The Title

The Author

The Date

Teacher's Guide for Contemporary College Algebra

Two stone cutters were asked what they were doing.
One said he was cutting stones into blocks.
The other said he was a member of a team building a cathedral.

0.1 General Comments and Suggestions

Task: **Educate students for the future rather than train them for the past**.

The primary goal of this text is to empower students to become **exploratory learners**, **not to master a list of algebraic rules**. Each section contains *Queries* that engage students in questioning and exploring the material being presented. Exercises that explicitly ask students to explore or what-if situations, to make up examples, to further investigate a worked example, to iterate for the purpose of recognizing a pattern and developing a sense for the behavior of a solution, and to graphically fit a curve to a data set are some of the means that are used to establish an exploratory environment for the students.

Goals of the Course are

1. Develop students to be **exploratory learners** (primary goal).

2. Improve communication skills—reading, writing, presenting, listening

   The large majority of the exercises are presented in the "story problem" format in order to address the reading aspect of this goal. The "story problem" format also address the applicability thread as real-life situations are usually described verbally or in written form rather than in terms of equations.

3. Small group work—in-class group activities and out-of-class group projects. In-class activities culminate in student presentations to the class and out-of-class projects culminate in both a written report and student presentation.

4. Use of technology—every student is expected to have daily access to a graphing calculator and/or computer. The ability to use technology for visualization and computation is a very important skill.

5. Modeling—the development of a sense for and an appreciation of the applicability of mathematics in addressing real-world problems. (Modeling is the central theme that underlies the development of topics in this text.)

6. Confidence—develop personal confidence as a problem solver. Develop confidence in the iterative process: "Try something, note the errors, modify previous attempt to lesson the errors and try again" until a satisfactory approximation has been obtained. The initial attempt is usually informed by sketching a picture.

7. Enjoy applying mathematics to meaningful situations.

Expectations

Students need to be repeatedly reminded and encouraged to **read and study the text**. In particular, students need to be constantly encouraged to study the worked problems and examples for the **purpose of understanding the concepts and reasoning involved**. They are expected to personalize their text by filling in missing details, making up examples and illustrations, and raising questions. The purpose of the exercises is to help clarify and expand the reasoning process. As such, working exercises is **secondary** in importance to studying the written material in the sections.

This course is very different from a traditional course both in content, pedagogy, and student expectations. Students as well as instructors need to frequently review and discuss the course goals (stated in the Preface). An interesting question for opening a class is: "What course goals did you address in preparing for today's class?" Instructors should make clear to the students that he/she expects the students to prepare new material and practice on old material in preparation for each class.

Small Groups

Establish small-groups (three or four students per group) at the beginning of the semester. Incorporate small group, in-class activities at least twice a week. This will be awkward and time consuming at first, but will soon become accepted as a standard procedure. Although the length of time to carry out activities varies with the activity and with the class experience, ten minute activities are very effective. One or two groups should always be asked to report to the class on their reasoning and results.

Fun Projects

These small group, out-of-class projects culminate in a written report that includes title page, one page executive summary (abstract of the problem statement, description of the reasoning approach, results), computations and plots, statement of results and why they make sense, group log, and summary evaluation of the project experience. Students should be given a class drop to work on the project. The project experience is enriched when the instructor introduces the project with a short discussion and then provides for student discussion

of the project experience after the project reports are submitted. There is a collection of Fun Projects at the end of Chapters 2, 3, and 4. Instructors are encouraged to individualize selections from these projects or to create their own.

Homework

The purpose of homework is (1) to support and expand the conceptual understanding gained from studying the content of the particular section, (2) to provide a check on the conceptual understanding, and (3) to challenge the students to explore beyond the material of the particular section. The first two purposes are addressed by assigning *Queries* and exercises that refer to worked problems in the Section. The third purpose is situation and class sensitive. The experience and insight of the instructor should determine the emphasis placed on this purpose. Many exercises are suitable for small-group, in-class activities or special projects.

Homework assignments should always provide time for students to study new material and review old material. In general an assignment will include one or two exercises over old material, computational skill, and two or three additional exercises over new material.

What-if Technique

The what-if technique, applied after a question (exercise) has been answered, consists of modifying the original question and then answering the modified question. For example after plotting $y = 2x^2 + x - 3$, modify the equation by replacing the coefficient of x^2 with -2 and then replot. Repeat, with the coefficient modified to be 4. This process provides student insight to the role of the coefficient of x^2 in the equation. Because the what-if technique is applied to a question or exercise that has already been answered, there is a minimum of time and computation involved in executing the what-if technique. The consistent application of the what-if technique helps students focus on problem types rather than on individual exercises. This, in turn, leads to conceptual understanding. Exercises 2.3 call explicit attention to using the what-if technique.

Important Objective

Students should understand and appreciate the following process of analyzing a real situation: (1) collect data, (2) plot the data, (3) fit a curve to the plotted data, and (4) use the function obtained from the curve fitting to obtain insights into the situation (for example, make predictions). Several exercises, worked examples, small-group activities and Fun Projects, as well as the underlying modeling theme of the text address this important objective. Predicting "stopping distances" as a function of vehicle speed is a nice application of this process. (See Section 3.3.)

Suggested Class Outline

Before class begins, students put problems on which they had trouble on the blackboards. (The student completes as much of the problem on the board as she/he can do.)

5–10 minutes: Teacher responds to student questions on the boards

5–10 minutes: Teacher asks different students questions about the homework (This reinforces teacher expectation that students prepare for class.)

5–10 minutes: Teacher reviews major points in the section

5–10 minutes: Small-group activity

5–10 minutes: Teacher "pre-teaches" new material for the next class.

Pre- and Postcourse Writing Exercise

During the first class, allow ten minutes for a precourse writing quiz (non-graded). Write short paragraph answers to each of the following questions.

a. What is data?

b. How can data be presented?

c. How can data be transformed into information?

d. How can information be transformed into knowledge?

Collect and keep the papers. Near the end of the semester, pass out the papers to the students and ask them to answer the same questions (on a separate sheet of paper). This provides the students as well as the teacher an opportunity to compare their "postcourse" work against their "precourse" work.

This exercise will also help establish the importance of the writing aspect of communication.

Grades

The Editorial Board suggests the following outline for grading:

Homework	20%
Tests	50%
Fun Projects	20%
Instructor	10%

0.2 Suggestions for Individual Sections

First Class

Administration, discussion of goals and expectations (Preface) including that new material will be assigned and expected to be prepared before it is discussed in class.

Data: Develop a class data table in which the column headings are: male/female, shoe size, height, weight, hair color, eye color, etc. and the rows represent the data of individual students. The instructor should individualize the table by changing the column headings and/or adding additional columns. The table is circulated through the class with each student filling in a row of data. (The instructor duplicates the table and, in the following class, gives each student a copy. At various times through the semester, the instructor assigns an exercise, group activity or project that is based on the class data.)

Calculator: Brief orientation to the calculator (turn on, plot a multiplot of two functions—say, x^2 and x^3—change the plot window settings)

Writing (nongraded) Writing exercise (10 minutes): Write short paragraph answers to each of the following questions.

a. What is data?

b. How can data be presented?

c. How can data be transformed into information?

d. How can information be transformed into knowledge?

HW Read and reread the Preface and Chapter 1; calculator exercises ???; Bring calculator manual to the next class.

Second Class

Hand out copies of the class data table.

Discuss (emphasize) the goals for the course

More orientation on the calculator. Review how to use the manual (How to plot data?).

Small-group activity (Purpose: emphasize group activity and use of calculator).

a. Plot $y = x^2 - 4$, $y = -x^2 - 4, y = 2x^2 - 4$, and $y = 0.5x^2 - 4$ on the same axes

(multiplot).

b. Approximate the solution(s) of $x^2 = 2^x$ by plotting $y = x^2 - 2^x$ and noting where the

curve meets the x-axis. Ask students to explain why the solutions are the points where

the graphs touch the horizontal axis.

c. Plot $y = |x - 2x|$. Students may need to use their manuals to learn how to plot the

absolute value function.

d. Plot the points $(1, 1), (2, 3), (4, -1), (5, 4)$.

(Have a few of the students explain how they plotted.)

HW(?) Study Section 2.1; #2, 3, 4, 6, Queries 1&2

Section 2.1 (Data and Variables)

Purpose: Understand different ways of displaying data.

Teachers are encouraged to make explicit references to how data is displayed in newspapers, magazines, posters, etc.—convey the idea that we live in a world of data.

Small groups (1): Students in pairs are given 5–10 minutes to find three data sets in newspapers, magazines, etc., and to describe to the class what they found. (Teachers need to supply enough old newspapers and magazines.)

Small groups (2): Students in pairs work Exercise # 8

HW(?) Study Section 2.2; Section 2.1 #7; Section 2.2 #2, 3, 4, 13, 14, Queries 1&2

Section 2.2 (Average (Mean))

Purpose: Understand average, one of the most important concepts in analysis.

Ask students to give examples of where they have used or computed an average.

Refer to the use of "average" in newspaper or magazine articles (temperature, price, income).

Ask a student to respond to Exercise #9

Work Exercise #5 as a class and then have students, working in groups, do Exercise #12

HW(?) Study Section 2.3; Section 2.2 #8; Section 2.3 #2, 14, 17

Section 2.3 (Median and Mode)

Purpose: Understand and distinguish between median, mode, and average (mean). Understand when they are used and for what purposes.

Make up some exercises (average, median, mode) or activities based on the class data table.

Explain the meaning and importance of the what-if technique (see note at beginning of exercises).

Check to see that students understand the definition of recursive sequence. This will be a tool in our modeling.

Large-Group Activity (Summarizing Data): (˜6 students/group, 15–20 minutes including reports) Note which students are showing leadership. This can be useful information as the course unfolds.

Small groups (pairs): Assign each pair of students two exercises from #4–14. Have the students explain their reasoning to the class.

HW(?): Study Section 2.4; Section 2.3 #3; Section 2.4 #1, 4, 7, 8; Queries 1&2

Section 2.4 (Variable Representation)

Purpose: Understand the meaning of variable. Understand that mathematics is a language and thus it is important to understand the meaning and use of mathematical terms.

Discuss the meaning and role of variable (mathematical pronoun?).

Ask students to describe recursive sequence and play with forming addition sequences.

"Catch up" on questions, difficulties in Sections 2.1–2.4

HW(?): Study Section 2.5; Section 2.4 #2; Section 2.5 #1, 4, 6, 9, 12, Queries 1 & 2

Section 2.5 (Circle Properties and Pie Charts)

Purpose: Understand the circle properties.

Understand and distinguish between radian and degree measure.

Check on how to set calculator mode for radian and degree measure.

Small groups (3–4): Work the Activity (Instructor Jay's grade report)

HW(?) Study Section 2.6; Section 2.5 #8; Section 2.6 #1, 4, 5, 6, 8, 9; Queries 1 & 2

Section 2.6 (Discovering Relations Between Variables)

Purpose: Critically important for students to

a. Understand slope of a straight line (what it represents, how to compute it).

b. Understand how to determine the equation and plot of a straight line.

Mathematics is a language and like any language there are different words that have the same meaning (for example: slope, direction, grade, pitch).

Practice computing the equation of a line given two points or point and slope.

Ask a student to put the solution to Query 1 on the board and explain his/her reasoning.

Ask a student to put the solution to Query 2 on the board and explain his/her reasoning.

Ask students to give examples of slopes in everyday life (e.g., playground slide).

Small groups (2–3): some groups work on the Fahrenheit-centigrade small-group activity, some on small-group activity part A, and some on small-group activity part B. Reports (reasoning as well as results)

Exercise 14 in Section 2.6 is an example of the desired Important Objective of the course.

HW(?): Study Section 2.7; Section 2.6 #10, 14; Section 2.7 #1, 4, 6, 11; Query 3

Section 2.7 (Applications of Linear Equations)

Purpose: Understand the reasoning in Wanda Investment problem and the

distance = (rate)x(time) relation.

This section begins the modeling process, a theme that will become more and more important as the course unfolds.

Check on understanding of the reasoning in Problem #3 (Ruby's Trip), converting from one system to another.

Review Section 2.6 by having a student work and explain a revised #6 (change the point) on the board.

Small-Group Activity (from Section 2.6) "Line of Sight"

Small-Group Activity: Exercise #22

HW(?): Study Section 2.8, Section 2.7 #3, 16; Section 2.8 #2, 4, 5, 6; Query 1

Section 2.8 (Systems of Equations)

Purpose: Learn how to solve systems of linear equations using a substitution, graphical, or elimination method for 2 x 2 systems and matrices for larger systems. Solving a system by expressing it as an augmented matrix and then applying the calculator's reduced row echelon form (rref) program will be the principle method for solving systems of three or more equations.

Be certain that every student understands the four solution methods and, in particular,

a. Understands how to express a system as an augmented matrix

b. Understands how to employ the rref method on the calculator

The application of balancing chemical equations illustrates the interdisciplinary aspect of the course and provides a nice opportunity to invite a chemistry instructor to speak to the class.

HW(?): Study Section 2.9, Section 2.8 #9, 12; Section 2.9 #2, 4, 5(a,c,d), 6(a,c,d); Query 1

Section 2.9 (Linear Inequalities)

Purpose: Understand the rules for inequalities and absolute value

Do not allow yourself to get bogged down on the mechanics of inequalities and absolute values. Most students have difficulty with absolute vales and inequalities, and all of them will survive without mastering these concepts. Calculators should be used for graphically solving most inequality and/or absolute value problems.

Small groups (pairs) Distribute Exercises #7–12 among the groups. Have groups report by showing examples on the board.

HW(?): Study Section 2.10; Section 2.9 #3, 13; Section 2.10 #2, 5, 7; Query 1

Section 2.10 (Linear Programming)

This section is optional in the sense that following sections do not depend on it. Because linear programming is an important topic in business, in which many students will major, it would be nice for students to work through this section. From a mathematics viewpoint, the real-world problem-solving process is impressive, and the

use of graphics is just very beautiful. This section is another example of the interdisciplinary aspect of the course and provides a nice opportunity to invite a business instructor to speak to the class.

Small group: Exercises #6, 8. Reports should emphasize reasoning and include graphs drawn on the blackboard

HW(?): Read Section 2.11; Review Sections 2.1-2.10. Divide class into 10 groups and assign a section to each group to prepare a 4-minute class review.

Review Chapter 2 in preparation for test over Chapter 2.

Note: The Editorial Committee estimated the following times
2 days for administration details and introduction to calculator
1 day for Chapter 0
11 days for Sections 2.1–2.11
1 day for Review
2 days for Fun project #1 (drop day, discussion day)
2 days for Chapter Test (one day for test, one day to review and celebrate the test)

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19 days total for Chapter 2.

Students should be assigned to study Section 3.1 and be prepared to discuss the advantages and disadvantages with each method of displaying functions.

Section 3.1 (Displaying Functions)

Purpose: Provide students with an intuitive feeling for functions (note Section 2.4) and to acquaint students with the graphic, symbolic, and numeric methods for displaying functions.

Ask students to provide examples of real-life dependency relations.

Call attention to the three solution methods (graphic, numeric, symbolic) illustrated in Problem #2 (Don's well).

Small groups (pairs): Work Exercises #4–11, reports should include sketching graphs on the blackboard.

HW(?): Study Section 3.2, Section 3.1 #14; Section 3.2 # 4, 5, 9, 19; Query 3

Section 3.2 (Definitions)

Purpose: Understand the meaning of function and the parts of a function (discuss terms in "street language" as well as the mathematical definitions).

Discuss why function is one of the most important concepts in mathematics. (The function relation is the primary means of transforming data into information.)

Students need to understand that function and equation do not mean the same thing.

Small groups (3–4): work the two Small-Group Activities and Query 6.

HW(?) Study Section 3.3, Section 3.2 # 25, 26; Section 3.3 #4, 9

Section 3.3 (Predictions Based on Data)

Purpose: Emphasize the desired **Important Objective** of the course—Students should understand and appreciate the following process of analyzing a real situation: (1) collect data, (2) plot the data, (3) fit a curve to the plotted data, and then (4) use the function obtained from the curve fitting to obtain insights into the situation (for example, make predictions).

Place increasing emphasis on modeling and identifying models.

Call attention to the process of transforming data into information.

Stress being able to recognize and sketch by hand the basic shapes of polynomials (even and odd degree), radicals, exponentials, logs, sine and cosine.

Every student should be developing skill in using their calculator to plot.

Small groups (pairs): Exercises #6, 7 (Remember we are developing exploratory attitudes.)

HW(?): Study Section 3.4; Section 3.3 #8, 10, 18, 19; Section 3.4 #1, 6, 9; Query 3

Section 3.4 (Shifting and Scaling Graphs)

Purpose: Develop skill in shifting and scaling graphs.

Check on the understanding of the reasoning in the example (Margaret's can of soda)

The ability to graphically approximate a data set will become increasingly important as the course unfolds.

Small groups (pairs): Exercises #2, 8, 13

HW(?): Study Section 3.5; Section 3.3 #11, 14; Section 3.4 #10, 14, 20; Section 3.5 #2, 4; Query 3

Section 3.5 (Algebra of Functions)

Spend two days on this section. Combining functions graphically is difficult as is composing functions numerically. Be careful not to become bogged down, particularly over graphically multiplying, dividing, and composing functions.

Purpose: Understand the need for an algebra (complicated functions are merely combinations of a few basic functions) and how to combine functions graphically, symbolically, and numerically.

Lots of practice is needed to gain confidence—work a couple of graphic examples on the board with student input and then move to pairs of students working by themselves.

HW(?): Restudy Section 3.5; Section 3.4 #12; Section 3.5 #1, 5, 7, 11, 12, Query 6

Section 3.5 (second day—Algebra of Functions)

Practice in pairs

Emphasize composition (symbolically and numerically)—composing two or more functions, decomposing a function into component parts.

Emphasize inverse functions graphically, symbolically, numerically

HW(?): Study Section 3.6; Section 3.5 #15; Section 3.6 #1, 2, 4, 6, 8, Queries 1&2.

Section 3.6 (Graphical Approximations)

This section may require two days. This is a fun section and thus we should extend the enjoyment to a second day.

Purpose: Learn to graphically approximate solutions of equations and to graphically approximate a data set.

This section is very important for the rest of the course.

Emphasize the basic problem-solving process of: make a reasonable approximation (i.e., guess), plot to observe the error, modify your

guess to reduce the error, plot your modified approximation, observe the error, modify your approximation, etc. Continue iterating this process until an acceptable solution is obtained. (Recall the Line of Sight activity in Section 2.5).

Check on the student's understanding of the reasoning on Problems #5–7

Small groups (pairs): Exercises #5,12 (Compare results)

HW(?): Rework Section 3.6, Section 3.5 #9, 12, 13; Section 3.6 #3, 5, 13, 15

Section 3.6 (second day—Graphical Approximations)

Practice in pairs

Small groups (pairs): Exercises #6, 7, 8, 11

HW(?): Study Section 3.7; Section 3.7 #1, 5, 6, 8,11

Section 3.7 (Symbolic Approximation of Data)

Understand the meaning of regression to fit a curve to a data set. Be able to determine the equation of a line passing through the origin that best fits a data set without using the regression programs in the calculator. Be able to use the calculator's regression programs.

Check on students' ability to use the regression programs programmed into their calculators.

Exercise 7 is a good (two-person) class activity.

Make up examples similar to Problem #1 in the reading, for students to work (in pairs).

HW(?): Study Section 3.8; Section 3.7 #2, 4, 9, 12; Section 3.8 #1, 2

Section 3.8 (Optimization)

This section should be given two days. The growing emphasis on efficiency in our daily lives and profits in business underscores the importance of modeling and solving optimization problems. Today's technology has moved optimization from a calculus topic to a college algebra topic.

Emphasize the problem-solving process.

Purpose: To understand the roles of objective function and constraint equations in modeling optimization problems.

Note that several graphing calculators have a built in program for computing maximum and minimum values.

HW(?): Study the worked examples and the problem-solving process in Section 3.8; Section 3.8 # 4, 6, 7, 8

Section 3.8 (second day—Optimization)

Nice opportunities for small-group class activities along with props. Some examples: Exercise #9—show an open box (shoe box), then cut the vertical edges, and show the "flat-opened" box with the corner sections removed. Exercise #10—show the class a pizza box. Exercise #12—ask if any pair of students have a situation similar to Venus and Oscar. Exercise #16 is a great problem. The problem is ill stated in that the problem does not explicitly state what is to be optimized. Thus the students need to formulate an explicit problem. Note that there are two possible orientations for the tent.

Emphasize the problem-solving process (particularly with the class activity problems).

HW{?}: Section 3.8 #9, 10, 12, 13, 16

Review Chapter 3 in preparation for a test over Chapter 3.

HW{?}: Review, Augment Section 3.9 by assigning Sections 3.–3.6 to groups to prepare a 5 minute class review.

Note: The Editorial Committee estimated the following times

12 days for Sections 3.1–3.9

1 day for Review

2 days for Fun project #2 (drop day, discussion day)

2 days for Chapter Test (one day for test, one day to review and celebrate the test)

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17 days total for Chapter 3.

Students should be assigned to study Section 4.1 and be prepared to discuss Chuck's problem and the derivation of the summation expression for a geometric series.

Chapter 4 offers an interesting spectrum of modeling problems, drawn from different disciplines, that is within the grasp of Contemporary College Algebra students. This Chapter illustrates the interdisciplinary nature of contemporary college algebra. Sections 4.1 and 4.2 are recommended to be covered with individual teachers selecting additional sections based on time and interest. Sections 4.3–4.8 provide opportunities to individualize the course to student interests. (The following suggestions are based on the unrealistic assumption that a class would take up each of the Sections in Chapter 4 in order.)

Section 4.1 (Mathematical Modeling)

Take two days on this section.

Purpose:

a. Understand the three "legs" in the modeling process. Review Chapter 1. Illustrate the

three "legs" using the worked Problems in Section 3.3.

b. Understand geometric series and how it arises in modeling an investment type

problem.

Check on students' understanding of the reasoning and process in solving Chuck's Problem.

Solution of Option #2 of Chuck's problem serves as a paradigm for several modeling problems in different disciplines.

Emphasize: **(New Situation) = (Old Situation) plus (Change)**

Calculator: learn how to iterate a recursive sequence (use the Table function as a spreadsheet).

Small groups (pairs): Answer Queries 1, 2, 3.

HW(?): Rework Section 4.1; practice iterating recursive sequences (calculator)

HW(?): Section 4.1 #1, 2, 3, 4, 6, 9

Section 4.1 (second day)

Purpose: Gain skill in working with the geometric series and in using the calculator to iterate recursive sequences.

HW(?): Study Section 4.2; Section 4.1 #10, 11, 13; Section 4.2 #1, 4, 5, 7; Query 2

Section 4.2 (Modeling (Business))

Take two days on this section.

Purpose: Practice using recursive sequences to model investment type problems. Develop an appreciation of the role of exponential growth particularly with respect to financial situations such as credit card debt, buying on time, etc.

Emphasize the approach to developing a recursive sequence:

(Next month's balance) = (this month's balance) + (interest and deposits)

Check on students' understanding of Exercise #7

Emphasize the importance of starting a mathematical model by explicitly defining variables, stating the given conditions, and listing the assumptions.

Small groups (pairs): Exercise #13

HW(?): Rework Section 4.2 focusing on the reasoning in the worked Problems; Section 4.2 #2, 3, 8, 9; Queries 3 & 4

Section 4.2 (second day—Modeling (business))

Purpose: Understand the defining characteristic of exponential functions which is:

The amount of change is proportional to the amount of the quantity present.

Check on students' understanding of the rules of logarithms (Exercise #23)

Small groups (pairs): Exercise #12

HW(?): Section 4.2 #10, 11, 14, 17, 21; Study Section 4.3, Section 4.3 #1, 2; Query 2

Section 4.3 (Modeling (Motion Problems))

May want to spend two days on this section.

Purpose: Understand how to model motion problems using Newton's Second Law of Motion

Understand how to use the quadratic formula

Understand the need for parametric functions and how to use them

Understand how slope $= \frac{rise}{run}$ leads to decomposing motion into horizontal and vertical components.

Treat the definition of the trigonometric functions as an extension of Section 2.5 (Circle Properties and Pie Charts).

HW(?): Section 4.3 # 4, 6, 7, 10; Study Section 4.4; Section 4.4 #2

Section 4.4 (Modeling (Physical Sciences))

Purpose: Understand how to model temperature change problems using Newton's Law of Cooling.

Understand the concept of equilibrium with respect to a chemical reaction.

Note the use of a recursive sequence in modeling the cooling cup of coffee problem.

Small-Group Activity (pairs): Baking a Potato.

HW(?): Section 4.4 #4, 6, 7, 8; Study Section 4.5; Section 4.5 # 1, 2

Section 4.5 (Modeling (Blend Problems))

Purpose: Understand how to model blend problems—relation between concentration, volume, and quantity. (Similar to the relation between distance, rate, and time.)

Small groups (pairs): Exercise #10

HW(?): Section 4.4 #9; Study Section 4.6; Section 4.5 #6, 7, 8; Queries 34 & 5

Section 4.6 (Modeling (Life Sciences))

Take two days on this section

Purpose: Understand how to use a recursive sequence to model drug retention problems

Understand the need for the logistic model in studying population growth

Discuss the reasoning in the development of the logistic model (Exercise #8)

Small groups (pairs): Exercise #13

HW(?): Study Section 4.6; Section 4.6 #2, 3, 5, 7; Query 3

Section 4.6 (second day—Modeling (Life Sciences))

Small groups (pairs): Exercise #10

Small group: Expand #9 to develop a model.

HW(?): Study Section 4.7; Section 4.6 #12, 13, 15

Section 4.7 (Modeling (Economics))

Take two days for this section.

Purpose: Provide an introduction to the opportunity cost associated with making a decision and the multiplier effects associated with spending and taxation.

Check on students' understanding of the list of basic assumptions.

Work through Example 4.7.3 explaining each of the three analyses.

HW(?): Study Section 4.7; Section 4.7 #1, 3, 5, 6

Section 4.7 (second day—Modeling (Economics))

Understand the three important insights illustrated by Example 4.7.3.

Work through Example 7.4.5

Discuss Query 6.

HW(?) Study Section 4.8; Section 4.7 #7, 8, 9, 10

Section 4.8 (Modeling (Music and Art))

Purpose: Appreciate how the musician, artist, and mathematician share a common goal of exhibiting beauty, harmony, and order within nature.

Recognize the geometric ratio of successive notes in an octave.

Appreciate the occurrence of the Golden Mean in several settings.

HW(?): Study 4.8; Section 4.8 #1, 2, 7, 8, 9

Review Chapter 4 in preparation for a test over Chapter 4.

Note: Extrapolating from the discussions of the Editorial Committee, the following times were estimated

4 days for Sections 4.1–4.2

4 days for two other sections

2 days for Chapter Test (one day for test, one day to review and celebrate the test)

10 days total for Chapter 4.

Note

This outline assumes 46 class periods.