Math

secondary subject overview

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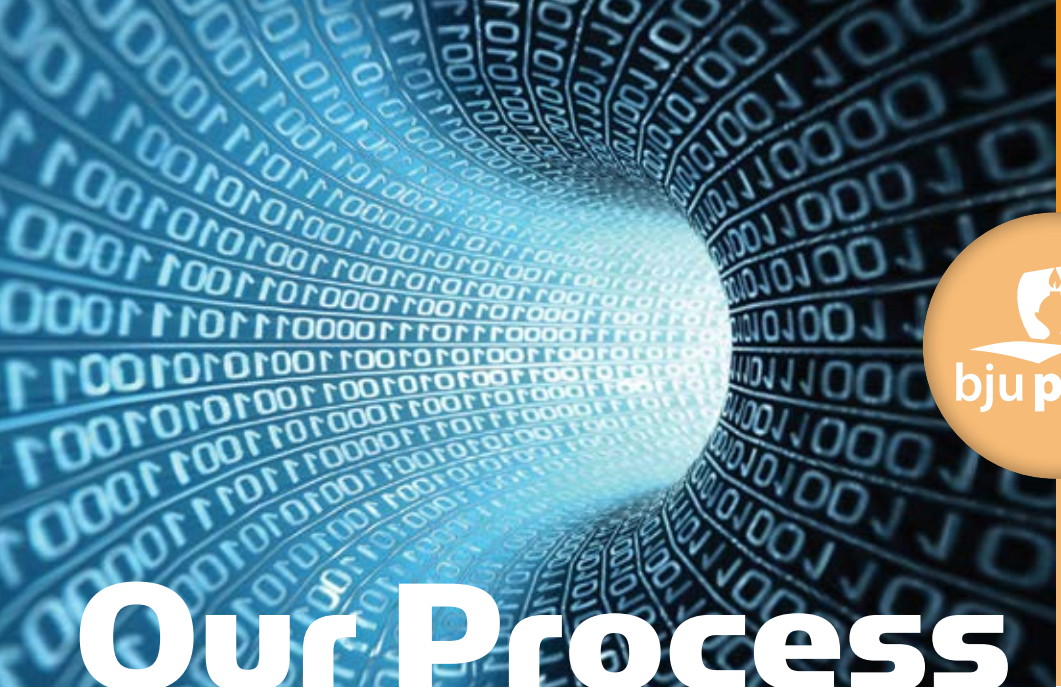


Our Process

Comprehension. Solution. Application

The goals of BJU Press Secondary Math are . . .

- To develop knowledge of mathematical concepts
- To foster analytical thinking and reasoning skills
- To emphasize how mathematics helps us serve others and glorify God
- To expose students to service opportunities in a variety of math-related occupations

Contents

Program Approach

Biblical Worldview

Using Math to Glorify God

Today, math educators are emphasizing integration of Science, Technology, and Engineering (STEM) into the math classroom. When students understand how the math skills they are mastering are used by scientists, programmers, and engineers, they will realize the value of mathematics.

STEM also provides excellent opportunities for Christian math educators. After creating man in His own image, God called image bearers to exercise good and wise dominion over the world (Gen. 1:28). This command calls us to maximize the usefulness of the world for the glory of God and the benefit of our fellow humans. STEM illustrates how math enables effective utilization of our world's resources. Christians using mathematics as a tool to build bridges, cure diseases, and create communication networks carry out God's mandate.

"Students will learn the relevance and purpose of math when it is presented from a biblical worldview."

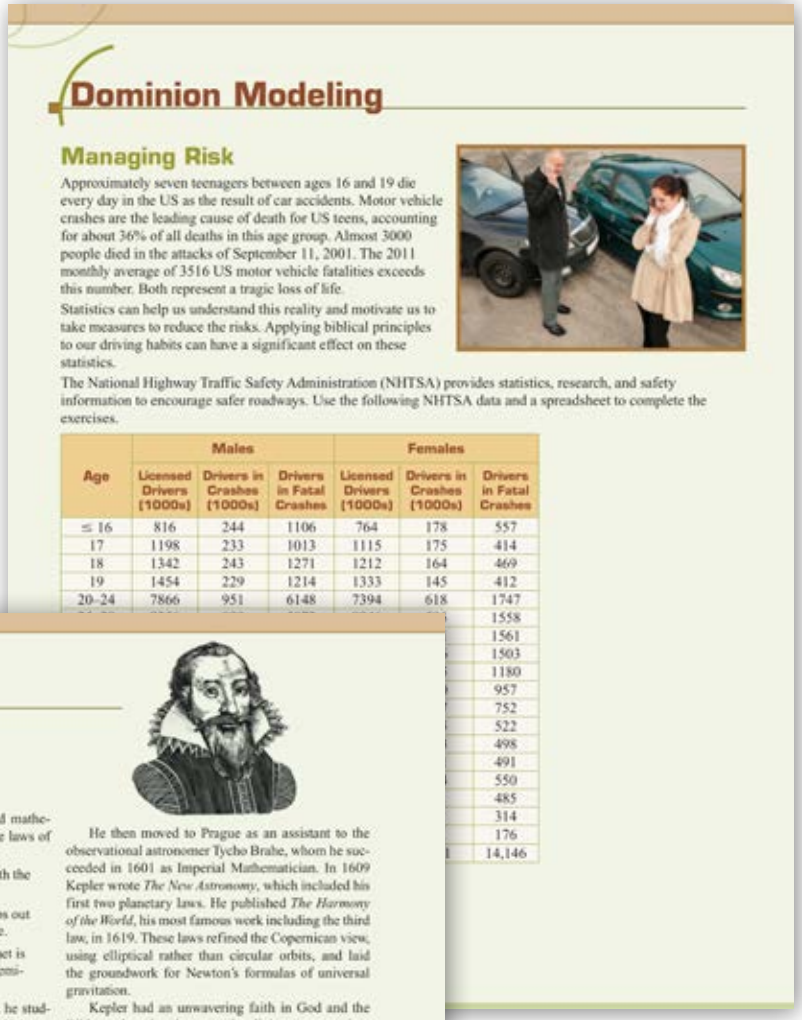
BJU Press presents math within a biblical worldview. It provides students with a powerful tool for fulfilling God's commands and serving others. STEM provides an opportunity to present math as a tool for service instead of the hope of human progress without God.

Students will learn the relevance and purpose of math when it is presented from a biblical worldview. God is a God of order. Math helps us to describe the order in the world God created. Although creation has been tarnished by the Fall of man into sin, God's original design and consistency can often be found in mathematical details, such as the perfect hexagons in a honeycomb, the symmetry of a snowflake, and the mathematical precision of a pendulum's oscillation.

Using Math to Exercise Dominion

God's creation can be measured with numbers; and if students know how to use numbers effectively, they can become skilled at obeying the Creation Mandate of Genesis 1:28. Historical features reveal how great mathematicians used their God-given abilities to develop and apply math in practical ways.

Dominion Modeling features that are in many of our math textbooks integrate real-world data and mathematical concepts with biblical principles through performing data analysis and applying Scriptural truth.
This provides biblical-worldview shaping in the context of real-world challenges, such as climate change, accident scene investigation, and risk management.



Dominion Modeling

Managing Risk

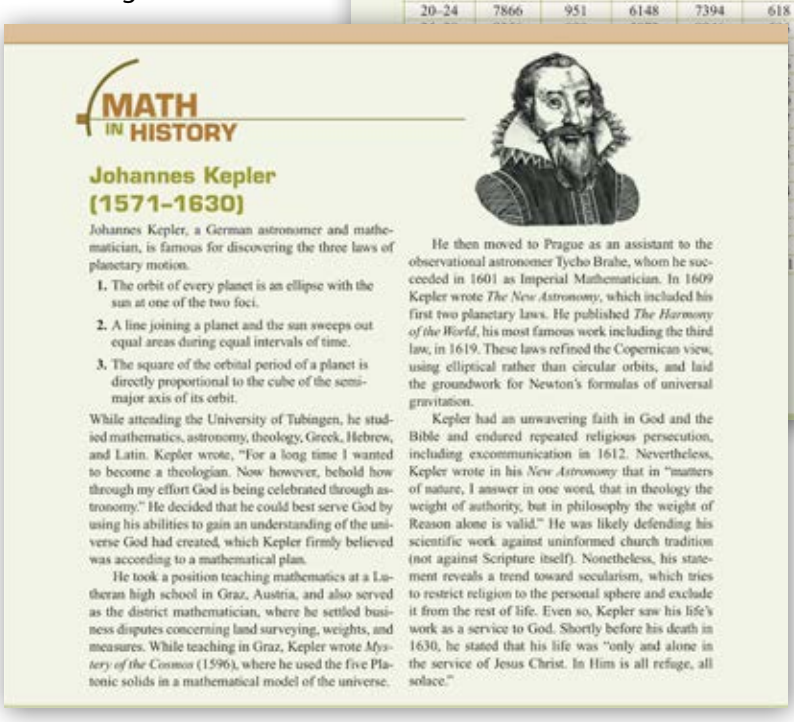
Approximately seven teenagers between ages 16 and 19 die every day in the US as the result of car accidents. Motor vehicle crashes are the leading cause of death for US teens, accounting for about 36% of all deaths in this age group. Almost 3000 people died in the attacks of September 11, 2001. The 2011 monthly average of 3516 US motor vehicle fatalities exceeds this number. Both represent a tragic loss of life.

Statistics can help us understand this reality and motivate us to take measures to reduce the risks. Applying biblical principles to our driving habits can have a significant effect on these statistics.

The National Highway Traffic Safety Administration (NHTSA) provides statistics, research, and safety information to encourage safer roadways. Use the following NHTSA data and a spreadsheet to complete the exercises.

Age	Males			Females		
	Licensed Drivers (1000s)	Drivers in Crashes (1000s)	Drivers in Fatal Crashes	Licensed Drivers (1000s)	Drivers in Crashes (1000s)	Drivers in Fatal Crashes
≤ 16	816	244	1106	764	178	557
17	1198	233	1013	1115	175	414
18	1342	243	1271	1212	164	469
19	1454	229	1214	1333	145	412
20–24	7866	951	6148	7394	618	1747
						1558
						1561
						1503
						1180
						957
						752
						522
						498
						491
						550
						485
						314
						176
						14,146

• Algebra 2, 3rd edition



MATH IN HISTORY

Johannes Kepler (1571–1630)

Johannes Kepler, a German astronomer and mathematician, is famous for discovering the three laws of planetary motion.

1. The orbit of every planet is an ellipse with the sun at one of the two foci.
2. A line joining a planet and the sun sweeps out equal areas during equal intervals of time.
3. The square of the orbital period of a planet is directly proportional to the cube of the semi-major axis of its orbit.

While attending the University of Tubingen, he studied mathematics, astronomy, theology, Greek, Hebrew, and Latin. Kepler wrote, "For a long time I wanted to become a theologian. Now however, behold how through my effort God is being celebrated through astronomy." He decided that he could best serve God by using his abilities to gain an understanding of the universe God had created, which Kepler firmly believed was according to a mathematical plan.

He took a position teaching mathematics at a Lutheran high school in Graz, Austria, and also served as the district mathematician, where he settled business disputes concerning land surveying, weights, and measures. While teaching in Graz, Kepler wrote *Mystery of the Cosmos* (1596), where he used the five Platonic solids in a mathematical model of the universe.

He then moved to Prague as an assistant to the observational astronomer Tycho Brahe, whom he succeeded in 1601 as Imperial Mathematician. In 1609 Kepler wrote *The New Astronomy*, which included his first two planetary laws. He published *The Harmony of the World*, his most famous work including the third law, in 1619. These laws refined the Copernican view, using elliptical rather than circular orbits, and laid the groundwork for Newton's formulas of universal gravitation.

Kepler had an unwavering faith in God and the Bible and endured repeated religious persecution, including excommunication in 1612. Nevertheless, Kepler wrote in his *New Astronomy* that in "matters of nature, I answer in one word, that in theology the weight of authority, but in philosophy the weight of Reason alone is valid." He was likely defending his scientific work against uninformed church tradition (not against Scripture itself). Nonetheless, his statement reveals a trend toward secularism, which tries to restrict religion to the personal sphere and exclude it from the rest of life. Even so, Kepler saw his life's work as a service to God. Shortly before his death in 1630, he stated that his life was "only and alone in the service of Jesus Christ. In Him is all refuge, all solace."

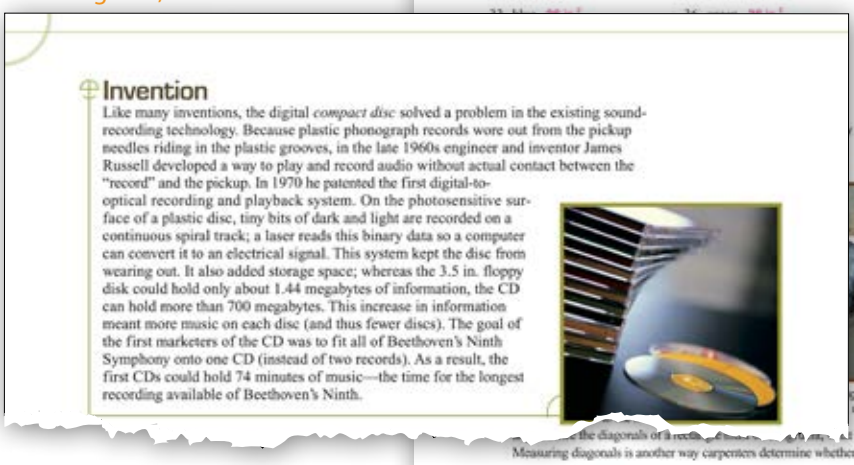
• Algebra 2, 3rd edition

Comprehension

The Key to Understanding Math

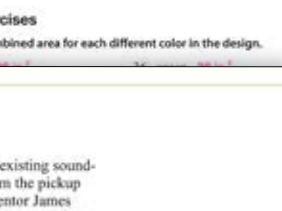
A firm grasp of mathematical concepts is fundamental to success in math. Students must have a thorough understanding of the mathematical processes and know how to use the processes to produce accurate solutions. While memorization is an essential component in math, students need to pair comprehension with the math concepts that they have memorized in order to succeed in higher-level mathematics.

- Pre-Algebra, 2nd edition



Invention

Like many inventions, the digital *compact disc* solved a problem in the existing sound-recording technology. Because plastic phonograph records wore out from the pickup needles riding in the plastic grooves, in the late 1960s engineer and inventor James Russell developed a way to play and record audio without actual contact between the "record" and the pickup. In 1970 he patented the first digital-to-optical recording and playback system. On the photosensitive surface of a plastic disc, tiny bits of dark and light are recorded on a continuous spiral track; a laser reads this binary data so a computer can convert it to an electrical signal. This system kept the disc from wearing out. It also added storage space; whereas the 3.5 in. floppy disk could hold only about 1.44 megabytes of information, the CD can hold more than 700 megabytes. This increase in information meant more music on each disc (and thus fewer discs). The goal of the first marketers of the CD was to fit all of Beethoven's Ninth Symphony onto one CD (instead of two records). As a result, the first CDs could hold 74 minutes of music—the time for the longest recording available of Beethoven's Ninth.



C. Exercises

Find the combined area for each different color in the design.

Measuring diagonals is another way carpenters determine whether the form is rectangular. 23.3 ft; *AC*

CUMULATIVE REVIEW

Simplify. Use the order of operations.

41. $36 \div 10 + 2 - 3 \times 5$ [1.9] 26

42. $20(5) - \frac{60 \cdot 4}{5}$ [4.2] 52

43. $\frac{1}{6} + \frac{5}{6} - \frac{3}{4}$ [4.10] $\frac{19}{24}$

44. $\frac{4 \times 16 \cdot 2}{9} + 4^2$ [4.2] 20

45. $7\sqrt{64} - (5 + 7)$ [1.9] 44

46. $\left(\frac{2}{3}\right)^3 + 1\frac{7}{9}$ [4.10] $2\frac{2}{27}$

Find the missing side in each pair of similar figures. [8.9]

47. 12

48. 18

49. 5.6

50. 18

392 CHAPTER 9 AREA AND VOLUME

- Fundamentals of Math, 2nd edition

Students connect each new lesson to previously learned concepts to get a unified view of mathematics. The lessons, exercises, and reviews are designed to promote maximum comprehension and retention of concepts. Extended problem sets—graded by A, B, and C levels of difficulty—allow the teacher to differentiate instruction for diverse learners. Cumulative Review sections help students recall prior concepts while preparing them for what is ahead.

Relevant Application

Teachers are inspired to make math relevant and fun. Students become more engaged through developing new math skills with practical, everyday connections. Real-life applications present math as a tool of commerce, the language of science, and a means for solving everyday problems. Story problems related to science, music, finances, sports, and the arts increase student appeal. Features on math history, biographies, math in other cultures, and careers help students develop an appreciation for math. The increasing importance of STEM education is reflected in the variety of application exercises that link mathematics to science, technology, and engineering.

CAREERS IN MATH

Chemist/Chemical Engineer

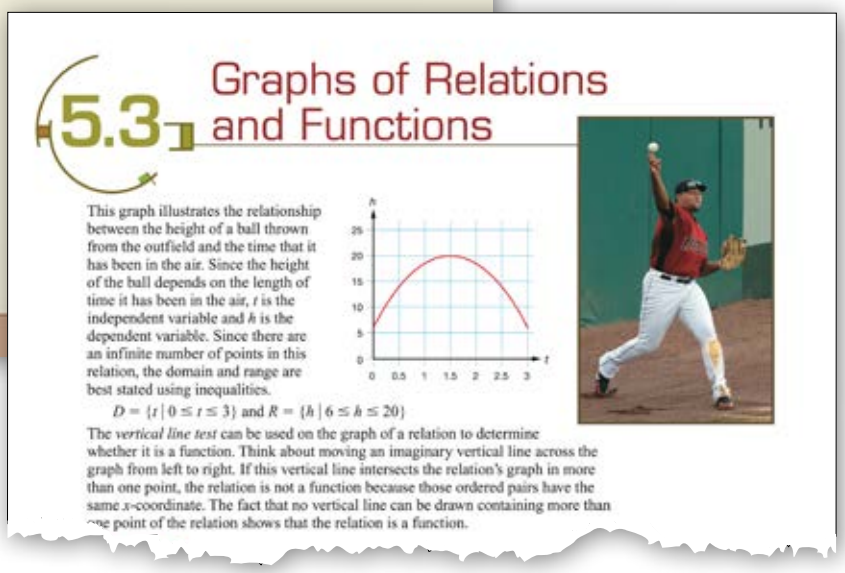
Chemists can do amazing things with the raw materials found in nature. The microchips in your computer, your cell phone, and even the family car are products of chemical engineering. The silicon in microchips is made from natural sand, or silica. The process involves the removal of oxygen, accomplished by heating silica and carbon to temperatures over 2000°C. Such processes require the scientific and mathematical knowledge and skills of a chemist.

The career of a Christian chemist offers not only the means to make a good living, but also many opportunities for demonstrating care and love for others. For instance, chemists work on cures for serious diseases or medicines for those suffering from physical infirmities, as well as the development of new materials for warmth or stronger materials for structural safety. Their efforts help others live more safely and comfortably through the wise use of the natural materials provided in God's creation.

Chemists develop new materials to improve existing products or make new ones. Analytical chemists determine the composition of a substance by identifying its elements and compounds and their relative quantities. Chemical engineers work together with industrial chemists to develop the processes needed to make new products.

God has created an astonishing variety of compounds with many differing chemical properties. A chemist can use his knowledge and skills to harness the potential of God's creation for His glory.

- Algebra 1, 3rd edition



5.3 Graphs of Relations and Functions

This graph illustrates the relationship between the height of a ball thrown from the outfield and the time that it has been in the air. Since the height of the ball depends on the length of time it has been in the air, t is the independent variable and h is the dependent variable. Since there are an infinite number of points in this relation, the domain and range are best stated using inequalities.

$D = \{t \mid 0 \le t \le 3\}$ and $R = \{h \mid 6 \le h \le 20\}$

The *vertical line test* can be used on the graph of a relation to determine whether it is a function. Think about moving an imaginary vertical line across the graph from left to right. If this vertical line intersects the relation's graph in more than one point, the relation is not a function because those ordered pairs have the same x-coordinate. The fact that no vertical line can be drawn containing more than one point of the relation shows that the relation is a function.

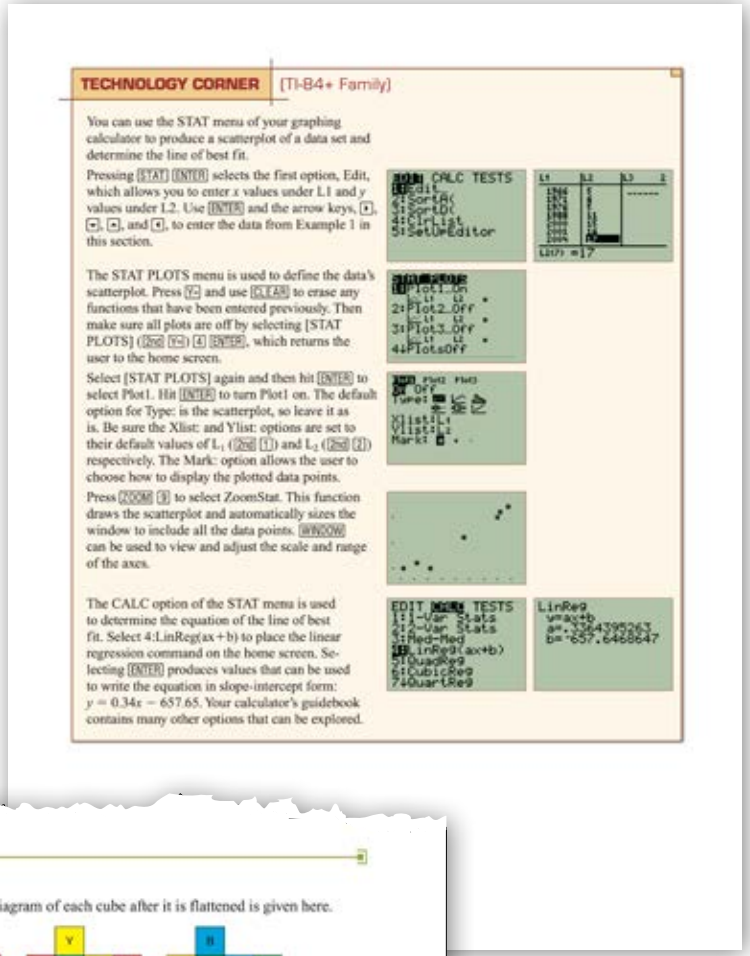
- Algebra 1, 3rd edition

Critical Thinking

Math Is More than Computation

A major goal of the Secondary Math program is to help students become critical thinkers and life-long problem solvers. Education is more than just getting good grades. It is learning to think for oneself. Students are encouraged not only to perform calculations but also to be able to explain and justify answers by applying critical-thinking skills. Our academically rigorous materials prepare students to excel in standardized assessments as well as college-level mathematics.

Our Secondary Math program helps students develop reasoning and problem-solving skills in a number of ways. Technology Corners provide tutorials that guide students in detailed use of the TI-84+ family of graphing calculators, spreadsheets, and dynamic geometry software. Programming Projects and Mind Over Math activities provide practical and motivating options for advanced students. Internet keyword searches assist students and teachers in accessing online tools and enrichment resources.



TECHNOLOGY CORNER (TI-84+ Family)

You can use the STAT menu of your graphing calculator to produce a scatterplot of a data set and determine the line of best fit.

Pressing [STAT] [ENTER] selects the first option, Edit, which allows you to enter x values under L1 and y values under L2. Use [ENTER] and the arrow keys, [▶], [▼], [▶], and [◀], to enter the data from Example 1 in this section.

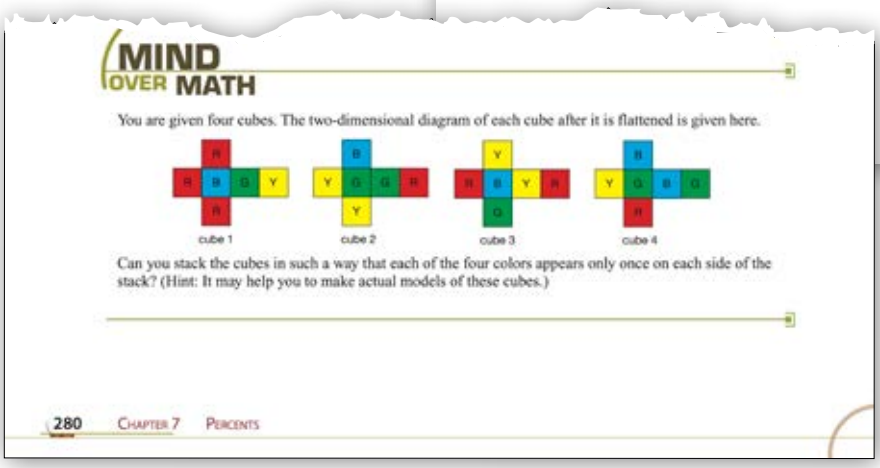
The STAT PLOTS menu is used to define the data's scatterplot. Press [Y=] and use [CLEAR] to erase any functions that have been entered previously. Then make sure all plots are off by selecting [STAT PLOTS] ([2nd] [Y=]) [4] [ENTER], which returns the user to the home screen.

Select [STAT PLOTS] again and then hit [ENTER] to select Plot1. Hit [ENTER] to turn Plot1 on. The default option for Type: is the scatterplot, so leave it as is. Be sure the Xlist: and Ylist: options are set to their default values of L_1 ([2nd] [1]) and L_2 ([2nd] [2]) respectively. The Mark: option allows the user to choose how to display the plotted data points.

Press [ZOOM] [9] to select ZoomStat. This function draws the scatterplot and automatically sizes the window to include all the data points. [WINDOW] can be used to view and adjust the scale and range of the axes.

The CALC option of the STAT menu is used to determine the equation of the line of best fit. Select 4:LinReg(ax+b) to place the linear regression command on the home screen. Selecting [ENTER] produces values that can be used to write the equation in slope-intercept form: $y = 0.34x - 657.65$. Your calculator's guidebook contains many other options that can be explored.

- Algebra 1, 3rd edition



MIND OVER MATH

You are given four cubes. The two-dimensional diagram of each cube after it is flattened is given here.

cube 1 cube 2 cube 3 cube 4

Can you stack the cubes in such a way that each of the four colors appears only once on each side of the stack? (Hint: It may help you to make actual models of these cubes.)

280 CHAPTER 7 PERCENTS

- Pre-Algebra, 2nd edition

Teacher Resources

Exploring the Teacher's Edition

Flash
Additional information about a photo in the student text.

Objectives and Vocabulary
Explicitly stated for each section.

Resources
Lists of related assessments, activities, visuals, and other resources.

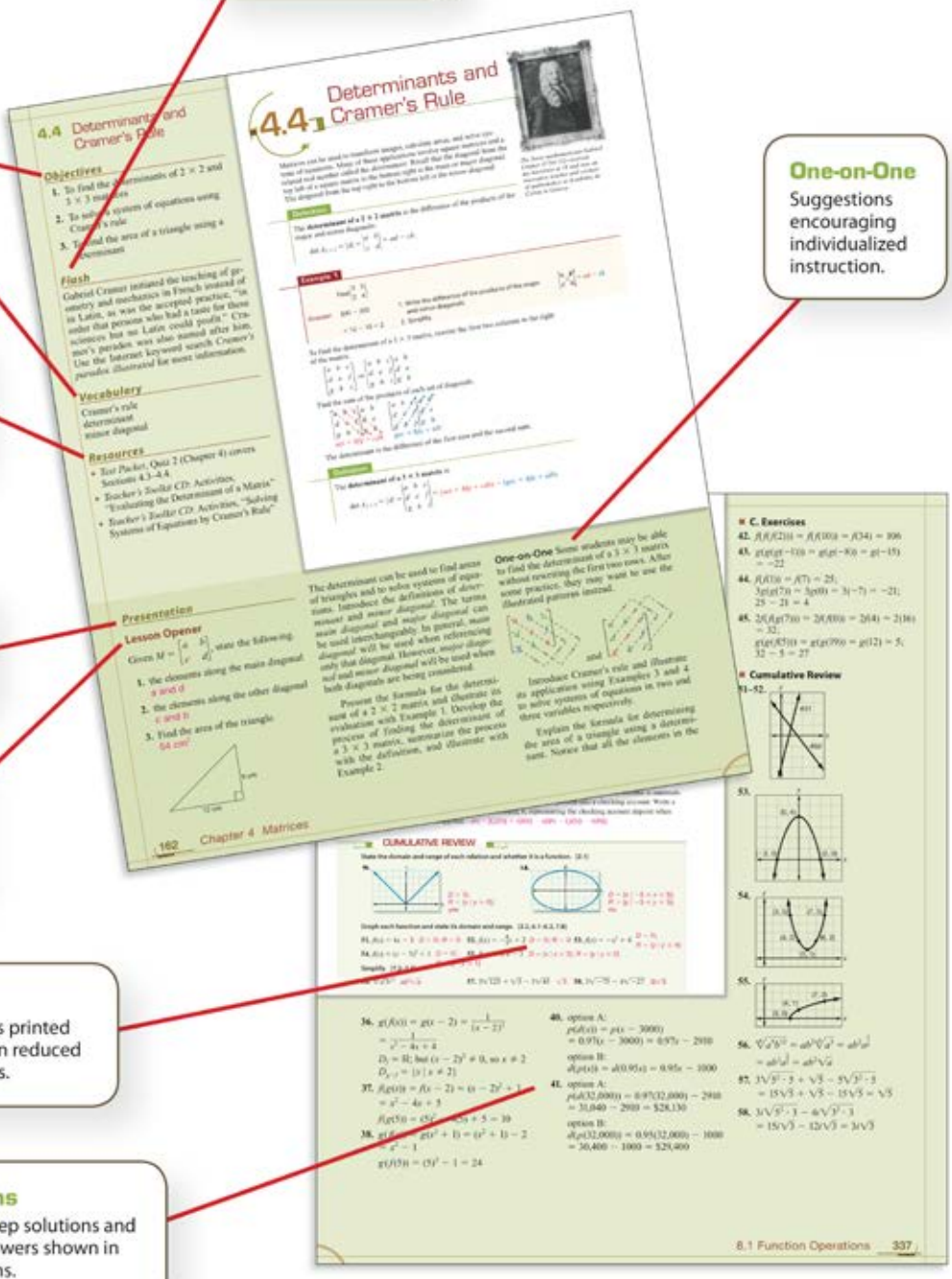
Presentation
Ideas for teaching the section.

Lesson Opener
Questions that review related concepts and focus student attention.

Answers
Short answers printed in magenta on reduced student pages.

Solutions
Step-by-step solutions and longer answers shown in the margins.

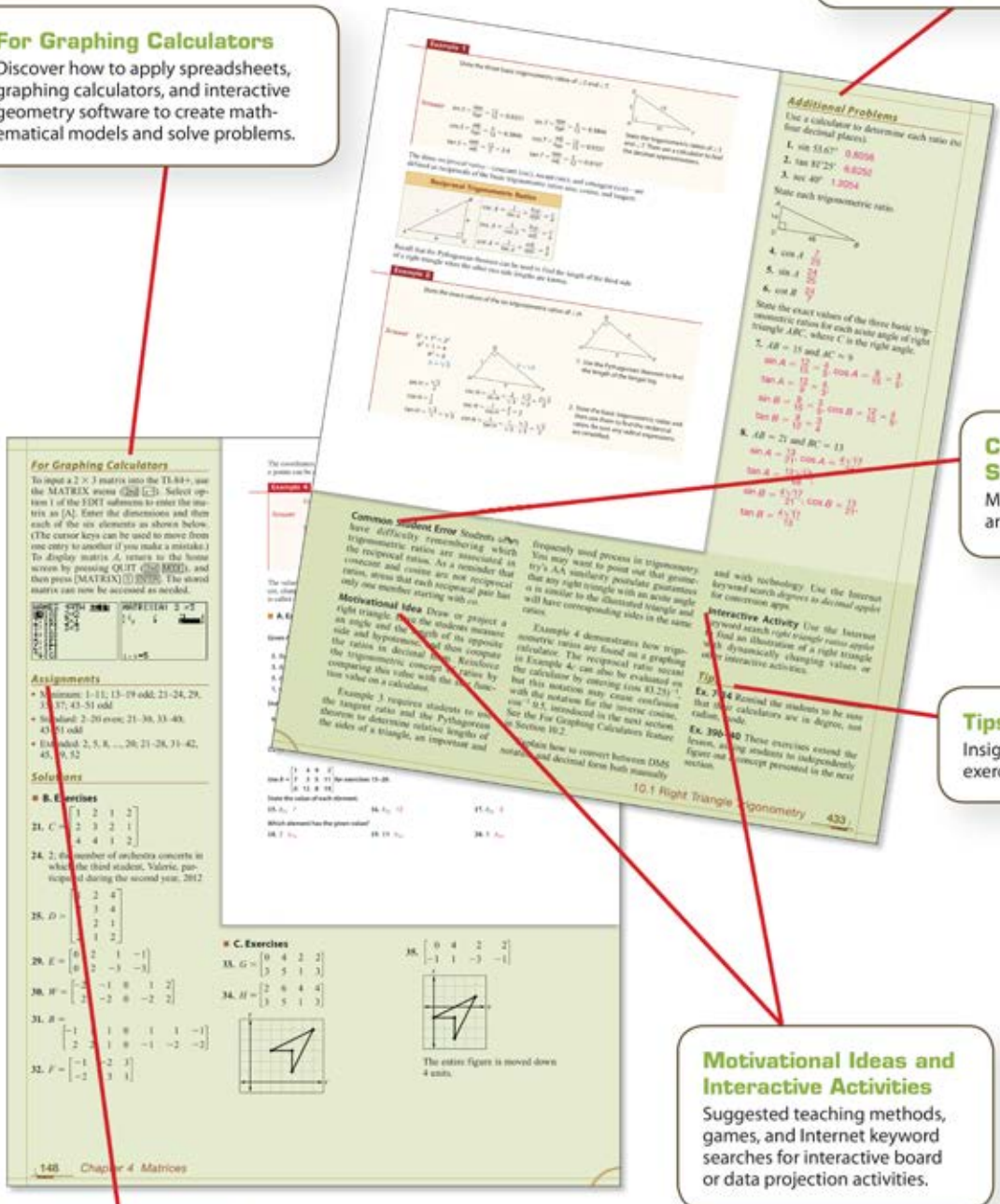
One-on-One
Suggestions encouraging individualized instruction.



- Algebra 2, 3rd edition

Additional Problems
More examples, in-class practice, or quiz items.

For Graphing Calculators
Discover how to apply spreadsheets, graphing calculators, and interactive geometry software to create mathematical models and solve problems.



Common Student Error
Mistakes students are likely to make.

Tips
Insights for selected exercises.

Motivational Ideas and Interactive Activities
Suggested teaching methods, games, and Internet keyword searches for interactive board or data projection activities.

Assignments
Suggested assignments for each track.

Feature Comparison Chart

Features & Additional Resources	Fundamentals of Math, 2ND	Pre-Algebra, 2ND	Algebra 1, 3RD	Algebra 2, 3RD	Geometry, 3RD	Precalculus	Consumer Math, 2ND
Teacher Tools Online†	✓	✓	✓	✓	✓	✓	
• PowerPoint Presentations (editable)	✓	✓	✓	✓	✓	✓	
• Digital Teacher's Edition (pdf)	✓	✓	✓	✓	✓	✓	
• Art in Digital Format	✓	✓	✓	✓	✓	✓	
• Video Clips	✓	✓	✓	✓	✓	✓	
• Assessment Database (Test Generator)	✓	✓	✓	✓	✓	✓	
• Teacher's MediaSuite Format for Interactive White Boards	✓	✓	✓	✓	✓	✓	
Suggested Bulletin Boards	✓	✓	✓	✓	✓		✓
Internet Keyword Searches			✓	✓			
Mind over Math Activities	✓	✓	✓		✓	✓	
Lesson Plan Overview (detailed)	✓	✓	✓	✓	✓	✓	✓
Student Activity Book with Key‡	✓	✓	✓		✓		
Student eTextbook Format‡	✓	✓	✓	✓	✓	✓	✓
Printed Tests, Quizzes, and Keys‡	✓	✓	✓	✓	✓	✓	✓
Full Solutions for Exercise Sets	✓	✓	✓	✓	✓	✓	
Calculator Skills Worksheets*			✓	✓	✓		
Mathardy Review Game (PowerPoint)*	✓	✓	✓	✓			

† Available with a one-time subscription for each title
‡ Purchased separately
* Included on the *Teacher's Toolkit* CD with the Teacher's Edition

Lesson Plan Overview

Algebra 2 Standard Lesson Plan Overview

This Standard Lesson Plan allocates 90 days for each semester.
Test Packet, supplementary material to *Student Text* and *Teacher's Edition*
Teacher's Toolkit CD, included in *Teacher's Edition*
Student Activities, included on the *Teacher's Toolkit CD*
*covered in the *Teacher's Edition* or *TTK CD*: Student Activities

Day	Topic	Pages	Support Materials	Bible Integration
Chapter 1: Basic Algebra				
1	Introduction	vi–1	• Appendix D, Dominion Modeling • Bible Integration: What Is the Dominion Mandate?	• Biblical Worldview Connection: predicting disease to help relieve human suffering • providing for the needs of others • managing creation*
2	1.1 Real Numbers	2–6	• *TTK CD*: Visuals	• successful living by depending on the foundation of Christ • God's creation and man created in His image* • understanding and declaring God's wondrous works*
3	1.2 Real Number Operations	7–11	• Quiz 1 (1.1)	
4	1.3 Simplifying Algebraic Expressions Algebra Around the World—Ancient Numeration	12–17	• Graphing Calculator: Evaluating Expressions	• the Lord blessed Daniel and his friends as they purposed to put Him first • God multiplies blessings as Christians develop godly character*
5	1.4 Solving Equations	18–22	• Quiz 2 (1.2–1.3)	• making growth a daily goal in one's Christian walk
6 7	1.5 Applying Equations	23–29		• applying godly wisdom to solve the problems of life • problem-solving ways of a godly person*
8	1.6 Solving Inequalities	29–33	• Appendix F, Study Skills (Before Class) • Quiz 3 (1.4–1.5)	• using God-given abilities to glorify Him
9	1.7 Compound Inequalities	34–38	• Math History: Richard Dedekind • *TTK CD*: Visuals	
10	1.8 Absolute Value Equations	38–43	• Quiz 4 (1.6–1.7) • Graphing Calculator: Absolute Value—Numbers and Equations	
11	Programming Project Technology Corner	43–44	• *TTK CD*: Resources	
12	1.9 Absolute Value Inequalities	45–49	• Practice with Linear Equations and Inequalities • Enrichment: Graphs of Absolute Value Inequalities	

continued

- Algebra 2 TE, 3rd edition

The Materials

Below is a sample of the standard Secondary Math materials provided for each course. Please see chart on Page 10 that shows features and resources for specific math courses. For more details, contact your Precept Sales Representative at 800.511.2771 or visit bjupress.com.

A. Student Text

Math concepts are presented in logically sequenced sections that each begin with a brief introduction followed by example problems, diagrams, photos, definitions, and other supporting materials. Problem sets are ranked in A, B, and C levels of difficulty for differentiation of instruction. Cumulative Review sections keep important material from earlier chapters fresh in the students' minds. Chapter Review sections provide ample practice for test preparation.

B. Teacher's Edition

The Teacher's Edition contains presentation suggestions, motivational ideas, and tips on common student errors. Overprint answers and complete step-by-step solutions save teachers time and simplify grading. A detailed Lesson Plan Overview assists in lesson preparation. Suggested scheduling and assignments for minimum, standard, and extended tracks enable easy adaptations for class differences.

C. Student Activities Manual

This *Student Activities Manual* provides resources for extra practice, remediation and enrichment activities, calculator skills exercises, and chapter and cumulative reviews.

D. Student Activities Manual Teacher's Edition

The *Student Activities Manual Teacher's Edition* contains overprint answers. Some include a CD with complete solutions.

E. *Teacher's Toolkit* CD

Select titles include a CD containing projection-ready answers, visuals, and Mathardy (a PowerPoint review game for each chapter).

F. Tests

Printed test packets also include section quizzes and exams. Complete step-by-step solutions are included with most Answer Keys (sold separately).

▶ *See pages 14–15 for technology solutions.*

Technology Solutions

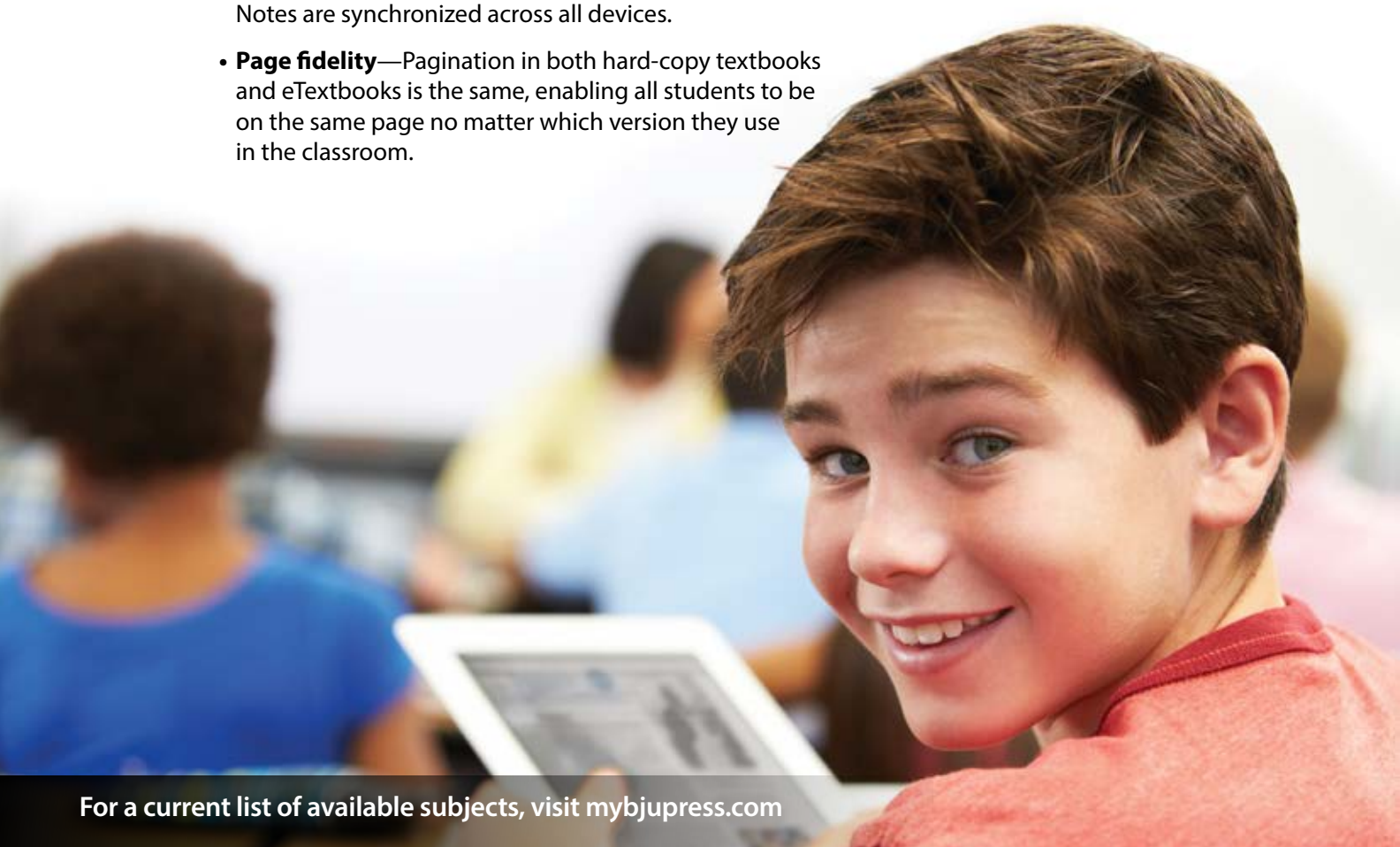
The days of teaching using a chalkboard or overhead projector are fast becoming distant memories. We live in a digital age. Teachers are looking for innovative ways to engage students in learning. BJU Press offers cutting-edge technology enhancements to do just that. We provide helpful resources for the teacher and the student—for use in both the classroom and on the go.

eTextbooks for Students

Stay on the leading edge of technology with BJU Press eTextbooks! Using eTextbooks means lighter loads for students and improved accessibility for students who use laptops or tablets. Parents and teachers alike will appreciate the increased level of student engagement that eTextbooks can provide.

BJU Press eTextbooks are offered through the VitalSource® Bookshelf® platform. Delivering digital content to more than 3.25 million users on 6,000 campuses in over 200 countries, VitalSource® is the preferred and most used eTextbook platform in higher education today.

- **Simple process**—After purchasing the book, sign up for a free VitalSource® Bookshelf account online, enter the special code received from BJU Press, and receive the eTextbook in your virtual bookshelf.
- **Anywhere, anytime access**—Get three-way access—desktop, online, and mobile—to your eTextbook for 16 months. Free apps that allow offline viewing are available for PC, Mac®, iOS (iPad®, etc.), and Android™ devices.
- **Study features**—Highlight text, define text (iOS only), write notes, and search content and notes.
- **Note-sharing**—Share notes or subscribe to friends' or teachers' notes. Notes are synchronized across all devices.
- **Page fidelity**—Pagination in both hard-copy textbooks and eTextbooks is the same, enabling all students to be on the same page no matter which version they use in the classroom.



For a current list of available subjects, visit mybjupress.com

Teacher Tools Online

Teacher Tools Online was created by BJU Press to give educators like you more of the digital resources you need when you need them.

What's Included

- Editable PowerPoint presentations
- Course art for use on bulletin boards or with other classroom materials
- Video clips
- PDF files of the Teacher's Editions
- Quizzes, rubrics, and other materials from the *Teacher's Toolkit* CD (where available)
- Editable lesson-plan overviews
- Electronic copies of the Test Answer Keys
- Links to free resources
- Easy online access
- Designed specifically for use with BJU Press materials

ExamView® Assessment Suite comes to Teacher Tools Online

The number one educational testing and assessment software program in the world is now available on BJU Press Teacher Tools Online.

Features

- Easy to use
- Allows teachers to create assessments, quizzes, study guides, and worksheets
- Build comprehensive tests with ExamView Test Generator, administer tests with ExamView Test Player, and analyze results with ExamView Test Manager
- Students can take secure tests and view study guides over the school network
- Teachers can create different versions of tests using 14 different formats of questions
- Teachers can create a database of curriculum-related materials
- The test administrator can analyze student results and generate comprehensive reports in minutes
- Portable into major interactive whiteboards, such as Mimio
- Used with BJU Press Heritage Studies, Math, and Science for Grades 9–12
- Available for Mac and PC

bju press®

To order an exam kit, call your Precept Sales Representative at **800.511.2771.**

To learn more about BJU Press Math,
visit **bjupress.com/scope/math.**

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