Instructor's Annotated Edition

WITH REFERENCES TO

Basic College Mathematics

An Applied Approach

SECOND EDITION

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BASIC COLLEGE MATHEMATICS

An Applied Approach

SECOND EDITION

Richard N. Aufmann and Vernon C. Barker

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Overview

Purpose

BASIC COLLEGE MATHEMATICS: AN APPLIED APPROACH, SECOND EDITION provides a mathematically sound and comprehensive coverage of basic computational skills and their applications. Certain topics from geometry and elementary algebra are also included. The content and level of rigor of the text form the basis of a course which would properly serve as preparation for a traditional algebra course. The text has been specifically developed to meet not only the needs of the traditional college student, but also the needs of the mature student whose mathematical proficiency may have declined during years away from formal schooling.

Contents

BASIC COLLEGE MATHEMATICS: AN APPLIED APPROACH is the first in a series of three texts by the authors:

BASIC COLLEGE MATHEMATICS: AN APPLIED APPROACH
INTRODUCTORY ALGEBRA: AN APPLIED APPROACH
INTERMEDIATE ALGEBRA: AN APPLIED APPROACH

The first book, BASIC COLLEGE MATHEMATICS: AN APPLIED APPROACH, provides a comprehensive coverage of computational skills and their applications. INTRODUCTORY ALGEBRA: AN APPLIED APPROACH contains a complete development of the basic skills and applications typically found in a first-year algebra course. INTERMEDIATE ALGEBRA: AN APPLIED APPROACH covers the essentials of second-year algebra as well as certain more advanced pre-calculus topics. Since the three texts share several important pedagogical and organizational features, they may be used sequentially to reap the benefits of a smoothly-integrated series of learning materials. However, because the three texts have been written so that the content of each is independent of the other two, any one book in the series may be used independently of the other two.

Organization

BASIC COLLEGE MATHEMATICS: AN APPLIED APPROACH is organized into 12 units. Each unit is divided into a varying number of sections, and each section contains several related objectives. Any one objective contains the exposition of a single skill or application. The exercise sets found at the end of each section are grouped by objective to establish a simple matching between exposition and related practice problems. The two Review/Tests found at the end of each unit are also organized by objective, in order to define a clear correspondence between exposition and related testing.

Features

BASIC COLLEGE MATHEMATICS: AN APPLIED APPROACH is built around the three proven and effective teaching strategies which are characteristic of the entire series. First, an *applied approach* generates an awareness of the value of mathematics as a practical tool. Second, an *interactive approach* encourages the student to practice each skill while it is being presented, thus avoiding needless confusion later when working practice assignments. Third, an *objective-specific approach* helps the student or the instructor manage instruction, improving both the efficiency and the effectiveness of the instruction. These three strategies are described pictorially on the next three pages.

An Applied Approach

The traditional approach to teaching or reviewing mathematics, which places major emphasis on the manipulation of numbers, is lacking in that it fails to teach the practical value of mathematics. By contrast, BASIS COLLEGE MATHEMATICS: AN APPLIED APPROACH places a heavy stress on applications. Where applicable, the last objective of any section is an applications objective in which the skills covered in the section are used in the solution of practical problems. Also, an entire unit of the text (Unit 7-Applications for Business and Consumers: A Calculator Approach) and portions of several other units are devoted to many frequently-encountered types of applications. This carefully-integrated applied approach generates awareness on the student's part of the value of mathematics as a real-life tool.

***Unit 7—Applications for Business and Consumers: A Calculator Approach* is devoted entirely to many frequently-encountered types of applications. The use of the calculator is encouraged.**

A strategy which the student may use in solving application problems is stated and explained for each major type of problem.

This strategy is used in the solution of the worked example.

SECTION 4 Real Estate Expenses

4.1 Objective To calculate the initial expenses of buying a home

One of the largest investments a person will make is the purchase of a home. The major initial expense in the purchase is the down payment. The amount of the down payment is normally a percent of the purchase price. This percent will vary among banks, but it usually ranges from 5% to 25%.

The **mortgage** is the amount that is borrowed to buy real estate. It is the difference between the purchase price and the down payment.

A home is purchased for $85,000 and a down payment of $12,750 is made. Find the mortgage.

Purchase price	–	down payment	=	mortgage
85,000	–	12,750	=	72,250

The mortgage is $72,250.

Another large initial expense in buying a home is the loan origination fee. This fee is charged by the bank for processing the mortgage papers. The loan origination fee is usually a percent of the mortgage and is expressed in **points,** which is the term used by banks to mean percent. For example, "5 points" means "5 percent."

Points	×	mortgage	=	loan origination fee

Example 1 A house is purchased for $87,000 and a down payment, which is 20% of the purchase price, is made. Find the mortgage.

Strategy To find the mortgage:
▷ Find the down payment by solving the basic percent equation for *amount*.
▷ Subtract the down payment from the purchase price.

Solution Percent × base = amount

Percent	×	purchase price	=	down payment
0.20	×	87,000	=	n

$17{,}400 = n$

Purchase price	–	down payment	=	mortgage
87,000	–	17,400	=	69,600

The mortgage is $69,600.

Example 2 An office building is purchased for $216,000 and a down payment, which is 25% of the purchase price, is made. Find the mortgage.

Your strategy

Your solution

Solution on p. 473

An Interactive Approach

Instructors have long realized the need for a text which requires the student to use a skill *as it is being taught.* BASIC COLLEGE MATHEMATICS: AN APPLIED APPROACH uses an interactive technique which meets this need. Every objective, including the one pictured below, contains at least one pair of examples in which one example is worked. The second example in the pair is not worked so that the student may "interact" with the text by solving it. In order to provide immediate feedback, *complete solutions to these examples are provided in the Answer Section.* The benefit of this interactive strategy is that the student can check that a new skill has been learned in advance of attempting a homework assignment.

A simple and concise explanatory passage begins each skill objective.

Paired examples follow the explanatory passage.

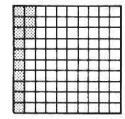
The interactive key is the second example in each pair. It has not been worked so that the students may test their skill by solving it, referring to the worked example at the left if necessary.

Reference to the answer section allows the student to check solutions immediately.

SECTION 1 Introduction to Percents

1.1 Objective To write a percent as a fraction or a decimal

Percent means "parts of 100." In the figure at the right, there are 100 parts. Thirteen of the 100 parts are shaded. So 13% of the figure is shaded.



In most applied problems involving percents, it is necessary either to rewrite a percent as a fraction or a decimal, or to rewrite a fraction or a decimal as a percent.

To write a percent as a fraction, drop the percent sign and multiply by $\frac{1}{100}$.

$$13\% = 13 \times \frac{1}{100} = \frac{13}{100}$$

To write a percent as a decimal, drop the percent sign and multiply by 0.01.

$$13\% = 13 \times 0.01 = 0.13$$

Move the decimal point two places to the left. Then drop the percent sign.

Example 1 Write 120% as a fraction and as a decimal.

Solution $120\% = 120 \times \frac{1}{100} = \frac{120}{100} = 1\frac{1}{5}$

$120\% = 120 \times 0.01 = 1.2$

Note that percents larger than 100 are greater than 1.

Example 2 Write 125% as a fraction and as a decimal.

Your solution

Example 3 Write $16\frac{2}{3}\%$ as a fraction.

Solution $16\frac{2}{3}\% = 16\frac{2}{3} \times \frac{1}{100} =$

$\frac{50}{3} \times \frac{1}{100} = \frac{50}{300} = \frac{1}{6}$

Example 4 Write $33\frac{1}{3}\%$ as a fraction.

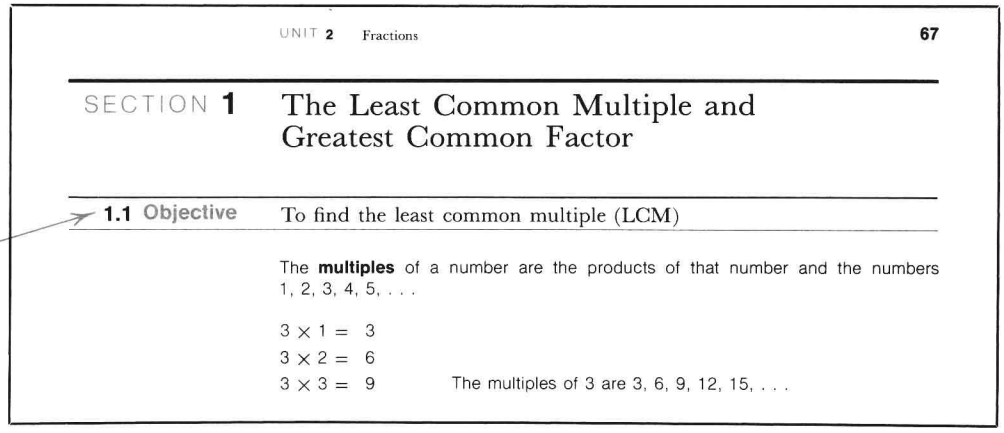
Your solution

Solutions on p. 464

An Objective-Specific Approach

Many texts in mathematics are not organized in a manner which facilitates management of learning. Typically, students are left entirely to their own devices to wander through a maze of loosely related lessons, practice sets, and tests. BASIC COLLEGE MATHEMATICS: AN APPLIED APPROACH solves this problem by organizing all lessons, practice sets, and tests around a carefully-constructed hierarchy of 159 objectives. The advantage of this objective-by-objective organization is that it enables the student who is uncertain at any step in the learning process to refer easily to the original presentation of a skill in order to review the skill or application involved. Record keeping and the tracking of progress are facilitated for both student and instructor.

A numbered objective statement names the skill taught in each lesson.



UNIT 2 Fractions 67

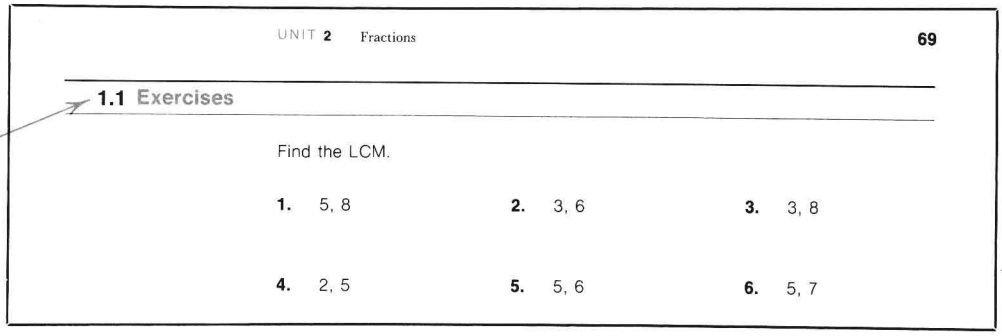
SECTION 1 The Least Common Multiple and Greatest Common Factor

1.1 Objective To find the least common multiple (LCM)

The **multiples** of a number are the products of that number and the numbers 1, 2, 3, 4, 5, . . .

$3 \times 1 = 3$
$3 \times 2 = 6$
$3 \times 3 = 9$ The multiples of 3 are 3, 6, 9, 12, 15, . . .

End-of-section exercise sets are referenced by number to objectives.



UNIT 2 Fractions 69

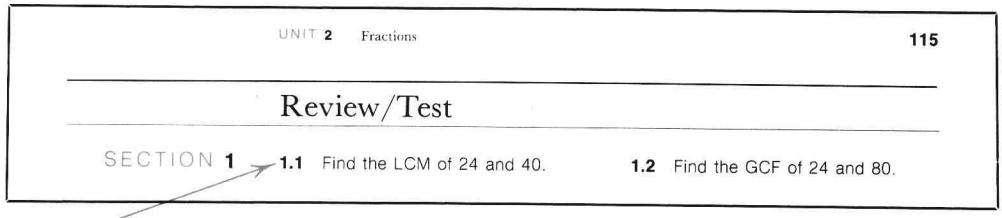
1.1 Exercises

Find the LCM.

1. 5, 8 **2.** 3, 6 **3.** 3, 8

4. 2, 5 **5.** 5, 6 **6.** 5, 7

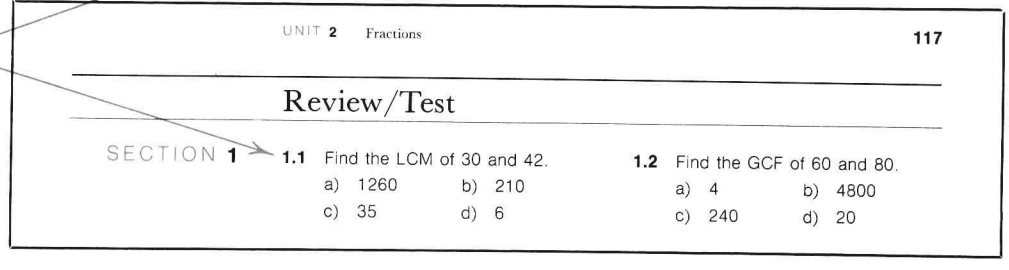
Two forms of Review/Tests are provided at the end of each unit, one in free-response format and the other in multiple-choice format. These are also referenced by number to objectives.



UNIT 2 Fractions 115

Review/Test

SECTION 1 **1.1** Find the LCM of 24 and 40. **1.2** Find the GCF of 24 and 80.



UNIT 2 Fractions 117

Review/Test

SECTION 1 **1.1** Find the LCM of 30 and 42.
a) 1260 b) 210
c) 35 d) 6

1.2 Find the GCF of 60 and 80.
a) 4 b) 4800
c) 240 d) 20

Instructor's Computerized Test Generator

For the Instructor

Reference for Computerized Test Generator

The INSTRUCTOR'S COMPUTERIZED TEST GENERATOR is a test-making tool designed to produce an infinite variety of both multiple-choice and free-response objective-referenced tests for each unit of the text. (Cumulative Tests and Final Exams may also be created.)

The INSTRUCTOR'S COMPUTERIZED TEST GENERATOR is *educationally sound.* The data base consists of 1821 customized test items that are organized around the same hierarchy of objectives that organize the lessons of the text. Thus, the "generator" is an instructional management tool that makes it possible to determine which objectives have been mastered and which objectives require the recycling of instruction for any individual student. The tests *directly* support the text!

As an aid to the Instructor, the Instructor's Annotated Edition (IAE) is cross-referenced to the appropriate disk in the INSTRUCTOR'S COMPUTERIZED TEST GENERATOR by virtue of a computer-referencing logo and annotation which is to be found at the end of the Listing of Objectives for each unit. (See example upper left.)

While there are other computer-based test generators available, the INSTRUCTOR'S COMPUTERIZED TEST GENERATOR for the Aufmann/Barker program clearly distinguishes itself as technically *superior.* Printouts of complex math symbolisms as well as graphic representations are faithful to the text and are of exceptionally high quality.

The INSTRUCTOR'S COMPUTERIZED TEST GENERATOR is currently available for the Apple® II family of microcomputers.

The Computer Tutor™

For the Student

Reference for Computer Tutor™

The COMPUTER TUTOR™ is an "interactive" instructional-delivery vehicle designed for student use. The objectives which organize the "tutor" are the same as those of the text. Thus, each lesson of the "tutor" directly supports a corresponding lesson in the text. Each lesson in the Student Text (as well as its replica in the Instructor's Annotated Edition) is now cross-referenced to the COMPUTER TUTOR™ by virtue of a computer-referencing logo which is found adjacent to the lesson objective. The COMPUTER TUTOR™ lessons, in turn, are cross-referenced to the corresponding text lessons.

The COMPUTER TUTOR™ can prove to be a useful adjunct to basal-text instruction for a variety of reasons:

- An individual student might require help with *initial instruction* because of class absence.
- An individual student might require the *recycling of instruction* because testing has revealed lack of mastery on a given skill or concept the first time around.
- An individual student might require *review instruction* as they prepare for competency exams or as they prepare for enrollment in higher-level courses.

The COMPUTER TUTOR™ is not only educationally sound (for the reasons listed above) but it is also technically well-executed. A special type face has been especially created for this screen-only program to enhance readability, and complex math symbolisms and graphics are particularly well-executed.

The COMPUTER TUTOR™ is currently available for the Apple® II family of microcomputers.

Other Ancillaries

Instructor's Annotated Edition

In order to facilitate the Instructor's grading of exercise sets and Review/Tests, the ancillary package of BASIC COLLEGE MATHEMATICS: AN APPLIED APPROACH includes an Instructor's Annotated Edition (IAE). The IAE is an exact replica of the student text except that the answer to every problem in the text has been printed in red directly adjacent to the problem. An uncommon item in college mathematics packages, the IAE can serve as an invaluable timesaver to the Instructor.

Solutions Manual

The ancillary package which accompanies BASIC COLLEGE MATHEMATICS: AN APPLIED APPROACH includes a Solutions Manual which contains the *complete solution for every exercise in the text.* At the Instructor's discretion, students may be granted access to the Solutions Manual. Use of the Solutions Manual allows the student to check the answers *and* the solution to every exercise. In the event that an answer is found to be incorrect, the student's solution may be compared to the solution found in the Solutions Manual in order to find the exact nature of the error. Students who are permitted use of the Solutions Manual are often able to help themselves, reducing the demand on the Instructor's time for tutorial help.

Alternate Testing Program

Instructors frequently request testing materials which are not available to the student. For this reason, the ancillary package for BASIC COLLEGE MATHEMATICS: AN APPLIED APPROACH includes *two* printed Alternate Testing Booklets. In each booklet, the first half is a battery of free-response tests, one for each unit. After every third unit test, there is a cumulative test which covers three units. The first half of the booklet ends with a Final Exam covering all twelve units in free-response form. The second half of each booklet is identical to the first except that the tests are multiple choice instead of free response. Thus, the Instructor has four printed tests (in two formats) for every unit including cumulative tests and final exams. All tests are on easy-to-copy, permission-to-reproduce pages.

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