



Program Overview

Grades 9–12



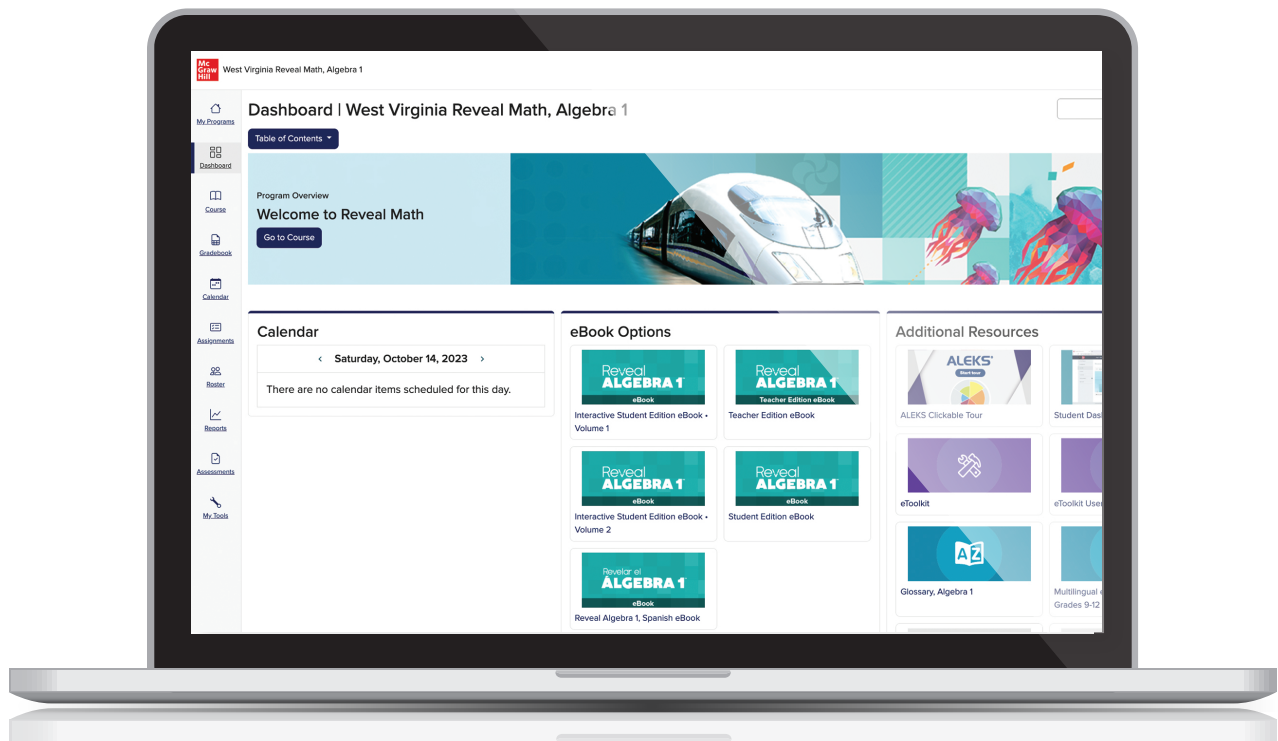
West Virginia Reveal
MATH[®]
Algebra 1 • Geometry • Algebra 2

Welcome to *West Virginia Reveal Math 9–12!*

Reveal *curiosity* with mathematical exploration and discovery that deepens conceptual understanding.

Reveal *understanding* with insightful instructional resources to more effectively differentiate and promote a positive student mindset.

Reveal *possibilities* with purposeful technology that creates an active classroom experience.



Reveal the Full Potential in Every Student

West Virginia Reveal Math helps students develop the positive mindset, confidence, and skills to become problem solvers and mathematical thinkers. The program works by incorporating both inquiry-focused and teacher-guided instructional strategies within each lesson. Informed by the latest research on how they learn best, *West Virginia Reveal Math* ensures students don't just meet the standards—they master them!

Our Powerful Program:



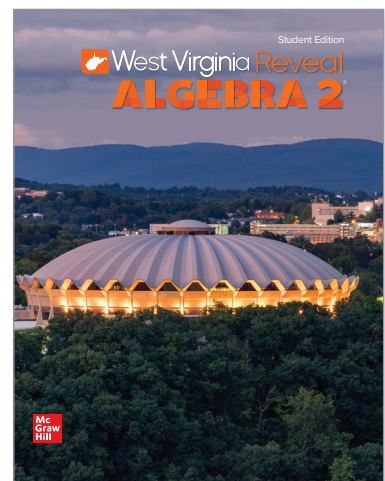
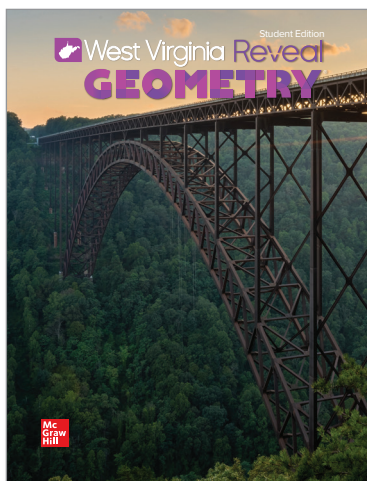
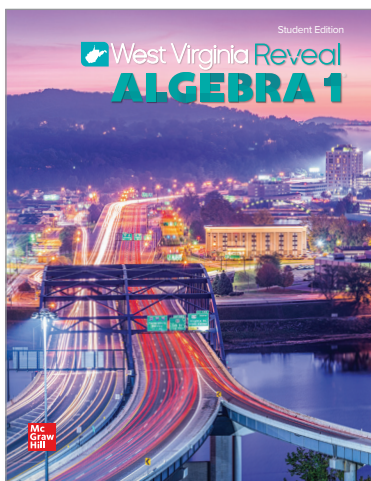
Champions a positive classroom centered on curiosity, connection, and a mathematical mindset.



Offers a flexible lesson design that provides access to rigorous instruction with robust teacher supports and scaffolds.



Tailors instruction for each student through data-driven insights and purposeful, personalized differentiation.



West Virginia Standards Content Alignment

With West Virginia Mathematics Standards as the center of development, *West Virginia Reveal Math* is designed to offer high-quality instructional materials needed for student success in math class and beyond.

1. Lesson Goal and Contents

The focused goal of the lesson and the segments within is outlined. Note the icons recommending class, pair, and individual student activities.

2. Differentiated Resources

At-a-glance resources for lesson differentiation make planning easy.

3. Pacing

Lesson pacing for each activity is represented for 45 or 90 minute periods.

4. West Virginia CCR Mathematics Standards

Each Lesson Opener specifies the Domain, Content Standard(s), and Mathematical Habits of Mind.

5. Balanced Structure

The tasks, problems, and exercises reflect a balance of the three pillars of rigor: Conceptual Understanding, Procedural Skill & Fluency, and Application.

6. Mathematical Background

Each lesson includes a point-of-use explanation of the mathematical context for teachers.

Lesson 5-5
Linear Regression
3

1

LESSON GOAL

Students use best-fit lines and correlation coefficients to determine how well linear functions fit sets of data.

1 LAUNCH

Launch the lesson with a **Warm Up** and an introduction.

2 EXPLORE AND DEVELOP

Develop:

- Linear Regression and Best-Fit Lines
 - Find a Best-Fit Line
 - Use a Best-Fit Line
- Residuals**
 - Graph and Analyze a Residual Plot

You may want your students to complete the **Checks** online.

3 REFLECT AND PRACTICE

Exit Ticket

Practice

2

DIFFERENTIATE

View reports of student progress on the **Checks** after each example.

Resources

Remediation: Draw Lines of Best Fit	●	●	●	●
Extension: Quadratic Regression	●	●	●	●

Language Development Handbook

Assign page 31 of the *Language Development Handbook* to help your students build mathematical language related to best-fit lines and correlation coefficients.

ELL You can use the tips and suggestions on page T31 of the handbook to support students who are building English proficiency.

5

Suggested Pacing

90 min	0.5 day
45 min	1 day

Focus

Domain: Statistics & Probability
West Virginia's College- and Career-Readiness Standards for Mathematics:

- M.A1HS.35** Represent data on two quantitative variables on a scatter plot, and describe how the variables are related.

Also addresses *M.A1HS.35a*, *M.A1HS.35b*, *M.A1HS.35c*, and *M.A1HS.36*.

Mathematical Habits of Mind:

- Make sense of problems and persevere in solving them.
- Use appropriate tools strategically.
- Attend to precision.

Coherence

Vertical Alignment

Previous
Students determined whether a situation illustrates correlation or causation.
M.A1HS.37

Now
Students use best-fit lines and correlation coefficients to determine how well linear functions fit sets of data.
M.A1HS.35, **M.A1HS.35a**, **M.A1HS.35b**, **M.A1HS.35c**, **M.A1HS.36**

Next
Students explore functions, including linear, quadratic, and exponential models.
M.A1HS.3 (para 2)

Rigor

The Three Pillars of Rigor

1 CONCEPTUAL UNDERSTANDING	2 FLUENCY	3 APPLICATION
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Conceptual Bridge In this lesson, students bring together all that they have learned about linear associations, correlations, and causation to find and interpret correlation coefficients. They build fluency in using technology to fit functions to data, and they apply their understanding by solving real-world problems.

Mathematical Background

An equation for a best-fit line can be written for any set of data, but it is only useful if the data exhibits a linear trend. A graphing calculator can be used to write an equation for the best-fit line and find the correlation coefficient. The closer the correlation coefficient is to 1 or -1, the more closely the equation models the data.

Focus
4

Domain: Statistics & Probability
West Virginia's College- and Career-Readiness Standards for Mathematics:

- M.A1HS.35** Represent data on two quantitative variables on a scatter plot, and describe how the variables are related.

Also addresses *M.A1HS.35a*, *M.A1HS.35b*, *M.A1HS.35c*, and *M.A1HS.36*.

Mathematical Habits of Mind:

- Make sense of problems and persevere in solving them.
- Use appropriate tools strategically.
- Attend to precision.

Progression Alignment

The scope and sequence within *West Virginia Reveal Math* feature the logical learning progression of mathematical content across all grades and within each grade, from kindergarten to high school. Vertical and horizontal progressions help strengthen each students' learning.

Module 5
Creating Linear Equations

Module Goals

- Students create linear equations in slope intercept, point slope, and standard forms.
- Students use scatter plots to make and evaluate predictions, and use best fit lines and correlation coefficients to determine how well linear functions fit sets of data.
- Students determine whether a situation illustrates correlation or causation.
- Students find inverses of functions.

Coherence

Vertical Alignment

Previous
Students understand the connections between proportional relationships, lines, and linear equations.
M.8.7

Now
Students create linear equations and analyze data to make predictions.
M.AHS.5, M.AHS.8, M.AHS.9, M.AHS.25, M.AHS.26, M.AHS.30, M.AHS.31, M.AHS.35a, M.AHS.35b, M.AHS.35c, and M.AHS.36

Next
Students will use their knowledge of linear equations to build linear functions to model linear relationships.
M.AHS.26 (Algebra 1, Algebra 2)

FOCUS
Domains: Algebra, Functions, Statistics and Probability
West Virginia's College- and Career-Readiness Standards for Mathematics

- M.AHS.8** Create equations in two or more variables, representing linear and exponential relationships, in slope-intercept form, point-slope form, and standard form, and solve systems of equations and inequalities, and interpret solutions as viable or non-viable options in a modeling context.
- M.AHS.25** Write a function defined by a linear equation, exponential, or quadratic expression in different but equivalent forms to reveal and explain different properties of the function.
- M.AHS.36** Interpret the rate of change and the constant term of a linear model in the context of the data. Use technology to compute and interpret the correlation coefficient of a linear fit. Also address **M.AHS.5, M.AHS.20, M.AHS.25, M.AHS.30c, M.AHS.35b, M.AHS.35c, and M.AHS.36**.

Mathematical Habits of Mind:
All Mathematical Habits of Mind will be addressed in this module.

Suggested Pacing

Lesson	Standards	45-min classes	90-min classes
Module Present and Launch the Module Video			
5.1 Writing Equations in Slope-Intercept Form	M.AHS.5, M.AHS.8, M.AHS.9, M.AHS.25, M.AHS.30	1	0.5
5.2 Writing Equations in Standard and Point-Slope Forms	M.AHS.5, M.AHS.8, M.AHS.25	2	1
Extend 5.2 Slope Criteria and Parallel and Perpendicular Lines	M.AHS.30	1	0.5
5.3 Scatter Plots and Lines of Fit	M.AHS.5, M.AHS.25, M.AHS.35a, M.AHS.35b, M.AHS.35c	2	1
5.4 Correlation and Causation	M.AHS.37	1	0.5
5.5 Linear Regression	M.AHS.30, M.AHS.35a, M.AHS.35b, M.AHS.35c, M.AHS.36	2	1
5.6 Inverses of Linear Functions	M.AHS.8	2	1
Module Review		1	0.5
Module Assessment		1	0.5
Total Days		16	7

Module 5 - Creating Linear Equations 285a

Coherence

Vertical Alignment

Previous

Students understood the connections between proportional relationships, lines, and linear equations.

M.8.7

Now

Students create linear equations and analyze data to make predictions.

M.AHS.5, M.AHS.8, M.AHS.9, M.AHS.25, M.AHS.26, M.AHS.30, M.AHS.35, M.AHS.35a, M.AHS.35b, M.AHS.35c, and M.AHS.36

Next

Students will use their knowledge of linear equations to build linear functions to model linear relationships.

M.AHS.26 (Algebra 1, Algebra 2)

Module-Level Learning Progression helps

teachers understand previously learned concepts and skills, the focus of the upcoming module, and follow-on concepts and skills.

Coherence

Vertical Alignment

Previous

Students determined whether a situation illustrates correlation or causation.

M.AHS.37

Now

Students use best-fit lines and correlation coefficients to determine how well linear functions fit sets of data.

M.AHS.35, M.AHS.35a, M.AHS.35b, M.AHS.35c, M.AHS.36

Next

Students will fit functions to data, including linear, quadratic, and exponential models.

M.AHS.35a (Algebra 1, Algebra 2)

Lesson-Level Learning Progression

guidance provides a more granular analysis of the learning progression from lesson to lesson within the module.

Lesson 5-5
Linear Regression

LESSON GOAL
Students use best fit lines and correlation coefficients to determine how well linear functions fit sets of data.

1 LAUNCH
Launch the lesson with a Warm Up and an Introduction.

2 EXPLORE AND DEVELOP
Develop:
Linear Regression and Best-Fit Lines
• Find a Best-Fit Line
• Use a Best-Fit Line
Residuals:
• Graph and Analyze a Residual Plot
• You may want your students to complete the **Checks** after each example.

3 REFLECT AND PRACTICE
Exit Ticket
Practice

DIFFERENTIATE
View reports of student progress on the **Checks** after each example.
Resources:
Renascence: Draw Lines of Best Fit
Extension: Quadratic Regression

Language Development Handbook
Assign page #1 of the Language Development Handbook to help your students build mathematical language related to best fit lines and correlation coefficients.
ELL You can use the tips and suggestions on page 131 of the handbook to support students who are building English proficiency.

Suggested Pacing
30 min
45 min
0.5 day
1 day

FOCUS
Domains: Statistics & Probability
West Virginia's College- and Career-Readiness Standards for Mathematics

- M.AHS.35** Represent data on two quantitative variables on a scatter plot, and describe how the variables are related. Also address **M.AHS.30c, M.AHS.35a, M.AHS.35b, M.AHS.35c, and M.AHS.36**.

Mathematical Habits of Mind:
1 Make sense of problems and persevere in solving them.
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Previous
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Now
Students use best fit lines and correlation coefficients to determine how well linear functions fit sets of data.
M.AHS.35, M.AHS.35a, M.AHS.35b, M.AHS.35c, M.AHS.36

Next
Students will fit functions to data, including linear, quadratic, and exponential models.
M.AHS.35a (Algebra 1, Algebra 2)

Rigor

The Three Pillars of Rigor
1 CONCEPTUAL UNDERSTANDING | **2 FLUENCY** | **3 APPLICATION**

Conceptual Bridge In this lesson, students bring together all that they have learned about linear associations, correlations, and causation to find and interpret correlation coefficients. They build fluency in using technology to fit functions to data, and they apply their understanding by solving real-world problems.

Mathematical Background
An equation for a best-fit line can be written for any set of data, but it is only useful if the data exhibits a linear trend. A graphing calculator can be used to write an equation for the best-fit line and find the correlation coefficient. The closer the correlation coefficient is to 1 or -1, the more closely the equation models the data.

Lesson 5-5 - Linear Regression 399a

Explore, Develop, and Apply Understanding

West Virginia Reveal Math was designed to provide teachers with high-quality, rigorous instructional materials that help students achieve academic success in mathematics. As a balanced curriculum that supports both student-directed and guided learning *West Virginia Reveal Math* includes research-based strategies to support instruction and learning.


Exploration

The *West Virginia Reveal Math* instructional model begins with the **Explore**, an activity where students engage in an exploration of concepts and skills.

Writing Equations by Modeling a Real-World Situation

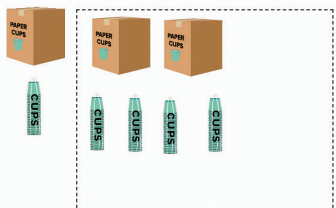
INQUIRY What steps can you use to write equations to represent a real-world situation?

During inventory at the restaurant where Garrett works, he counted the paper products. The small paper cups come in sleeves inside of a cardboard case. Garrett counted 6 cases and 12 sleeves outside of a case. He recorded a total of 162 sleeves of cups.



Exercise 1

Drag the items to the bin to represent the situation and then complete the exercises.



Summary of the Activity

Students will complete guiding exercises throughout the Explore activity. They will use a drag and drop activity to help organize the presented information before considering algebraic representations. The guiding exercises will lead students to write an algebraic equation involving the given information. Then, students will answer the Inquiry Question.

(continued on the next page)

Understanding and Fluency

The **Examples** found in every lesson focus on building students' understanding, procedural reliability, and procedural fluency.

- Practice exercises help students build and solidify procedural fluency and procedural reliability.

Example 2 • Write an Equation

The first step in using algebra to solve a real-world problem is to take the facts from the context of the situation and represent them with symbols.

Write an Equation

LIFE ONLINE OF 799 teens surveyed about what they do online, some use a social network. Of those on a social network, 429 say people their age are "mostly kind" online and the remaining 193 do not. Write an equation to find the number of teens surveyed who are not on a social network.

Social Teens Mostly Kind Online

Name _____ Period _____ Date _____

35. **SCIENCE** Newton's second law of motion is $F = ma$, where F is the force acting on an object, m is the mass of the object and a is the acceleration of the object.

36. **SCIENCE** The formula $d = rt$ relates the distance traveled d , the rate of travel r , and the time spent traveling t .

Mixed Exercises

For Exercises 37–40, match each sentence with an equation.

A. $g^2 = 2(g - 10)$ B. $\frac{1}{3}g + 32 = 15 + 6g$ C. $g^3 = 24g + 4$ D. $3g^2 = 30 + 9g$

37. One half of g plus thirty-two is as much as the sum of fifteen and six times g .

38. A number g to the third power is the same as the product of 24 and g plus 4.

39. The square of g is the same as two times the difference of g and 10.

40. The product of 3 and the square of g equals the sum of thirty and the product of nine and g .

Translate each sentence into an equation.

41. The difference of the square of y and twelve is the same as the product of five and x .

42. The difference of f and five times g is the same as 25 minus f .

43. Three times b less than 100 is equal to the product of 6 and b .

44. Four times the sum of 14 and c is a squared.

Translate each equation into a sentence.

45. $4n = x(5 - n)$ 46. $2b - 10 = 4$ 47. $y + 3x^2 = 5x$

Translate each sentence into a formula.

48. The area A of a circle is pi times the radius r squared.

49. The volume V of a rectangular prism equals the product of the length l , the width w , and the height h .

50. **REASONING** The area of a kitchen is 182 square feet. This is 20% of the area of the first floor of the house. Let F represent the area of the first floor. Write an equation to represent the situation.

51. **REASONING** Katie is twice as old as her sister Mara. The sum of their ages is 24. Write a one-variable equation to represent the situation.

52. **GEOMETRY** The formula $F + V = E + 2$ shows the relationship between the number of faces F , edges E , and vertices V of a polyhedron, such as a pyramid. Write the formula in words.

Lesson 2-1 • Writing and Interpreting Equations 73

53. **STRUCTURE** A recycling company charges business owners \$10 for each cubic yard of waste removed from their facility plus a 10% fuel charge based on the total monthly bill. Let w represent the number of cubic yards of waste removed during the month. Write an equation to describe the total cost c of the recycling service per month.

54. **WRITE** Determine whether the two sentences describe the same equation. Explain.
The product of x and y plus z equals w .
The product of x and the sum of y and z equals w .

55. **ANALYZE** Determine whether the equation is an accurate translation of the sentence. Explain.
a. The square of the product of the number and 6, (4)
b. Three more than one-third of n plus 3 is $n - 2$

56. **PERSEVERE** Translate the area A represent the area. List

57. **CREATE** Write a scenario

58. **CREATE** Write a problem equation $x + 8 = 30$.

59. **ANALYZE** The surface area of the faces. If ℓ represent the surface area of the cu

60. **ANALYZE** Given the perim find the length ℓ .

61. **WRITE** How can you tran Explain.

74. **Module 2 • Equations in One**

NAME _____ DATE _____ PERIOD _____ SCORE _____

Performance Task At Arm's Length

In this task, you will attempt to determine if there is a relationship between arm length and height.

Arm Length (in.)	Height (in.)

Collect data from 10 people. Measure each person's height and arm length, which is the length from shoulder to fingertip. Round to the nearest inch. Record the data in the table.

Part A
Use a graphing calculator to create a scatter plot of the data. Does there appear to be a correlation between arm length and height? Can you describe the relationship as causation?

Part B
Determine the line of fit for the scatter plot. Using two points, find the slope of the line of fit, and write an equation for your estimated line in slope-intercept form.

Part C
Using linear regression, write the equation for the best-fit line, and find the correlation coefficient. Round all values to the nearest hundredth.
What does the correlation coefficient tell you about the fit of this function to the data?

Application

Students encounter real-world problems throughout each lesson. From the **Launch the Lesson** scenario to **Examples** and **Apply** problems, concluding with practice exercises that include application-based question types.

The **Performance Task** found in the Digital Teacher Center offers another opportunity for students to solve non-routine application problems.

Developing Mathematical Thinking

Every lesson within *West Virginia Reveal Math* features embedded prompts for teachers to naturally orchestrate a focus on the Mathematical Habits of Mind, and for students to practice as they are learning. Students learn to examine how they're becoming more proficient in mathematics as they develop these critical thinking habits and problem-solving skills.

Practical Lesson Integration

Lessons include embedded prompts and recommendations for teachers to help students become comfortable with practicing these behaviors.

1 CONCEPTUAL UNDERSTANDING | 2 FLUENCY | 3 APPLICATION

Learn Correlation and Causation

Objective
Students determine whether a data set or situation illustrates correlation or causation by analyzing the data or situation.

Teaching the Mathematical Habits of Mind

6 Communicate Precisely Encourage students to routinely write or explain their solution methods. Point out that they should use clear definitions when they discuss their solutions with others.

Important to Know
When a correlation exists between two variables, there may be a factor that is influencing both of the variables. It is important to know that this does not mean that causation exists between the two variables. For example, the number of ice cream cones sold by a vendor at the beach on a given day and the number of ocean rescues on that day may exhibit a positive correlation due to the fact that both of these variables likely increase or decrease in tandem. However, neither variable causes the other. The fact that both of these variables may be affected by the temperature at the beach (which, in turn, affects the number of people at the beach) does not mean that the data exhibit causation.

Example 1 Correlation and Causation by Graphing

Teaching the Mathematical Habits of Mind

4 Apply Mathematics In this example, students apply what they have learned about correlation and causation to solving a real-world problem.

Questions for Mathematical Discourse

A1 What type of correlation does the data exhibit? **positive correlation**
What does this tell you about the data? **Sample answer:** As the amount of mozzarella consumed increases, so does the number of civil engineering doctorates awarded.

B1 Does the positive correlation mean that the amount of mozzarella cheese consumed affects the number of doctorates awarded? **Explain your reasoning.** **Sample answer:** No; eating mozzarella cheese does not give you a degree. This is a correlation, not a causation.

B2 What factors might have an effect on the number of doctorates awarded? **Sample answers:** the job market, financial aid for graduate school, engineering companies paying for their workers to continue their education

Go Online

- Find additional teaching notes.
- View performance reports of the Checks.
- Assign or present an Extra Example.

Lesson 5-4 • Correlation

2 EXPLORE AND DEVELOP

CONCEPTUAL UNDERSTANDING | 2 FLUENCY | 3 APPLICATION

Example 2 Causation and Correlation by Situation

Teaching the Mathematical Habits of Mind

6 Communicate Precisely Encourage students to routinely write or explain their solution methods. Point out that they should use clear definitions when they discuss their solutions with others.

Questions for Mathematical Discourse

A1 What is the dependent factor? **risk of developing heart disease**

B1 What is the independent factor? **average weekly time spent exercising**

B2 Can the university state that this is the only cause for developing heart disease? **Why? No; sample answer: There are many other factors that contribute to heart disease. This study shows only a causation between lack of exercise and heart disease.**

students hold up their whiteboards so that you can see all student responses. Tap to reveal the answer when most or all students have completed the Exit Ticket.

Interactive Presentation

274 **Module 5 • Creating Linear Equations**

Example 2

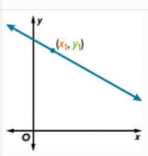
TYPE
Students answer a question to show they understand how the survey could be changed to show causation.

CHECK
Students complete the Check online to determine whether they are ready to move on.

Building Mathematical Habits

The thinking habits embodied by the Mathematical Habits of Mind Standards are integral elements in each lesson that focus on four critical areas: problem-solving, modeling, mathematical language, and discourse. Here are a few features to review in the Student Edition:

Key Concept: Point-Slope Form

Words	The linear equation $y - y_1 = m(x - x_1)$ is written in point-slope form, where (x_1, y_1) is a given point on a nonvertical line and m is the slope of the line.
Symbols	$y - y_1 = m(x - x_1)$
Example	

Talk About It!

Why must a line be nonvertical in order to be written in point-slope form? Explain.

Clear Show Sample Answer Done

Explore

Talk About It!

Describe an experiment that could be conducted to show causation between the number of civil engineers who were awarded a doctoral degree and another factor.

Talk About It!

Think About It!

How can you ensure that your data predictions that are outside the range of data are as accurate as possible?

Think About It!

Think About It!

Use a calculator to find the correlation coefficient of the best-fit line. Does the correlation coefficient also suggest a good-fit? Justify your argument.

15. CREATE For a class project, the scores that 10 randomly selected students earned on the first 8 tests of the school year are given. Explain how to find a line of best fit. Could it be used to predict the scores of the other students? Explain your reasoning.

Higher Order Thinking

Mathematical Language Routines

West Virginia Revealed Math was developed around the belief that mathematics is not a series of operations, but is a way of thinking and communication. For students to be successful, they must learn and become comfortable with the language of mathematics.

West Virginia Revealed Math has embedded **Math Language Routines** for each lesson in the **Language Development Handbook, Teacher Edition** to be used during **Explore and Develop**. These routines, developed by a team of authors at Center for Assessment, Learning, and Equity at Stanford University, are based on principles for the design of mathematics curricula that promote both content and language. The eight routines are:

MLR1

Stronger and Clearer Each Time

MLR2

Collect and Display

MLR3

Critique, Correct, and Clarify

MLR4

Information Gap

MLR5

Co-Craft Questions and Problems

MLR6

Three Reads

MLR7

Compare and Connect

MLR8

Discussion Supports



Three Reads

Ensure comprehension of the species discovery problem.

1st Read: Make sure students understand that they need to write and simplify an expression representing the total number of species discovered. Ensure comprehension of the meaning of *species*.

2nd Read: Focus students' attention on the meaning of span and *discovered*.

3rd Read: Brainstorm ways to write and simplify an expression that represents the total number of species discovered.



Discussion Supports

As students engage in discussing the answers to the question, restate statements they make as a question to seek clarification and to confirm comprehension, providing validation or correction when necessary. Encourage students to challenge each other's ideas when warranted, as well as to elaborate on their ideas and give examples.

Build Math Language Together

Strategies to build students' proficiency with language are built within each course.

Academic Language

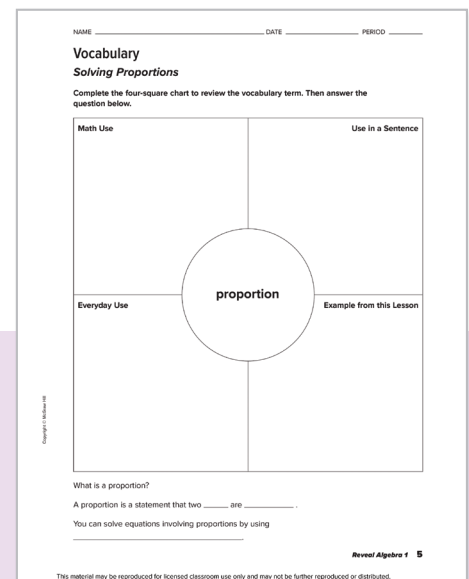
Focusing on the development of academic vocabulary, the **Language Development Support** opens each lesson and includes a suggested strategy to build students' proficiency with language.

Language of Math

What Vocabulary Will You Learn? Teacher Notes found in the Digital Teacher Center promotes the development of key vocabulary terms that support how students talk about and think about math in the context of the lesson content.

English Learner Scaffolds

English Learner Scaffolds found in the **Language Development Handbook, Teacher Edition** for each lesson are based on combined WIDA proficiency levels and provide teachers with scaffolded instruction to help students understand math vocabulary, ideas, and concepts in context.



Language Development Handbook

Found online embedded in each lesson is the **Language Development Handbook** which includes support for each lesson, including graphic organizers, word cards, three-column charts, and more to build students' math vocabulary and improve note-taking skills.

Effective Teaching Practices

The National Council of Teachers of Mathematics (NCTM) presented and described research-based teaching practices in *Principles to Action: Ensuring Mathematical Success for All*. The instructional design of *West Virginia Reveal Math* integrates the eight **Effective Mathematics Teaching Practices** (ETPs) and establishes mathematical goals to focus learning.

Plan to Facilitate Productive Learning

Embedded at the point-of-use within the *West Virginia Reveal Math* Teacher Edition, NCTM's **Effective Teaching Practices** and research-based routines help guide instruction.

These eight practices include:

- **ESTABLISH** mathematical goals to focus learning.
- **IMPLEMENT** tasks that promote reasoning and problem-solving.
- **USE AND CONNECT** mathematical representations.
- **FACILITATE** meaningful mathematical discourse.
- **POSE** purposeful questions.
- **BUILD** procedural fluency from conceptual understanding.
- **SUPPORT** productive struggle in learning mathematics.
- **ELICIT AND USE** evidence of student thinking.

Learn Linear Regression and Best-Fit Lines

Objective

Students compute and use best-fit lines and correlation coefficients for sets of data by using technology to perform linear regressions.

Teaching the Mathematical Habits of Mind

7 Use Structure Help students to explore the structure of linear regression and best-fit lines in this Learn.

What Students Are Learning

Students have already explored lines of fit. In this lesson, students learn that there is a line of best fit that can be determined using a calculator. Students use a calculator to find the line of best fit, and to identify the correlation coefficient associated with the data.

Common Misconception

A common misconception some students have is believing that the smaller the correlation coefficient, the weaker the correlation. This is not true. Explain that the closer the correlation coefficient is to 0, the weaker the correlation; the closer it is to -1 or 1 , the stronger the correlation.

Example 1 Find a Best-Fit Line

Teaching the Mathematical Habits of Mind

5 Use a Source Guide students to find external information to answer the question posed in the Use a Source feature.

Questions for Mathematical Discourse

- A1** What patterns do you notice in the table? **Sample answer:** In general, as the year increases the number of hits decreases.
- O1** How would the equation change if the values used for List 1 were the years? **Sample answer:** The slope would be the same but the y-intercept would be different.
- E1** What is the correlation coefficient? What does it mean? **−0.8022**; **sample answer:** It means the equation models the data well. The closer this number is to 1 or to -1 , the better the equation represents the data.

Common Error

Student may forget to clear L1 and L2 on their calculators before entering a new set of data. This error will produce an incorrect result. Help students to avoid making this error by making the first step in the procedure “Clear L1 and L2.”

Go Online

- Find additional teaching notes.
- View performance reports of the Checks.
- Assign or present an Extra Example.

Teaching the Mathematical Habits of Mind

7 Use Structure Help students to explore the structure of linear regression and best-fit lines in this Learn.


Linear Regression

Learn: Linear Regression and Best-Fit Lines

A calculator can find the line that most closely approximates data in a scatter plot, called the **best-fit line**. Linear regression is one algorithm used to find a precise line of fit for a set of data.


Calculators may also compute a number r called the **correlation coefficient**. This measure shows how well data are modeled by a linear equation. It will tell you if a correlation is positive or negative and how closely the equation is modeling the data. The closer the correlation coefficient is to 1 or -1 , the more closely the equation models the data.

Weak Correlation




$r = 0.02$

Moderate Correlation



$r = 0.72$

Strong Correlation



$r = -0.87$

Example 1 Find a Best-Fit Line

Scenario: The table shows Justin Williams's total hits during each season of his major league career. Use a graphing calculator to write an equation for the best-fit line for the data. Then find and interpret the correlation coefficient.

Year	1947	1948	1949	1950	1951	1952	1953	1954	1955	1956
Total Hits	175	179	201	203	143	185	157	159	120	81

Step 1 Enter the data.
Before you begin, make sure that your Diagnostic setting is on. You can find this under the CATALOG menu. Press **D** and then scroll down and click **DiagnosticOn**. Then press **2ND**.

(continued on the next page)

Today's Goals

- Write equations of best-fit lines using linear regression.
- Determine how well functions fit sets of data.

Today's Vocabulary

best-fit line
linear regression
correlation coefficient
residual

Think About It!
Write the following correlation coefficients in order from weakest to strongest.
0.95, 0.2, 1, -0.78 , 0.54, -0.96 , -0.9 , -0.66 , 0.1, 0.54, -0.78 , 0.85, -0.9 .

Correlation Coefficient
The table shows a set of data used for determining how well the equation models the data based on the correlation coefficient.

Correlation Strength of Coefficient (Correlation)

$ r \geq 0.8$	Strong
$0.5 \leq r < 0.8$	Moderate
$ r < 0.5$	Weak

Go Online to see how to use a graphing calculator with this scenario.


Lesson 8-9 • Linear Regression 319

Interactive Presentation

Linear Regression and Best-Fit Lines


Write the equation of the best-fit line for the data from the scatter plot. Then write the equation of the best-fit line for the data from the scatter plot. Use a graphing calculator to write an equation for the best-fit line for the data. Then find and interpret the correlation coefficient.

Weak Correlation




$r = 0.02$

Moderate Correlation



$r = 0.72$

Strong Correlation



$r = -0.87$

Learn

DRAG & DROP

Students drag and drop the correlation coefficients in order from weakest to strongest.

Each lesson includes at least one of the eight teaching practices.

Go Online

- Find additional teaching notes.
- View performance reports of the Checks.
- Assign or present an Extra Example.

As indicated by the **Go Online!** icon, find additional teaching support for Teaching the Mathematical Practices in the Teacher Digital Center.

Purposeful Practice

West Virginia Reveal Math offers frequent and robust practice opportunities for students to develop and understand procedural fluency with grade-level concepts and skills.

Practice options designed to focus and challenge learners

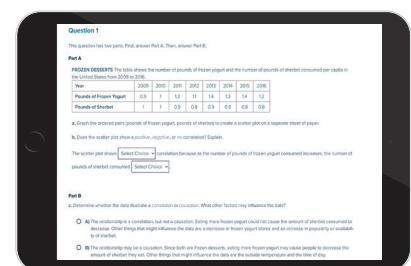
West Virginia Reveal Math includes flexible practice options—including printable, editable, and fully customizable exercise sets. Each course includes thousands of items with a variety of support and assignment options.

Type	Purpose	Print	Digital*
Practice	Lesson Practice with exercises that target different depths of knowledge	X	X
Extra Practice	Additional practice exercises for each lesson with dynamic question functionality		X
Spiral Review	Distributed practice of previously learned grade-level concepts and skills to prepare for end-of-year assessments. Includes dynamic question functionality		X
Module Review	Practice at the end of the module is focused on fluency and preparation for module assessment	X	X
Dynamic Module Practice	Practice sets focused on module-level content, using dynamic questions that change value based on the number of attempts to improve proficiency		X
LearnSmart®	Personalized practice option to assign students focused on learning objectives across modules		X
ALEKS™ **	Adaptive practice focused on ready-to-learn topics to fill gaps or accelerate learning		X

*Embedded Learning Aids and Autoscored
**West Virginia Reveal Math and ALEKS.

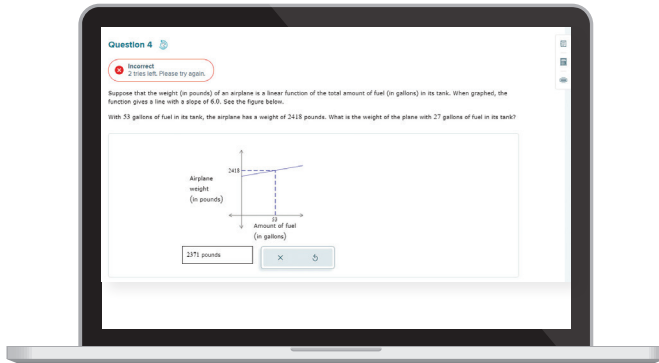
Benefits of Digital Practice

- Multiple Attempts
- Embedded Student Learning Aids
- Tech-Enhanced Question Types
- Question values that change per attempt
- Auto-Scoring



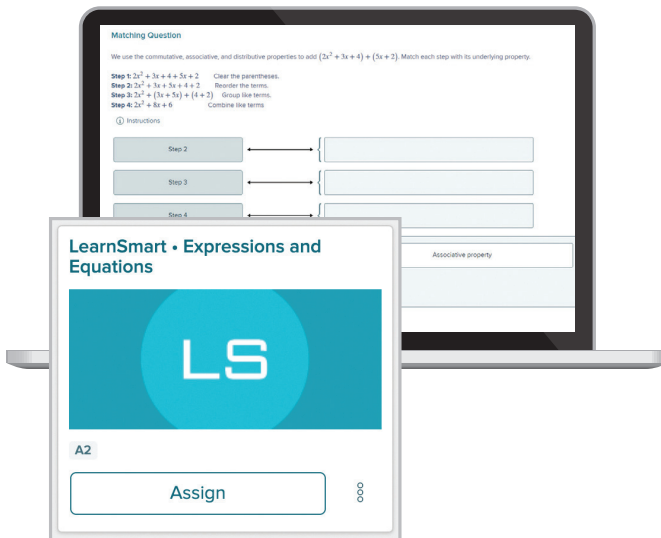
Dynamic Practice

Questions that change value for each student and each attempt are found in Extra Practice, Spiral Review, and Dynamic Module Practice sets.



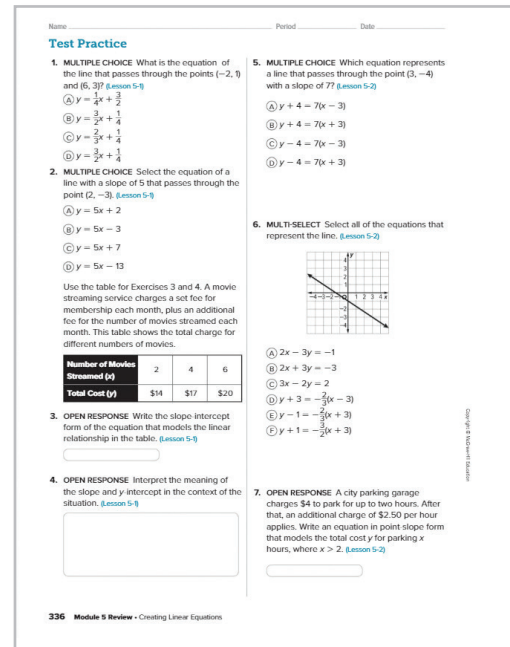
LearnSmart®

After several modules, assign students personalized, adaptive practice focused on learning objectives.



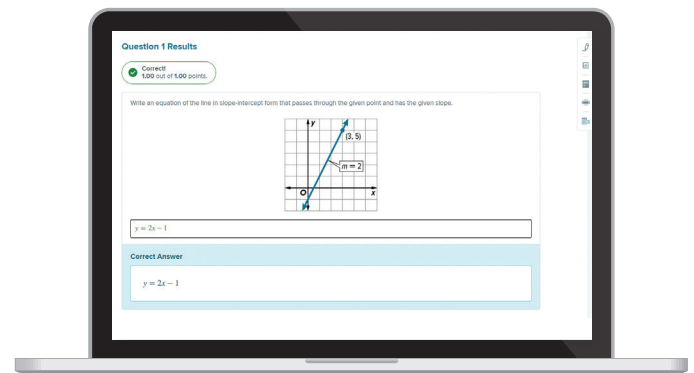
Module Test Practice

Assessment practice concludes the module in the student edition.



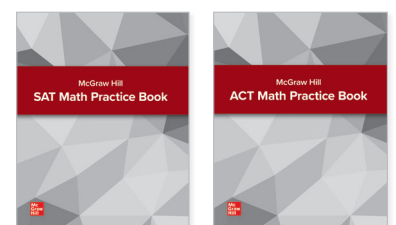
Spiral Review

End-of-lesson practice on concepts presented in prior lessons.



ACT® and SAT® Practice

Each *West Virginia Reveal Math* high school course includes student-directed practice support with a **McGraw Hill ACT Practice Book** or **McGraw Hill SAT Practice Book** option. Question sets are also available for digital administration.



Assessment

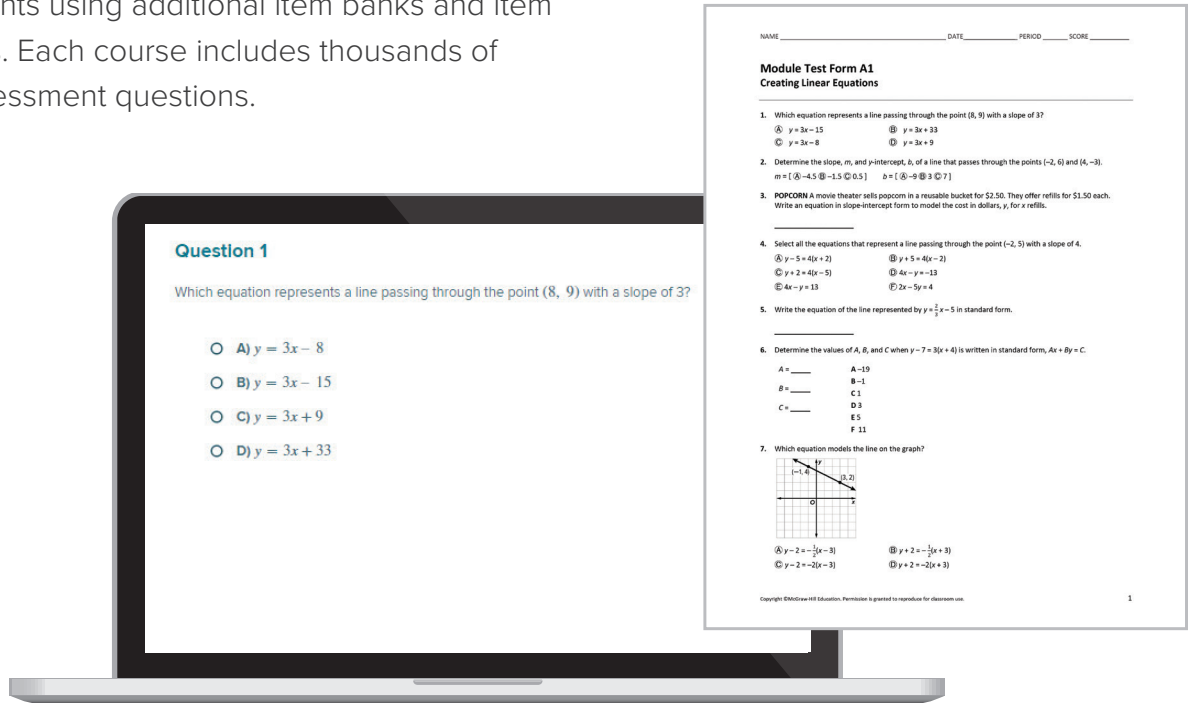
West Virginia Revealed Math offers a comprehensive set of assessments that includes diagnostic, formative, and summative, to allow teachers to effectively evaluate what students know and where they need additional instructional support and practice.


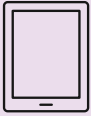
Type	Assessment	When	Description
Diagnostic	Diagnostic and Placement Test	Start of Course	Assists teachers in making course placement decisions for the upcoming course.
	Module Pretest	Start of the Module	Evaluates students' knowledge of prerequisite concepts and skills for the upcoming module.
Formative	Checks	During a Lesson	Assesses students' understanding of the concepts and skills presented in the Learn and Examples.
	Exit Tickets	After a Lesson	Assesses student conceptual understanding with lesson concepts and skills.
	Put It All Together	During a Module	Assesses student understanding of connections between math concepts presented across multiple lessons.
	Cheryl Tobey Formative Assessment Math Probes	During a Module	Identifies common misconceptions.
Summative	Module Assessment: Forms A (3 versions), B, and C	End of Module	Evaluates students' understanding of concepts and skills learned in the module.
	Performance Task	End of Module	Measures student's ability to apply concepts and skills learned in the module.
	End-of-Year Course Assessment	End of Year	Evaluates students' mastery of course concepts and skills during the academic year.

Print and digital formats

All *West Virginia Reveal Math* assessments are available for either print or digital administration. Assessments can be found in the **Digital Teacher Center**.

All digital assessment items, except for open response questions, are auto-scorable. Teachers can customize existing or create new assessments using additional item banks and item authoring tools. Each course includes thousands of dedicated assessment questions.



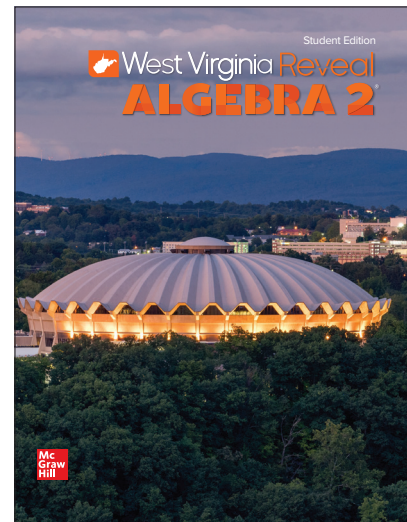
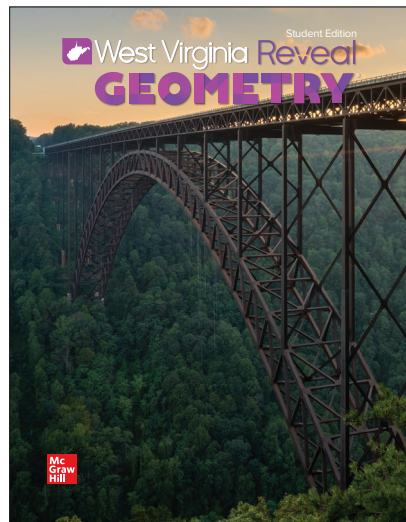
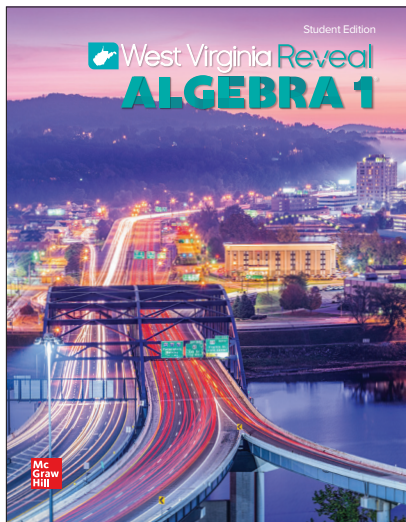
Assessment	In Print or Printable 	Digital 
Course Diagnostic	X	X
Module Pretest	X	X
Checks	X	X
Exit Tickets		X
Put It All Together	X	X
Cheryl Tobey Formative Assessment Math Probes	X	
Module Assessment: Forms A, B, and C	X	X
Performance Task	X	X
End-of-Year Course Assessment	X	X

Student Resources

Print Resources

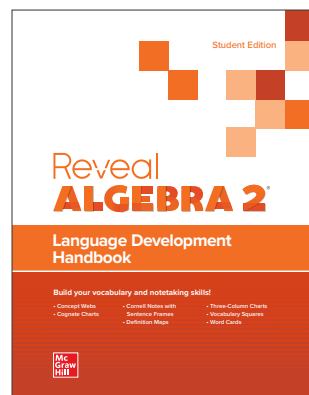
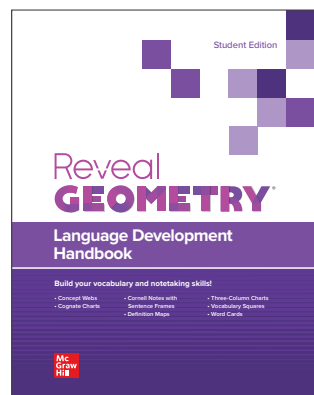
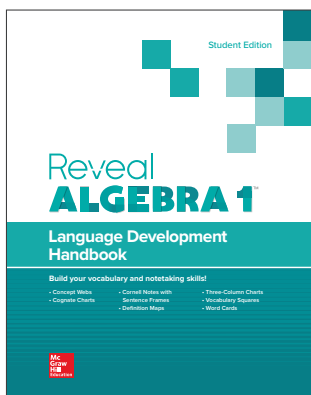
Student Edition

Available in print and interactive formats, the hardbound Student Edition engages students in learning through the use of problem-solving, discourse, reflection, and application.



Language Development Handbook

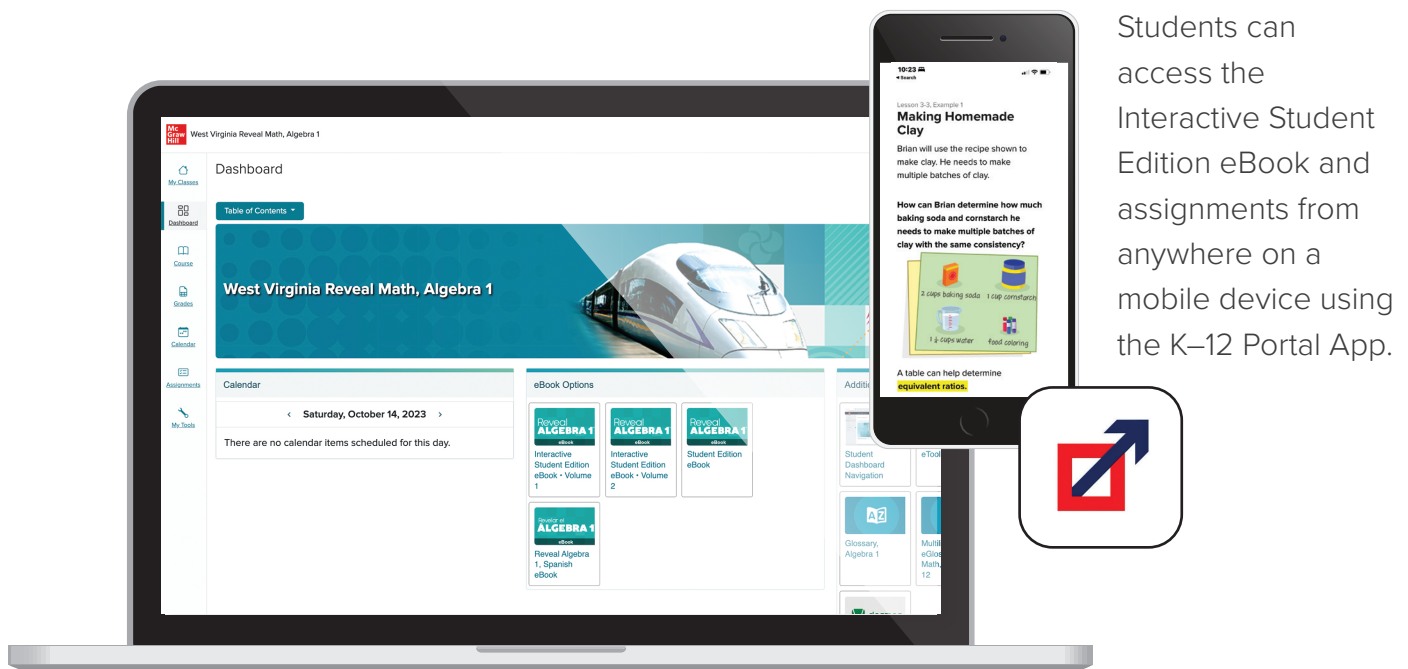
Students utilize graphic organizers and note-taking strategies to build mathematical vocabulary and language development



Digital Student Center Resources

Students have access to a robust set of engaging digital tools and interactive learning aids, including:

- Interactive Student Edition eBook
- Language Development Handbook, Student Edition
- Student Edition eBook
- Dynamic Digital Practice
- Interactive Digital Practice
- Web Sketchpad®
- eToolkit (Virtual Manipulative Suite)
- eGlossary
- Multilingual eGlossary
- Personal Tutor Video Lesson Support
- ALEKS® *



Students can access the Interactive Student Edition eBook and assignments from anywhere on a mobile device using the K–12 Portal App.

Register for Access to Review the Digital Student Center at mheonline.com/westvirginia

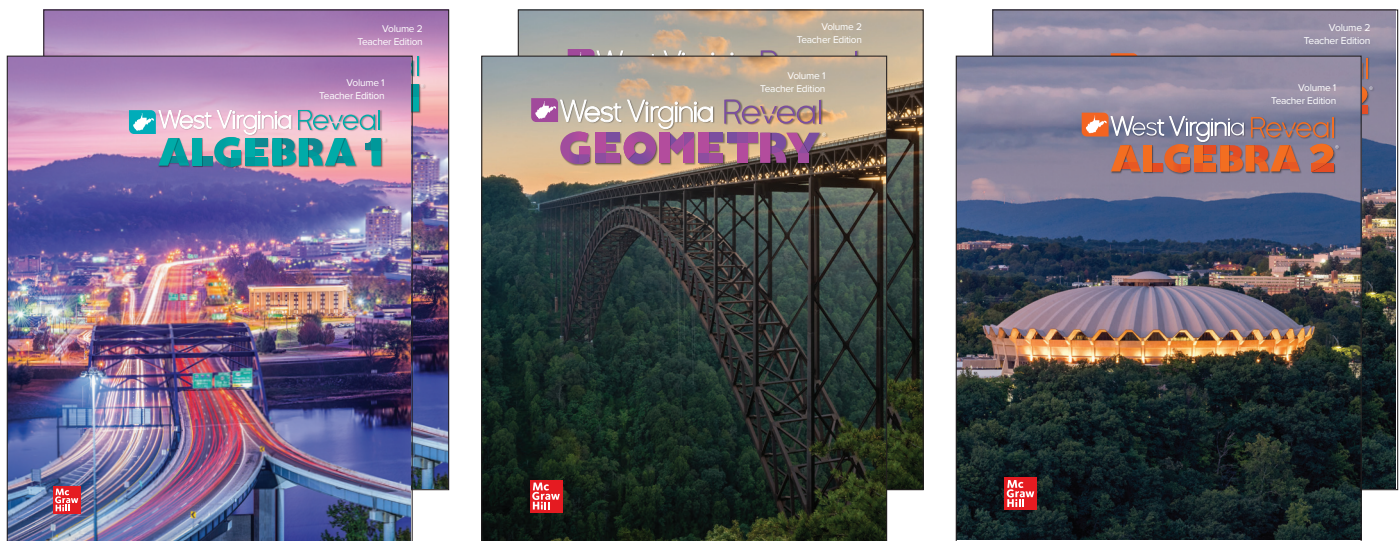
**with West Virginia Reveal Math and ALEKS bundle*

Teacher Resources

Print Resources

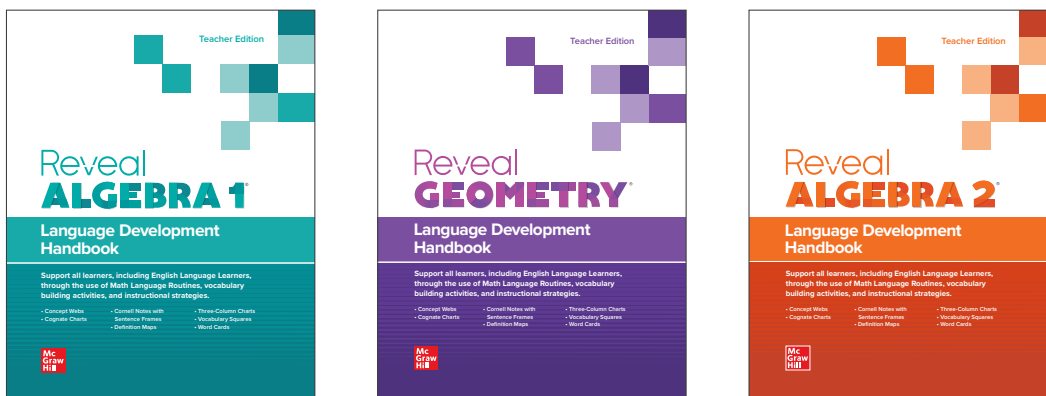
Teacher's Edition, 2-Volume

These spiral-bound Teacher Editions provide the essentials to plan and implement classroom instruction focused on West Virginia College- and Career-Readiness (CCR) for Mathematics Standards. Inside, you will find teacher instructional supports, embedded NCTM's Effective Teaching practices, guidance on going online for additional teaching tips, incorporation of digital resources, and differentiation recommendations.



Language Development Handbook, Teacher Edition

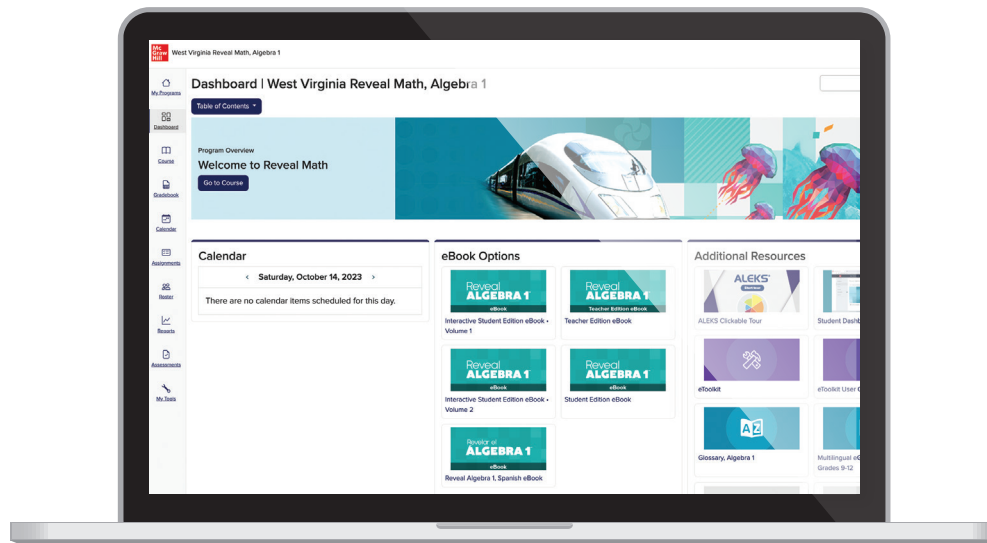
This handbook is designed to provide teachers tips and strategies to support math language support for all students, including English Language Learners, at the right time in every lesson.



Digital Teacher Center Resources

Through the Open Learning Platform, teachers have an easy-to-use portal for planning, teaching, and validation of learning. The teacher experience includes:

- Teacher Edition eBook
- Language Development Handbook, Teacher Edition
- Interactive Lesson Presentations
- Expert Insight Videos
- Auto-Scored, Customizable Online Assessment
- Differentiated Resources
- Dynamic Digital Practice
- Auto-scored, Customizable Interactive Practice
- Spiral Review
- Web Sketchpad® Interactive Lesson Content
- eToolkit (Virtual Manipulative Suite)
- ALEKS® *
- Teacher and Administrator Reporting
- Rich, holistic reporting across multiple online learning interactions



Register for Access to Review the Digital Teacher Center at mheonline.com/westvirginia

**with West Virginia Reveal Math and ALEKS bundle*

West Virginia Reveal
MATH[®]
Algebra 1 • Geometry • Algebra 2

Reveal the Full Potential in Every Student

Learn more at
mheonline.com/westvirginia

