# MS-Math 8

## Huntingdon Area School District

| UNITS (14/14 SELECTED) | SUGGESTED DURATION |
|---|---|
| 🟦 Unit 1: Exponents and Scientific Notation | *6 lessons* |
| 🟩 Unit 2: Real Numbers | *5 lessons* |
| 🟪 Unit 3: Solve Equations with Variables on Each Side | *5 lessons* |
| 🟥 Unit 4: Linear Relationships and Slope | *6 lessons* |
| 🟩 Unit 5: Functions | *6 lessons* |
| 🟪 Unit 6: Systems of Linear Equation | *5 lessons* |
| 🟪 Unit 7: Pythagorean Theorem | *3 lessons* |
| 🟩 Unit 8: Transformations | *4 lessons* |
| 🟦 Unit 9: Congruence and Similarity | *5 lessons* |
| 🟥 Unit 10: Volume | *5 lessons* |
| 🟧 Unit 11: Scatter Plots and Two-Way Tables | *5 lessons* |
| 🟪 Unit 12: Spaced Learning Over Time (SLOT) | *25 lessons* |
| 🟪 Unit 13: Interleaved Practice Format (IPF) | *15 lessons* |
| ⬛ Unit 14: Spring Math | *26 lessons* |

# Unit 1: Exponents and Scientific Notation
**MS-Math 8**

## UNIT OVERVIEW

Develop and use the Law of Exponents to evaluate, simplify, and perform computations with expressions and powers.

## STANDARDS/EXPECTATIONS

**Pennsylvania - Eligible Content - Grade 8 - Mathematics**

M08.B-E.1.1.1     M08.B-E.1.1.3     M08.B-E.1.1.4     M08.B-E.1.1

**Pennsylvania Common Core - Grade 8 - Mathematics**

CC.2.2.8.B.1

## BIG IDEAS

**Big Ideas**

- **Powers and Exponents**
- **Multiply and Divide Monomials**
- **Powers of Monomials**
- **Zero and Negative Exponents**
- **Scientific Notation**
- **Compute with Scientific Notation**

## ESSENTIAL QUESTIONS

**Essential Questions**

- Why are exponents useful when working with very large or very small numbers?

# Unit 1: Exponents and Scientific Notation
**MS-Math 8**

| Knowledge | Skills |
|---|---|
| **Students will know . . . . . (Acquired Knowledge)** | **Students can do . . . . . (Acquired Skill)** |
| Students will know that repeated mulitiplication can be simplified using exponents. | Students can write and evaluate expressions involving powers and exponents. |
| Students will know the product of powers and the quotient of powers exponent laws. | Students can use laws of exponents to multiply and divide monomials. |
| Students will know the power of a power and power of a product exponent laws. | Students can use laws of exponents to find powers of monomials. |
| Students will know the Exponents of zero and negative exponent laws of exponents. | Students can simplify expresions that have zero and negative exponents. |
| Students will know that scientific notation is a way to represent very small and very large numbers. | Students can write numbers in scientific notation. |
| Students will know that laws of exponents can be applied to computing with scientific notation. | Students can compute numbers written in scientifc notation. |

# Unit 1: Exponents and Scientific Notation
**MS-Math 8**

| Name of Assessment | Type (formative, summative, project-based, diagnostic) | Description |
|---|---|---|
| Questioning and observation during instruction. | Formative | Teacher observes student work and uses prompting and questioning strategies to check student understanding. |
| Lesson Practice | Formative | At the conclusion of each lesson, students complete the lesson practice with immediate feedback to check for understanding. |
| Module Test | Summative | At the conclusion of each module, students will complete the module test that includes all topics and concepts. |
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# Unit 2: Real Numbers

**MS-Math 8**

Learn about the real number system by identifying, calculating, and estimating irrational numbers and comparing them to rational numbers

## STANDARDS/EXPECTATIONS

**Pennsylvania Common Core - Grade 8 - Mathematics**

CC.2.1.8.E.1     CC.2.1.8.E.4     CC.2.2.8.B.1

**Pennsylvania - Eligible Content - Grade 8 - Mathematics**

M08.A-N.1.1.1     M08.A-N.1.1.2     M08.A-N.1.1.3     M08.A-N.1.1.4     M08.A-N.1.1.5     M08.B-E.1.1.2

M08.A-N.1.1

## BIG IDEAS

<u>Big Ideas</u>

- **Terminating and Repeating Decimals**
- **Roots**
- **Real Numbers**
- **Estimate Irrational Numbers**
- **Compare and Order Real Numbers**

## ESSENTIAL QUESTIONS

<u>Essential Questions</u>

- Why do we classify numbers

# Unit 2: Real Numbers

**MS-Math 8**

| Knowledge | Skills |
|---|---|
| **Students will know . . . . . (Acquired Knowledge)** | **Students can do . . . . . (Acquired Skill)** |
| Students will know what it means for a decimal to be a terminating decimal. | Students can convert rational numbers between decimal and fraction forms. |
| Students will know the concepts of square and cube roots. | Student can find square and cube roots. |
| Students will know the concepts of numbers in the real number system. | Students can identify and describe sets of numbers in the real number system. |
| Students will know the process of estimating irrational numbers. | Students can estimate irrational numbers. |
| Students will know how to compare and order numbers in the real number system. | Students can compare and order numbers in the real number system. |
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EVIDENCE OF LEARNING & ASSESSMENT

| Name of Assessment | Type (formative, summative, project-based, diagnostic) | Description |
|---|---|---|
| Questioning and Observation during instruction | Formative | Teacher observes student work and uses prompting and question strategies to check student understanding. |
| Lesson Practice | Formative | At the conclusion of each lesson, students complete the lesson practice with immediate feedback to check for understanding. |
| Module Test | Summative | At the conclusion of each module, students will complete a module test that includes all topics. |
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# Unit 3: Solve Equations with Variables on Each Side
**MS-Math 8**

Write and solve linear equations with variables on each side.

## STANDARDS/EXPECTATIONS

### Pennsylvania - Eligible Content - Grade 8 - Mathematics

M08.B-E.3.1.1      M08.B-E.3.1.2      M08.B-E.3.1

### Pennsylvania Common Core - Grade 8 - Mathematics

CC.2.2.8.B.3

## BIG IDEAS

**Big Ideas**

- **Solve Equations with Variables on Each Side**
- **Write and Solve Equations with Variables on Each Side**
- **Solve Multi-Step Equations**
- **Write and Solve Multi-Step Equations**
- **Determine the Number of Solutions**

## ESSENTIAL QUESTIONS

**Essential Questions**

- How can equations with variables on each side be used to represent everyday situations?

# Unit 3: Solve Equations with Variables on Each Side
**MS-Math 8**

| Knowledge | Skills |
|---|---|
| **Students will know . . . . .  (Acquired Knowledge)** | **Students can do . . . . . (Acquired Skill)** |
| Students will know inverse operations and properties of equality. | Students can solve equations with variables on both sides. |
| Students will know how to translate real world situations to algebraic equations. | Students can write and solve equations with variables on both sides. |
| Students will know the distributive property and how it is used to combine like terms. | Students can solve multi-step equations with variables on each side. |
| Students will know how to translate real world situations involving the distributive property and combining like terms. | Students can write and solve multi-step equations with variables on both sides. |
| Students will understand how the structure of an equation indicates whether it has one solution, no solution or infinitely many solutions. | Students can determine the number of solutions to an equation . |
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# Unit 3: Solve Equations with Variables on Each Side
**MS-Math 8**

## EVIDENCE OF LEARNING & ASSESSMENT

| Name of Assessment | Type (formative, summative, project-based, diagnostic) | Description |
|---|---|---|
| Questioning and Observation during instruction | Formative | Teacher observes student work and uses prompting and question strategies to check student understanding. |
| Lesson Practice | Formative | At the conclusion of each lesson, students complete the lesson practice with immediate feedback to check for understanding. |
| Module Test | Summative | At the conclusion of each module, students will complete a module test that includes all topics. |
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# Unit 4: Linear Relationships and Slope
**MS-Math 8**

Graph and write equations to represent linear relationships.

**STANDARDS**

| Pennsylvania - Eligible Content - Grade 8 - Mathematics |
|---|

| M08.B-E.2.1 | M08.B-E.2.1.1 | M08.B-E.2.1.2 | M08.B-E.2.1.3 |

| Pennsylvania Common Core - Grade 8 - Mathematics |
|---|

| CC.2.2.8.B.2 |

**STANDARDS/EXPECTATIONS**

| Pennsylvania - Eligible Content - Grade 8 - Mathematics |
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| M08.B-E.2.1.1 | M08.B-E.2.1.2 | M08.B-E.2.1.3 | M08.B-E.2.1 |

| Pennsylvania Common Core - Grade 8 - Mathematics |
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| CC.2.2.8.B.2 |

**BIG IDEAS**

<u>Big Ideas</u>

- **Proportional Relationships and Slope**
- **Slope of a Line**
- **Similar Triangles and Slope**
- **Direct Variation**
- **Slope-Intercept Form**
- **Graph Linear Equations**

**ESSENTIAL QUESTIONS**

<u>Essential Questions</u>

- How are linear relationships related to proportional relationships?

# Unit 4: Linear Relationships and Slope
**MS-Math 8**

| Knowledge | Skills |
|---|---|
| **Students will know . . . . . (Acquired Knowledge)** | **Students can do . . . . . (Acquired Skill)** |
| Student will know the concepts of proportional relationships and slopes. | Students can graph and compare proportional relationships, interpreting the unit rate as the slope of the line. |
| Students will know different methods of finding slope | Students can find slope of a line from a graph, table, and using the formula. |
| Students will know how to connect slope with similar triangles. | Students can relate the slope to similar triangles. |
| Students will know how to use the slope formula to derive the equation y=mx. | Students can derive the equation y=mx from graphs, tables, and verbal descriptions of proportional relationships. |
| Students will know how to use the slope formula to derive the equation y=mx+b. | Students can write linear equations to represent relationships in the form y=mx+b |
| Students will  how to graph an equation in slope-intercept form by using the slope and y-intercept. | Students will graph lines in slope-intercept form, vertical lines, and horizontal lines. |

# Unit 4: Linear Relationships and Slope
**MS-Math 8**

| Name of Assessment | Type (formative, summative, project-based, diagnostic) | Description |
|---|---|---|
| Questioning and Observation during instruction | Formative | Teacher observes student work and uses prompting and question strategies to check student understanding. |
| Lesson Practice | Formative | At the conclusion of each lesson, students complete the lesson practice with immediate feedback to check for understanding. |
| Module Test | Summative | At the conclusion of each module, students will complete a module test that includes all topics. |
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# Unit 5: Functions

**MS-Math 8**

## UNIT OVERVIEW

Identify, construct, and compare linear and nonlinear functions.

## STANDARDS/EXPECTATIONS

**Pennsylvania - Eligible Content - Grade 8 - Mathematics**

M08.B-F.1.1  M08.B-F.1.1.1  M08.B-F.1.1.2  M08.B-F.1.1.3  M08.B-F.2.1  M08.B-F.2.1.1

M08.B-F.2.1.2

**Pennsylvania Common Core - Grade 8 - Mathematics**

CC.2.2.8.C.2

## BIG IDEAS

**Big Ideas**

- **Identify Functions**
- **Function Tables**
- **Construct Linear Functions**
- **Compare Functions**
- **Nonlinear Functions**
- **Qualitative Graphs**

## ESSENTIAL QUESTIONS

**Essential Questions**

- What does it mean for a relationship to be a function?

# Unit 5: Functions

**MS-Math 8**

| Knowledge | Skills |
|---|---|
| **Students will know . . . . . (Acquired Knowledge)** | **Students can do . . . . . (Acquired Skill)** |
| Students will know when a relation is a function. | Students can identify functions from mapping diagrams, tables and graphs. |
| Students will know the relationship between domains, inputs and x's and range, outputs and y's. | Students can create function tables and graph functions. |
| Students will know the relationships of the domains and ranges when dealing withing different formats of functions. | Students can construct functions from graphs, tables and verbal descriptions. |
| Students will know how to identify and compare intial amounts and rates of change of functions in different forms. | Students can compare functions represented in different forms. |
| Students will know the characteristics of nonlinear functions in a variety of formats. | Students can identify nonlinear functions using tables, graphs and equations. |
| Students will know how to identify initial values and rates of change for a function in a graph format. | Students can analyze and sketch qualitative graphs. |

# Unit 5: Functions

**MS-Math 8**

| Name of Assessment | Type (formative, summative, project-based, diagnostic) | Description |
|---|---|---|
| Questioning and Observation during instruction | Formative | Teacher observes student work and uses prompting and question strategies to check student understanding. |
| Lesson Practice | Formative | At the conclusion of each lesson, students complete the lesson practice with immediate feedback to check for understanding. |
| Module Test | Summative | At the conclusion of each module, students will complete a module test that includes all topics. |
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# Unit 6: Systems of Linear Equation
**MS-Math 8**

## UNIT OVERVIEW

Write and solve systems of linear equations.

## STANDARDS/EXPECTATIONS

**Pennsylvania - Eligible Content - Grade 8 - Mathematics**

M08.B-E.3.1.4    M08.B-E.3.1.3    M08.B-E.3.1.5    M08.B-E.3.1

**Pennsylvania Common Core - Grade 8 - Mathematics**

CC.2.2.8.B.3

## BIG IDEAS

**Big Ideas**

- **Solve Systems of Equations by Graphing**
- **Determine Number of Solutions**
- **Solve Systems of Equations by Substitution**
- **Solve Systems of Equations by Elimination**
- **Write and Solve Systems of Equations**

## ESSENTIAL QUESTIONS

**Essential Questions**

- How can systems of equations be helpful in solving everyday problems?

# Unit 6: Systems of Linear Equation
**MS-Math 8**

| Knowledge | Skills |
|---|---|
| **Students will know . . . . . (Acquired Knowledge)** | **Students can do . . . . . (Acquired Skill)** |
| Students will know the process of solving systems of linear equations by graphing. | Students can solve systems of linear equations by graphing. |
| Students will know how to analyze equations in order to find a system of solutions. | Students can determine the number of solutions of a system of linear equations by analyzing the equations. |
| Students will know how to solve systems of equations algebraically. | Students can solve systems of linear equations by using substitution. |
| Students will know how to solve systems of equations by eliminating one of the variables. | Students can solve systems of linear equations by using elimination. |
| Students will know how to a write system of equations to model a real-world problem. | Students can write and solve systems of linear equations. |
| | |

# Unit 6: Systems of Linear Equation

**MS-Math 8**

| Name of Assessment | Type (formative, summative, project-based, diagnostic) | Description |
|---|---|---|
| Questioning and Observation during Instruction | Formative | Teacher observes student work and uses prompting and question strategies to check student understanding. |
| Lesson Practice | Formative | At the conclusion of each lesson, students complete the lesson practice with immediate feedback to check for understanding. |
| Module Test | Summative | At the conclusion of each module, students will complete a module test that includes all topics. |
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# Unit 7: Pythagorean Theorem
**MS-Math 8**

## UNIT OVERVIEW

Use the Pythagorean Theorem

## STANDARDS/EXPECTATIONS

**Pennsylvania - Eligible Content - Grade 8 - Mathematics**

M08.C-G.2.1    M08.C-G.2.1.1    M08.C-G.2.1.2    M08.C-G.2.1.3

**Pennsylvania Common Core - Grade 8 - Mathematics**

CC.2.3.8.A.3

## BIG IDEAS

**Big Ideas**

- **The Pythagorean Theorem**
- **Converse of Pythagorean Theorem**
- **Distance on a Coordinate Plane**

## ESSENTIAL QUESTIONS

**Essential Questions**

- How can right triangles be use to solve everyday problems?

# Unit 7: Pythagorean Theorem
**MS-Math 8**

| Knowledge | Skills |
|---|---|
| **Students will know . . . . . (Acquired Knowledge)** | **Students can do . . . . . (Acquired Skill)** |
| Students will know the names of the sides of a right triangle (hypotenuse and leg). | Students can solve problems using the Pythagorean Theorm. |
| Students will know how to use the converse of the Pythagorean Theorem to determine if a given triangle is a right triangle. | Students can solve problems using the converse of the Pythagorean Theorem. |
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# Unit 7: Pythagorean Theorem
**MS-Math 8**

| Name of Assessment | Type (formative, summative, project-based, diagnostic) | Description |
|---|---|---|
| Questioning and Observation during instruction | Formative | Teacher observes student work and uses prompting and question strategies to check student understanding. |
| Lesson Practice | Formative | At the conclusion of each lesson, students complete the lesson practice with immediate feedback to check for understanding. |
| Module Test | Summative | At the conclusion of each module, students will complete a module test that includes all topics. |
| | | |

# Unit 8: Transformations
**MS-Math 8**

## UNIT OVERVIEW

Analyze translations, rotations, reflections, and dilations.

## STANDARDS/EXPECTATIONS

| **Pennsylvania - Eligible Content - Grade 8 - Mathematics** |
|---|

M08.C-G.1.1     M08.C-G.1.1.1     M08.C-G.1.1.3

| **Pennsylvania Common Core - Grade 8 - Mathematics** |
|---|

CC.2.3.8.A.2

## BIG IDEAS

**Big Ideas**

- **Translations**
- **Reflections**
- **Rotations**
- **Dilations**

## ESSENTIAL QUESTIONS

**Essential Questions**

- What does it mean to perform a transformation on a figure?

# Unit 8: Transformations
**MS-Math 8**

| Knowledge | Skills |
|---|---|
| **Students will know . . . . .  (Acquired Knowledge)** | **Students can do . . . . . (Acquired Skill)** |
| Students will know that transformations map one geometric figure onto another. | Students can translate figures and describe translations on the coordinate plane. |
| Students will know that reflecting a figure on the coordinate plane results in a mirror image of that figure across a line of reflection. | Students can reflect figures and describe reflections on the coordinate plane. |
| Students will know how to rotate two-dimensional figures about a vertex on the coordinate plane. | Students can rotate figures and describe rotations on the coordinate plane. |
| Students will understand that a dilation is a transformation that can enlarge or reduce a figure proportionally. | Students can dilate figures and describe dilations on the coordinate plane. |
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|  |  |

# Unit 8: Transformations
**MS-Math 8**

| Name of Assessment | Type (formative, summative, project-based, diagnostic) | Description |
|---|---|---|
| Questioning and Observation during instruction | Formative | Teacher observes student work and uses prompting and question strategies to check student understanding. |
| Lesson Practice | Formative | At the conclusion of each lesson, students complete the lesson practice with immediate feedback to check for understanding. |
| Module Test | Summative | At the conclusion of each module, students will complete a module test that includes all topics. |
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# Unit 9: Congruence and Similarity
**MS-Math 8**

Analyze and use similar and congruent figures using transformations.

## STANDARDS/EXPECTATIONS

**Pennsylvania - Eligible Content - Grade 8 - Mathematics**

M08.C-G.1.1    M08.C-G.1.1.2    M08.C-G.1.1.4

**Pennsylvania Common Core - Grade 8 - Mathematics**

CC.2.3.8.A.2

## BIG IDEAS

**Big Ideas**

- **Congruence and Transformations**
- **Congruence and Corresponding Parts**
- **Similarity and Transformations**
- **Similarity and Corresponding Part**
- **Indirect Measurement**

## ESSENTIAL QUESTIONS

**Essential Questions**

- What information is needed to determine if two figures are congruent or similar?

# Unit 9: Congruence and Similarity
**MS-Math 8**

| Knowledge | Skills |
|---|---|
| **Students will know . . . . . (Acquired Knowledge)** | **Students can do . . . . . (Acquired Skill)** |
| Students will know the properties of translations, reflections, and rotations and how these transformations are used to show that a pair of two-dimensional figures are congruent. | Students can use a sequence of transformations to describe congruency between figures. |
| Students will know the relationships between the corresponding angles of two-dimensional congruent figures. | Students can write congruence statements and find missing measures for congruent figures. |
| Students will know how dilations, translations, reflections, and rotations are used to show that a pair of two-dimensional figures is similar. | Students can use a sequence of transformations to describe similarity between figures. |
| Students will know how corresponding angles and corresponding sides of similar polygons are related. | Students can write similarity statements and find missing measures for similar figures. |
| Students will know how properties of similar triangles can be used to solve problems involving indirect measurement. | Students can solve problems involving similar triangles. |
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# Unit 9: Congruence and Similarity
**MS-Math 8**

| Name of Assessment | Type (formative, summative, project-based, diagnostic) | Description |
|---|---|---|
| Questioning and Observation during instruction | Formative | Teacher observes student work and uses prompting and question strategies to check student understanding. |
| Lesson Practice | Formative | At the conclusion of each lesson, students complete the lesson practice with immediate feedback to check for understanding. |
| Module Test | Summative | At the conclusion of each module, students will complete a module test that includes all topics. |

# Unit 10: Volume
**MS-Math 8**

## UNIT OVERVIEW

Find and use the volumes of cylinders, cones, spheres, and composite figures.

## STANDARDS/EXPECTATIONS

**Pennsylvania - Eligible Content - Grade 8 - Mathematics**

M08.C-G.3.1    M08.C-G.3.1.1

**Pennsylvania Common Core - Grade 8 - Mathematics**

CC.2.3.8.A.1

## BIG IDEAS

**Big Ideas**

- **Volume of Cylinders**
- **Volume of Cones**
- **Volume of Spheres**
- **Find Missing Dimensions**
- **Volume of Composite Solids**

## ESSENTIAL QUESTIONS

**Essential Questions**

- How can you measure a cylinder, cone, or sphere?

# Unit 10: Volume
**MS-Math 8**

| Knowledge | Skills |
|---|---|
| **Students will know . . . . . (Acquired Knowledge)** | **Students can do . . . . . (Acquired Skill)** |
| Students will know how the volumes of cylinders and prisms are related. | Students can find the volume of cylinders. |
| Students will know how the relationship between the volume of cones and the volume of cylinders. | Students can find the volume of cones. |
| Students will know how to find the volume of spheres | Students can find the volume of spheres and hemispheres. |
| Students will know how to find missing dimensions of cylinders, given the volume. | Students can use volume formulas to find missing dimensions in cylinders, cones, and spheres. |
| Students will know the characteristics of composite solids. | Students will find the volume of composite solids. |
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# Unit 10: Volume

**MS-Math 8**

| Name of Assessment | Type (formative, summative, project-based, diagnostic) | Description |
|---|---|---|
| Questioning and Observation during instruction | Formative | Teacher observes student work and uses prompting and question strategies to check student understanding. |
| Lesson Practice | Formative | At the conclusion of each lesson, students complete the lesson practice with immediate feedback to check for understanding. |
| Module Test | Formative | At the conclusion of each module, students will complete a module test that includes all topics. |
| | | |
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# Unit 11: Scatter Plots and Two-Way Tables
**MS-Math 8**

## UNIT OVERVIEW

Create scatter plots and two-way tables and use lines of fit and relative frequencies to identify and use association.

## STANDARDS/EXPECTATIONS

**Pennsylvania - Eligible Content - Grade 8 - Mathematics**

| M08.D-S.1.1 | M08.D-S.1.1.1 | M08.D-S.1.1.2 | M08.D-S.1.1.3 | M08.D-S.1.2 | M08.D-S.1.2.1 |

**Pennsylvania Common Core - Grade 8 - Mathematics**

| CC.2.4.8.B.1 | CC.2.4.8.B.2 |

## BIG IDEAS

**Big Ideas**

- **Scatter Plots**
- **Draw Lines of Fit**
- **Equations for Lines of Fit**
- **Two-Way Tables**
- **Associations in Two-Way Tables**

## ESSENTIAL QUESTIONS

**Essential Questions**

- What do patterns in data mean and how are they used?

# Unit 11: Scatter Plots and Two-Way Tables
**MS-Math 8**

| Knowledge | Skills |
|---|---|
| **Students will know . . . . . (Acquired Knowledge)** | **Students can do . . . . . (Acquired Skill)** |
| Students know how to construct scatter plots. | Students can construct and interpret scatter plots. |
| Students know how to informally draw and assess lines that fit a set of data. | Students can informally draw lines that fit a set of data and use them to make conjectures. |
| Students will know how to write an equation for a line that approximates a set of data. | Students can write the equations for lines that fit a set of data and use them to make conjectures. |
| Students will know how to construct a two way table to summarize the results of a survey. | Students can construct two-way tables and find and interpret their relative frequencies. |
| Students will know how to find associations in two way tables. | Students can determine if an association exists between categories of two-way tables. |
| | |

# Unit 11: Scatter Plots and Two-Way Tables
**MS-Math 8**

| Name of Assessment | Type (formative, summative, project-based, diagnostic) | Description |
|---|---|---|
| Questioning and Observation during instruction | Formative | Teacher observes student work and uses prompting and question strategies to check student understanding. |
| Lesson Practice | Formative | At the conclusion of each lesson, students complete the lesson practice with immediate feedback to check for understanding. |
| Module Test | Summative | At the conclusion of each module, students will complete a module test that includes all topics. |

## UNIT OVERVIEW

Spaced Learning Over Time (SLOT) is a retention strategy that utilizes specific timeframes to help students retain concepts. This method helps reinforce memory and improve long-term retention by allowing time for the brain to consolidate information. By revisiting material over time, it leverages the spacing effect to combat the forgetting curve.

After a month of teaching, it should be utilzed weekly to revisit problematic concepts that were taught precisely 28-42 days prior for SLOT #1.  Only focus on one concept at a time.  Instruction should be teacher heavy in the beginning that gradually transfers to the students. It should not take up the entire class, only 15-30 minutes.

SLOT #2 can occur about 2 months after SLOT #1 and can be similar in nature or worked into other areas of class.

It can be beneficial to include SLOT questions on homeworks and/or assessments. Digital aids that can provide immediate feedback are also recommended.

## STANDARDS/EXPECTATIONS

### Pennsylvania Common Core - Grade 8 - Mathematics

| CC.2.1.8.E.1 | CC.2.1.8.E.4 | CC.2.2.8.B.1 | CC.2.2.8.B.2 | CC.2.2.8.B.3 | CC.2.2.8.C.1 |

| CC.2.2.8.C.2 |

### Pennsylvania - Eligible Content - Grade 8 - Mathematics

| M08.A-N.1.1 | M08.A-N.1.1.3 | M08.B-E.1.1.2 | M08.B-E.1.1.1 | M08.B-E.1.1.3 | M08.B-E.1.1.4 |

| M08.B-E.2.1.3 | M08.B-E.3.1.2 | M08.B-F.1.1.1 | M08.B-F.1.1.3 | M08.B-F.1.1.2 |

## BIG IDEAS

**Big Ideas**

- **Power of a Power**
- **Negative Exponents**
- **Square and Cube Roots**
- **Real Numbers**
- **Scientific Notation**
- **Construct Linear Functions**
- **Equations with Variables on Both Sides**
- **Multi Step Equations**
- **Function Tables**
- **Proportional Relationships/Slope**
- **Similar Triangles and Slope**
- **Volume**

## ESSENTIAL QUESTIONS

## LEARNING TARGETS: KNOWLEDGE & SKILLS

| Knowledge | Skills |
|---|---|
| **Students will know . . . . . (Acquired Knowledge)** | **Students can do . . . . . (Acquired Skill)** |
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**EVIDENCE OF LEARNING & ASSESSMENT**

# Unit 13: Interleaved Practice Format (IPF)
**MS-Math 8**

Interleaved Practice Format (IPF) is a retention strategy that involves mixing different types of problems or skills within a single study session, rather than focusing on one topic at a time. This approach enhances retention by forcing the brain to continuously retrieve and apply different types of information, promoting deeper learning. It also helps learners differentiate between concepts, improving long-term understanding and adaptability.

*Choose 3 to 4 dissimilar problems and arrange them in an ABC(D)-ABC(D)-ABC(D) as opposed to AAABBBCCC.

*9-12 problems total, too many problems will defeat the purpose.

*The process required to answer a problem should be considered when identifying "dissimilar" problems.

*Consider the difficulty level of each problem (Basic, Moderate & Advanced). Do not group 3 advanced problems together on an IPF. Have a good mix.

*The concepts used should not have been taught closely together in the same unit. There should also be some time in between when they were taught and used in an IPF.

*The activity should progress from teacher heavy to student heavy but is flexible to your preferences. Sample, the first set of ABC questions are "I do." The second set is "we do" and the third/fourth set is "you do."

*IPF's should occur 2-3 times per month.

*Can be classwork or homework

*Should not look or feel like a test situation.

*Can be combined with other activities (SLOT, Worked out solutions, etc)

STANDARDS/EXPECTATIONS

## BIG IDEAS

Big Ideas

- **Estimating Irrationals, Scientific Notation, Power of a Power**
- **Negative Exponents, Compare and Order Numbers, Equations with Variables on both sides**
- **Terminating/Repeating Decimals, Multiply and Divide Monomials, Slope of a line**
- **Solve Multi Step Equations, Slope Intercept Form, Identify Functions**
- **Compare Functions, Solutions to Systems of Equations, Direct Variation**
- **Pythagorean Theorem, Similar Triangles and slope, computing with scientific notation**
- **Real Numbers, Rotations, Distance**
- **Converse of the Pythagorean Theorem, Reflections, Similarity**
- **Congruence, Volume of Cylinders, Solve Equations**
- **Volume of Cones, Linear vs Nonlinear, Graph linear equations**

## ESSENTIAL QUESTIONS

## LEARNING TARGETS: KNOWLEDGE & SKILLS

## EVIDENCE OF LEARNING & ASSESSMENT

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**UNIT OVERVIEW**

Spring Math Classwide interventions are structured, evidence-based programs designed to improve math skills for an entire class by integrating frequent assessments and targeted practice. The program uses data to identify student needs and adjusts instruction accordingly, allowing for personalized support within a group setting. The benefits include improved math fluency, enhanced problem-solving skills, and more efficient identification of students who need additional help, all while fostering a collaborative learning environment.

# HAMS Spring Math:
# What it looks like, things we have learned to do, and not do

**Overview:**

-We have adopted spring math K-8 in our district

-This is our 3rd year of full implementation

-It was rough the first couple years, but we are really seeing improvement this year

-**PEER TUTORING IS THE KEY!!!!!!!**

-Include extra paper in the budget, there is a lot of copying involved but it's not difficult to fit in timewise.
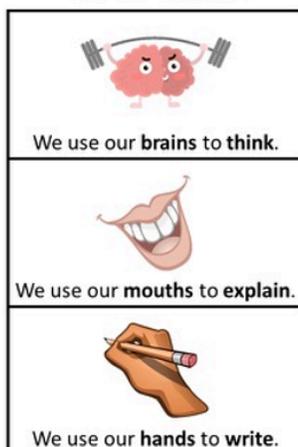

**In our building:**

*We have a separate 20 minute period designated for spring math in which teachers of all content areas have their own class-this makes it very easy to group heterogeneously which is important. Once roles and routines are established, it goes very smoothly. In general, students enter the room and grab materials and sit with their partner (assigned by spring math).
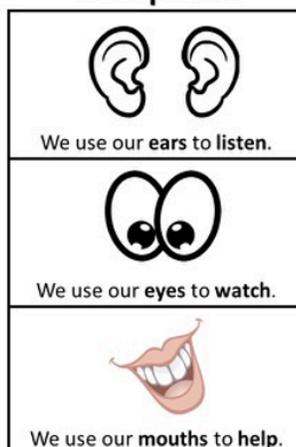

Clearly define and show examples of what workers should do, and what helpers should do during peer tutoring.

This graphic is available in the support section of the spring math website and is very helpful in the early stages, and also to review if peer tutoring starts to decline later in the year.



Workers
- We use our **brains** to **think**.
- We use our **mouths** to **explain**.
- We use our **hands** to **write**.

Helpers
- We use our **ears** to **listen**.
- We use our **eyes** to **watch**.
- We use our **mouths** to **help**.

Some other helpful hints that can be included:

1. Do not degrade a peer of their work

2. Do not give answers

3. If stuck, give your partner some hints

4. Its ok to a give a number fact as a hint

*The Daily Classwide Intervention:The spring math crew will train you how to do this:*

The first 6 minutes is peer tutoring, **PEER TUTORING IS THE KEY!!!!!!!** The stronger student goes first as "the worker" and works through the problems literally verbalizing each and every step. The other is "the helper" who listens, watches and checks the answers. If the worker gets one wrong, the helper doesn't give the answer, just indicates that it's wrong and they should recheck their work. If needed, they can give prompts and hints. After 3 minutes, they switch roles and sometimes the stronger student as the helper may need to offer more hints or explanation. Students then recycle the worksheets and answer keys and get ready for the timed assessment-which is either 2 or 4 minutes (read the directions). After the timed assessment, they switch papers with their partners, use correcting pens and check answers. Then they hand them back, make corrections and mark their tracking sheets. Collect them, pull a random paper for the "score to beat" and you only need to enter the scores online at the end of the week-more than half the class needs to meet the goal to pass.

*Spring Math is not meant to be graded; however, most teachers offer rewards as motivation and have freedom on how to do so. Since, **PEER TUTORING IS THE KEY!!!!!!!**

It is recommend that this is part of the reward system. Here is a sample rewards system:
*-Peer tutoring 1-10pts:*
Teacher walks around during peer tutoring and then assigns a score at the end. It is helpful after the first 3 minutes to recognize what is good and what could be better.
*-"Score to beat" = 5 pts*
If the random paper pulled is higher than the previous day.
*-Beat your best score or the goal* = 1 pt/student
Students check their tracking sheet, if they beat their best score or the goal for that skill
(kids always want to throw the peer tutoring sheets in the trash like basketballs, some teachers work this into a rewards system as well in various ways-1 pt for a make or you can only shoot if the peer tutoring is 8 or higher, etc)
*Pass the skill as a class = 20 pts*

Rewards:
We have found gym/outdoor time very motivating. Many teachers take their kids to the gym or go outside during spring math when they pass a skill or earn a certain amount of points. It's more

motivating if the students pick the reward and a reasonable amount of points to earn for it. It is helpful to wait a couple weeks before assigning point values to rewards until you see what the average scores are.

Other reward ideas:

Teacher/admin must wear a tutu all day long

Pie a teacher/admin in the face

Duct tape teacher/admin to the wall

Party (students provide refreshments)

Outdoor activity

Extra credit in classes (as long as teachers agree to it)

Anything reasonable students come up with

You can offer a tiered reward system as well, and it's okay to adjust points if the students start to lose hope.

*For difficult topics-Sometimes we would swap spring math classes so a math teacher can explain the procedures to a different class. The math teachers also made videos or found youtube links to explain how to do the problems and shared it with everyone (this is still a work in progress).

Adjustments we have made through the years

Do **not** group homogeneously-You will have groups that finish in half of a year and groups that won't pass skill 3. This is not how spring math was designed, and we kind of learned this the hard way with 6th grade our first year.

*This year, we removed about 10 students from spring math classes and they work on basic math skills during this time with a designated teacher, typically multiplication facts. They were students that were flagged in the system for consistently getting 0's on their assessments. These kids were probably embarrassed of their skills so didn't try on purpose, hoping to cover up inadequacies. Spring Math encourages Individual Interventions for kids that fall behind, but can't really tell us how to do it in a middle school setting. We eventually got around to it for a handful of students and found every single time that they didn't know their multiplication facts-which is needed for a large portion of the skills. This is part of the reason we pulled those kids and work primarily on multiplication.

It also seemed that many classes were getting held back by these few students and we've seen a lot of progress in our current model. Not saying it's the best idea, but we found it to work well for us.

Some kind of organization system is helpful-many teachers have a hanging folder system with folders for Day 1 through 5, answer keys and tracking sheets. This way you can make all the copies needed for the week at once.

One of our teachers came up with a google form to help students track their progress online instead of using the paper sheet. It takes some savvy spreadsheet skills, but is doable.

**STANDARDS/EXPECTATIONS**

# Unit 14: Spring Math
**MS-Math 8**

<u>Big Ideas</u>

- **2 Digit Addition with and Without Regrouping**
- **2 Digit Subtraction with and Without Regrouping**
- **Multi-Digit Multiplication with and w/o Regrouping**
- **Multi-Digit Division With & Without Remainders**
- **Find the Least Common Denominator**
- **Simplify Fractions: A**
- **Simplify Fractions: B**
- **Simplify Fractions: C**
- **Add/Subtract Fractions with Unlike Denominators**
- **Mixed Fraction Operations**
- **Add, Subtract, Multiply and Divide Integers of Varied Signs**
- **Collect like terms to simplify expressions**
- **Distributive property to simplify expressions**
- **Add or Subtract with exponents**
- **Multiply with exponents**
- **Division with exponents**
- **Order of Operations II**
- **Simplify Expressions**
- **Solve One Step Equations with Rational Numbers**
- **Algebraic Proportions**
- **Calculate Missing Value in percentage problem**
- **Solve two step equations**
- **Solve Slope/intercept Using linear function y=mx+b**
- **Point on a line**
- **Solve two step equations with fractions**
- **Linear Combinations to solve equations**

# Unit 14: Spring Math
**MS-Math 8**

**ESSENTIAL QUESTIONS**

**LEARNING TARGETS: KNOWLEDGE & SKILLS**

**EVIDENCE OF LEARNING & ASSESSMENT**