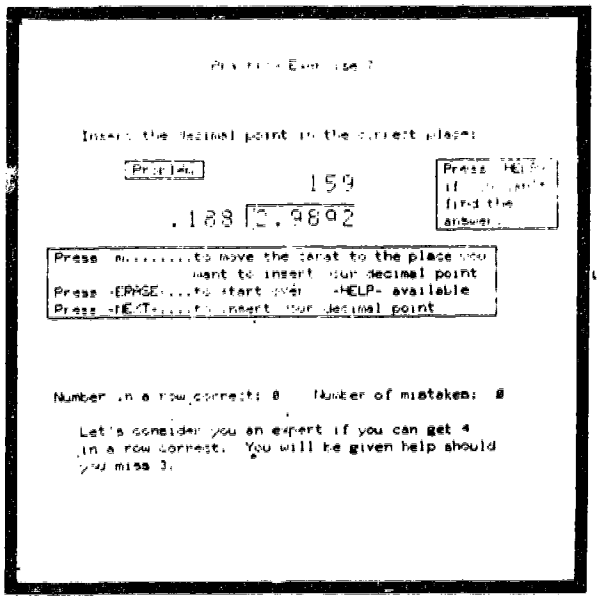
Subject Area: Arithmetic

ecs: 5278

File Name: dec3
Multiplying and Dividing Decimals

Author: Errol Magidson, Kennedy-King College




Objective:
To enable the student to multiply and divide decimals.

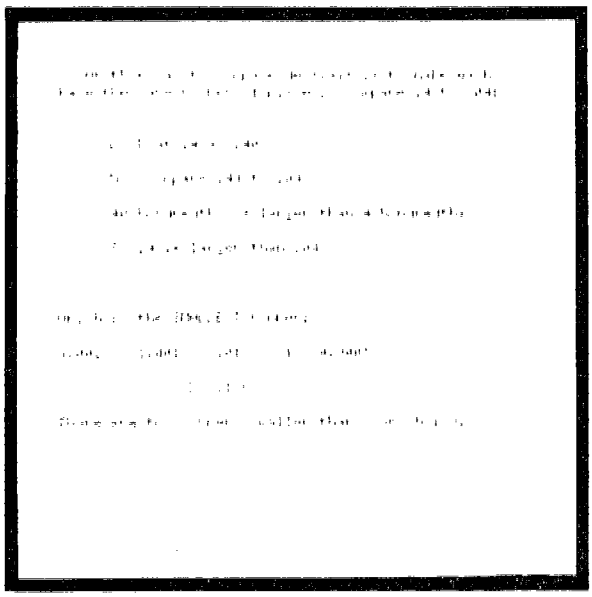
Description:
1. There are two major sections:
   a. Multiplication of Decimals
   b. Division of Decimals
2. Each section has instruction and exercises.
3. There are pre- and posttests.

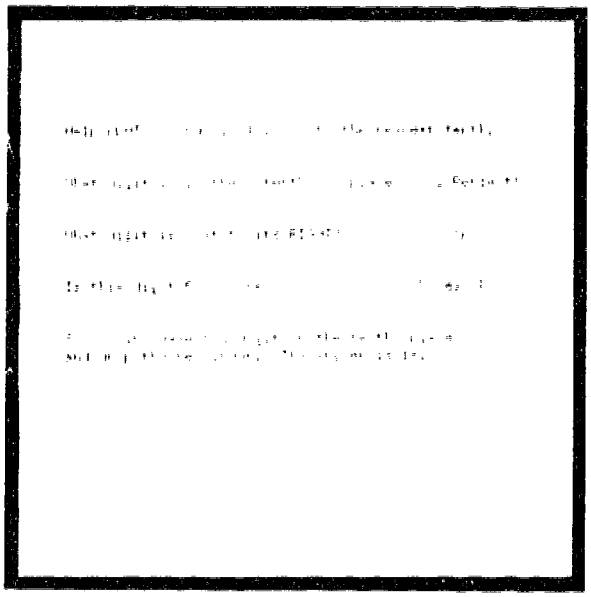
Grade Level: Basic mathematics
Student Time: 60 minutes

Subject Area: Arithmetic
ecs: 5911

File Name: dec4
Rounding and Comparing Decimals

Author: Errol Magidson, Kennedy-King College





Objectives:
1. To enable the student to round off decimals.
2. To enable the student to convert fractions or mixed numbers to decimals and vice versa.
3. To enable the student to compare decimals and fractions.

Description:
1. There are five major sections:
   a. Rounding off decimals
   b. Changing fractions to decimals
   c. Changing mixed numbers to decimals
   d. Changing decimals to fractions
   e. Comparing fractions and decimals
2. Each section contains instruction and exericses. The lesson contains pre- and posttests.

Grade Level: Basic mathematics

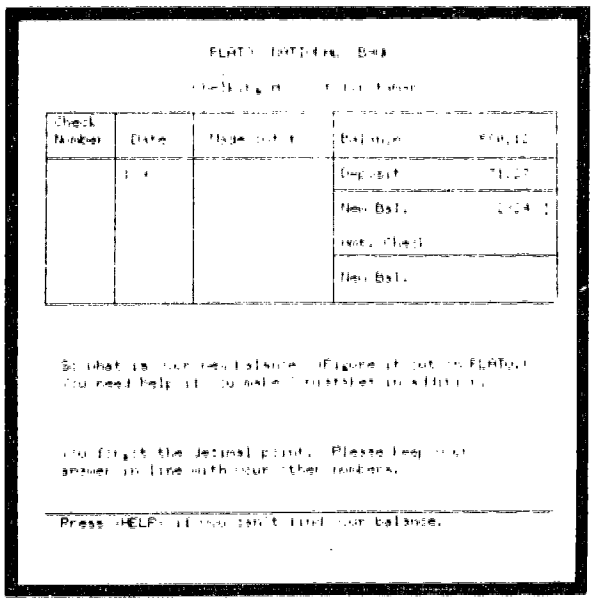
Student Time: 60 minutes

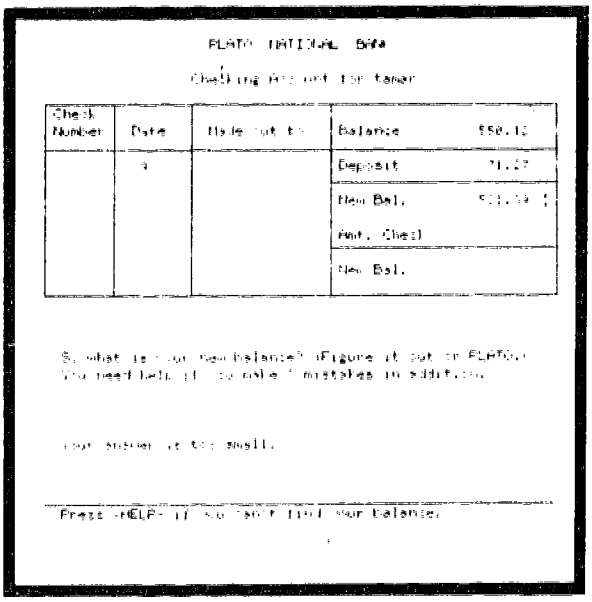
Subject Area: Arithmetic

ecs: 5963

File Name: ckbk
Keeping a Balanced Checkbook

Author: Errol Magidson, Kennedy-King College




Objectives:
1. To enable the student to use his decimal skills to keep a balanced checkbook.
2. To provide a practical setting for the student to strengthen his skills at adding and subtracting decimals.

Description:
1. There are three sections:
   a. How entries are made in a checkbook
   b. Finding balance after deposits or checks
   c. Making entries in your own checkbook
2. Checking account and money transactions are simulated for the students.

Grade Level: Basic mathematics

Student Time: 60 minutes

Subject Area: Arithmetic

ecs: 3567

File Name: per
Introduction to Percent

Author: Errol Magidson, Kennedy-King College

Objective:
To provide overall rationale, set of objectives, and index to lessons per1 and per2.

Description:
There are four sections:
a. Rationale
b. Lesson Objectives
c. Definition of "percent"
d. Index to Percent Lessons

Grade Level: Basic mathematics

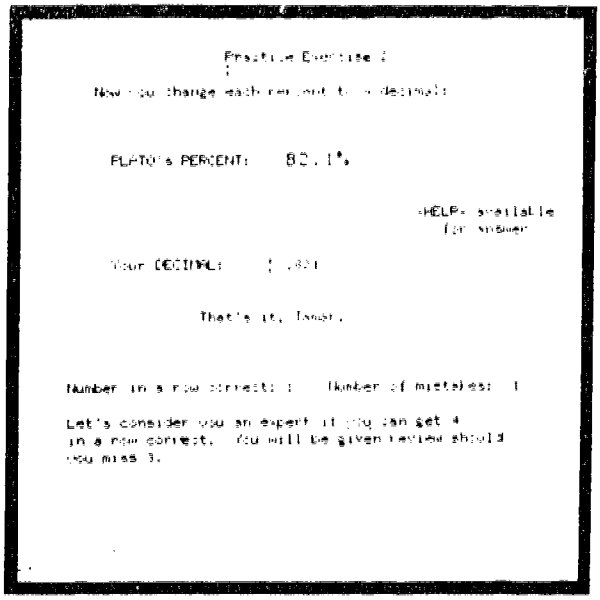
Student Time: 10 minutes

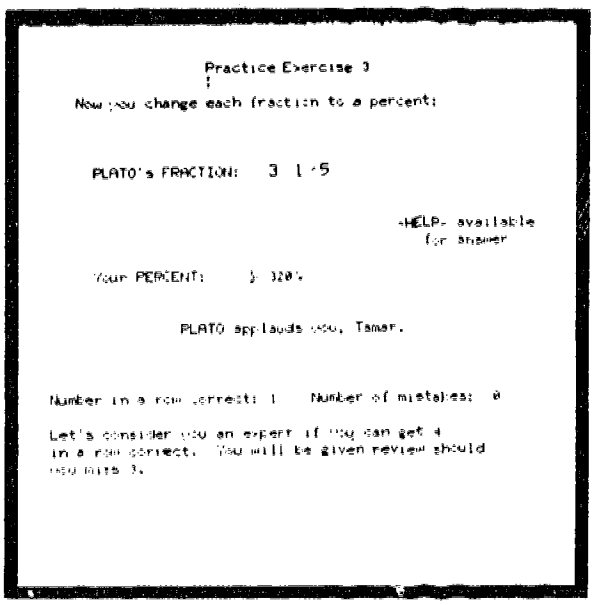
Subject Area: Arithmetic

ecs: 1500

File Name: per1
Percent-Decimal-Fraction Conversions

Author: Errol Magidson, Kennedy-King College




Objective:

To enable the student to convert from one to another among percents, decimals, and fractions.

Description:

1. There are three major sections:
   a. Introduction
   b. Converting from decimals to percents and vice versa
   c. Converting from fractions to percents and vice versa
2. Each section has instruction and exercises.
3. The lesson has pre- and posttests.

Grade Level: Basic mathematics

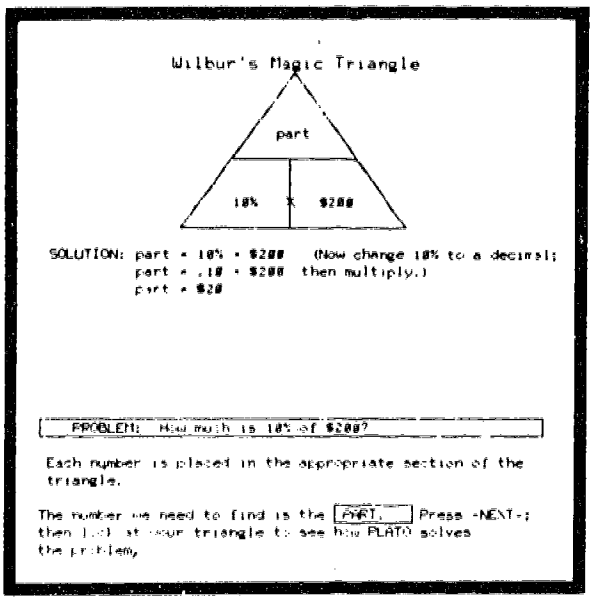
Student Time: 60 minutes

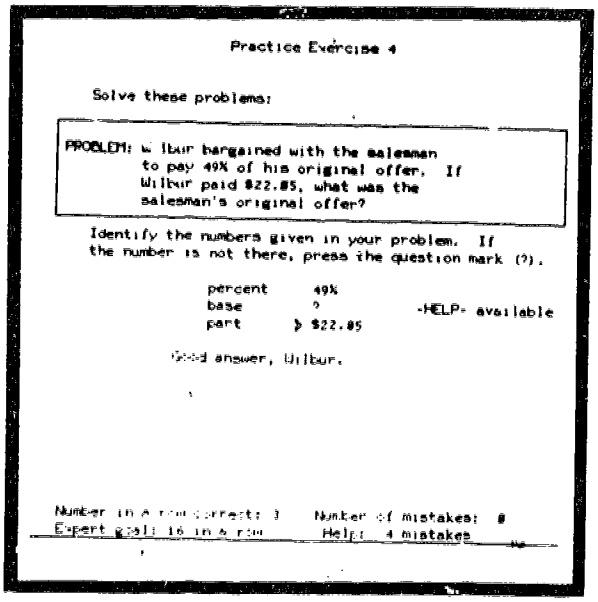
Subject Area: Arithmetic

ecs: 4146

File Name: per2 (jumps out to per3 and per4)
Word Problems with Percent

Author: Errol Magidson, Kennedy-King College




Objective:

To enable the student to solve word problems involving percent.

Description:

1. There are four sections:
   a. Introduction to percent word problems.
   b. Magic triangle method for solving word problems with percent.
   c. More difficult word problems with percent.
   d. Problems using simple interest.
2. Each section provides instruction and exercises.
3. The lesson has pre- and posttests.

Grade Level: Basic mathematics

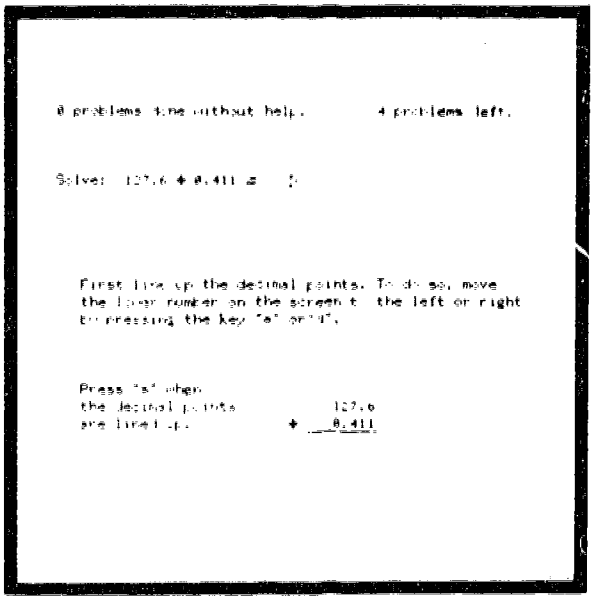
Subject Area: Arithmetic

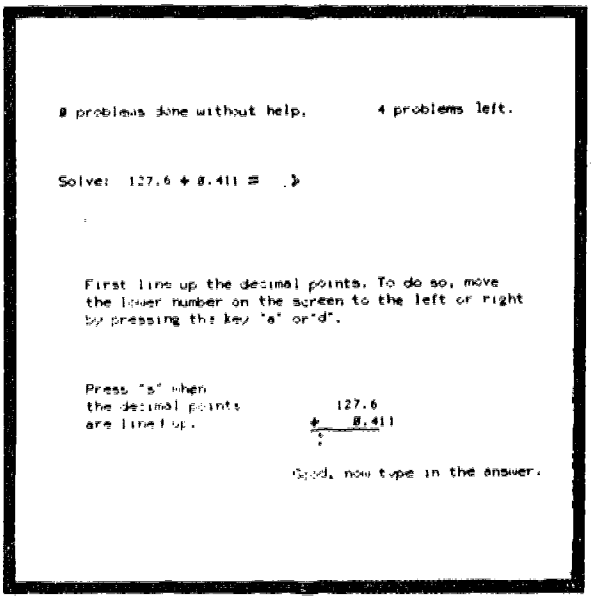
Student Time: 90 minutes

ecs: per2 4738
per3 1776
per4 4201

File Name: mars
Math Review Drills I

Authors: Shin Saito, City Colleges of Chicago, and
Noa Shinderman, Malcolm X College




Objective:

To present review practice with help on fractions and decimals.

Description:

1. There are six sections:
   Fractions
   a. Multiplication
   b. Division
   Decimals
   c. Addition (paper and pen needed)
   d. Subtraction (paper and pen needed)
   e. Multiplication (paper and pen needed)
   f. Division (paper and pen needed)
2. In each section there is a short explanation of how to work the problem type indicated on the index. The section then consists of working exercises in that problem type. Help is available to show the student how to work on exercises. He must, however, do four exercises without help to complete the section.

Grade Level: Basic mathematics

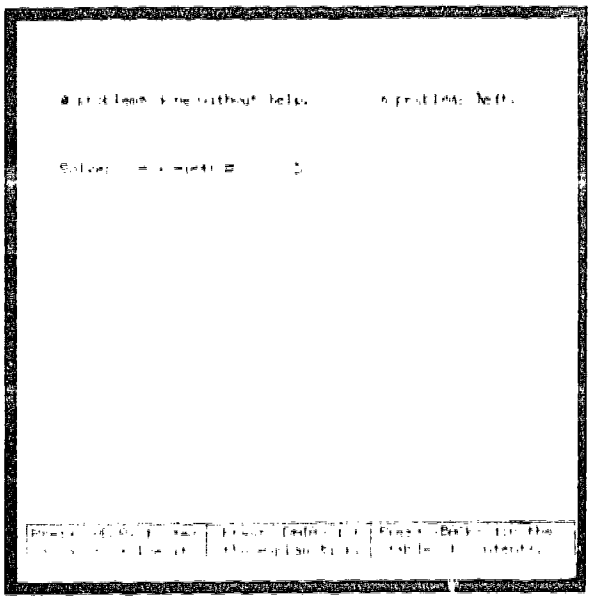
Student Time: 35 minutes

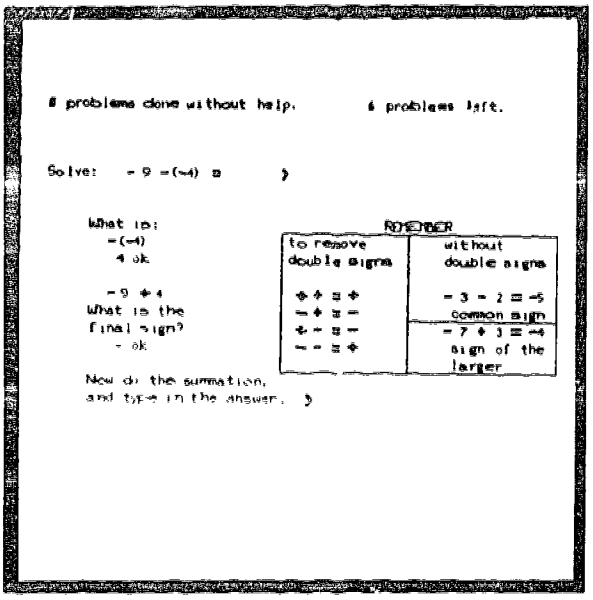
Subject Area: Arithmetic

ecs: 2788

File Name: mars4
Math Review Drills II

Authors: Shin Saito, City Colleges of Chicago, and
Noa Shinderman, Malcolm X College






Objective:

To present review practice with help on signed numbers and powers of ten.

Description:

1. There are five sections:
   Signed Numbers
   a. Addition and Subtraction
   b. Double Signs
   c. Multiplication
   d. More Addition and Subtraction
   The Powers of Ten
   e. Multiplication and Division
2. In each section there is a short explanation of how to work the problem type indicated on the index. The rest of the section consists of working exercises of that problem type. Help is available to see how to work a given exercise. The student must, however, do six exercises without help to complete the section.

Grade Level: Basic mathematics

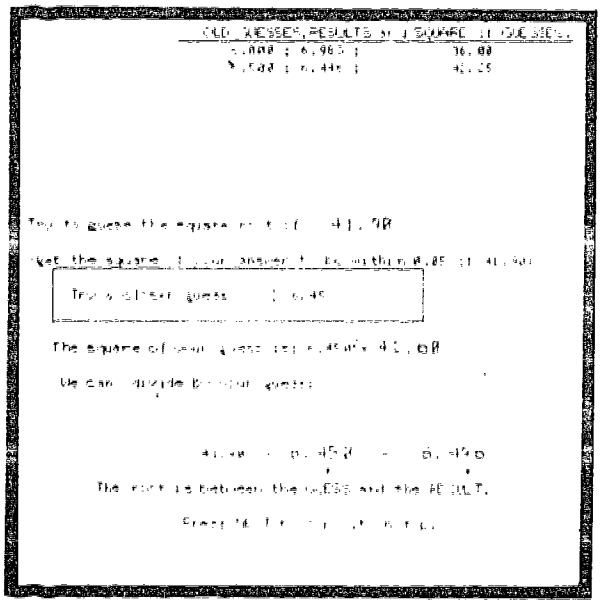
Student Time: 35 minutes

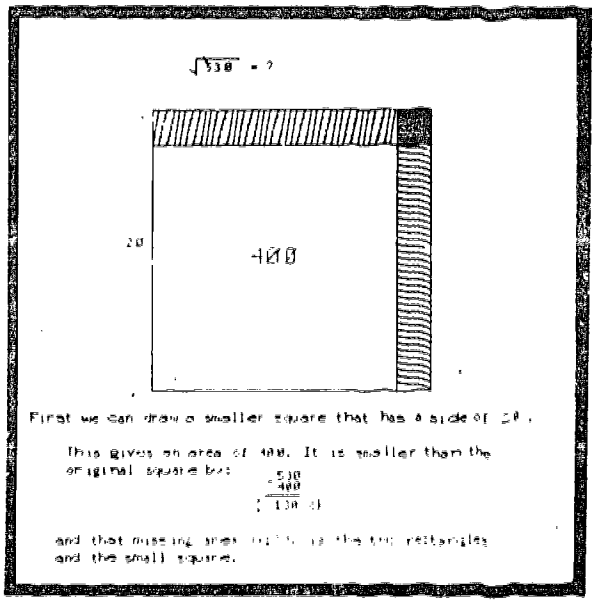
Subject Area: Arithmetic

ecs: 2451

File Name: sqrt
Finding the Square Root

Author: Tamar Abeliovich Weaver, CERL






Objective:

To provide three methods for finding square roots:

a. Guessing and Adjusting
b. Newton's Method
c. The Square Root Algorithm

Description:

The student gets an index from which he can choose one method and/or see an explanation of why the method works. Each technique is taught by helping the student through the steps.

Grade Level: Basic mathematics

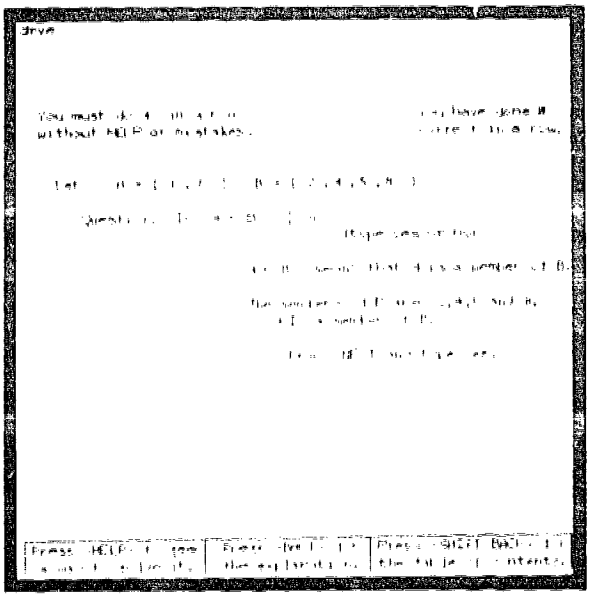
Student Time: 30 minutes

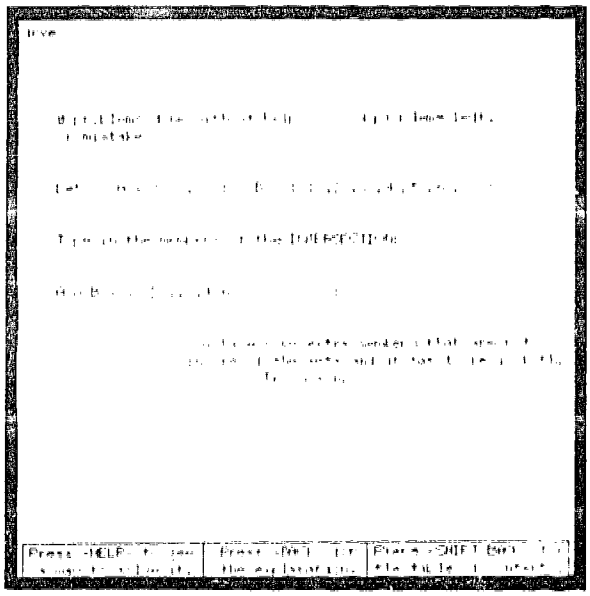
Subject Area: Arithmetic

ecs: 3470

File Name: ccset
Introduction to Sets

Authors: Tamar Abeliovich Weaver and Louis V. DiBello, CERL
programmed by Tamar Abeliovich Weaver, CERL





Objective:

To provide an introduction to set theory including a discussion of sets, subsets, elements of a set, and the three operations: union, intersection, and complementation.

Description:

1. Each topic is presented via a short description and example.
2. Practice exercises are given which include help and error feedback.
3. The student must correctly complete four exercises in a row for each topic.

Grade Level: Intermediate algebra

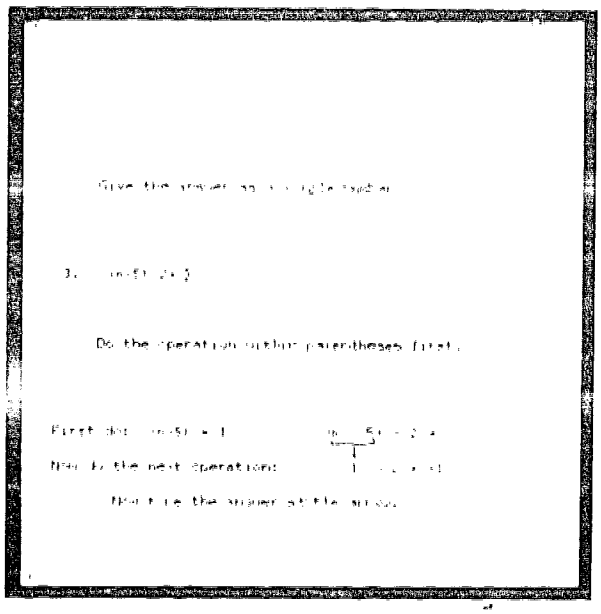
Student Time: 20 minutes

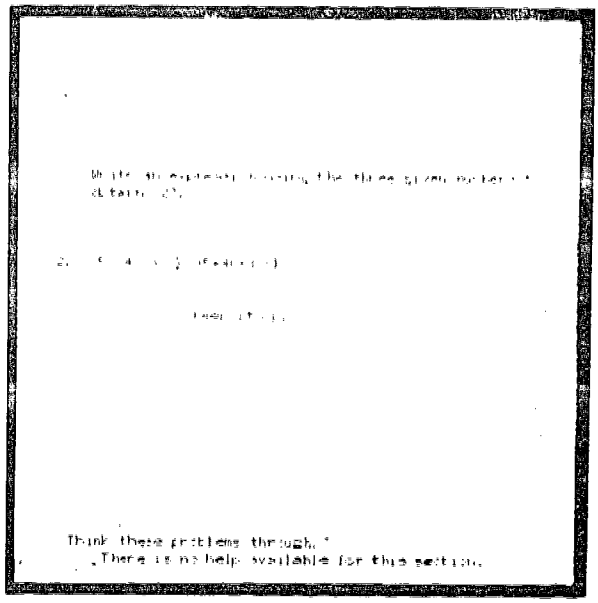
Subject Area: Albegra

ecs: 2524

File Name: math95c
Symbols of Grouping

Authors: Mitsuru Yamada, Malcolm X College, Steven Brayndick, Malcolm X College, and Shin Saito, City Colleges of Chicago





Objective:

To present easy numerical problems involving order of operations and parentheses.

Description:

1. There are five sections:
   a. Addition and subtraction without parentheses
   b. Addition and subtraction with parentheses
   c. Operations without parentheses
   d. Operations with parentheses
   e. Backward drill
2. In each section the student is asked to evaluate arithmetic expressions. Some sections contain expressions with parentheses, while others do not. The student may press DATA to be given a sequence of questions and arrows which lead him through the evaluation in steps; or he may press HELP to be shown how to perform the evaluation. He must perform ten evaluations without HELP to complete a section.

Grade Level: Basic mathematics

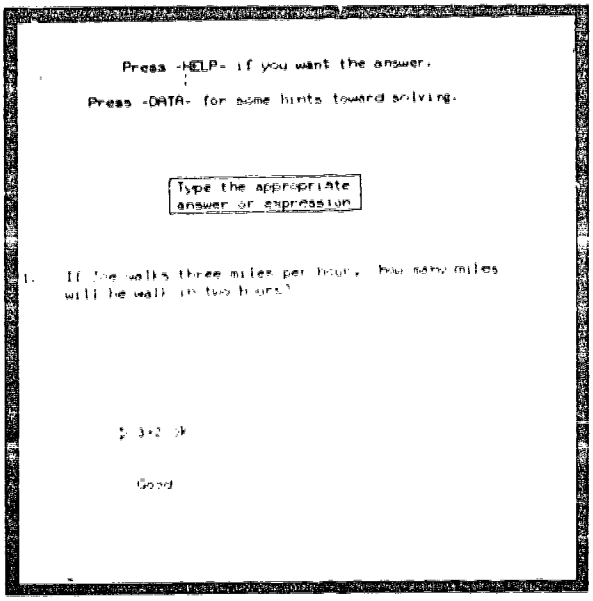
Student Time: 30 minutes

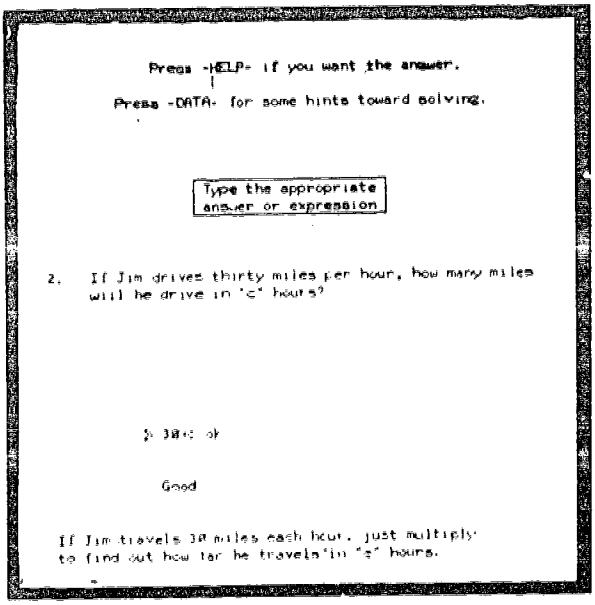
Subject Area: Arithmetic

ecs: 2941

File Name: mars1
Word Problems Drills I

Author: Shin Saito, City Colleges of Chicago




Objective:

To enable the student to translate simple word problems into algebraic and arithmetic expressions.

Description:

There are two sections:

a. Beginning Exercises I
b. Rate Problems II

Each section consists of ten word problems. At the beginning, the problems are arithmetic. At the end it is necessary to solve a linear equation to solve the problem. The student can obtain the correct answer by pressing HELP. However, he must solve all problems without help to complete the section.

Grade Level: Elementary Algebra

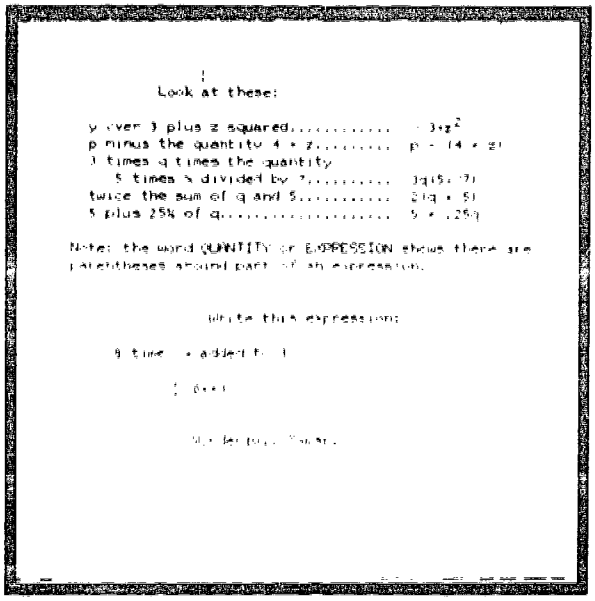
Student Time: 15 minutes

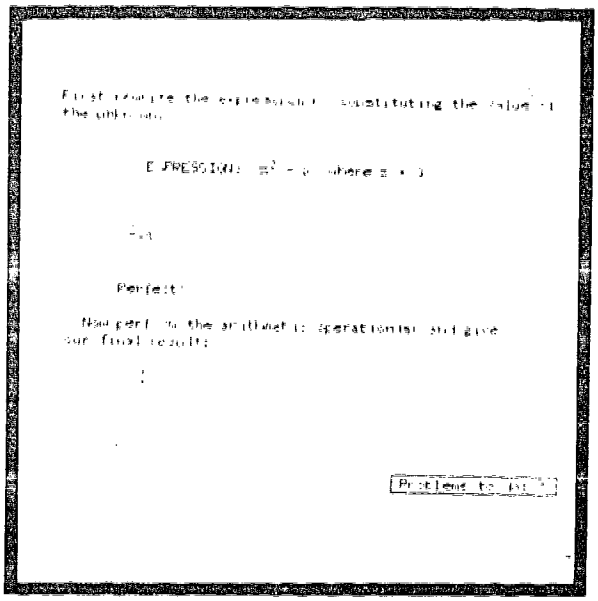
Subject Area: Algebra

ecs: 3164

File Name: eac
Evaluating Algebraic Expressions

Author: Errol Magidson, Kennedy-King College




Objective:
The student will be able to evaluate algebraic expressions by substituting numbers for unknowns and then computing the solution.

Description:
1. Introduction
2. Arithmetic Operations: review
3. Order of Operations
4. Reading Algebraic Expressions
5. Writing Algebraic Expressions
6. Substitution

Grade Level: Elementary Algebra

Student Time: 60 minutes

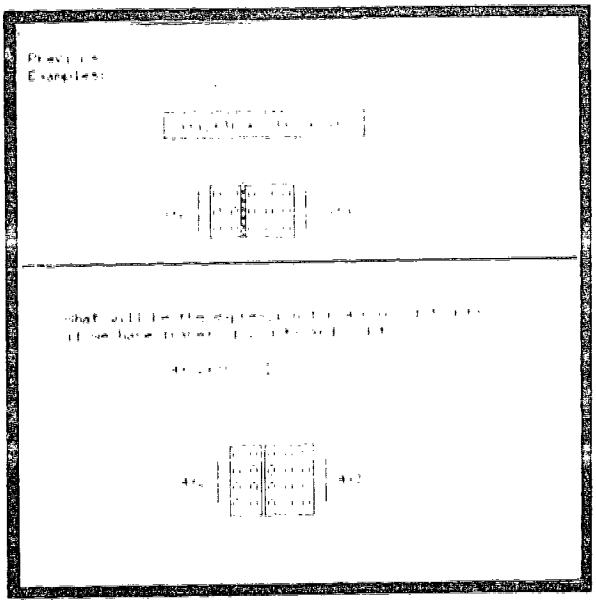
Subject Area: Algebra

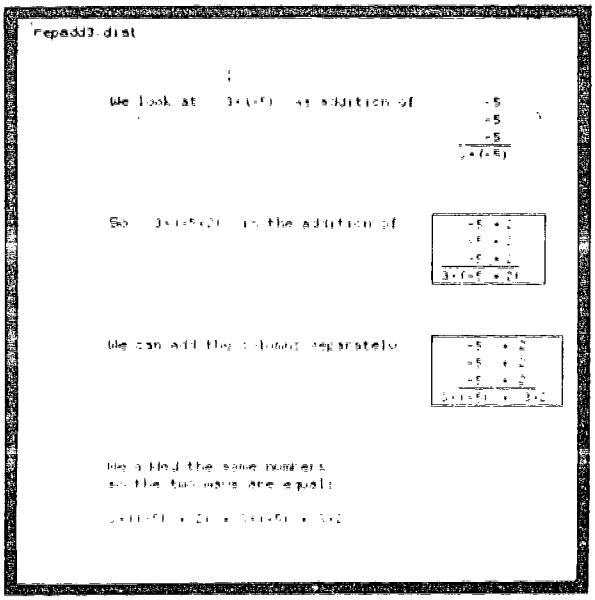
ecs: 3768

Special Notes:
Pretest and posttest are available.

File Name: dist
The Distributive Law

Author: Tamar Abeliovich Weaver, CERL
programmed by Robert Baillie, CERL






Objectives:
1. To provide a graphic model for the distributive law.
2. To provide practice on the distributive law with signed numbers and variables.

Description:
1. A model of dots in rows and columns is used to get the rule $a \times (b + c) = a \times b + a \times c$.
2. The student assigns signed numbers to a, b, and c and applies this rule.
3. A simple example of repeated addition is provided as an alternative justification of the rule.
4. The student is given practice exercises in applying the law with signed numbers and variables.

Grade Level: Elementary Algebra

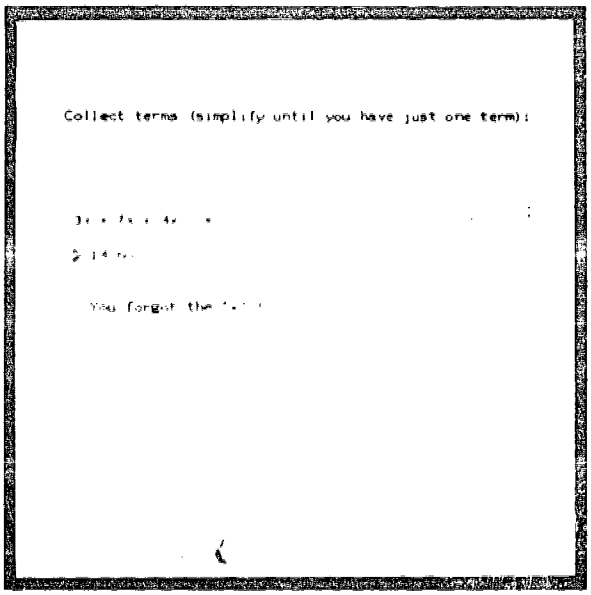
Student Time: 30 minutes

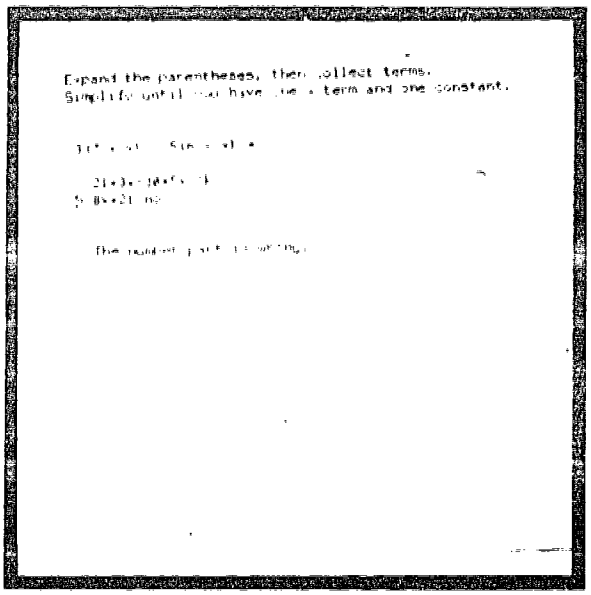
Subject Area: Algebra

ecs: 4831

File Name: collect
Collecting Like Terms

Author: Tamar Abeliovich Weaver, CERL
programmed by Robert Baillie, CERL




Objectives:

1. To introduce the following terminology: like terms, x-term, constant.
2. To provide practice in simplifying algebraic expressions by collecting like terms.

Description:

After introducing the vocabulary, the student answers simple questions on identifying x-terms and constants. The distribution law is used to open parentheses and like terms are collected to simplify the results.

Grade Level: Elementary albegra

Student Time: 25 minutes

Subject Area: Algebra

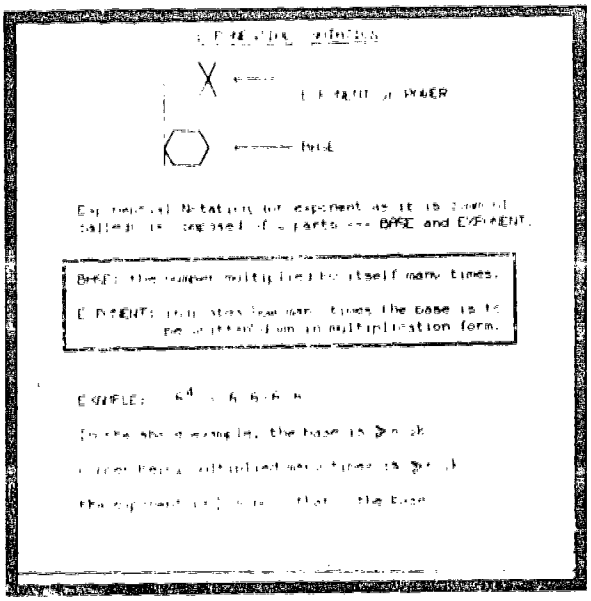
ecs: 3790

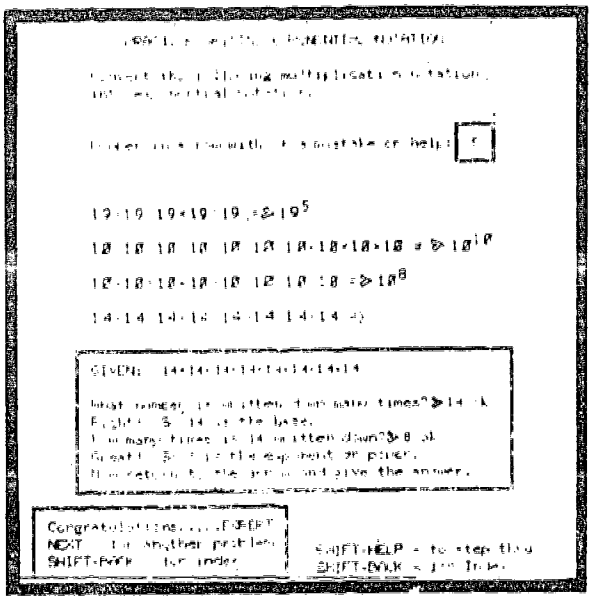
Special Notes:

The distributive law is a prerequisite (available in lesson "dist").

File Name: exp3
Introduction to Exponents

Author: Carroll (Steve) Robinson, Chicago Urban Skills Institute





Objective:

To provide an introduction and drill and practice on exponents.

Description:

There are six sections:

a. What Is an Exponent
b. Practice Writing Exponential Notation
c. Practice Writing Multiplication Notation
d. Calculating Numerical Value
e. Practice Calculating Numerical Value
f. Final Quiz

Grade Level: High School and above

Student Time: 50 - 60 minutes

Subject Area: Algebra

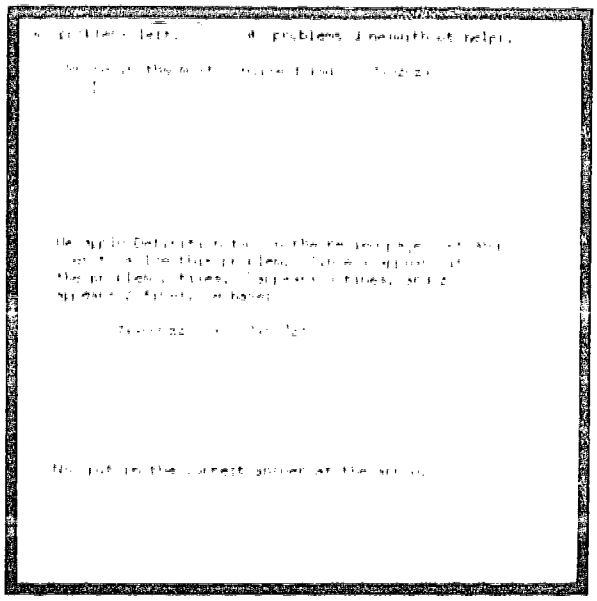
ecs: 4140

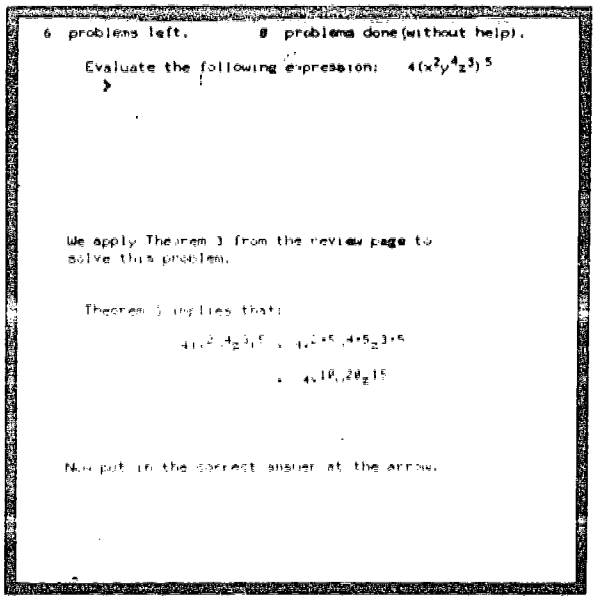
Special Notes:

1. A section covering the SUPER key precedes the index.
2. A student is only required to pass the final quiz to complete the lesson.

File Name: math95b
Laws of Exponents

Author: Richard Neapolitan, Wright College






Objective:
To present practice with help on exponent problems.

Description:
1. There are seven sections:
   a. Writing an expression in exponential form
   b. Writing an expression without exponents
   c. Multiplying exponential expressions in one variable
   d. Multiplying exponential expressions in three variables
   e. Dividing exponential expressions
   f. Expressions (one variable) to a power
   g. Expressions (multiple variables) to a power
2. In each section the student is first shown how to perform the task indicated on the index page. He must then successfully perform that task six times to complete the section. He may, however, request HELP at any time to receive assistance on a given problem. The HELP consists of being shown how to perform the task in steps.

Grade Level: Intermediate algebra

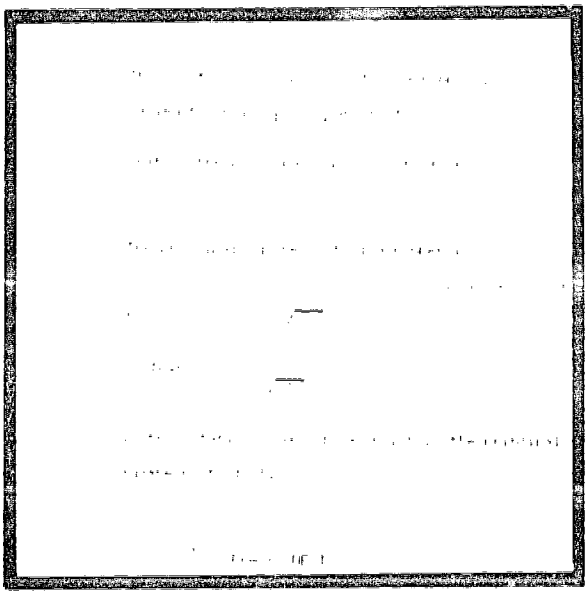
Student Time: 40 minutes

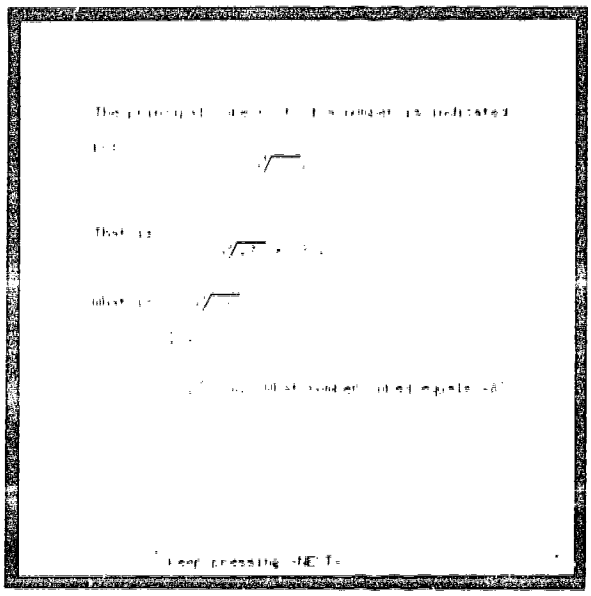
Subject Area: Algebra

ecs: 2207

File Name: math95f
Powers and Roots of Natural Numbers

Authors: Shin Saito, City Colleges of Chicago, and
Richard Neapolitan, Wright College





Objective:

To present practice with help on roots of natural numbers.

Description:

1. There are five sections:
   a. Powers
   b. Introduction to Radicals
   c. Radicands
   d. The Principal Square Root
   e. The Principal Cube Root
2. Section a teaches the student the concept of a power. The student must find four powers without HELP to complete the section. He may, however, request HELP to find a given power. The HELP consists of a sequence of questions and arrows which lead him through the steps involved.
3. Section b introduces him to the concept of roots and radicals.
4. Sections c, d, and e test him on the concepts indicated on the index. The format and requirements to complete these sections are exactly those of section a.

Grade Level: Intermediate algebra

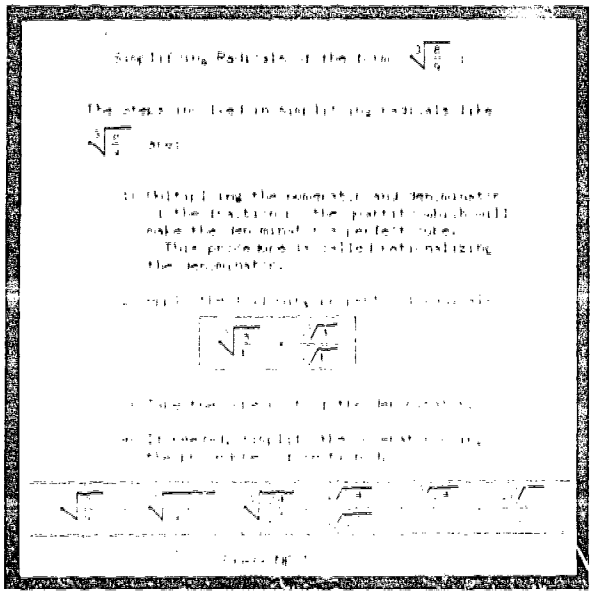
Student Time: 30 minutes

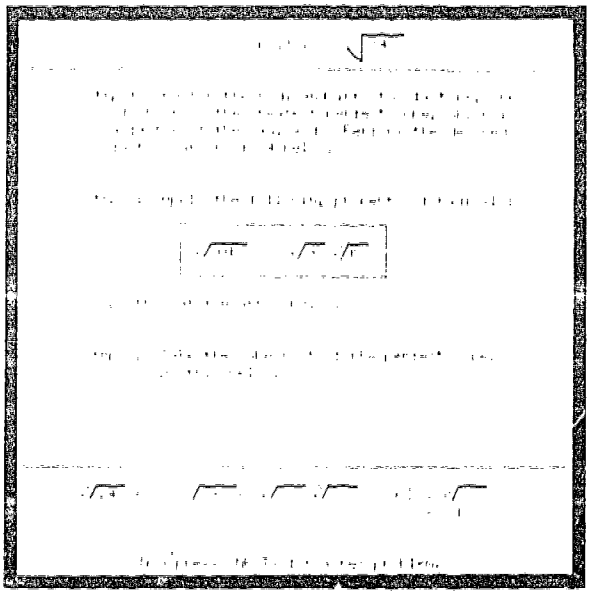
Subject Area: Algebra

ecs: 2339

File Name: frac
Introduction to Radicals I

Authors: Shin Saito, City Colleges of Chicago, and Richard Neapolitan, Wright Colleges





Objective:

To provide an introduction and practice on radicals.

Description:

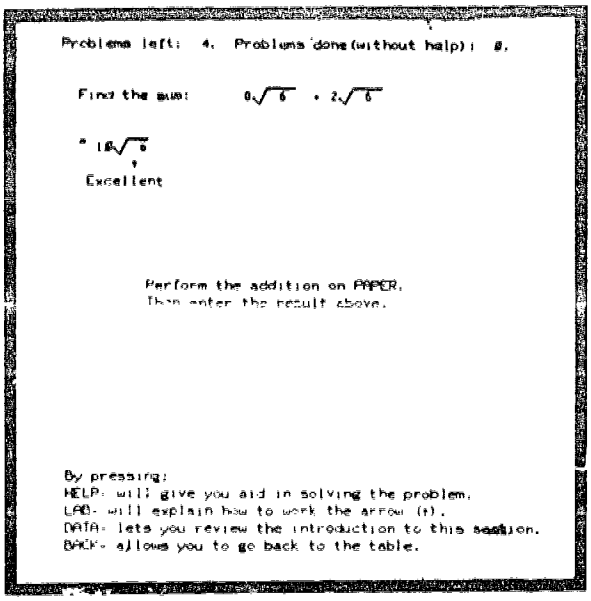
1. There are five sections:
   a. Properties of Radicals
   b. Simplifying a Square Root
   c. Simplifying a Square Root with a Fraction
   d. Simplifying a Cube Root
   e. Simplifying a cube root with a Fraction
2. Section a contains the statement of four properties of radicals used in the following four sections.
3. In each of the last four sections the student is first shown how to simplify the radical type indicated on the index. The student must then simplify radicals of that type himself. The student may press HELP to receive a series of questions which will lead to the simplification of a radical. He must, however, simplify four radicals without HELP to complete the lesson.

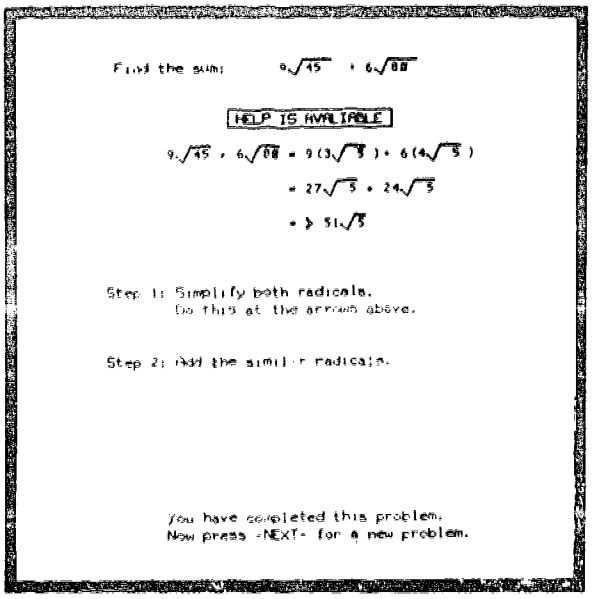
Grade Level: Intermediate algebra Student Time: 30 minutes

Subject Area: Albegra ecs: 4673

File Name: math95d
Addition of Radicals

Authors: Shin Saito, City Colleges of Chicago and
Richard Neapolitan, Wright College




Objective:
To present practice with help on addition of radicals.

Description:
1. There are four sections:
   a. Addition of Radicals
   b. Adding Similar Radicals
   c. Adding Two Radicals
   d. Adding Several Radicals
2. In section a the student is shown how to add similar radicals, and shown how tc combine radicals which can be simplified into similar radicals.
3. In section b, he must add similar radicals. He must do four problems without HELP to complete the section. He may, however, request HELP at any time, to work a given problem. The HELP consists of a sequence of questions and arrows which lead him through the problem in steps.
4. In sections c and d he must add radicals which are not similar. The criteria and HELP are similar to that of section b.

Grade Level: Intermediate algebra

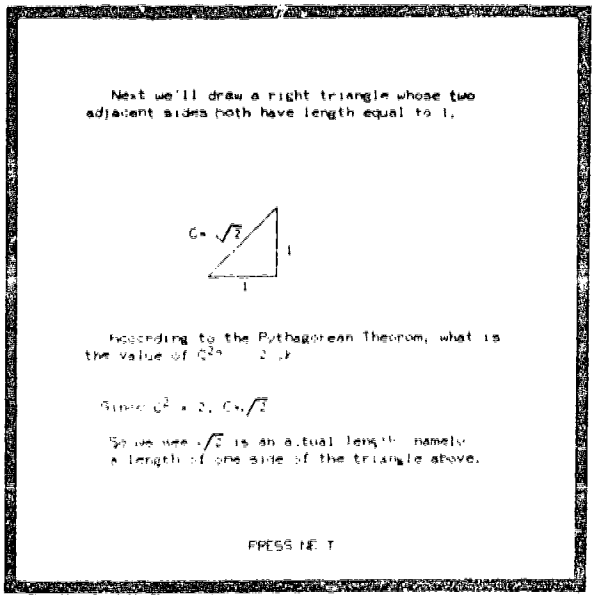
Student Time: 30 minutes

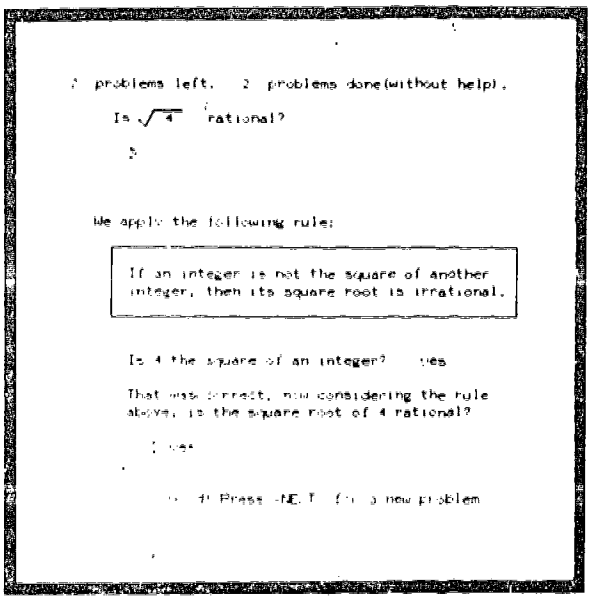
Subject Area: Algebra

ecs: 3478

File Name: math951
Irrational Numbers

Authors: Allan Meers, Wright College, Shin Saito, City Colleges of Chicago, and Richard Neapolitan, Wright College




Objectives:
1. To present a rationale for the existence of irrational numbers.
2. To present practice in recognizing irrational roots of whole numbers.

Description:
1. There are two sections:
   a. Introduction
   b. Drill
2. Section a demonstrates how the need for more numbers gave rise to the rational numbers; then further need gave rise to the irrationals.
3. Section b is a drill designed to teach the student which roots of whole numbers are irrational. He must recognize four numbers correctly to complete the lesson.

Grade Level: High School and above

Student Time: 20 minutes

Subject Area: Algebra

ecs: 2595

File Name: algex
Introduction to Polynomials

Author: B. F. Lathan, Kennedy-King College

Objective:

To provide an introduction and practice exercises on operations with monomials.

Description:

1. Operation with monomials.
2. Definitions of monomial, binomial, trinomial, and polynomial are introduced.
3. This introduction is followed by four drill sections on:
   a. Adding monomials
   b. Combining like terms
   c. Multiplying monomials
   d. Dividing monomials
4. The criterion for each section is to do five problems correctly (not necessarily in a row).
5. A short review can be accessed in each section by using the BACK key.
6. A lesson (file name: puzl) containing a crossword puzzle on algebraic vocabulary can be accessed from the index of this lesson.

Grade Level: Elementary algebra

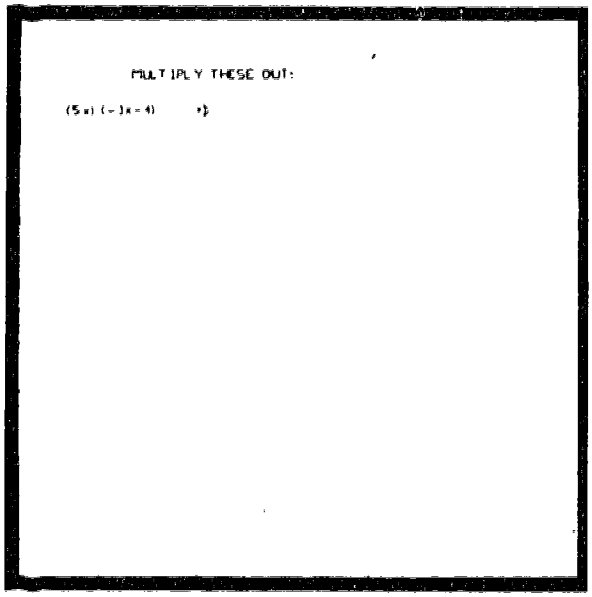
Student Time: 40 minutes

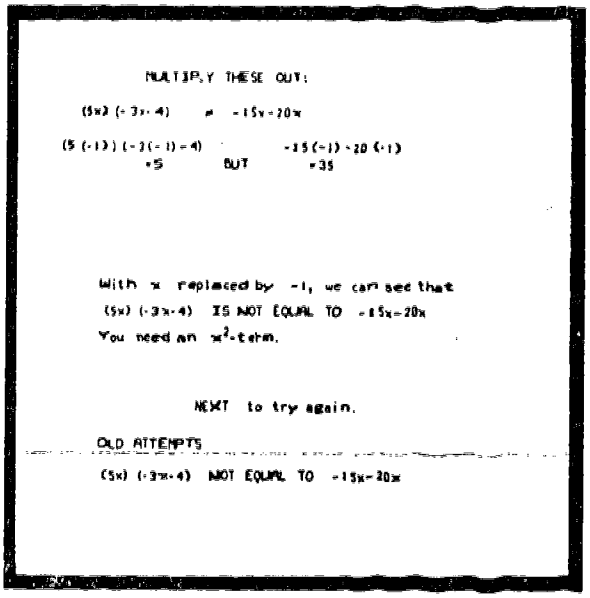
Subject Area: Algebra

ecs: 4331

File Name: quad1
Binomial Products: (x + 2)(x - 3) etc.

Author: Louis V. DiBello, CERL




Objective:
To provide drill practice in multiplying binomials

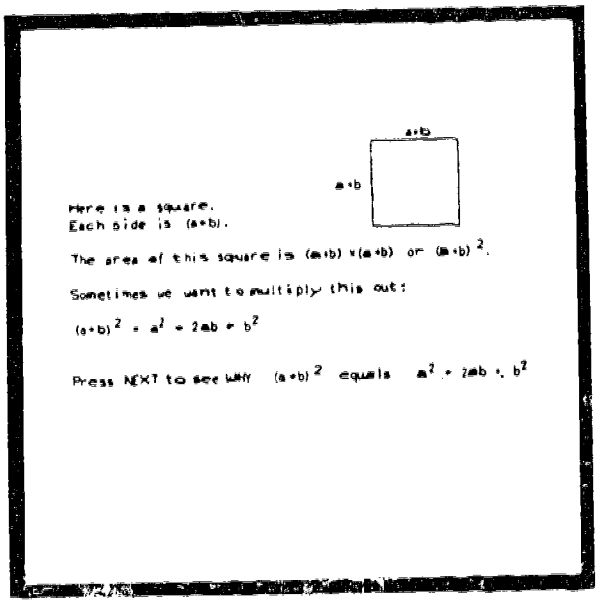
Description:
1. There are four sections:
   a. A guide to these drills
   b. Products like 3x(-2x + 5)
   c. Products like (x - 2)(x + 3)
   d. Products like (-5x + 1)(2x - 4)
2. In each of the drill sections the problems are generated at random, and the student may work as many problems as he wants.
3. Unacceptable answers are diagnosed and saved on the screen for the student; the correct answer is given after four mistakes.

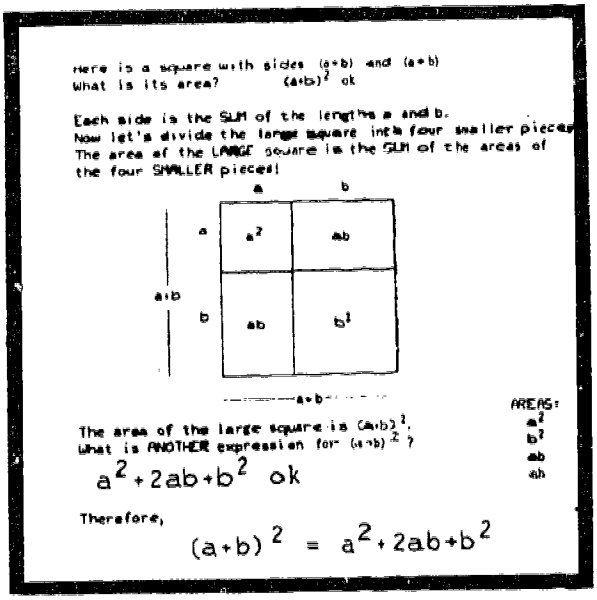
Grade Level: Elementary Algebra
Student Time: 45 minutes

Subject Area: Algebra
ecs: 3382

File Name: park2
Binomial Products: (a + b)(a - b) etc.

Authors: Paul Thompson, Parkland College, and Robert Baillie, CERL




Objective:

To provide instruction and practice in binomial products.

Description:

1. There are five sections:
   a. $(a + b)^2$
   b. $(a - b)^2$
   c. $(a + b)(a - b)$
   d. $(a + b)(c + d)$
   e. Review Questions
2. In each of the first four sections, a geometric diagram is used to justify the appropriate algebraic formula (e.g., $(a + b)^2 = a^2 + 2ab + b^2$ in section one). Then the student is given exercises of the same type until he has answered four in a row on first or second try. Section five contains exercises of all four types.

Grade Level: Elementary algebra

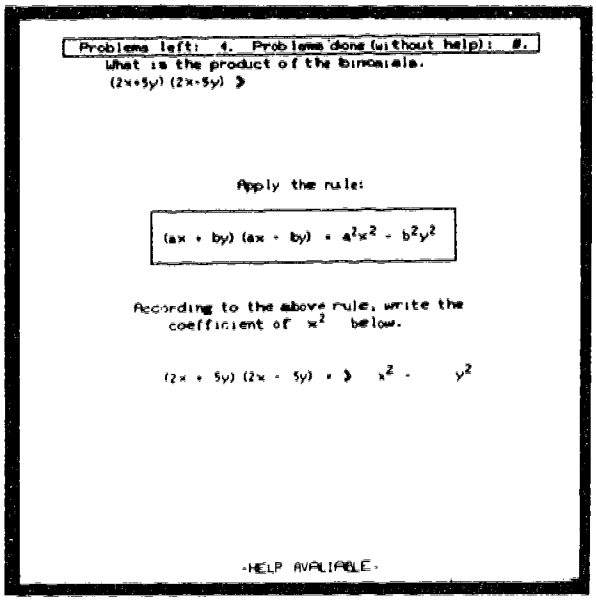
Student Time: 60 minutes

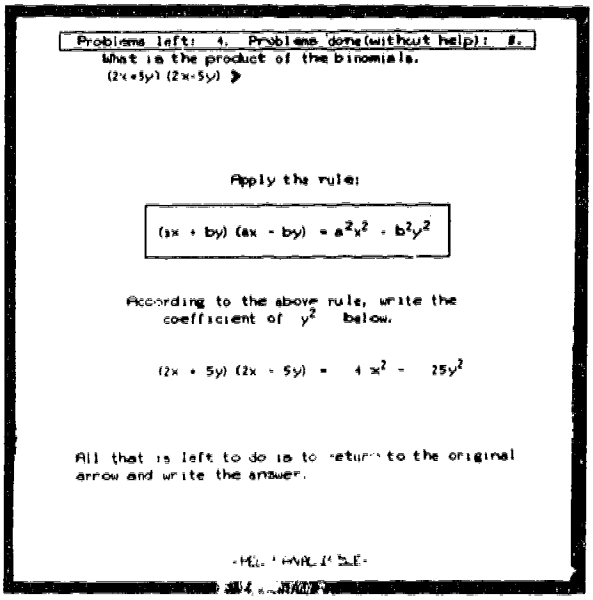
Subject Area: Algebra

ecs: 4182

File Name: math95e
Math Special Products I

Authors: Shin Saito, City Colleges of Chicago, and
Richard Neapolitan, Wright College




Objective:

To provide practice with help in special products.

Description:

1. There are three sections:
   a. Problem type: (ax + by) (ax - by)
   b. Squaring a binomial
   c. Multiplying two binomials
2. In each section the student is shown how to find the type of product indicated on the index page. He must then find six products of that type without HELP to complete the section. The HELP consists of a sequence of questions which lead him to finding the product in steps.

Grade Level: Intermediate algebra

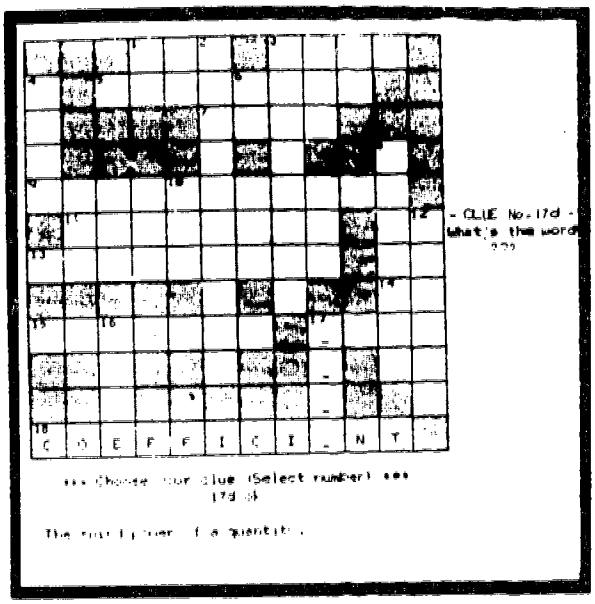
Student Time: 25 minutes

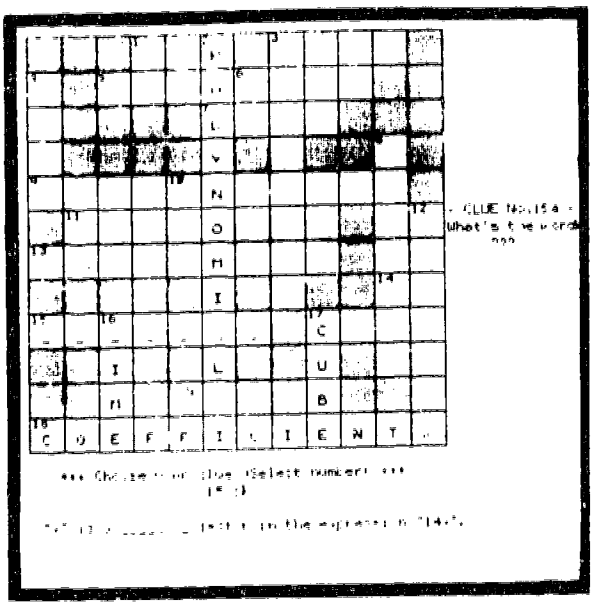
Subject Area: Algebra

ecs: 3478

File Name: puzl
Crossword Puzzle on Algebraic Vocabulary

Author: B. F. Lathan, Kennedy-King College





Objective:
To provide practice working with terminology of polynomials.

Description:
1. The crossword puzzle to be completed is displayed on the screen. The student chooses a location (e.g., 3a for 3 across). He is then given the clue for that word and can enter his answer in the puzzle.
2. The student can erase previous answers and by using the HELP key, he can get the correct answer for a location he selects.
3. Complete instructions can always be accessed by using the BACK key.
4. When the student has filled in the puzzle, he can have his answers checked. He is required to correct any mistakes.

Grade Level: Intermediate algebra

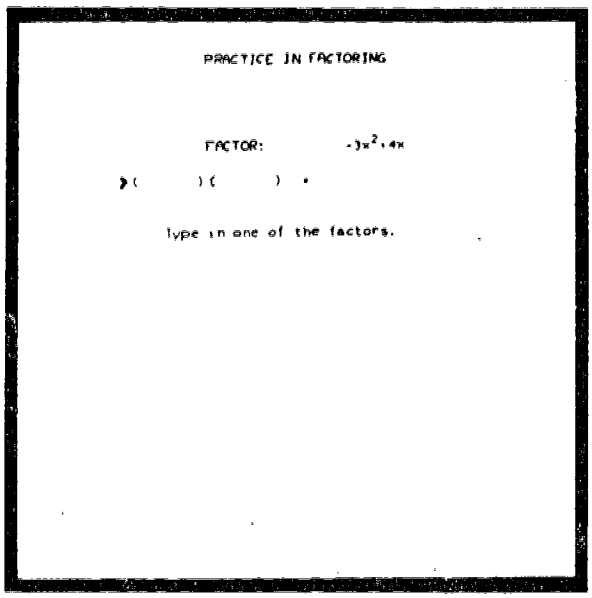
Student Time: 20 minutes

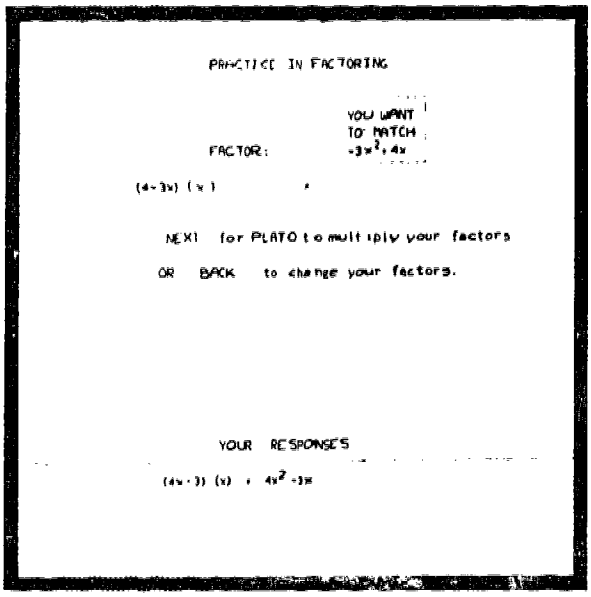
Subject Area: Algebra

ecs: 2631

File Name: quad2
Factoring Quadratic Polynomials

Author: Louis V. DiBello, CERL




Objective:

To provide drill practice in factoring quadratic polynomials.

Description:

1. There are five sections:
   a. A guide to these drills
   b. Polynomials like $3x^2 - 5x$
   c. Polynomials like $x^2 - x + 2$
   d. Polynomials like $-2x^2 + 5x + 3$
   e. Polynomials like $10x^2 - 31x - 63$
2. In each of the drill sections the problems are generated at random, and the student can work as many problems as he wants.
3. The student is required to factor each quadratic into a product of two linear factors by providing the linear factors one at a time. Once the student has given two linear factors, his two factors are multiplied out by PLATO to show him whether his factorization is correct or not. Incorrect factorizations are saved on the screen and diagnosed for the student.

Grade Level: Intermediate algebra

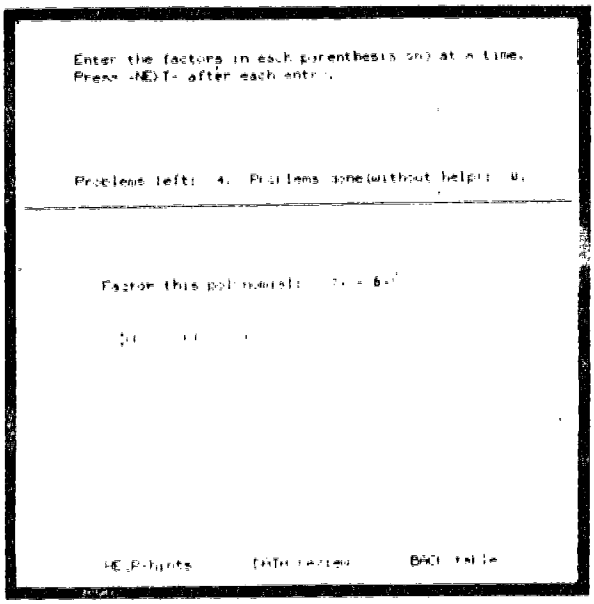
Student Time: 60 minutes

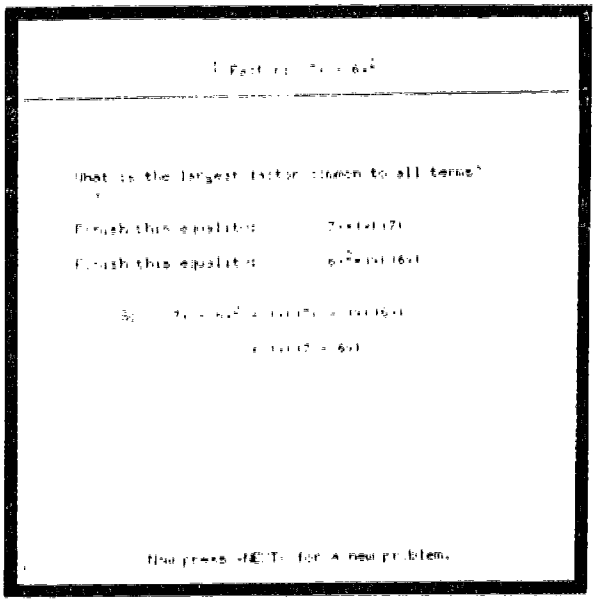
Subject Area: Algebra

ecs: 2495

File Name: math95a
Factoring Polynomials

Authors: Shin Saito, City Colleges of Chicago, and
Richard Neapolitan, Wright College




Objective:

To present practice with help on factoring polynomials.

Description:

1. There are six sections:
   a. Problem type: $ax - bx^2$
   b. Problem type: $ax^4 + bx^2 + cx$
   c. Problem type: $ax^2y + bxy + cxy^2$
   d. Factoring the difference at two squares
   e. Factoring the trinomial square
   f. Factoring the trinomial
2. In each section the student is first shown how to factor the polynomial type listed for that section. He must then factor four polynomials of that type without HELP to complete the section. He may, however, request HELP at any time to receive assistance in factoring a given polynomial. The HELP consists of a sequence of questions and arrows which lead the student through the factoring process in steps.

Grade Level: Intermediate algebra

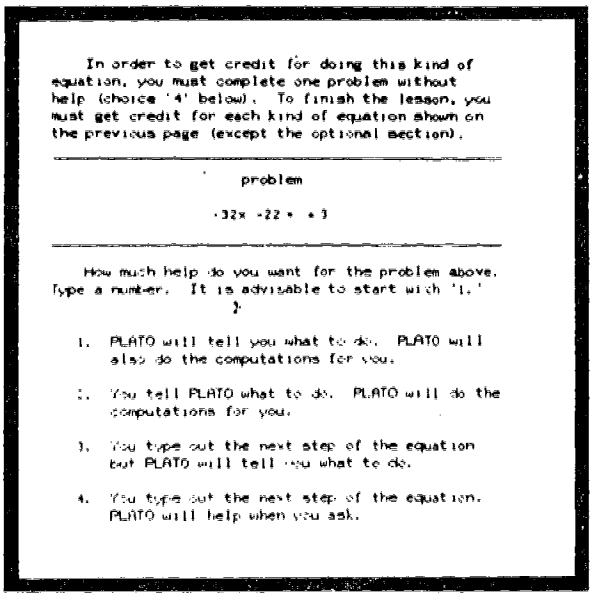
Student Time: 40 minutes

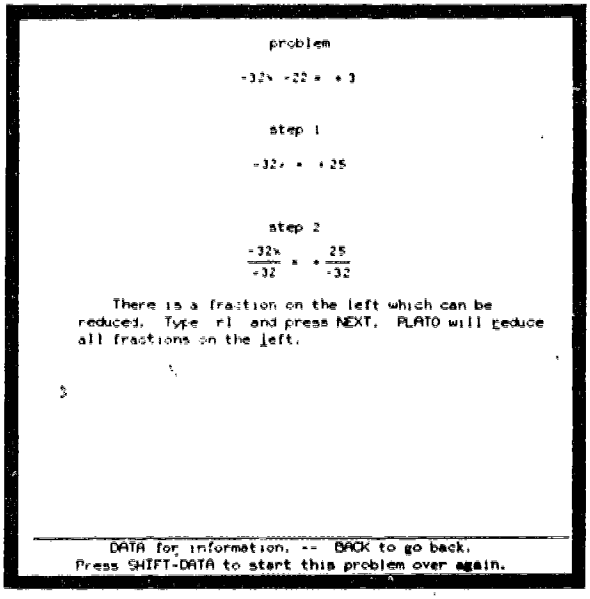
Subject Area: Algebra

ecs: 4715

File Name: solve1
Solving Linear Equations

Author: Mitsuru Yamada, Malcolm X College




Objective:

The student will solve one equation of each type (see the following description) without help from PLATO.

Description:

1. One-step problems like 3x = 4.
2. Two-step problems like 2x + 3 = 4.
3. Equations where 'x' appears on both sides of the equal sign.
4. Equations which have terms that can be combined.
5. Equations with parentheses.
6. Equations with fractions.
7. Harder equations with fractions (optional)

Grade Level: Intermediate algebra

Student Time: 2 - 3 hours estimated

Subject Area: Algebra

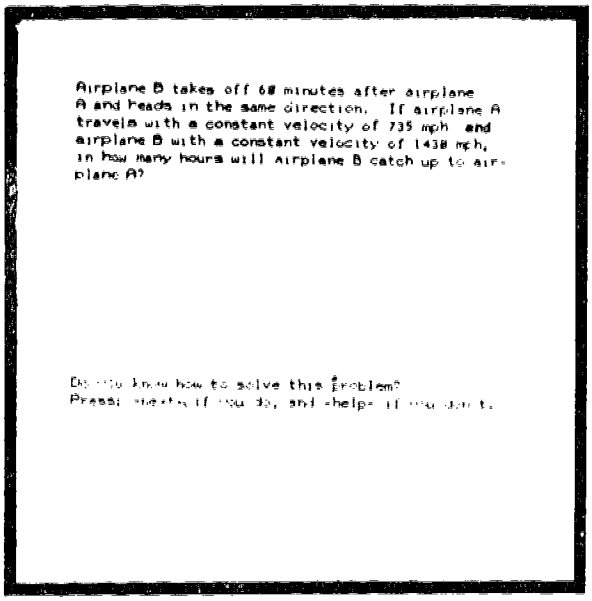
ecs: 7479

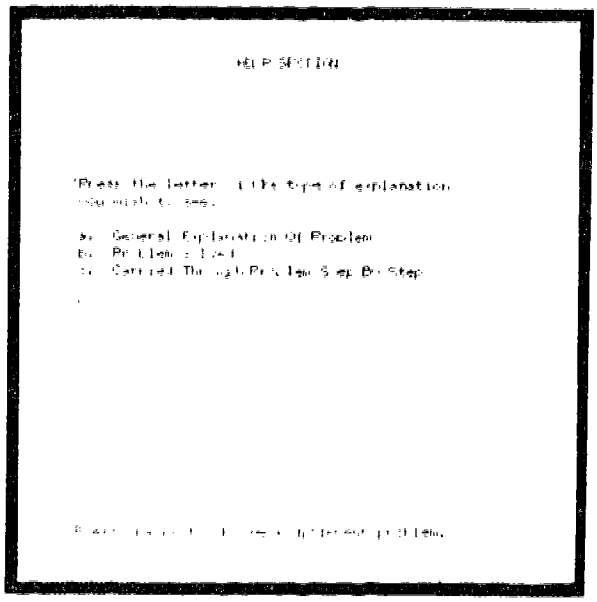
Special Notes:

1. There are four levels of "help" available to the student on each problem. At the highest level, PLATO tells the student what to do next and then does the arithmetic for the student. At the lowest level, the student must type in an equivalent equation.
2. There is cumulative data available to all non-student users of this lesson.

File Name: word1
Word Problems Involving Linear Equations

Authors: Gary Peltz, Malcolm X College, and Mitsuru Yamada, Malcolm X College



Objective:
The student will be able to write equations for the word problems presented in this lesson and solve the equations.

Description:
Problems involving age, mixture, and rates are presented.

Grade Level: Intermediate algebra

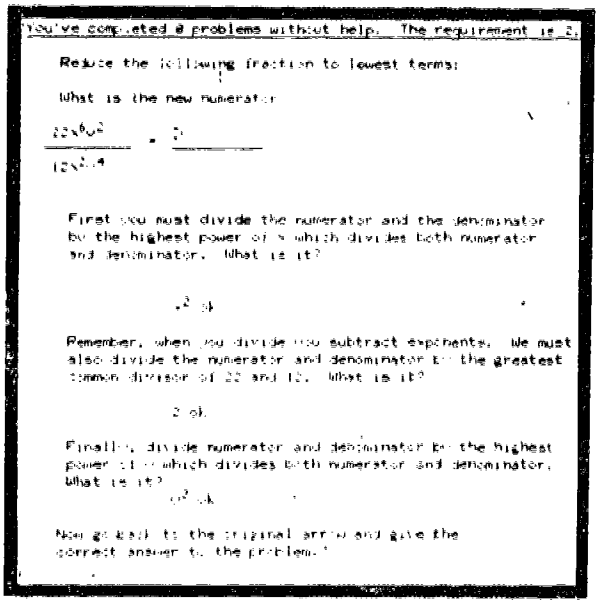
Student Time: 60 minutes

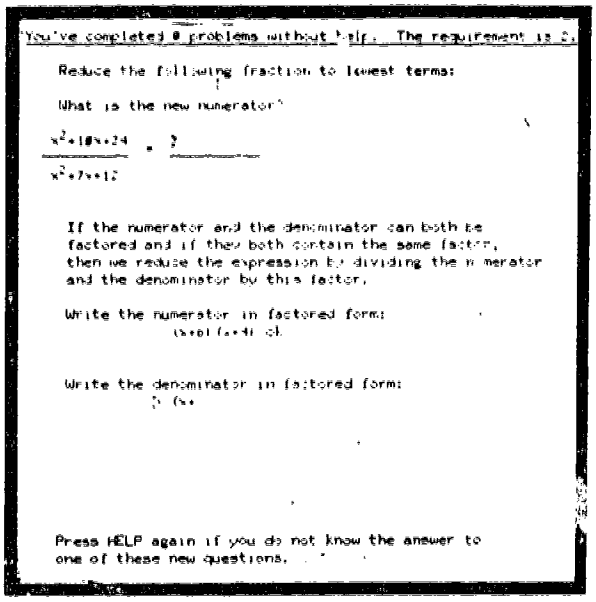
Subject Area: Algebra

ecs: 4548

File Name: math95g
Reducing Algebraic Fractions

Author: Richard Neapolitan, Wright College




Objective:

To present introduction and practice with help on reducing algebraic fractions.

Description:

1. There are four sections:
   a. Problems of the form $8x^4/4x^2$
   b. Problems of the form $10x^6y^4/2x^4y^7$
   c. Problems of the form $(6x^5 - 4x^4)/12x^2$
   d. Problems of the form $(x^2 + 5x + 6)/(x^2 + 3x + 2)$
2. In each section the student is shown how to reduce the fraction shown on the index. He must then reduce two fractions without HELP to complete the section. He may, however, request HELP for any given fraction to receive a sequence of questions and arrows which will lead him through the reduction process in steps.

Grade Level: Intermediate algebra

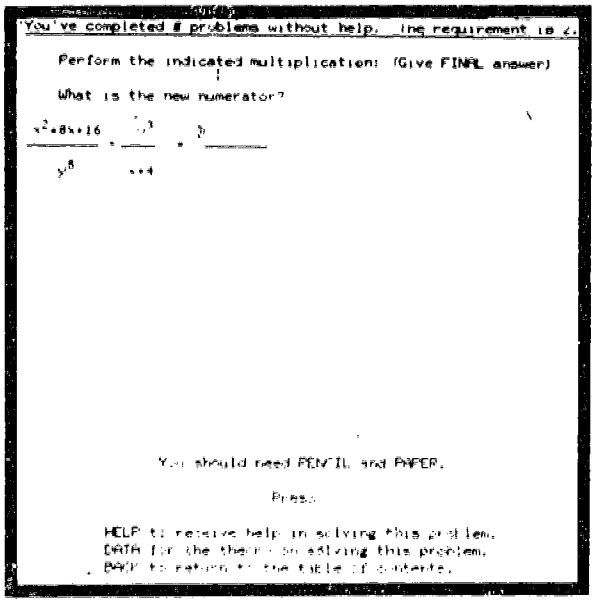
Student Time: 35 minutes

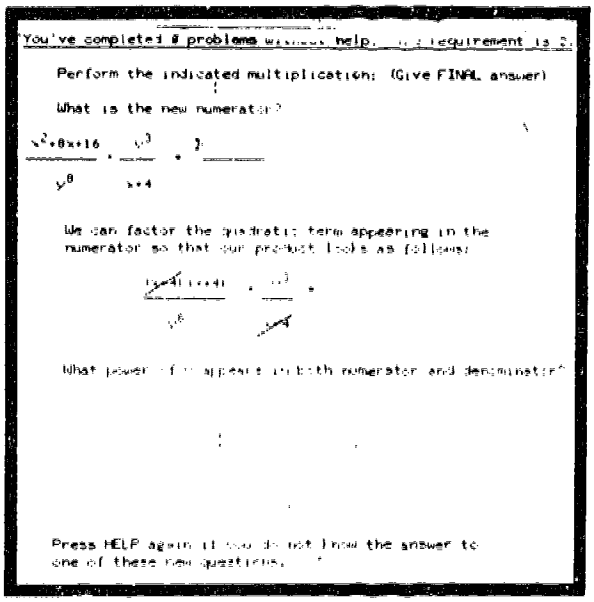
Subject Area: Algebra

ecs: 3471

File Name: math95h
Multiplying Algebraic Fractions

Author: Richard Neapolitan, Wright College




Objective:
To present practice with help on multiplication of algebraic fractions.

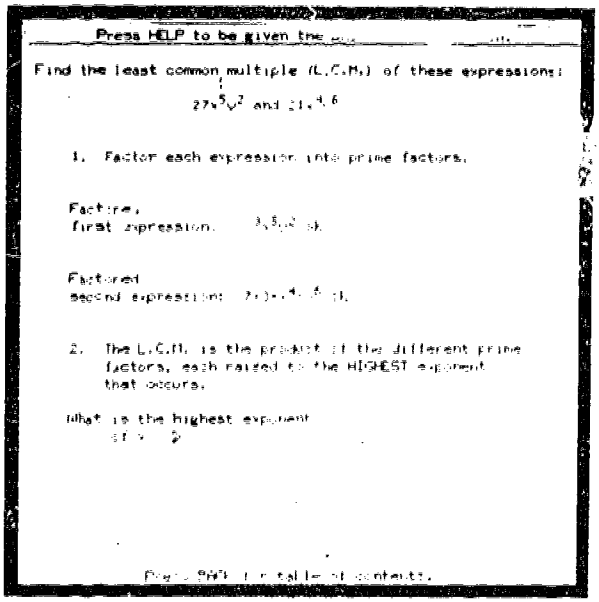
Description:
1. There are three sections:
   a. Problems of the form $(x^5/3y^2) \times (7x^3/y^4)$
   b. Problems of the form $(x^4/3y^5) \times (5y^2/x^3)$
   c. Problems of the form $[(x^2 + 7x + 12)/y^7] \times [y^6/(x + 4)]$
2. In each section the student is first shown how to multiply the algebraic fractions shown on the index. He must then perform two multiplications without HELP to complete the section. He may, however, request HELP for any problem to receive a series of questions and arrows which will perform the multiplication for him.

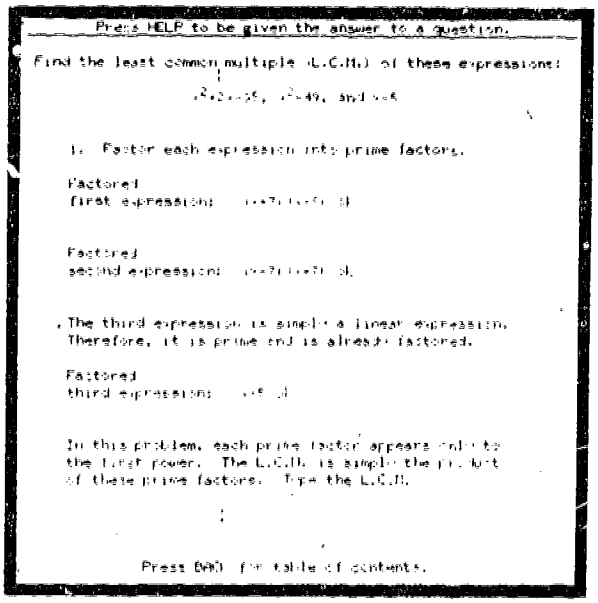
Grade Level: Intermediate algebra
Student Time: 35 minutes

Subject Area: Algebra
ecs: 3101

File Name: math95i
Finding the Least Common Multiple of Algebraic Expressions

Author: Richard Neapolitan, Wright College




Objective:

To present practice with help on finding the least common multiple of algebraic expressions.

Description:

1. There are five sections:
   a. Two expressions of the form $6x^3y^4$
   b. Three expressions of the form $6x^3y^4$
   c. Three expressions of the form $x^2 + x - 6$
   d. Two expressions of the form $x^3 + x^2 - 6x$
   e. Three expressions of the form $x^2 + x - 6$
2. In each section the student is first shown how to find the least common multiple of expressions of the form indicated by the index. He must then find the least common multiple in three problems without HELP to complete the section. He may, however, request HELP for any problem to receive a sequence of questions which will find the least common multiple in steps.

Grade Level: Intermediate algebra

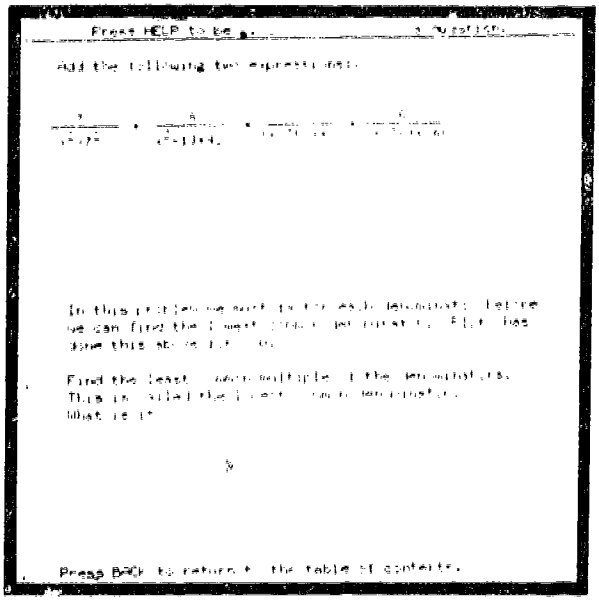
Student Time: 30 minutes

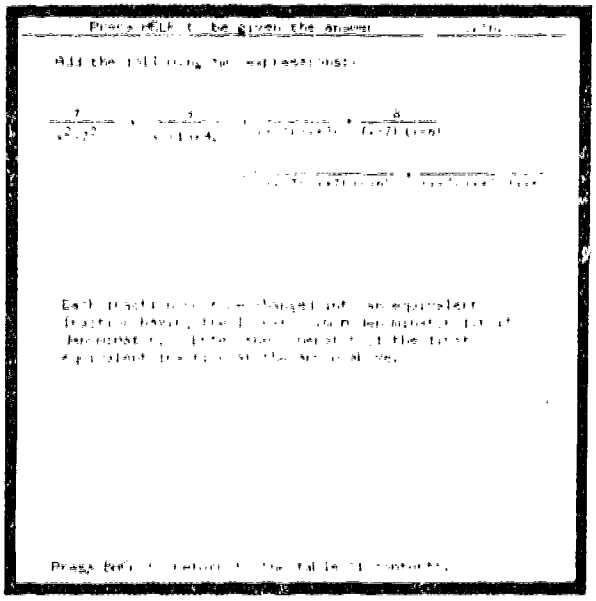
Subject Area: Algebra

ecs: 4367

File Name: m:th95j
adding Algebraic Fractions

Author: Richard Neapolitan, Wright College





Objective:

To present practice with help on addition of algebraic fractions.

Description:

1. There are seven sections:
   a. Problems like $4x/3 + 5x/4$
   b. Problems like $7x/2 + 2x^2/3$
   c. Problems like $3x/4 + 2y/5$
   d. Problems like $2/5x + 5/3x$
   e. Problems like $2/7x + 3/2xy$
   f. Problems like $(3x + 2)/4x + (2y + 5)/3y$
   g. Problems like $3/(x^2 - 4) + 2/(x^2 - 3x + 2)$
2. In each section the student is shown how to add the algebraic fraction shown on the index. He must then add algebraic fractions of that same variety. He must do this three times without HELP to complete the section. He may, however, request HELP at any time to receive a sequence of questions which will lead him through the addition in steps.

Grade Level: Intermediate algebra

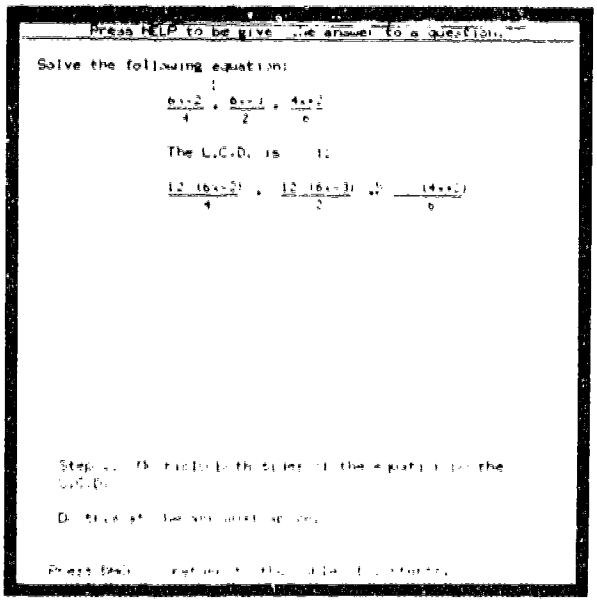
Student Time: 45 minutes

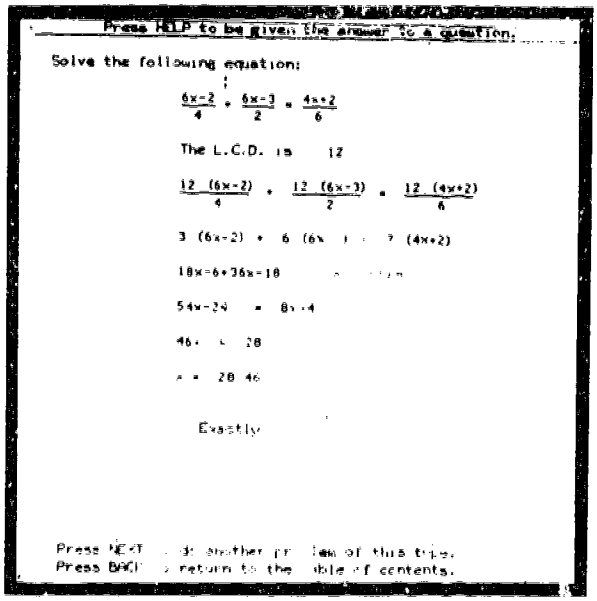
Subject Area: Algebra

ecs: 4623

File Name: lim1
Solving Fractional Equations

Author: Richard Neapolitan, Wright College




Objective:
To provide practice with help on solving fractional equations.

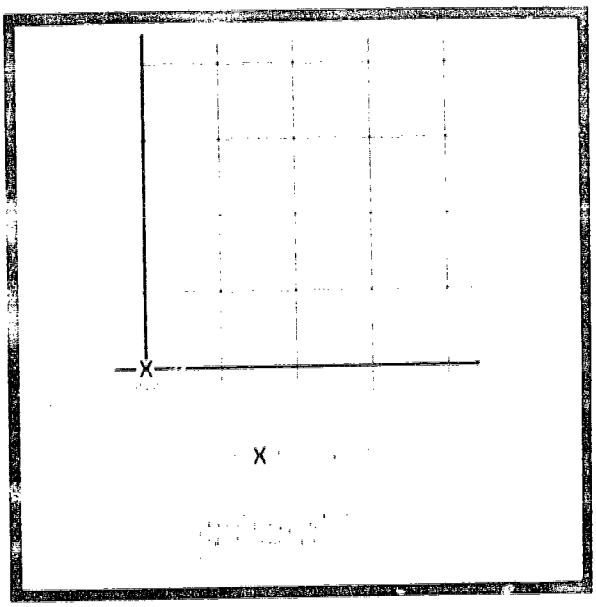
Description:
1. There are three sections:
   a. Problems like (x + 3)/2 + (x + 5)/6 = (x + 1)/9
   b. Problems like 3/4x + 6/5x = 13/20
   c. Problems like 2/(x - 1) - 3/(x + 3) = 6/(x + 2x - 3)
2. In each section the student is shown how to solve the equation listed on the index. He must then solve fractional equations of that type himself. He may press HELP to receive a sequence of questions which will lead to the solution. However, he must solve two equations without help to complete the section.

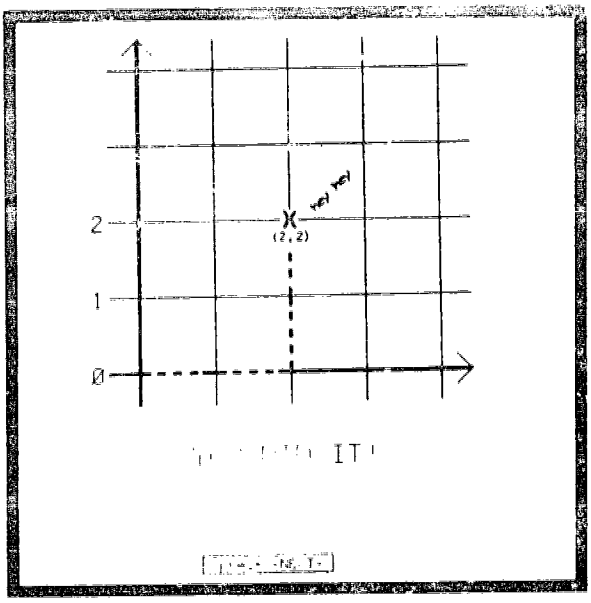
Grade Level: Intermediate Algebra
Student Time: 30 minutes

Subject Area: Algebra
ecs: 4705

File Name: remttt
How to Plot Points

Authors: Donald Cohen and Jerry Glynn, Elementary Math Group, CERL
adapted by David Lassner, CERL






Objective:

To provide remediation in plotting points for students who have failed the checkup in cctttest several times.

Description:

1. The student is taught to move a cursor to a specified x,y location in a grid.
2. He is stepped through this process first, then he is asked to work several similar problems until he can work them without error.

Grade Level: Intermediate algebra

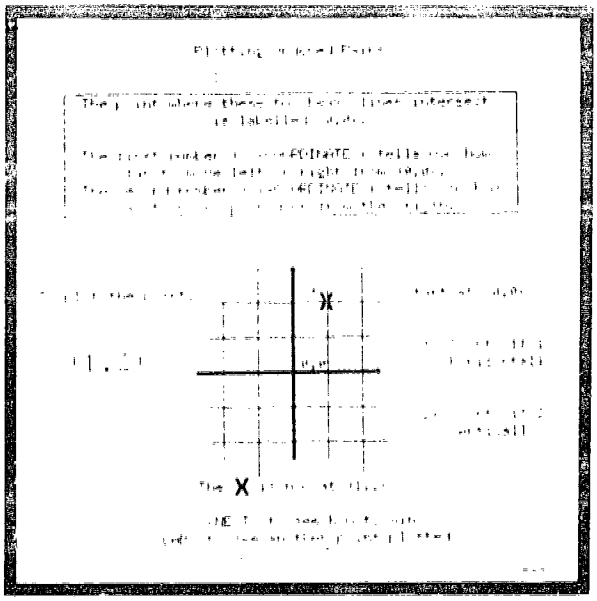
Student Time: 30 minutes

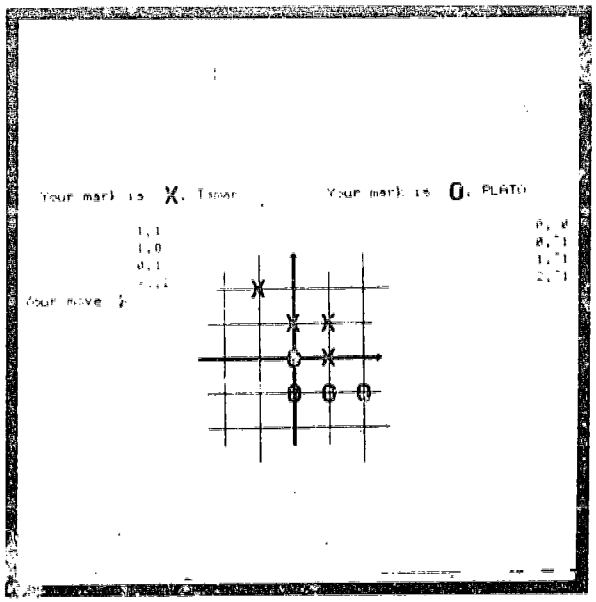
Subject Area: Algebra

ecs: 2679

File Name: ccttt
Tic-Tac-Toe

Authors: Donald Cohen and Jerry Glynn, Elementary Math Group, CERL
adapted by David Lassner, CERL





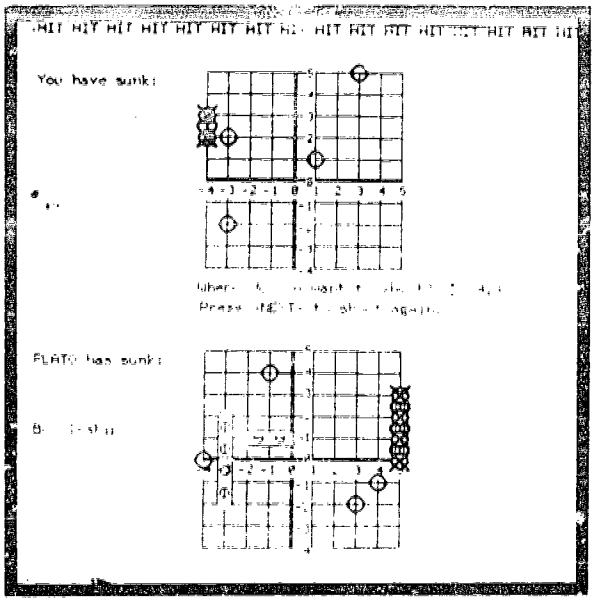
Objective:
To teach plotting points on a grid by using a tic-tac-toe game format.

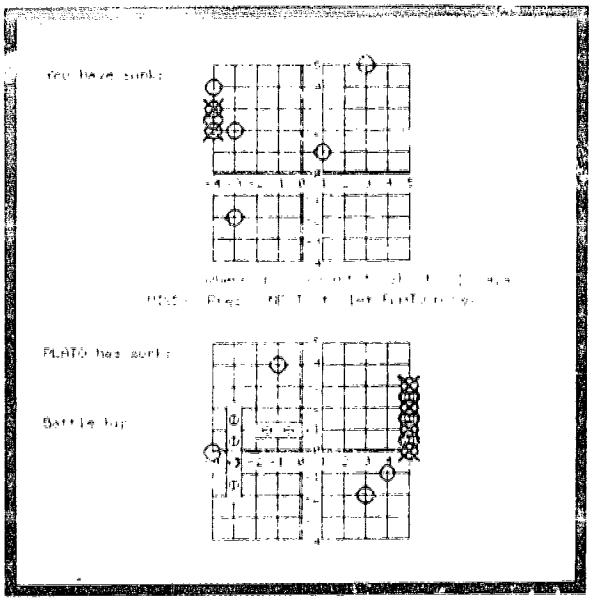
Description:
1. The student plays tic-tac-toe against PLATO on a 4 × 4 grid. The markers are placed at the grid points by giving the coordinates of the grid point.
2. Depending on the level of pla[illegible] grid may include negati[illegible] coordinates.

Grade Level: Intermediate algebra
Student Time: 30 minutes
Subject Area: Algebra
ecs: 3249

File Name: ccbattle
Battleship

Authors: Donald Cohen and Jerry Glynn, Elementary Math Group, CERL
adapted by David Lassner, CERL



Objective:

To provide remediation on plotting points if student fails the checkup in cottest.

Description:

1. Similar to the commercial game "Battleship." The markers are placed on grid points by typing their coordinates. The grid consists of all four quadrants.
2. The student plays against PLATO.

Grade Level: Intermediate algebra

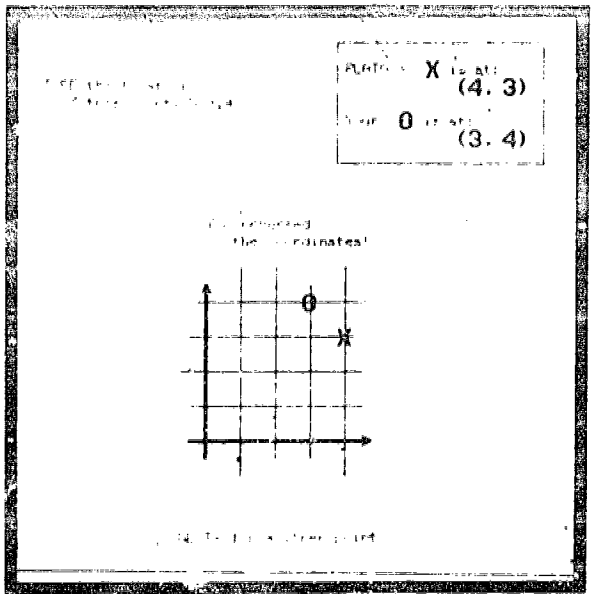
Student Time: 30 minutes

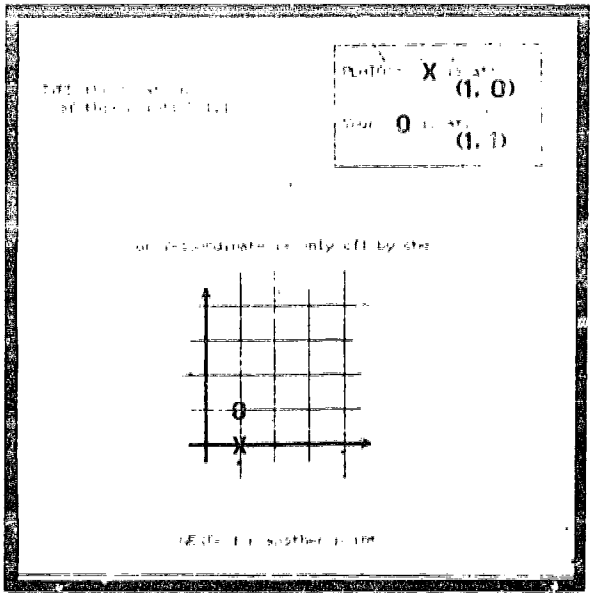
Subject Area: Algebra

ecs: 2340

File Name: cctttest
Plotting Poin[illegible]eckup

Authors: Donald Cohen and Jerry Glynn, Elementary Math Group, CERL
adapted by David Lassner, CERL




Objective:
To provide a checkup on the student's ability to plot points.

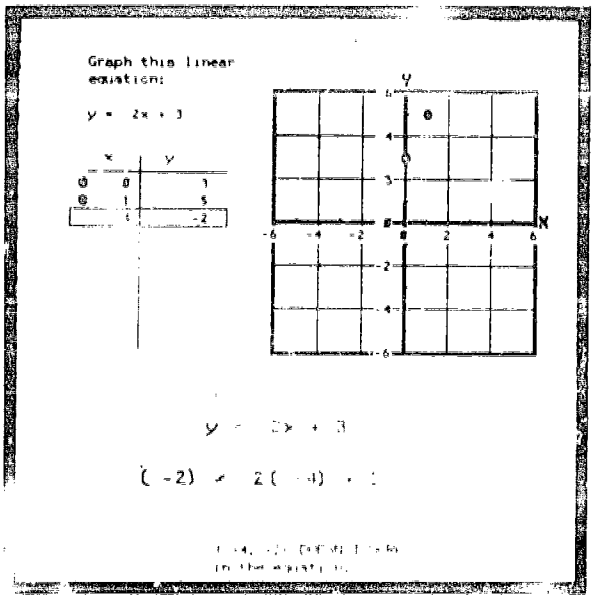
Description:
1. The student is asked to answer two types of questions:
   a. Give the coordinates of a given point on a grid
   b. Move a cursor on a grid to a point whose coordinates are given
2. To pass the checkup he must answer three out of four questions correctly.

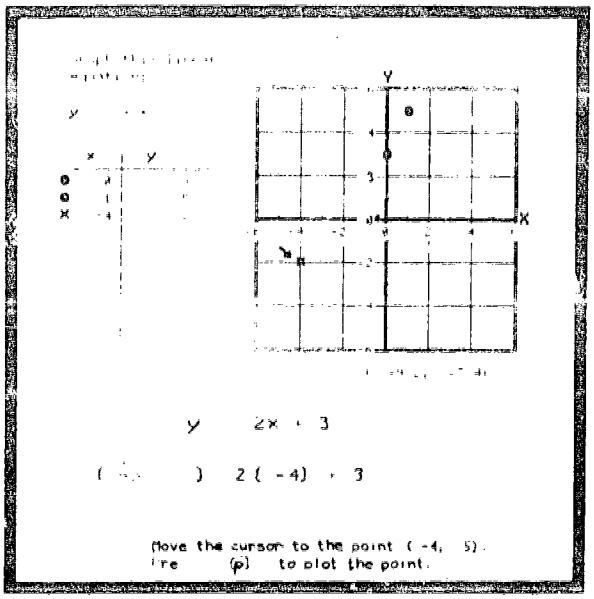
Grade Level: Intermediate algebra
Student Time: 15 minutes

Subject Area: Algebra
ecs: 1560

File Name: line1
Graphing Straight Lines -- Table of Values

Author: Barbara Lederman, CERL




Objective:

To provide instruction and practice in getting a table of values satisfying a given equation of the form $y = mx + b$, and using it to graph the corresponding straight line.

Description:

1. There are three sections:
   a. Getting the table of values
   b. What's my line (graph it using the table of values)
   c. What's my line (graph it by moving a cursor on a grid)
2. In the first two sections the student is given a linear equation of the form $y = mx + b$ and required to provide x and y values to make a table of values that satisfy the given equation. As each pair is entered in the table it is automatically plotted on a grid.
3. In the third section the student moves a cursor to plot points on a grid that satisfy a given linear equation of the form $y = mx + b$. In all three sections at least three correct points are required and all points are checked in the equation.

Grade Level: Intermedia[illegible]ra

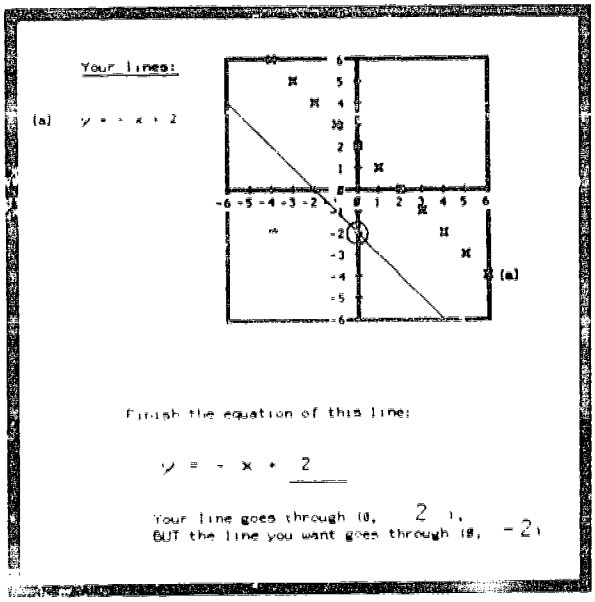
Student Time: 30 minutes

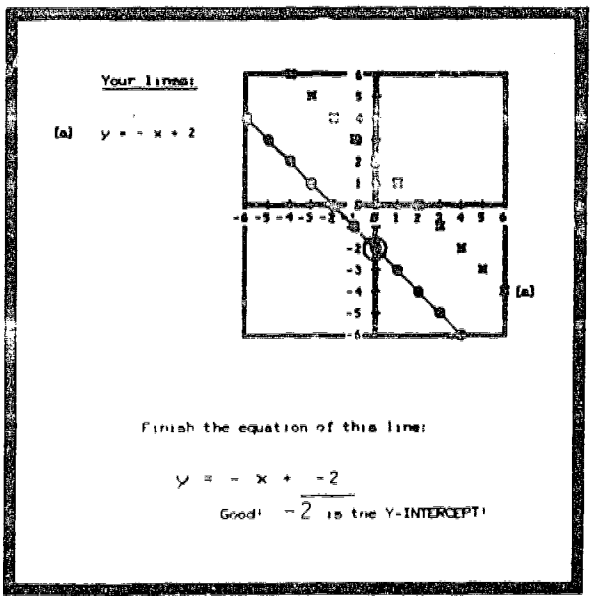
Subject Area: Algebra

ecs: 4713

File Name: line2
Intercept of Straight Lines

Author: Barbara Lederman, CERL




Objective:

To introduce the y-intercept and to provide instruction and practice in finding it from the graph of a linear equation.

Description:

1. There are two sections:
   a. What is the y-intercept
   b. What's my equation (fill in the y-intercept)
2. Section a starts by allowing the student to fill in the blank in an equation of the form $y = mx + \_\_$ and displaying the graph of that equation. In section b, he is taken through a series of exercises until he can determine the intercept by looking at the graph.

Grade Level: Intermediate algebra

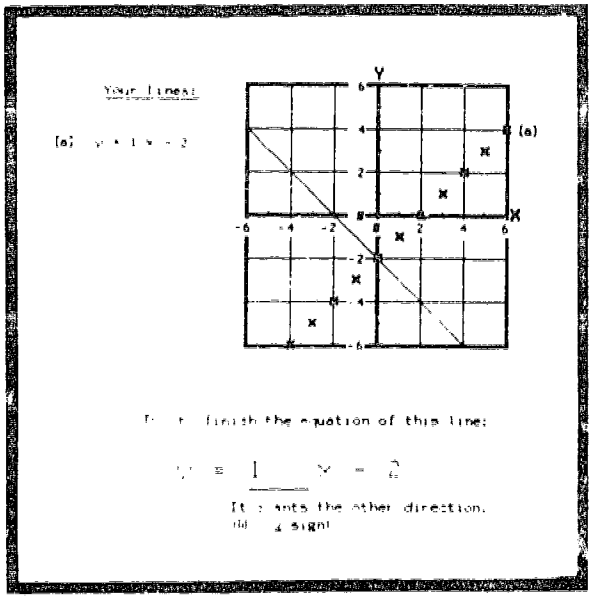
Student Time: 15 minutes

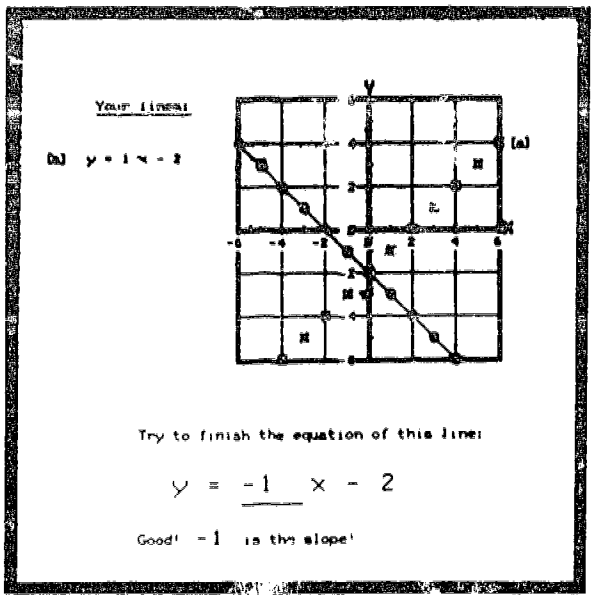
Subject Area: Algebra

ecs: 2123

File Name: line2a
Slope of a Line

Author: Barbara Lederman, CERL






Objective:

To introduce the slope and to provide instruction and practice in finding it from the graph of a linear equation.

Description:

1. In section a the student fills in the blank in equations of the form y = __x + b and the graph of the resulting equation is displayed on the grid.
2. Section b presents a trial-and-error drill where the student determines the slope from a graph. If the student types in an incorrect slope, the graph of the line with that slope is displayed on the grid.
3. Section c presents the rise-over-run definition of slope.
4. Section d develops the two-point formula for slope.

Grade Level: Intermediate Algebra

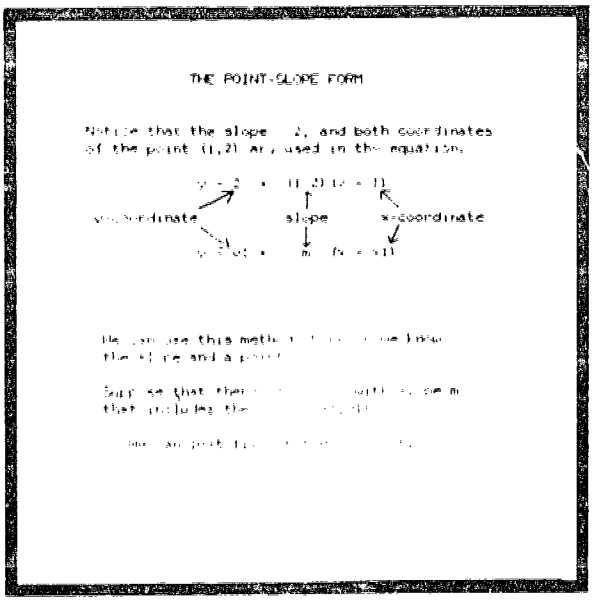
Student Time: 30 minutes

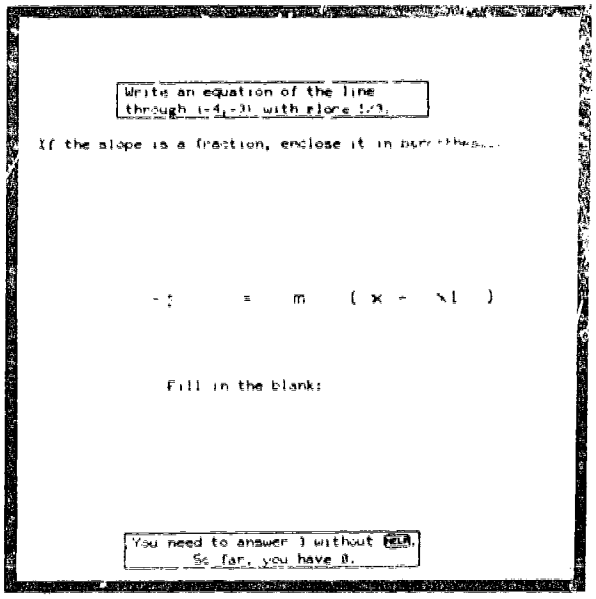
Subject Area: Algebra

ecs: 4462

File Name: line1a
Point-Slope Form

Authors: LaVerne McFadden, Parkland College, Keith Bailey, CERL, and Barbara Lederman, CERL
programmed by David Lassner




Objective:

Given two points or one point and the slope, the student will be able to write an equation of the corresponding line.

Description:

1. There are two sections:
   a. Given the slope and a point, write an equation
   b. Given two points, write an equation.
2. Each section contains instruction and practice exercises all of which can be accessed from an index.
3. In the practice exercises, the student can step through a problem by pressing the HELP key. He is required to do three problems without help in each section to complete the lesson.

Grade Level: Intermediate algebra

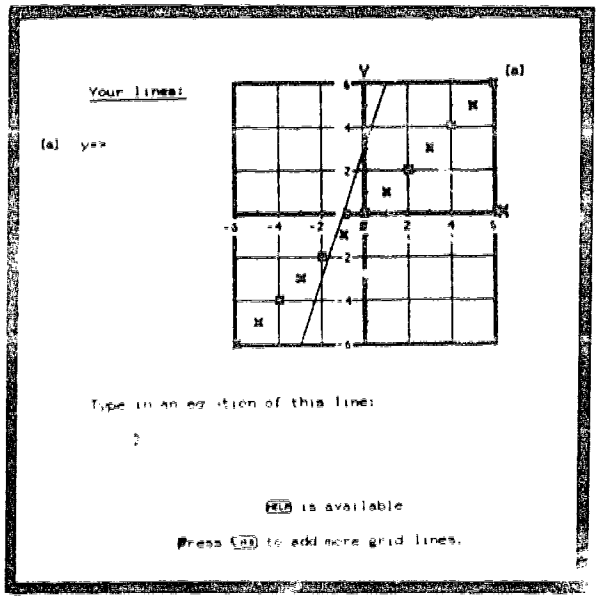
Student Time: 30 minutes

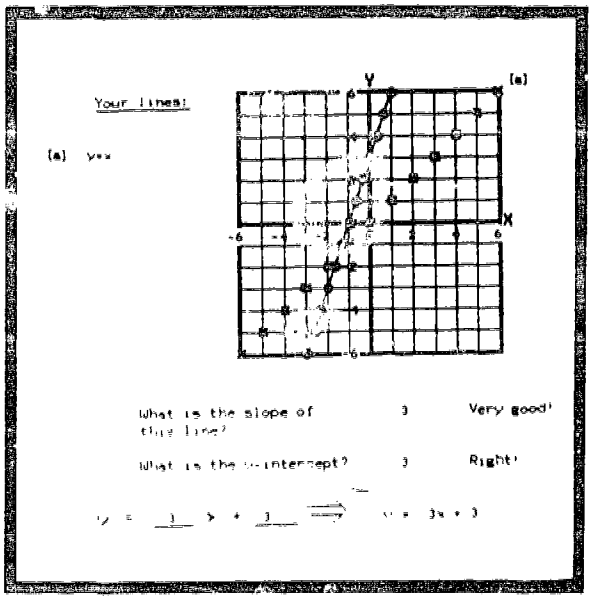
Subject Area: Algebra

ecs: 1976

File Name: line3
Graphing Any Line in the Form y = mx + b

Author: Barbara Lederman, CERL




Objective:

To provide practice in using the slope and intercept to find the equation of a given straight line or to graph a given linear equation.

Description:

1. There are four sections:
   a. Summary of intercept and slope
   b. What's my equation (type it)
   c. Graphing hints
   d. What's my line (graph it)
2. In the first section, the student is given equations in the form y = mx + b for which he must give the slope and the y-intercept.
3. In the second section, the student is given the graph of a straight line and he must type in a linear equation with that graph.
4. The third section helps the student step-by-step to graph a linear equation by using the y-intercept and the slope.
5. In the fourth section he is given a linear equation and he must graph it by plotting at least three correct points on a grid. The student is expected to make use of the concepts and techniques learned in the previous line lessons.

Grade Level: Intermediate algebra

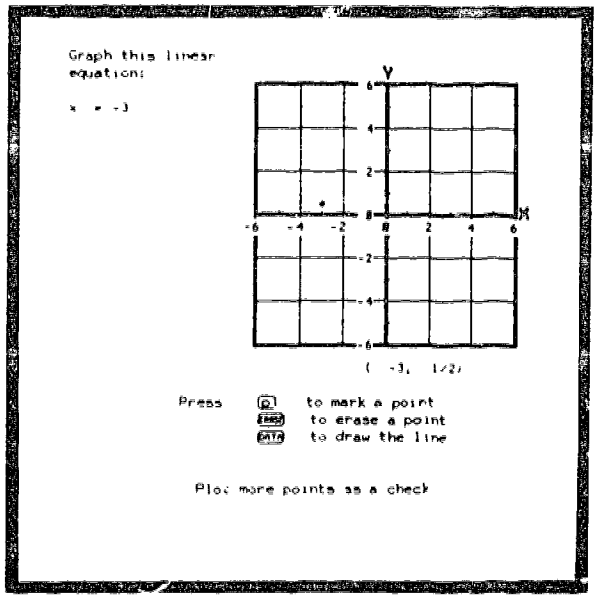
Student Time: 30 minutes

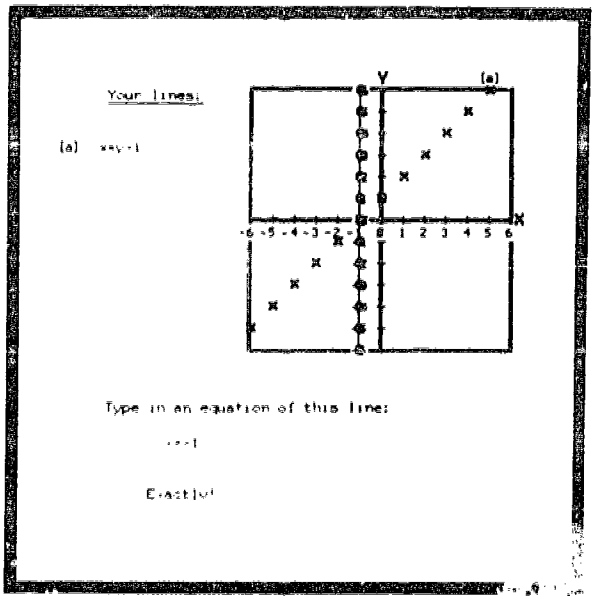
Subject Area: Algebra

ecs: 3587

File Name: line4
The Lines y = b and x = c

Author: Barbara Lederman, CERL




Objective:

To introduce the lines y = b and x = c and to drill the student in graphing any such equation and in finding the equation of any horizontal or vertical line.

Description:

1. There are four sections:
   a. Type the equation (horizontal lines)
   b. Graph the equation (horizontal lines)
   c. Type the equation (vertical lines)
   d. Graph the equation (vertical lines)
2. These sections introduce horizontal and vertical lines and present drills similar to those used in earlier lessons.

Grade Level: Intermediate algebra

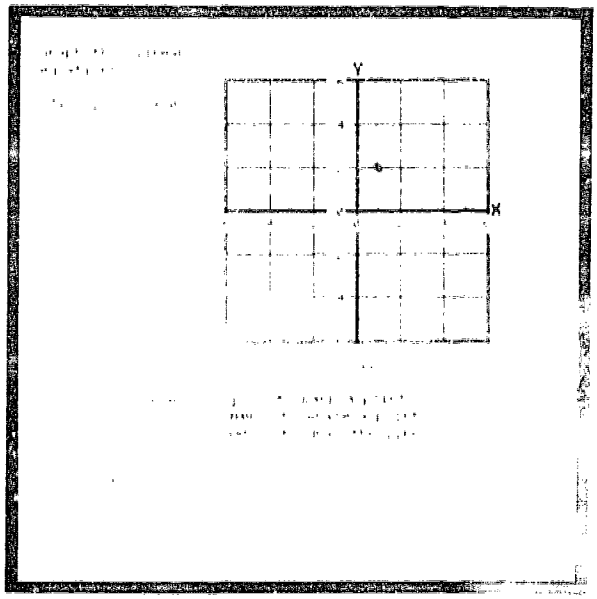
Student Time: 30 minutes

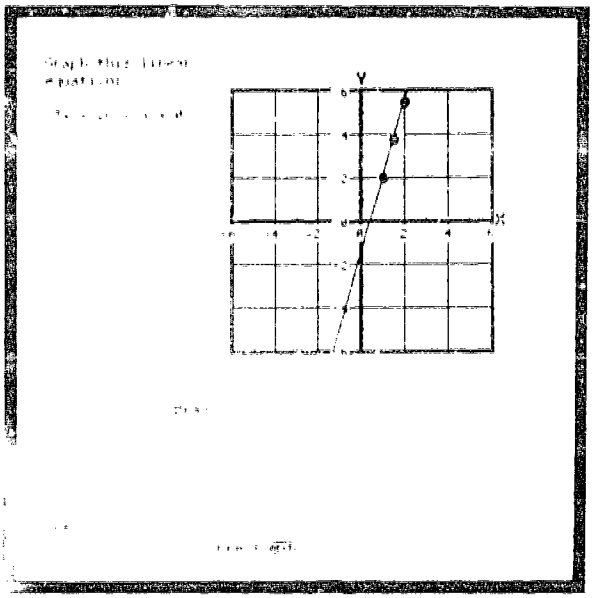
Subject Area: Algebra

ecs: 3634

File Name: line5
Graphing Lines in the Form $ax + by + c = 0$

Author: Barbara Lederman, CERL





Objective:

To enable the student to convert a linear equation in the form $ax + by + c = 0$ to the form $y = mx + b$ and thereby identify its slope and intercept and be able to graph it.

Description:

1. There are five sections:
   a. Find a, b, c
   b. Change $ax + by + c = 0$ to form $y = mx + b$
   c. What's my slope
   d. What's my intercept
   e. What's my line (graph it)
2. In the first two sections the student is taught to convert a linear equation from the form $ax + by + c = 0$ to $y = mx + b$.
3. In the last three sections the equations are given in the a, b, c, form and the drills are otherwise the same as in earlier line lessons.

Grade Level: Intermediate algebra

Student Time: 60 minutes

Subject Area: Algebra

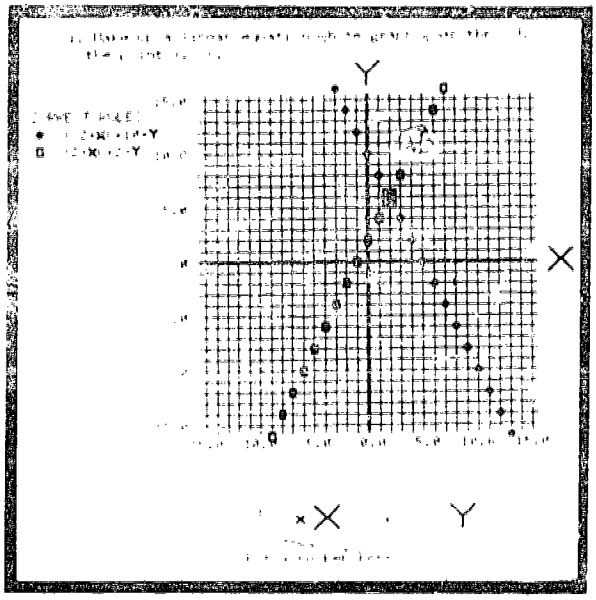
ecs: 357

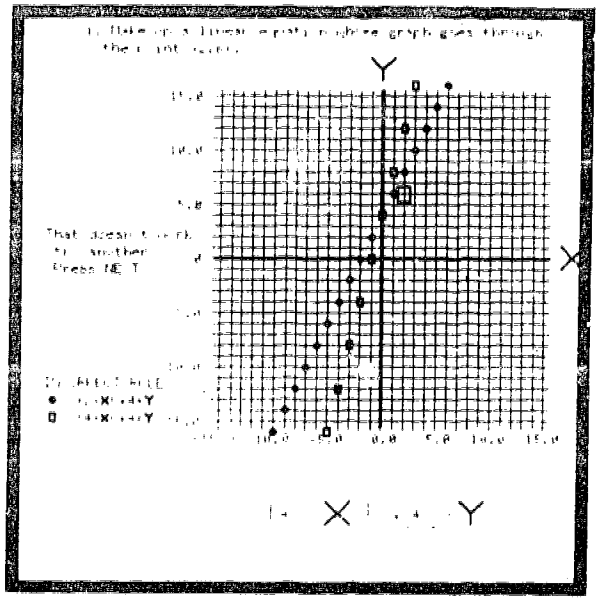
Special Notes:

At this time all lines presented in this lesson can be converted to the form $y = mx + b$. At some time in the future, vertical lines in the form $ax + by + c = 0$ will be added to this lesson.

File Name: line7
More Exercises on Linear Equations and Straight Lines

Authors: Donald Cohen and Jerry Glynn, Elementary Math Group, CERL





Objective:

To provide a series of problems which require the consolidation of all previously learned skills in graphing straight lines.

Description:

1. There are seven sections:
   a. Give the equation of a line through a given point
   b. Give the equation of a line flatter than a given line
   c. Give the equation of a line with the same slope as a given line
   d. Give the equation of a line that meets a given line in a given point
   e. Give the equation of a line through two given points
   f. Give the equation of a line perpendicular to a given line
   g. Give the equation of a line through three given points
2. In each section, the student works with three specific instances of the given type of question.

Grade Level: Intermediate algebra

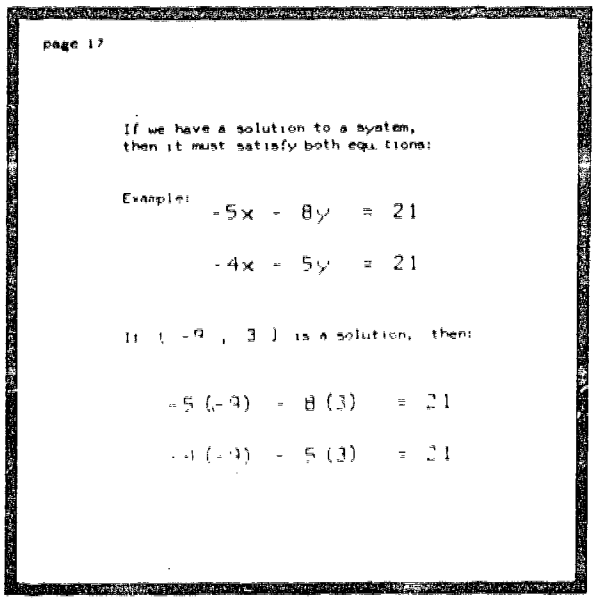
Student Time: 60 minutes

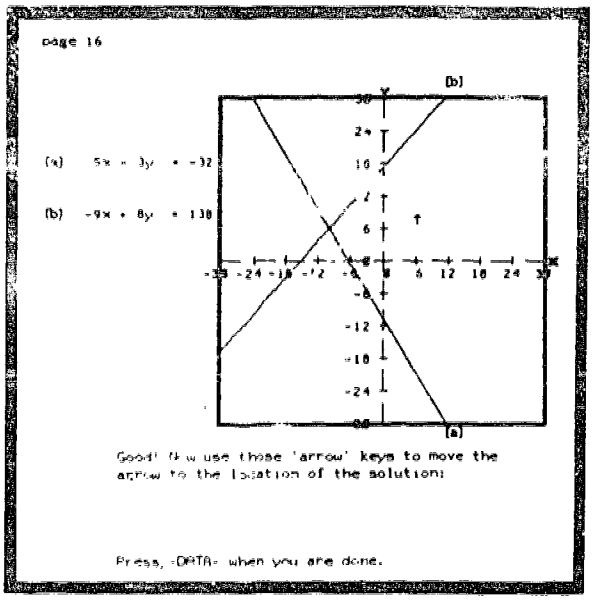
Subject Area: Algebra

ecs: 2054

File Name: simequ
Introduction to Systems of Equations

Author: Barbara Lederman, CERL




Objective:

To provide an introduction to systems of linear equations with emphasis the geometric meaning of the solution to a 2 × 2 system.

Description:

Several large systems are shown. 2 × 2 systems are discussed. Solutions to a system are shown to be intersections of pairs of lines.

Grade Level: Intermediate algebra

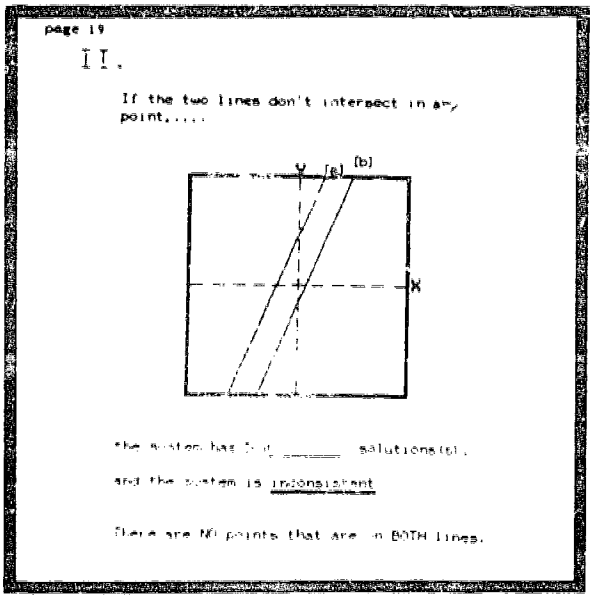
Student Time: 15 minutes

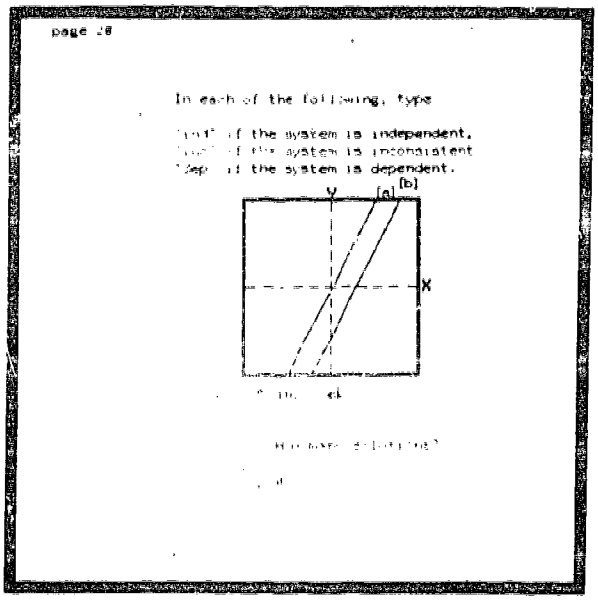
Subject Area: Algebra

ecs: 3140

File Name: simequ1
Independent Systems of Equations and Numbers of Solutions

Author: Barbara Lederman, CEMC




Objective:

To familiarize the student with the geometry (graphs) of three different types of systems: independent, inconsistent, and dependent as well as the number of solutions for each type.

Description:

Two series of drills are presented:

a. A graph (two equations) is presented. The student enters which type of system it represents and how many solutions it has.
b. Only the equations are presented and ratios of coefficients are discussed. The students give system type and number of solutions as before.

Grade Level: Intermediate algebra

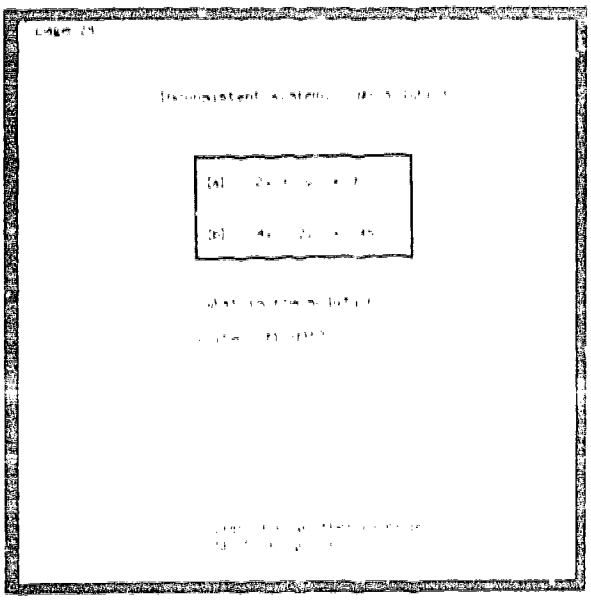
Student Time: 30 minutes

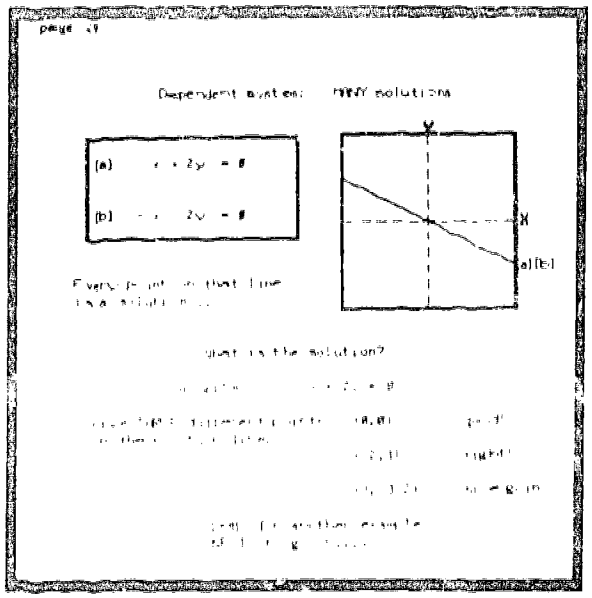
Subject Area: Algebra

ecs: 3826

File Name: simequla
How to Write Solutions to Systems of Equations

Author: Barbara Lederman, CERL






Objective:

To provide directions and practice in typing in solutions to the three types of systems.

Description:

1. There are three sections:
   a. Independent
   b. Inconsistent
   c. Dependent
2. A help sequence is available for the dependent system section.

Grade Level: Intermediate algebra

Student Time: 15 minutes

Subject Area: Algebra

ecs: 3072

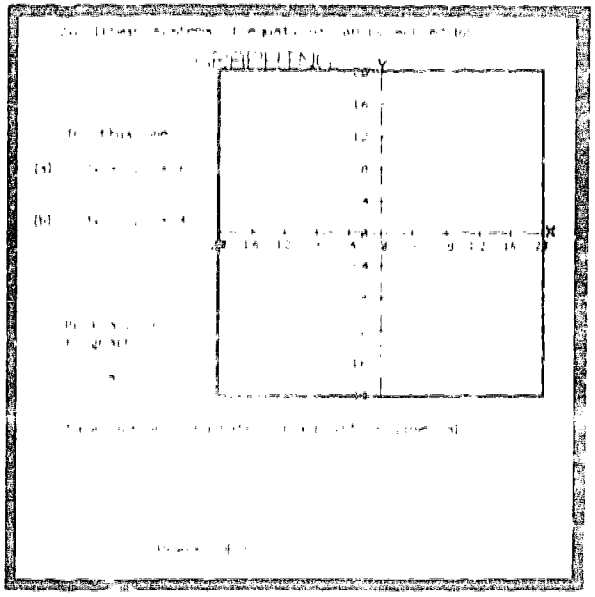
Special Notes:

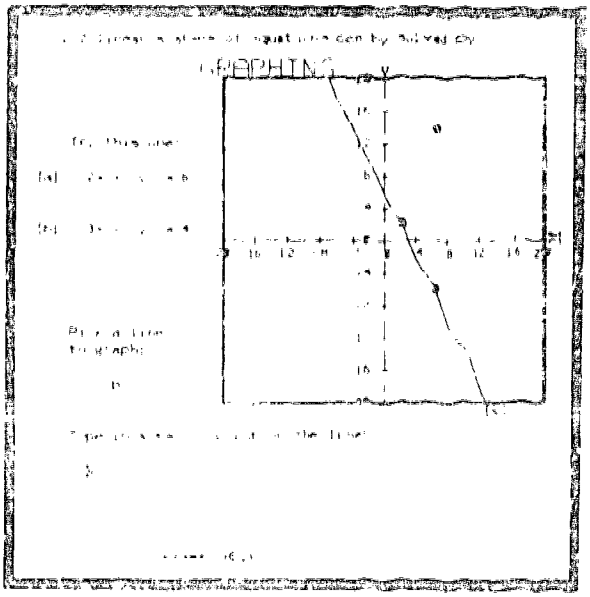
Solutions to the systems are given as follows:

a. Independent systems: an order pair
b. Inconsistent systems: the word "none"
c. Dependent systems: first either equation is typed; then three points on the "solution" line must be given.

File Name: simequ2
Solving 2 × 2 Systems by Graphing

Author: Barbara Soderman, CERL





Objective:
To provide instruction in solving 2 × 2 linear systems by graphing.

Description:
The student graphs one equation at a time, and then estimates the solution to the system by reading the graph.

Grade Level: Intermediate Algebra

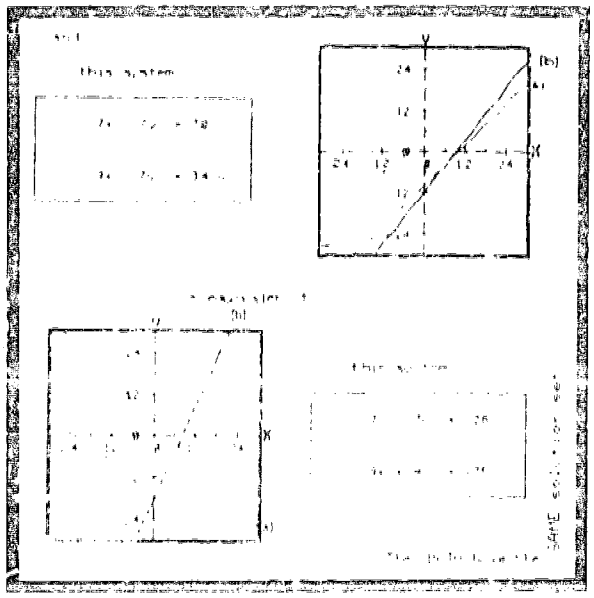
Student Time: 30 minutes

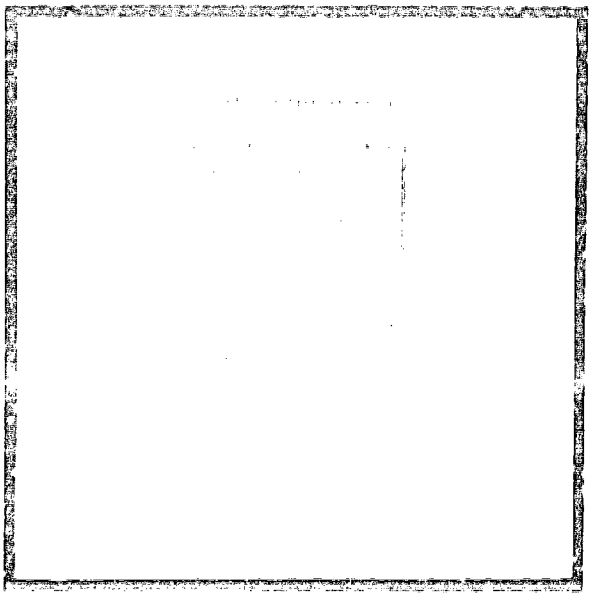
Subject Area: Algebra

ERS: 2611

File Name: simequ3
Introduction to Algebraic Methods of Solving 2 × 2 Systems

Author: Barbara Lederman, CERL





Objectives:

1. To provide motivation for learning algebraic methods for solving systems of equations.
2. To promote an understanding of why the methods work through the use of graphs.

Descriptions:

1. Several systems are presented which can almost be solved by inspection. The student solves these with any requested help.
2. The idea of equivalent systems is presented using equations and graphs.
3. The student is told that algebraic methods can be used to change "ugly" systems into equivalent systems whose solutions are easy to read.

Grade Level: Intermediate Algebra

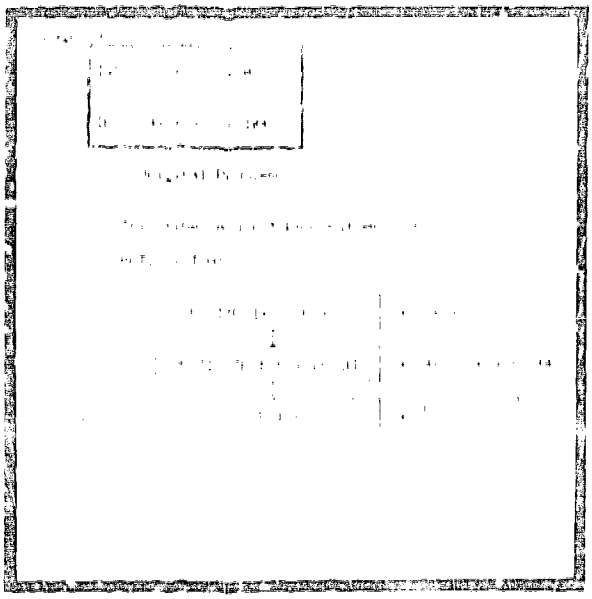
Student Time: 30 minutes

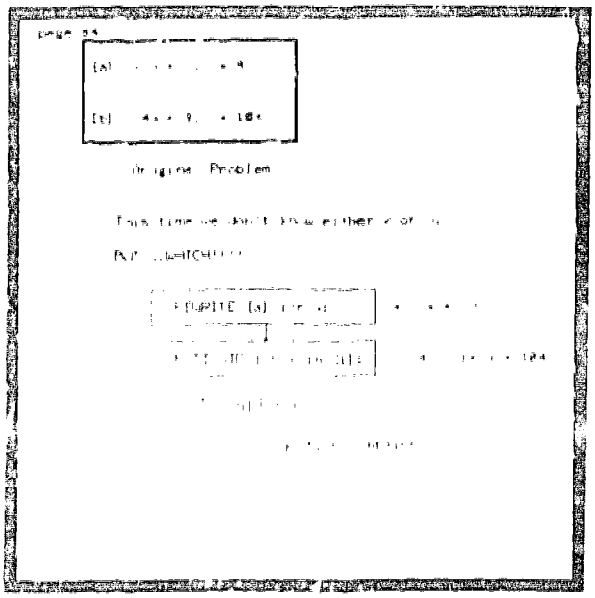
Subject Area: Algebra

ecs: 3459

File Name: simeqn4
Solving 2 × 2 Systems by Substitution

Author: Barbara Lederman, CERL





Objective:

To provide instruction and exercises in solving 2 × 2 systems of linear equations using the substitution method.

Description:

1. The substitution method is presented step-by-step using flowcharts. The student then practices each step typing in the resulting equations. Graphs are used to picture what is happening to the system.
2. Dependent and inconsistent systems are also solved.

Grade Level: Intermediate Algebra

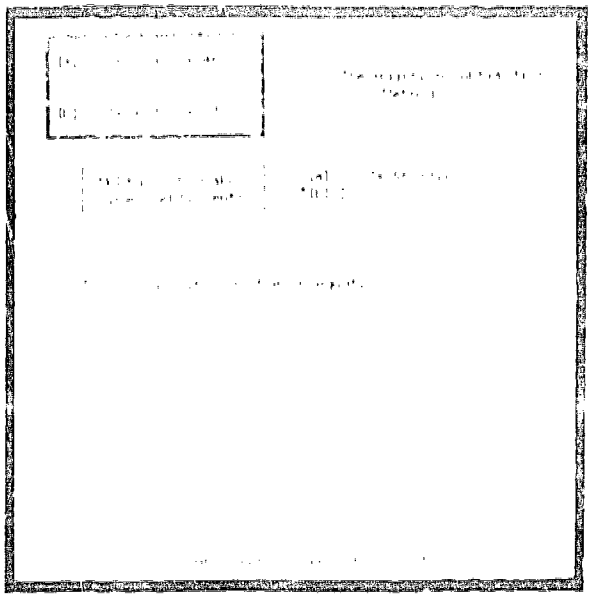
Student Time: 45 minutes

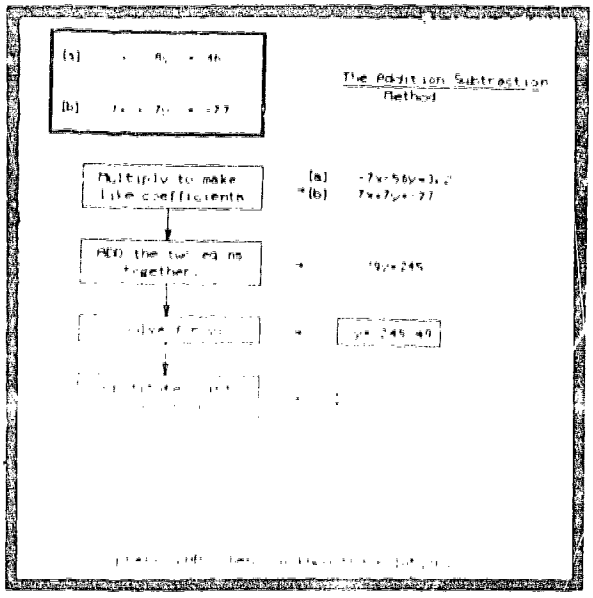
Subject Area: Algebra

ecs: 5560

File Name: simeq:5
Solving 2 × 2 Systems by the Addition-Subtraction Method

Author: Barbara Lederman, CERL






Objective:

To provide instruction and exercises in solving 2 × 2 systems of linear equations using the addition-subtraction method (this method is also known as the method of linear combinations).

Description:

1. The addition-subtraction method is presented step-by-step using flowcharts.
2. The student then practices each step, typing in the resulting equations. Graphs are used to picture what is happening to the system.
3. Independent, dependent, and inconsistent systems are presented.

Grade Level: Intermediate algebra

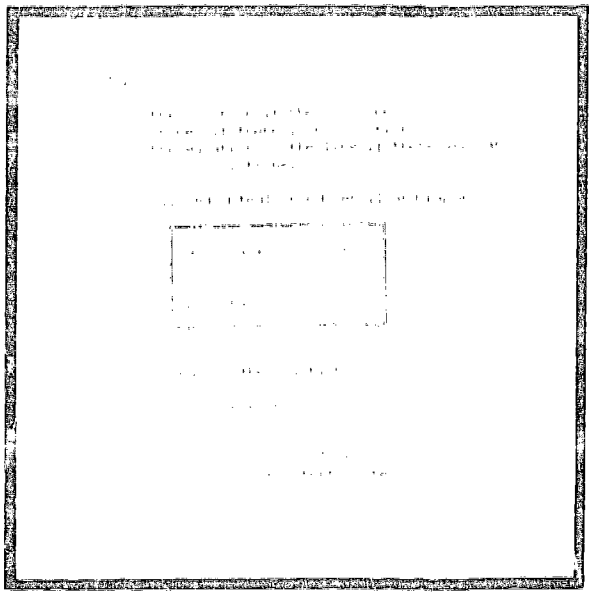
Student Time: 45 minutes

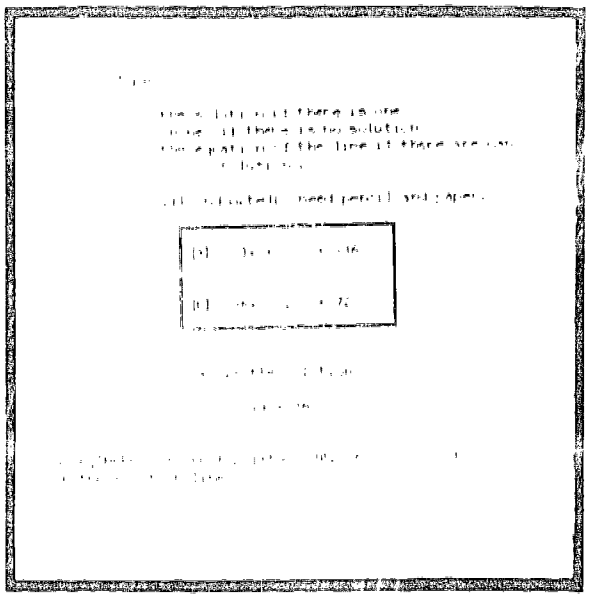
Subject Area: Algebra

ecs: 5344

File Name: simequ6
Exercises on Solving 2 × 2 Systems of Equations

Author: Barbara Lederman, CERL





Objective:

To provide practice in solving each type of 2 × 2 system of linear equations: independent, inconsistent, and dependent.

Description:

This lesson is strictly a drill. No instruction is provided. A student gives solutions to systems of equations.

Grade Level: Intermediate algebra

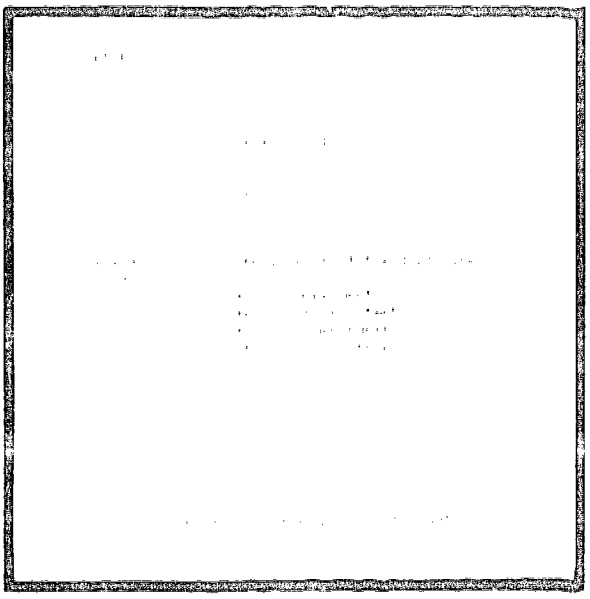
Student Time: 15 minutes, minimum

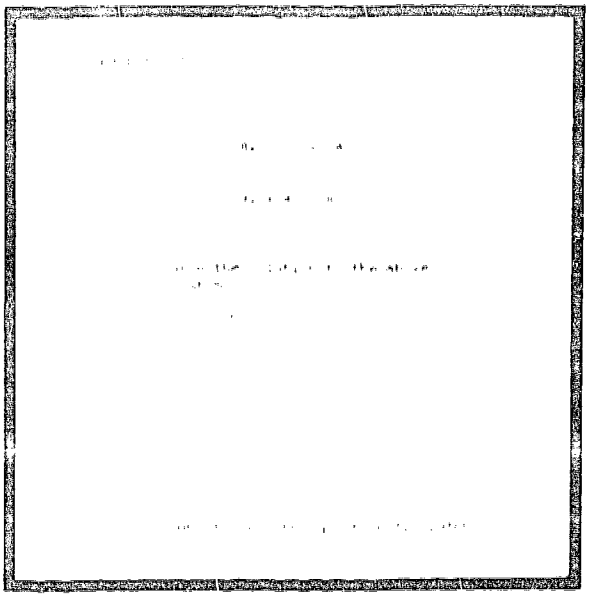
Subject Area: Algebra

ecs: 2572

File Name: sintest
Posttest for Simultaneous Equations

Author: Barbara Lederman, CERL





Objective:

To provide a posttest for the sequence of PLATO lessons on simultaneous equations.

Description:

1. The test consists of twelve questions. There are two multiple choice questions, six yes or no type questions, and four questions where the student must give the solution to a system.
2. The student can skip any question by pressing LAB and return to that question later.
3. Within each problem type, parameters for the exercises are randomly generated so that new questions will be presented to students who repeat the test.

Grade Level: Intermediate algebra

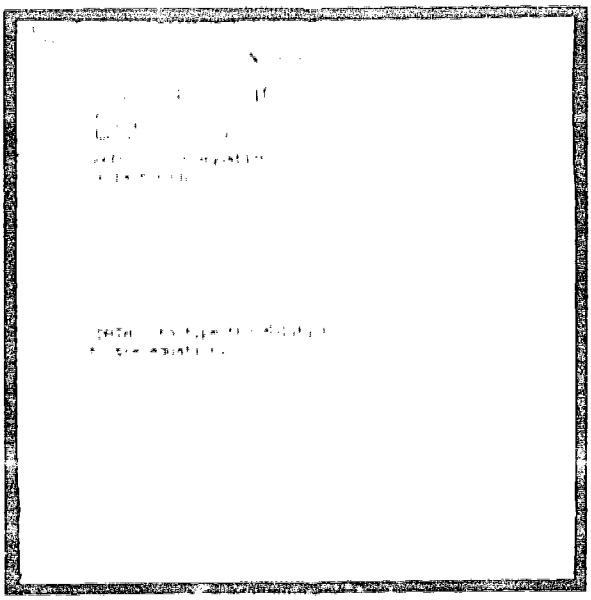
Student Time: 15 - 20 minutes

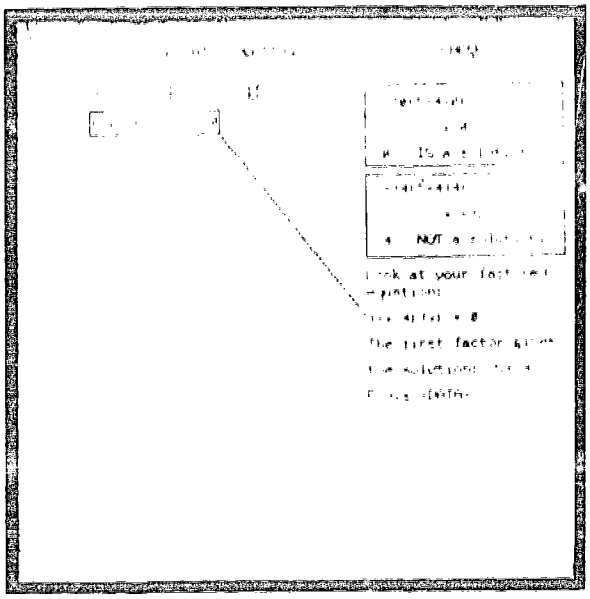
Subject Area: Algebra

ecs: 2821

File Name: quad3
Solving Quadratic Equations by Factoring

Author: Louis V. DiBello, CERL





Objective:

To give drill practice in solving quadratic equations by factoring.

Description:

1. There are five sections:
   a. A guide for these drills
   b. Equations like $3x^2 - 5x = 0$
   c. Equations like $x^2 - x + 2 = 0$
   d. Equations like $-2x^2 + 5x + 3 = 0$
   e. Equations like $10x^2 - 31x - 63 = 0$
2. In each of the drill sections the problems are generated at random, and the student may work as many problems as he wants.
3. The student can choose to give the solutions right away or to factor the equation first. Any solution he gives is checked by plugging it into the equation and the student is shown this check.
4. If the student cannot give the solutions, he is required to factor the equation first. Incorrect factorizations are multiplied out for the student and saved on the screen.
5. After four incorrect factorizations, the correct factorization is given and the student is required to solve the equation. After three incorrect attempts to give a solution, the factorization is analyzed to find a solution from it.

Grade Level: Intermediate algebra

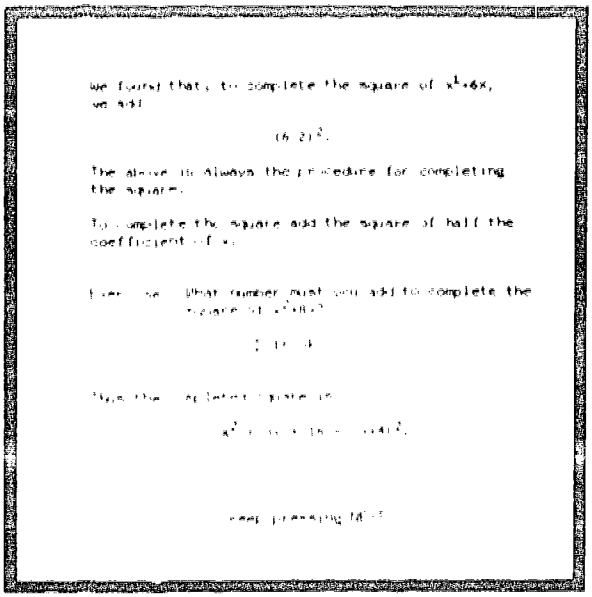
Student Time: 60 minutes

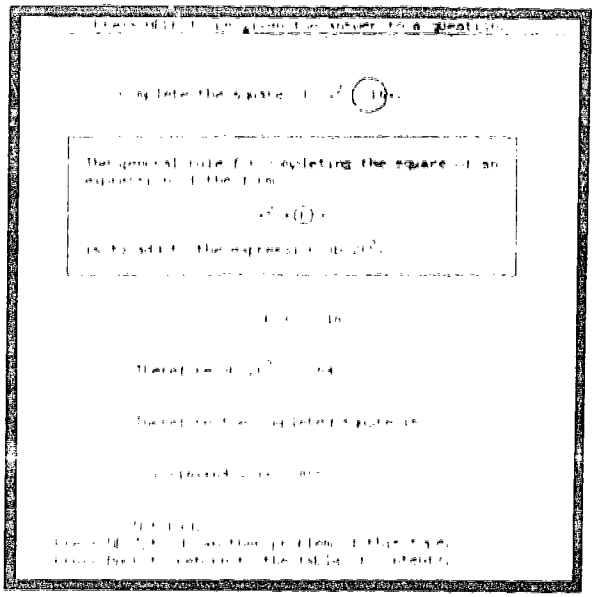
Subject Area: Algebra

ecs: 3370

File Name: math95m
Solving Quadratic Equations by Completing the Square

Author: Richard Neapolitan, Wright College





Objectives:

1. To present an introduction and practice with help on completing the square.
2. To present practice with help in solving quadratic equations by completing the square.

Description:

1. There are two sections:
   a. Completing the Square
   b. Solving by Completing the Square
2. In section a the student is shown how to complete the square. He must then complete four squares himself without HELP to complete the section. He may, however, press HELP to receive a sequence of questions which will complete the square in steps.
3. In section b he is shown how to solve a quadratic equation by completing the square. Again he must solve four problems without HELP, but may request HELP to solve any particular problem.

Grade Level: Intermediate algebra

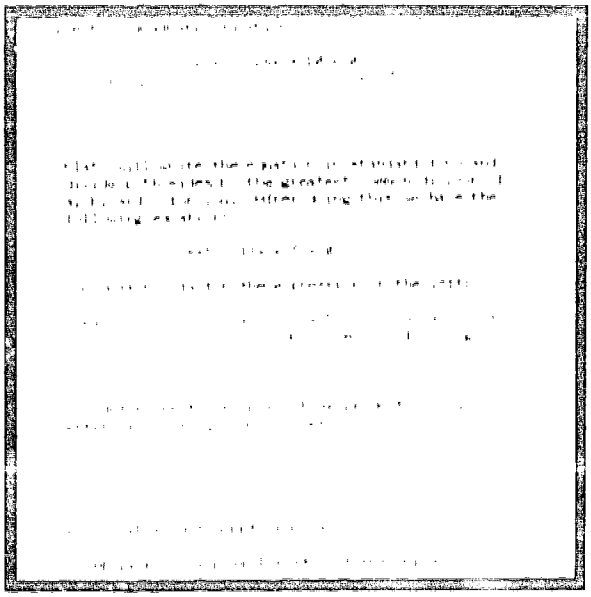
Student Time: 30 minutes

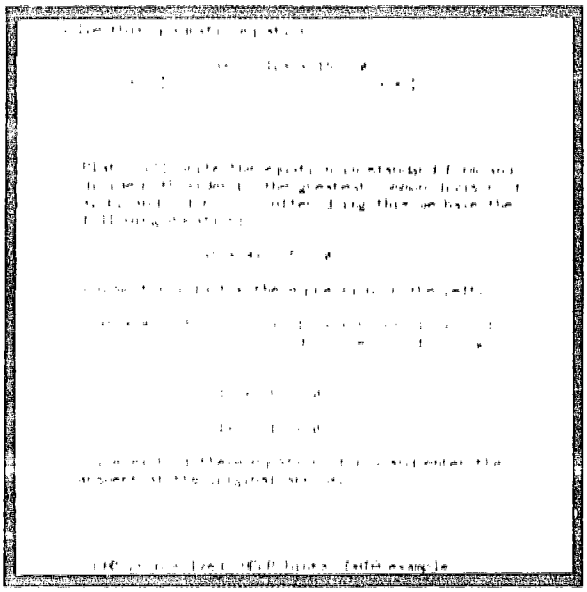
Subject Area: Algebra

ecs: 4668

File Name: solquad
Solving Quadratic Equations by Factoring

Author: Richard Neapolitan, Wright College





Objective:

To present practice exercises with help on solving quadratic equations by factoring.

Description:

1. The student is first shown, step-by-step, how to solve a quadratic equation by factoring. He must then solve quadratic equations himself. He can press LAB to see the equation solved in steps, or HELP to receive a sequence of questions and arrows which lead to the solution.
2. He must solve two equations without any help to complete the lesson.

Grade Level: Intermediate Algebra

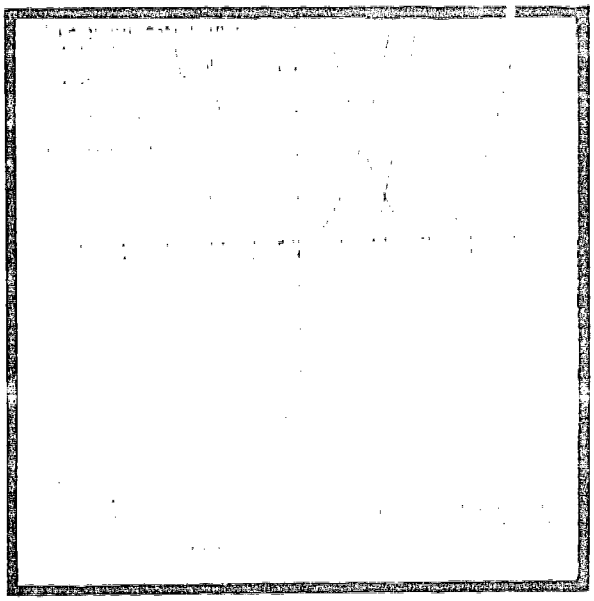
Student Time: 30 minutes

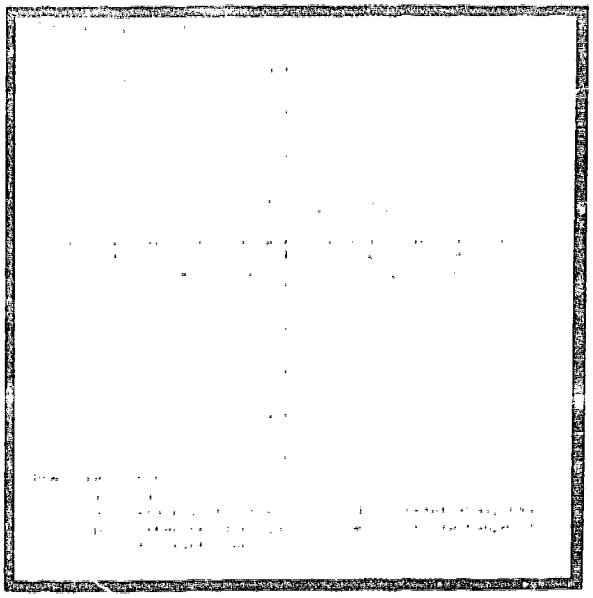
Subject Area: Algebra

ecs: 3080

File Name: ccplot
Function Plotter

Author: Keith Bailey, CERL
section four designed and programmed by Dan Sleator, CERL





Objective:

To provide a function plotter for the students to use.

Description:

1. There are four main sections.
   a. y = f(x): y a function x
   b. r = f(t): polar functions
   c. x = f(t), y = g(t): parametric equations
   d. Implicit functions
2. In each section the student can type in any function or equation of the appropriate type and PLATO will graph it on a grid. The student can graph several functions on the same grid for purposes of comparison, and he can choose the x and y scales.
2. A section containing instructions is available from the index or by pressing the HELP key.

Grade Level: High School and above

Student Time: open-ended

Subject Area: Function Plotting

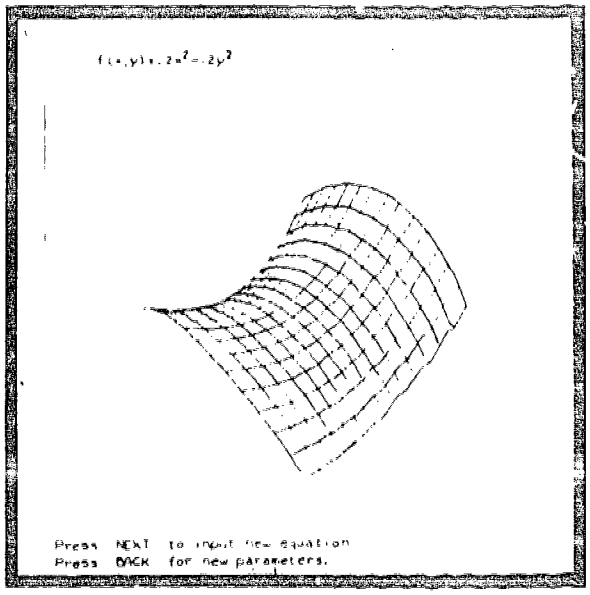
ecs: 2954

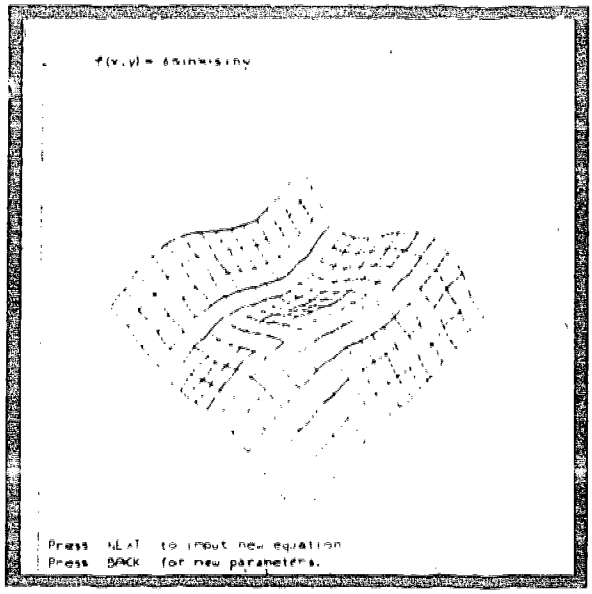
Special Notes:

Previously entered formulas can be recalled and modified using the COPY, EDIT, and ERASE keys. Use of this lesson has been most effective when students were provided by their instructors with sequences of equations to be graphed.

File Name: plot3
Three-Dimensional Function Plotter

Author: James Bowery, RIIRC




Objective:
To provide a three-dimensional surface plotter.

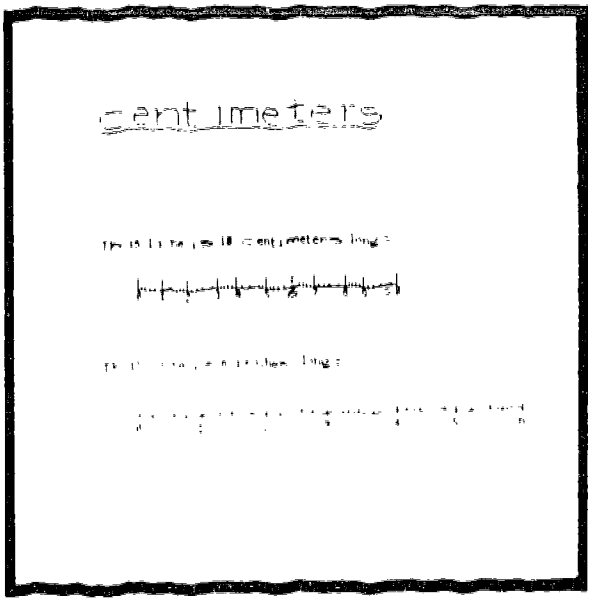
Description:
An expression in x and y, coordinates of the observation point, and size can be entered. The corresponding surface is then plotted.

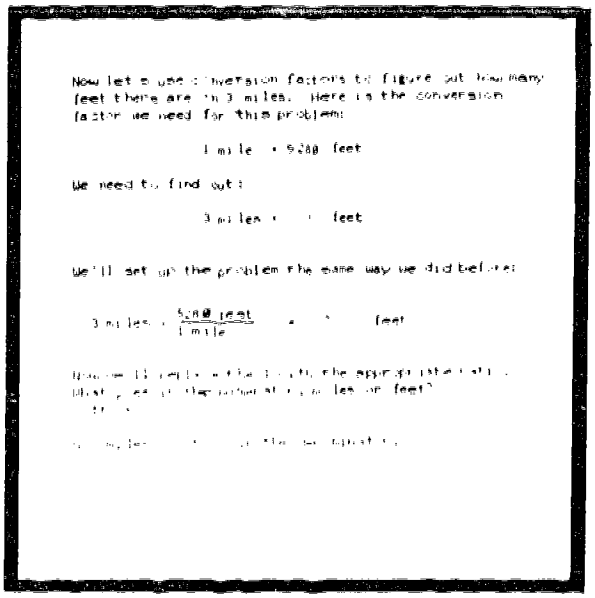
Grade Level: Community College and above Student Time: open

Subject Area: Graphing functions ecs: 951

File Name: liter
Introduction to the Metric System

Author: Ruth Chabay, Department of Chemistry, University of Illinois at Urbana-Champaign




Objective:
To present an introduction and practice on metric measures and conversions.

Description:
1. Instruction and practice on metric measures of distance, weight, volume, and temperature.
2. Covers conversions within the metric system and conversion between metric and English units.

Grade Level: Basic mathematics

Student Time: 30 minutes

Subject Area: Arithmetic

ecs: 5521

Special Notes:
Contains an index from which each topic can be accessed.

File Name: introtrig1
Introduction to Trigonometry

Author: Richard Neapolitan, Wright College

Objective:

To provide an introduction to the basic concepts of angles, triangles, and the terminology used in defining sine, cosine, and tangent of angles in a right triangle.

Description:

There are four sections, each of which is available from an index.

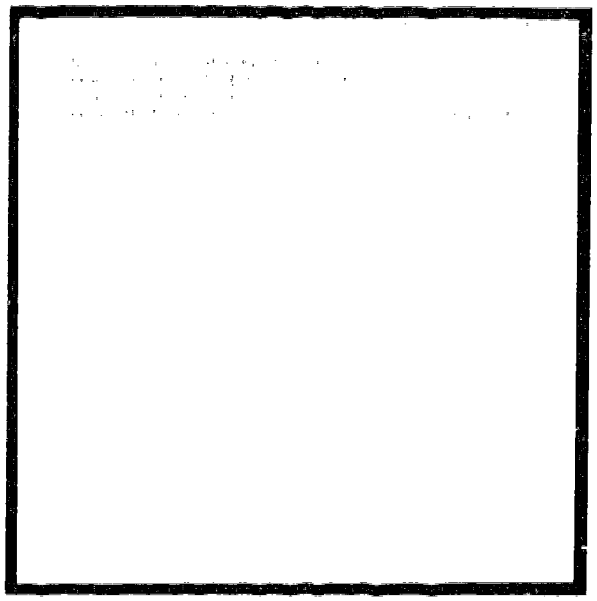
a. Angle. The meaning of "angle" and measuring angles in degrees, based on dividing a circle into 360 equal parts, are presented.
b. Triangle. The student is asked to select figures which are triangles from a display of a variety of plane figures. Exercises based on the fact that the sum of the angles in a triangle is 180 degrees are given.
c. Right triangles. The definition and examples are given.
d. Basic trigonometric concepts. Instruction and exercises on hypotenuse, side opposite an angle, and side adjacent to an angle are given. Sine, cosine, and tangent of angles in a right triangle are defined and the student is asked to compute these values for triangles with given sides and angles.

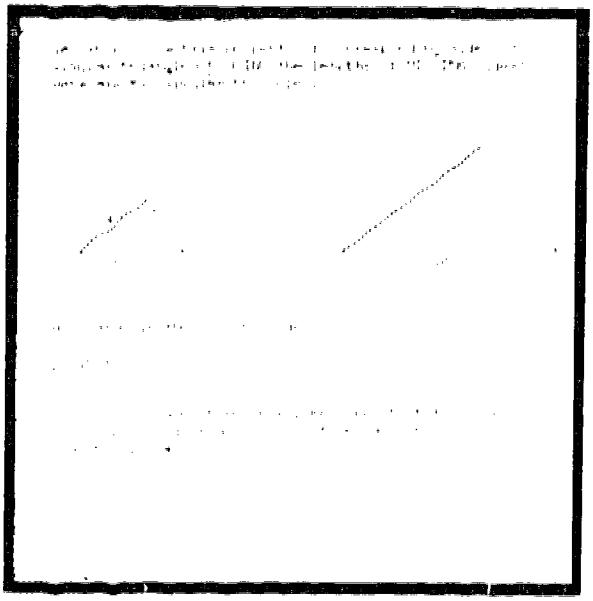
Grade Level: High School and above Student Time: 30 minutes

Subject Area: Trigonometry ecs: 4526

File Name: trig1
Similar Triangles and Pythagorean Theorem

Authors: Paul Thompson, Parkland College, and Robert Baillie, CERL
programmed by Robert Baillie, CERL





Objective:
To provide review of geometric concepts prerequisite to trigonometry.

Description:
1. Review of the concepts of acute, obtuse, and right triangles.
2. Introduction to similar triangles and corresponding parts in them. The student is asked to rotate one triangle until it is in the same position as a similar triangle (see picture).
3. The student calculates ratios of sides and finds missing sides by similarity.
4. The Pythagorean Theorem is presented -- along with the terminology: hypotenuse, opposite side, adjacent side, opposite angle, adjacent angle.

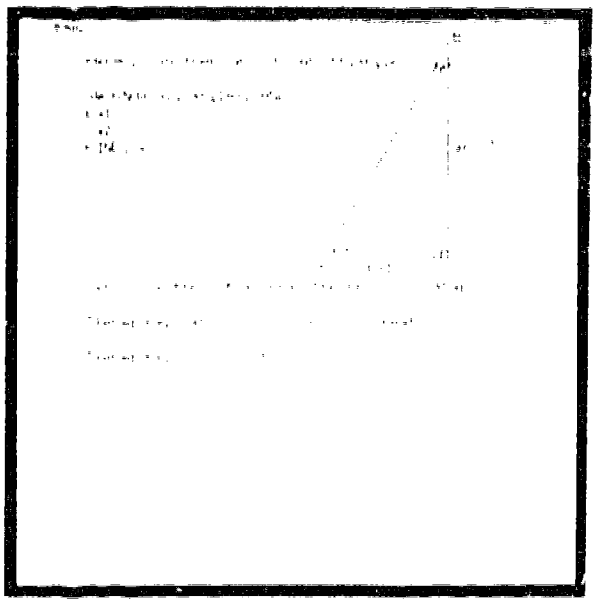
Grade Level: High School and above
Student Time: 40 minutes

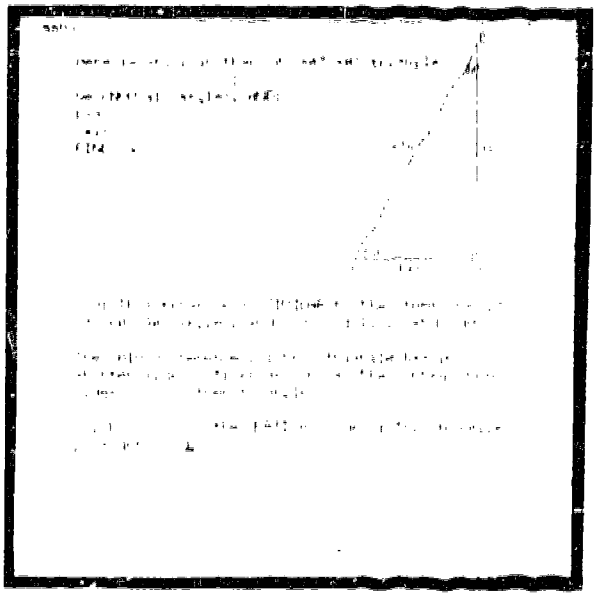
Subject Area: Trigonometry
ecs: 4024

Special Notes:
The student gets an index and can review the sections in any order.

File Name: trig2
Special Right Triangle

Authors: Paul Thompson, Parkland College, and Robert Baillie, CERL
programmed by Robert Baillie, CERL





Objective:
To familiarize the student with facts about right triangles.

Description:
1. Instruction in typing the degree symbol (°), and a proof for "The sum of the angles of a triangle equals 180°" are provided.
2. Properties of the 90°-45°-45° and 90°-60°-30° right triangles are developed. The student uses these and the Pythagorean Theorem to find the unknown sides.

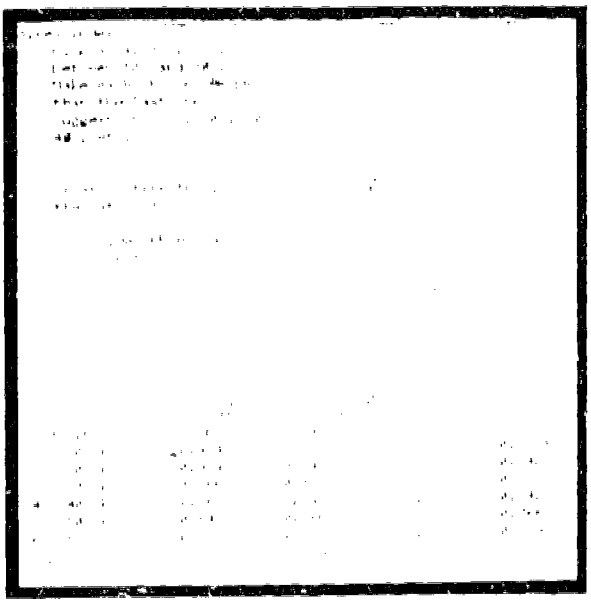
Grade Level: High School and above
Student Time: 30 minutes

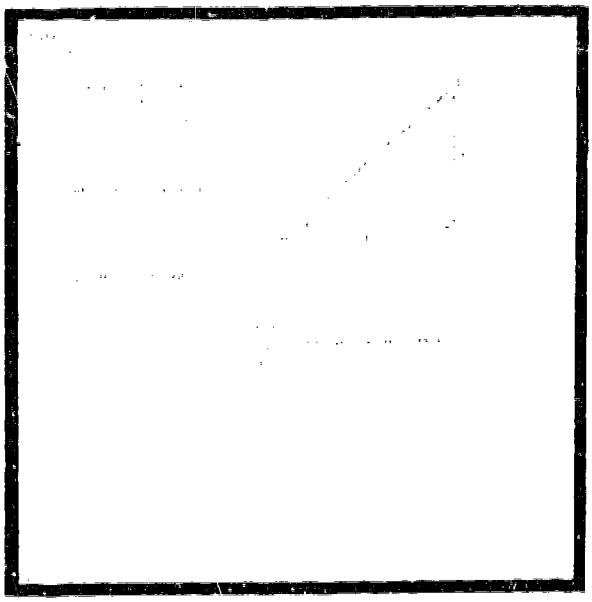
Subject Area: Trigonometry
ecs: 2110

Special Notes:
The student gets an index and he can study the sections in any order.

File Name: trig3
The Sine of an Angle

Authors: Paul Thompson, Parkland College, and Robert Baillie, CERL
programmed by Robert Baillie, CERL





Objective:

To provide instruction in using the sine for finding missing sides or angles of a right triangle.

Description:

1. A definition of sinA is provided and used to find sinA when the sides are known.
2. The student finds missing parts of a right triangle when the sine of an angle is given. Examples and practice are provided.
3. The student uses tables of sines to find sines or angles when one of them is given.

Grade Level: High School and above

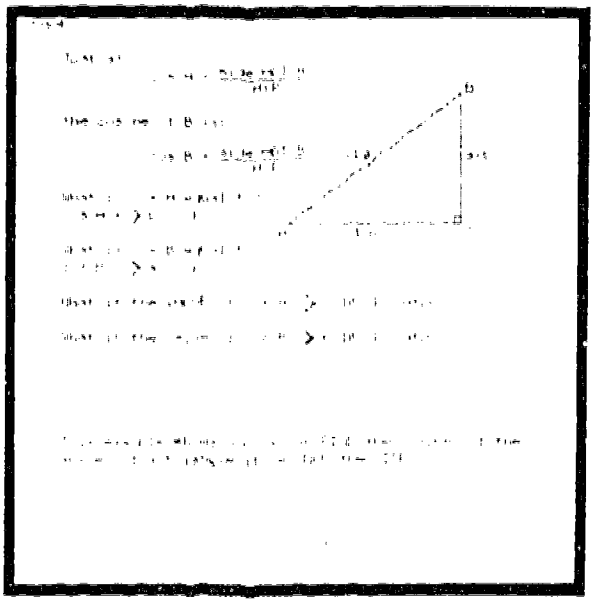
Student Time: 30 minutes

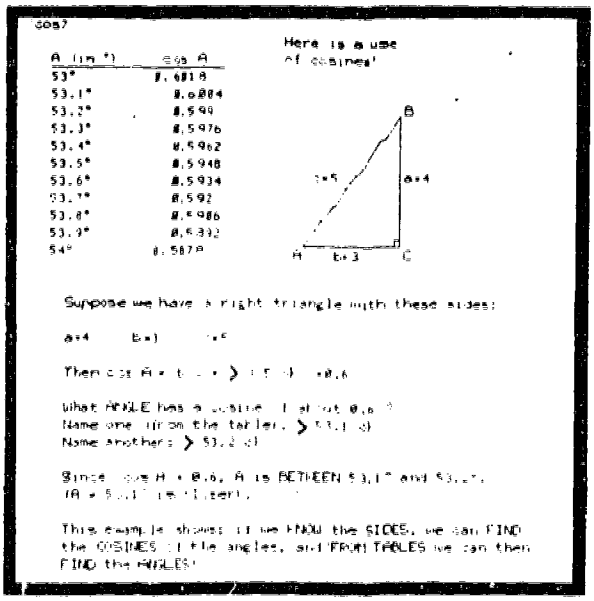
Subject Area: Trigonometry

ecs: 3110

File Name: trig4
The Cosine and Tangent of an Angle

Authors: Paul Thompson, Parkland College, and Robert Baillie, CERL
programmed by Robert Baillie, CERL






Objective:

To provide instruction and practice on using the cosine and the tangent to find missing sides or angles of right triangles.

Description:

1. A definition of cosA is provided and used to find cosA when the sides are given.
2. The student uses tables of cosines to find cosines or angles when one of them is given.
3. Use of cosine to find missing parts of a right triangle.
4. Finding sinA by using cos(90-A) and vice versa. Proof and practice are provided.
5. Definition of tanA, and finding tanA when the sides are given.
6. Using tables of tangents to find tanA or A when one is given.
7. Use of tangent to find missing parts of a right triangle.

Grade Level: High School and above

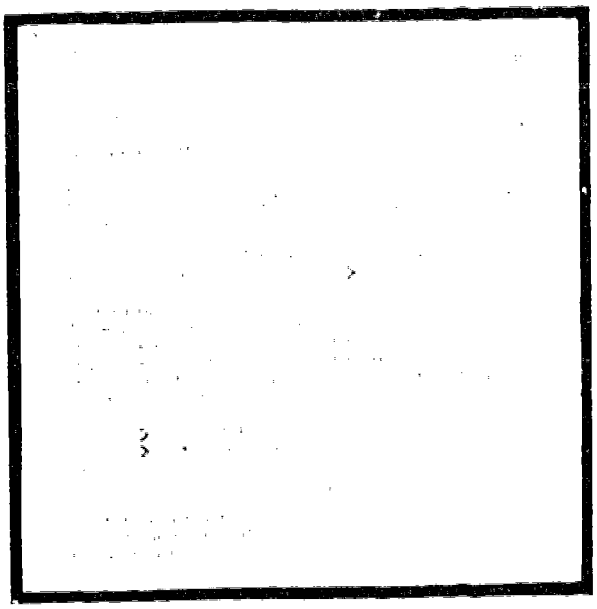
Student Time: 30 minutes

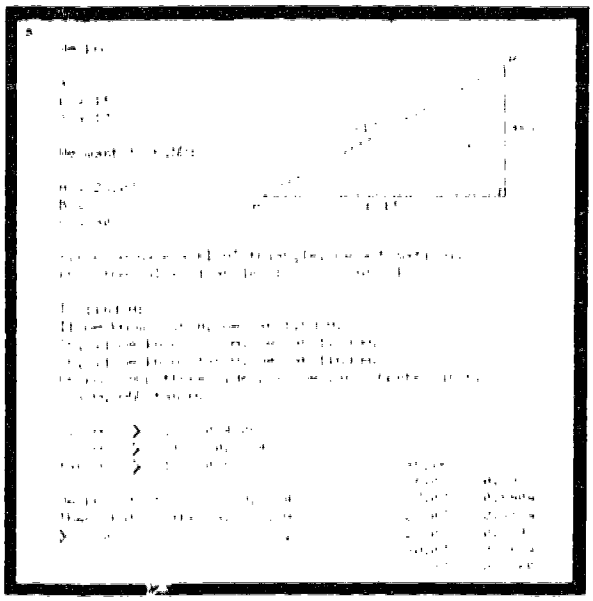
Subject Area: Trigonometry

ecs: 4150

File Name: trig5
Solving Right Triangles

Author: Robert Baillie, CERL





Objective:
To provide a review for the sine, cosine, and tangent of an angle and applications to solving right triangles.

Description:
1. Right triangle problems are provided with the following parts given:
   a. All three sides
   b. Two sides
   c. One side and one acute angle
2. The student is given help in finding the missing parts by breaking the procedure into steps.

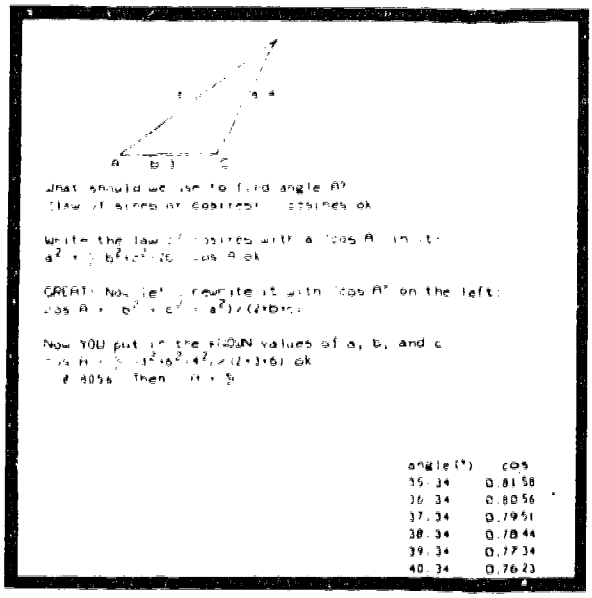
Grade Level: High School and above  Student Time: 30 minutes

Subject Area: Trigonometry  ecs: 4150

Special Notes:
An index is provided so that the student can review the sections in any order.

File Name: trig6
Solving Oblique Triangles

Author: Robert Baillie, CERL



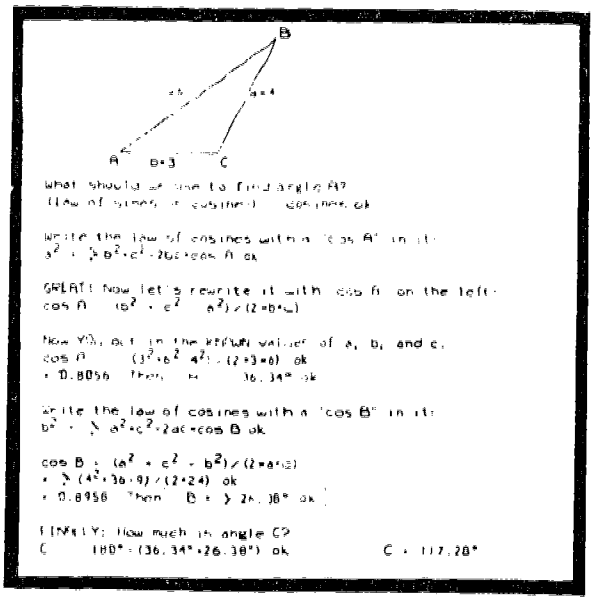
What should we use to find angle A?
(law of sines or cosines) sines ok

Write the law of cosines with a "cos A" in it:
$a^2 = b^2+c^2-2bc \cdot \cos A$ ok

GREAT! Now let's rewrite it with "cos A" on the left:
$\cos A = (b^2 + c^2 - a^2)/(2 \cdot b \cdot c)$

Now YOU put in the KNOWN values of a, b, and c
$\cos A = (3^2+6^2-4^2)/(2 \cdot 3 \cdot 6)$ ok
$= 0.8056$ Then $A =$ ?

| angle(°) | cos |
|---|---|
| 35.34 | 0.8158 |
| 36.34 | 0.8056 |
| 37.34 | 0.7951 |
| 38.34 | 0.7844 |
| 39.34 | 0.7734 |
| 40.34 | 0.7623 |



What should we use to find angle A?
(law of sines or cosines) cosines ok

Write the law of cosines with a "cos A" in it:
$a^2 = b^2+c^2-2bc \cdot \cos A$ ok

GREAT! Now let's rewrite it with "cos A" on the left:
$\cos A = (b^2 + c^2 - a^2)/(2 \cdot b \cdot c)$

Now YOU put in the KNOWN values of a, b, and c.
$\cos A = (3^2+6^2-4^2)/(2 \cdot 3 \cdot 6)$ ok
$= 0.8056$ Then $A = 36.34°$ ok

Write the law of cosines with a "cos B" in it:
$b^2 = a^2+c^2-2ac \cdot \cos B$ ok

$\cos B = (a^2 + c^2 - b^2)/(2 \cdot a \cdot c)$
$= (4^2+36-9)/(2 \cdot 24)$ ok
$= 0.8958$ Then $B = 26.38°$ ok

FINALLY: How much is angle C?
$C = 180° - (36.34° + 26.38°)$ ok $C = 117.28°$

Objective:

To introduce the laws of sines and cosines and provide examples and practice in solving oblique triangles.

Description:

1. The laws of sines and cosines are presented without proofs but with examples.
2. Oblique triangle problems are provided with the following parts given:
   a. All three sides
   b. Two sides and the included angle
   c. One side and two angles
3. The student gets help with the algebraic manipulation of the laws as needed in the problems. Answers are given in some places after several mistakes are made.

Grade Level: High School and Above

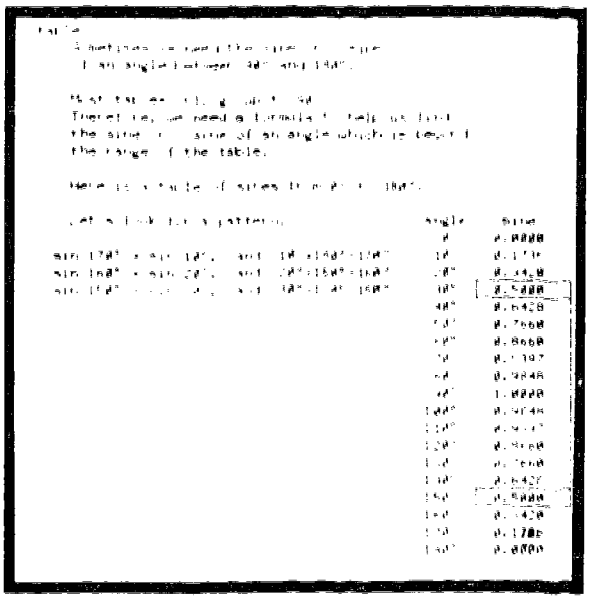
Student Time: 30 minutes

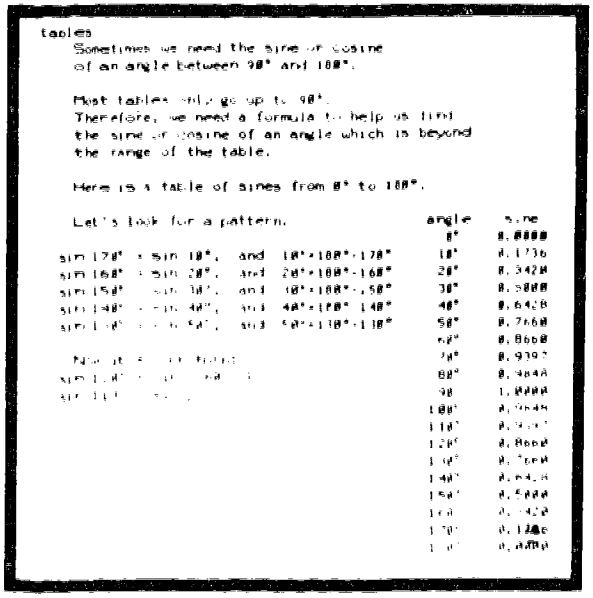
Subject Area: Trigonometry

ecs: 4720

File Name: trig7
Sine of Angles Greater than 90 Degrees

Author: Robert Baillie, CERL






Objective:

To teach the student how to use tables to find values of the sine for angles greater than 90 degrees.

Description:

This is a short lesson with exercises which develop the formula sinA = sin(180 - A) from the pattern in a table of sine values.

Grade Level: High School and above

Student Time: 5 minutes

Subject Area: Trigonometry

ecs: 568

Special Notes:

This lesson will be expanded to include a similar treatment for cosine.

File Name: word2
Word Problems with Trigonometry

Author: Gary Peltz, City Colleges of Chicago

Objective:
To provide practice in solving word problems.

Description:
1. Given the angles of elevation from two observation points of a tree on the opposite side of a river, the student is asked to generate an equation which can be solved for the width of the river. When he has entered such an equation, he must then find its solution.
2. Several types of help are available: see a general explanation of the procedure to use, have the problem solved, or be stepped through the problem. In the step-through help sequence, the answers can always be obtained by pressing the HELP key.

Grade Level: High School and above

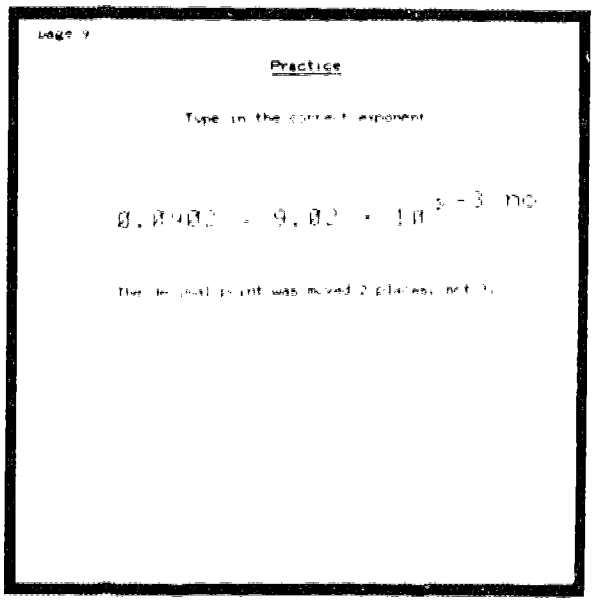
Student Time: 20 minutes

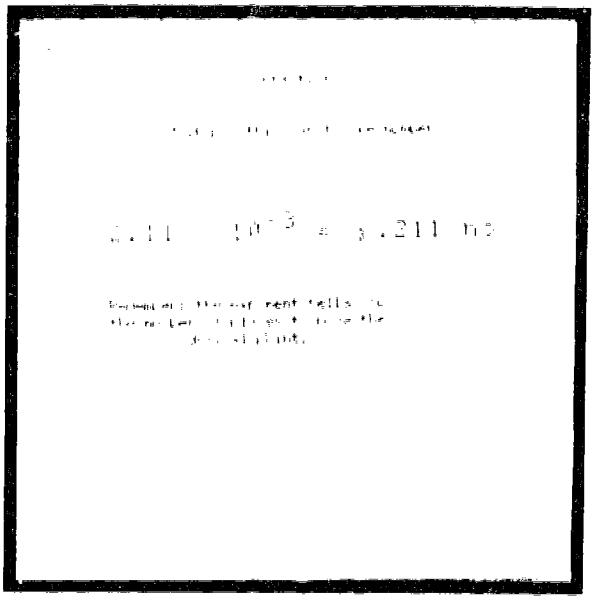
Subject Area: Trigonometry and Elementary Algebra

ecs: 4362

File Name: scienot
Scientific Notation

Author: Barbara Lederman, CERL
programmed by David Lassner, CERL



Objective:
To provide instruction and exercises on scientific notation.

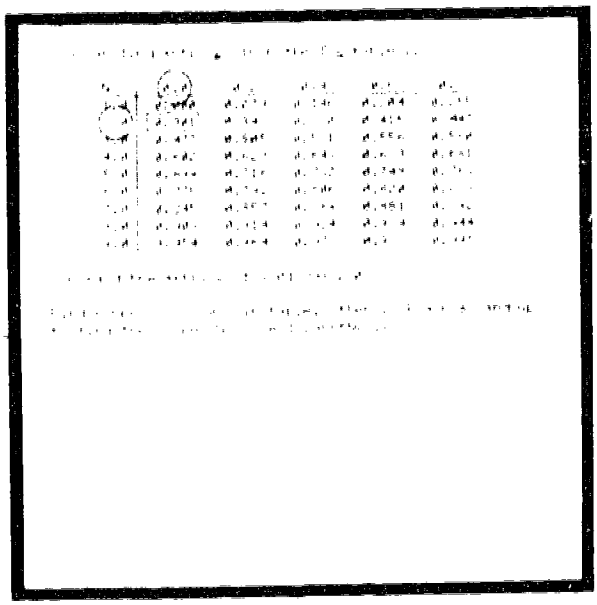
Description:
1. In the instructional section which precedes the practice exercises, the relationship between the exponent in the power of 10 and moving the decimal point is taught.
2. There are two types of practice exercises:
   a. Multiply out a number given in scientific notation.
   b. Fill in the correct exponent in the power of ten so that the number will be in scientific notation.

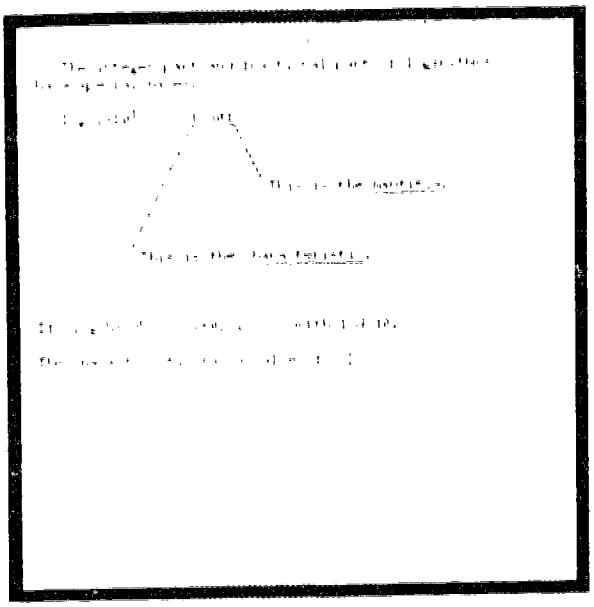
Grade Level: High School and above
Student Time: 10 - 15 minutes

Subject Area: Arithmetic
ecs: 1873

File Name: cclog
Introduction to Logarithms

Author: Donald Shirer, Valparaiso University





Objective:
To provide an introduction to logarithms and logarithm tables.

Description:
1. The lesson includes instruction and exercises on powers of 10 logarithms, log tables, antilogs, use of logs, and a quiz.
2. There are also two optional topics: construction of log tables, and logarithmic relations between two quantities.

Grade Level: Elementary Algebra

Student Time: 45 minutes

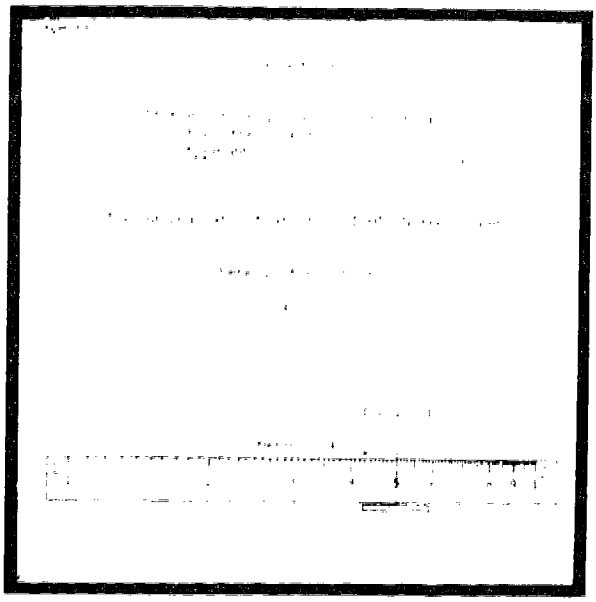
Subject Area: Algebra

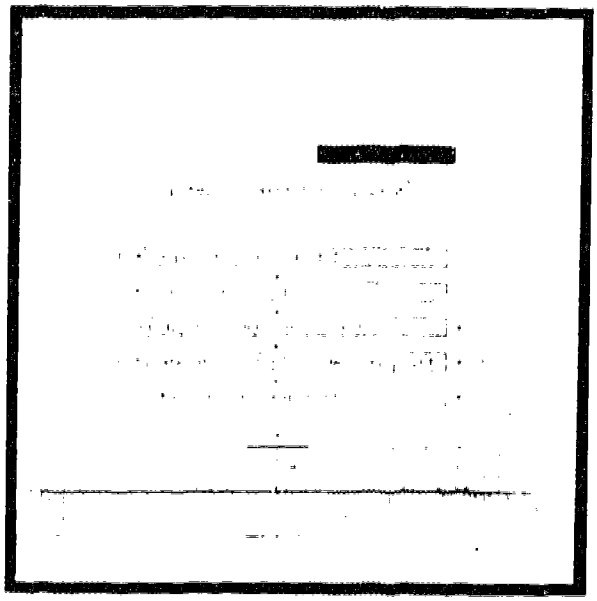
ecs: 5679

Special Notes:
1. Use of on-line calculator is explained and made available.
2. Topics are accessed from an index.

File Name: sr1 (jumpout to sr and scienot)
Slide Rule

Author: Barbara Lederman, formerly of CERL
programmed by David Lassner, CERL





Objective:

To provide instruction and practice in the use of a slide rule for multiplication and division problems.

Description:

1. There are five sections:
   a. Review of scientific notation
   b. Reading a slide rule
   c. Estimating answers
   d. Multiplication
   e. Division
2. Each section has instruction and practice drills.
3. A simulated slide rule is used for the instruction. The student uses his own slide rule to work the exercises, with remediation provided by the simulated slide rule.

Grade Level: Technical math or physical science courses

Student Time: 3.5 hours

Subject Area: Slide Rule

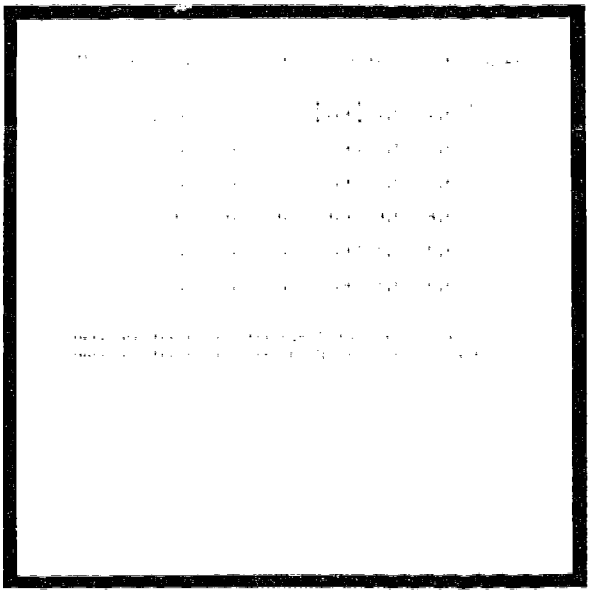
ecs: sr: 3351
sr1: 5994
scienot: 1873

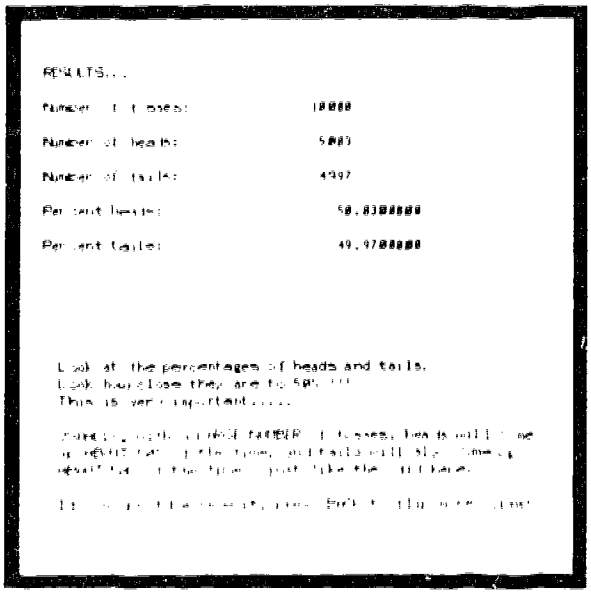
Special Notes:

The student needs his own slide rule to work the exercises in sections four and five.

File Name: ccprob
Introduction to Probability

Author: Robert Baillie, CERL






Objective:
To acquaint the student with the meaning of randomness and probability.

Description:
1. Randomness experiment shows that randomness involves unpredictability (the outcome of a coin toss can not always be predicted in advance).
2. Formal definition of probability is given, followed by examples which use the definition to calculate the values of various probabilities.
3. Example to show that impossible events have probabilities of 0, events that are certainties have probabilities of 1, and all other events have probabilities between 0 and 1.
4. Coin and dice throwing experiments (see Special Notes).
5. Explanation of the fact that, if 100 consecutive tosses of a balanced coin come up "heads," the probability that the 101st toss will also be "heads" is still 1/2.
6. Examples show the difference between independent and dependent events, and the product law for independent events is obtained from examples.

Grade Level: Community College Student Time: 60 minutes

Subject Area: Elementary probability ecs: 6200

Special Notes:
Two sections simulate coin and dice throwing experiments. The student can see what is likely to happen when a large number (up to a billion) of coins or dice are tossed.

File Name: mathcc
Community College Math Index

Contact: Louis V. DiBello, CERL

Objective:

To provide an on-line index of all community college math materials which are currently available for use, inspection, or criticism.

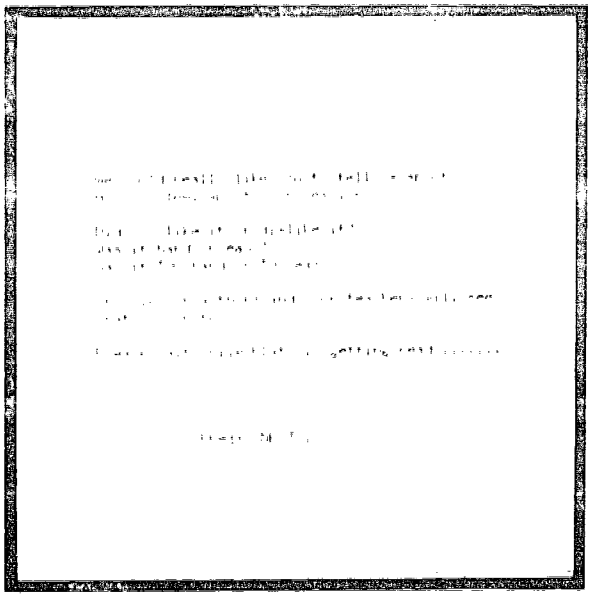
Description:

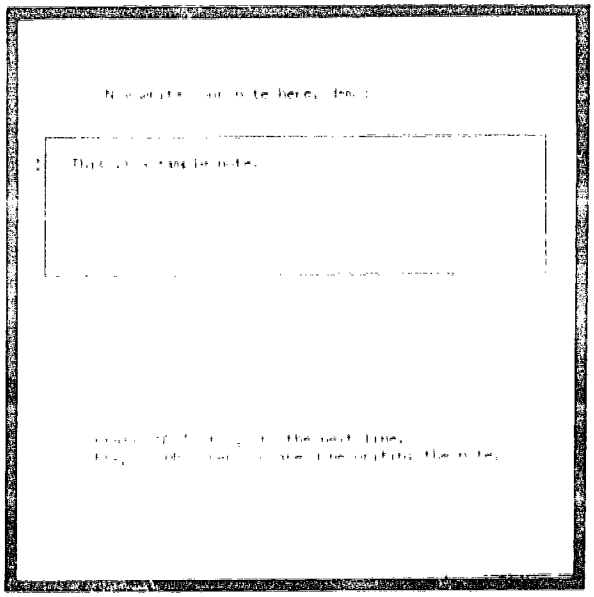
This is an index allowing easy access to basic mathematics materials. It is periodically updated, and it contains the current status of lessons as "preliminary version," "under review," or "classroom tested."

| | | | |
|---|---|---|---|
| Grade Level: | Adult Education and Community College | Student Time: | not applicable |
| Subject Area: | Mathematics | ecs: | 2349 |

File Name: studnotes

Author: Tamar Abeliovich Weaver, CERL
adapted from the Elementary Math Group lesson "kidnotes"





Objective:

To let the student write notes or comments on the lessons he has completed.

Description:

1. The student is given a blank note space and a simple editor to write notes or comments. His name, course, date and time are automatically saved along with the lesson the student has come from.
2. The note is stored in a dataset and these are readable by instructors and authors through lesson "studnotesr".

Grade Level: not applicable

Student Time: not applicable

Subject Area: not applicable

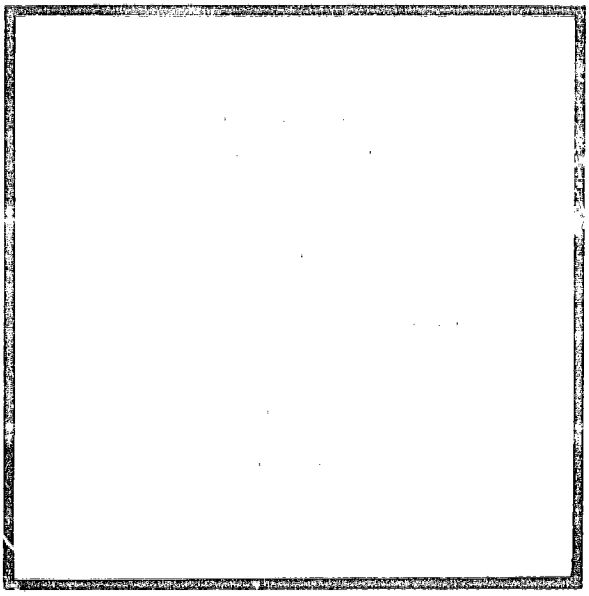
ecs: 797

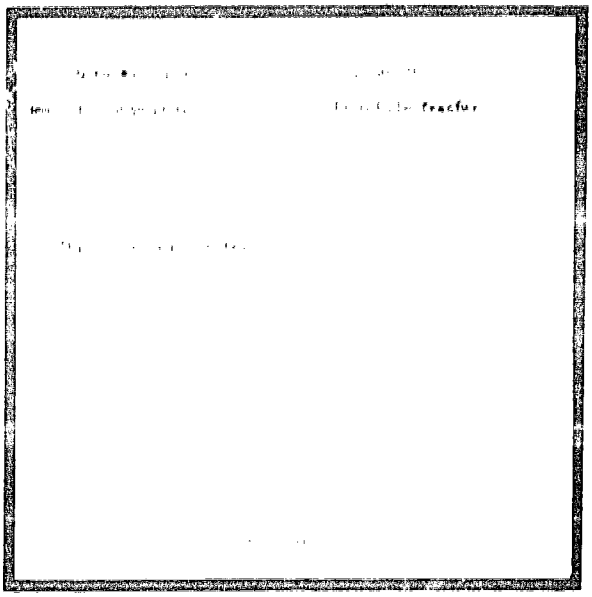
Special Notes:

In order to make comments lesson available at the end of a lesson, the author must insert a short unit of code in the lesson. For more information, contact Tamar Abeliovich Weaver.

File Name: studnotesr

Author: Tamar Abeliovich Weaver, CERL
adapted from the Elementary Math Group lesson "kidnotes"





Objective:

To allow reading of student's comments about lessons that have been collected via lesson "studnotes".

Description:

Instructors and authors are able to read notes including the information about the student and which lesson he came from.

Grade Level: not applicable

Student Time: not applicable

Subject Area: not applicable

ecs: 1568

Special Notes:

This file must be periodically emptied to allow for more notes. A file of copies of student notes is kept for notes that have been deleted. For information, contact Tamar Abeliovich Weaver.

File Name: mathnotes
Math Notes

Contact: Louis V. DiBello, CERL

Objective:

To provide a communication file for authors, users, instructors, and other personnel interested in the community college math group.

Description:

Space is available for messages to be written to individuals or groups. Messages will be maintained until they are no longer needed and then deleted.

Grade Level: not applicable

Student Time: not applicable

Subject Area: not applicable

ecs: 5830