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SUGGESTED

**INSTRUCTIONAL**

**PLANNING GUIDE**

*for the Mississippi College- and Career-Readiness Standards*

** Mathematics**

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| **Foundations** **of Algebra** |

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**INTRODUCTION**

The unprecedented, nationwide school closures in the spring of 2020 due to the COVID-19 pandemic have created a shift in how districts plan for school re-entry. Instead of the traditional brick-and-mortar planning, administrators are now identifying models that will support a variety of instructional delivery scenarios as they plan for school reopening. The traditional methods of planning and delivery are nearly impossible to implement as a stand-alone model; instead, innovative educators are developing and identifying strategies and resources to support a variety of distance learning scenarios as part of their plans. When using new models of delivery, it is important to recognize that the traditional approach to remediation—providing work better suited for earlier grades—may be insufficient. Instead, the conventional approach to remediation will likely compound the problem educators are trying to correct. According to a 2018 study, [The Opportunity Myth[[1]](#footnote-2)](https://tntp.org/assets/documents/TNTP_The-Opportunity-Myth_Web.pdf), the approach of “meeting students where they are”, while often well-intended, only widens the achievement gap. Instead of remediation, teachers and administrators are encouraged to look toward acceleration methods to support student growth and close the gaps.

**PURPOSE**

The purpose of the *Suggested Mississippi College- and Career-Readiness Standards Instructional Planning Guides* is to provide a *SUGGESTED* guide to assist teachers in planning rigorous, coherent lessons that focus on the critical content of each grade level. Providing curriculum guidance through intentional standard grouping and consideration for the time needed to address different objectives, should encourage consistent instruction that fully aligns to the Mississippi College- and Career-Readiness Standards. The use of this guide can also foster collaborative planning across schools and districts throughout the state.

**DEVELOPMENT**

The following planning and subsequent grouping of standards were determined through a collaborative process among state-level content specialists. By connecting standards through common conceptual understandings and relationships, the expectation is that conceptual connections will promote a cohesive process and avoid the teaching of standards in isolation. Additionally, it promotes a deeper understanding and a more authentic acquisition of mathematical knowledge and skills. The Standards for Mathematical Practices (SMPs) presented are those suggested to be highlighted within the respective standard; however, this does not exclude the inclusion of other SMPs. The standards determined as “**priority**” have been bolded and are standards identified as critical to the mastery of other standards. A standard’s “**priority**” status does *NOT* have a direct correlation with test item frequency. Additionally, some standards may appear multiple times throughout the course with a portion of the standard highlighted to depict that only that portion of the standard is to be taught within that unit.

**RESOURCES FOR CONSIDERATION**

The resources listed below may be referenced to support classroom teachers in the development of lesson plans and instruction at the local level. This list is not meant to be exhaustive, rather it represents consultative resources that align with the Units/Themes provided in the Instructional Planning Guides. Educators are encouraged to use these resources in addition to those curriculum materials that meet the needs of the students they serve.

| High-Quality Instructional Materials (HQIM) | Instruction and Planning Resources | Standards for Mathematical Practices (SMPs) | AssessmentResources | Professional Development |
| --- | --- | --- | --- | --- |
| * [MS HQIM Defined](https://mdek12.org/HQIM)
* [MS Adopted HQIM (Textbooks)](https://www.mdek12.org/caravan2019)
* [Illustrative Mathematics Grade 6-8 Curriculum](https://curriculum.illustrativemathematics.org/MS/teachers/index.html)
* [Illustrative Mathematics Grade Algebra Curriculum](https://curriculum.illustrativemathematics.org/HS/teachers/1/index.html)
* [Big Ideas Easy Access Student Edition Algebra I](https://bim.easyaccessmaterials.com/index.php?level=11.00)
* [Great Minds (Eureka Math) Teacher Resource Pack K-12](https://eurekamath.greatminds.org/teacher-resource-pack)
* [Great Minds Alignment to MSCCRS](https://greatminds.org/resources/products/mississippi-standards-alignment-study)
* [Kendall Hunt-Illustrative Mathematics Curriculum](https://im.kendallhunt.com/)
 | * [Achieve the Core Coherence Map-K-HS Math](https://achievethecore.org/coherence-map/)
* [Standards Dependency and Flow View](http://jeffbaumes.github.io/standards/)
* *Scaffolding Instruction for ELLs*
* [Achieve the Core CCR Shifts in Mathematics](https://achievethecore.org/content/upload/SAP_ShiftsAtAGlance_02.pdf)
* [Standards Progressions for Mathematics Progression Documents](http://ime.math.arizona.edu/progressions/)
* [Teacher Desmos](https://teacher.desmos.com/)
* [SFUSD Manipulatives List](http://www.sfusdmath.org/manipulatives.html)
* [Printable Manipulatives](https://www.mathematicalpractices.com/mp1e/content/printable-manipulatives/)
* [Achieve the Core Instructional Practice Guide HS](https://achievethecore.org/content/upload/Instructional%20Practice%20Guide_Math_HS.pdf)
* [Mississippi Exemplar Units and Lesson Plans-Foundations of Algebra](https://www.mdek12.org/sites/default/files/documents/OAE/OEER/Exemplar%20Units/math/Foundations-of-Algebra-Exemplar-Unit.pdf)
* [CPM Foundations of Algebra Year 1 Resources](https://cpm.org/ffa1)
* [CPM Foundations of Algebra Year 2 Resources](https://cpm.org/ffa2)
* [Big Ideas Skills Review Handbook HS](https://bim.easyaccessmaterials.com/protected/content/srh/hs/)
* [HCPSS Family Mathematics Support Center-Geometry](http://hcpssfamilymath.weebly.com/geometry-gt.html)
* [MS CCRS Scaffolding Documents](https://mdek12.org/ese/ccr)
* [Access for All Guidance](https://mdek12.org/sites/default/files/documents/OAE/OAE/2019-access-for-all-guide.pdf)
* [MDE Family Guides for Student Success](https://mdek12.org/OAE/OEER/FamilyGuidesEnglish)\*

(Alternative Language: [Spanish](https://mdek12.org/OAE/OEER/FamilyGuidesSpanish))*\*This resource can be used for standards reinforcement of previous grades.* | * [Illustrative Mathematics Understanding the Standards for Mathematical Practices (SMPs)](http://tasks.illustrativemathematics.org/practice-standards/)
* [Inside Mathematics Mathematical Practice Standards](https://www.insidemathematics.org/common-core-resources/mathematical-practice-standards)
* [Inside Mathematics Mentors of Mathematical Practice](https://www.insidemathematics.org/common-core-resources/mentors-of-mathematical-practice)
 | * [Desmos Graphing Calculato](https://www.desmos.com/calculator)r
* [MDE Desmos Calculator Support](https://www.mdek12.org/ese/Desmos-Calculator-Support)
* [Inside Mathematics Performance Tasks 2-HS](https://www.insidemathematics.org/performance-assessment-tasks)
* [Illustrative Mathematics Grade K-HS Tasks](https://tasks.illustrativemathematics.org/content-standards)
* [MARS Mathematics Assessment Project (6-HS)](https://www.map.mathshell.org/index.php)
* [Goalbook Pathways Grade 8](https://goalbookapp.com/pathways/?ref=topic#!/browse-topics/math/8)
* [Goalbook Pathways Grade HS](https://goalbookapp.com/pathways/?ref=topic#!/browse-topics/math/9-12)
* [Khan Academy K-8 Math](https://www.khanacademy.org/math/k-8-grades)
* [Khan Academy Get Ready for Algebra I](https://www.khanacademy.org/math/get-ready-for-algebra-i)
* [Khan Academy Algebra I](https://www.khanacademy.org/math/algebra)
 | * [MDE Professional Development Resources](https://www.mdek12.org/OPD/home)
* [SchoolKit and IM Video Lessons](http://schoolkitgroup.com/illustrative-mathematics-video-learning-series/)-6th – Algebra
* [MARS Prototype Professional Development Modules](https://www.map.mathshell.org/pd.php)
* [NCTM Professional Development Resources](https://www.nctm.org/Conferences-and-Professional-Development/Professional-Development-Resources/)
* [NCTM Math Forum](https://www.nctm.org/mathforum/)
* [Great Minds (Eureka) Webinars](https://eurekamath.greatminds.org/webinar-library)
* [Using Manipulatives in the Classroom](https://www.teachervision.com/professional-development/using-manipulatives)
* [Learn Desmos](https://learn.desmos.com/)
 |
| Applets, Demos, Interactives, and Virtual Manipulatives |
| * [CPM Tiles](https://technology.cpm.org/general/tiles/)
* [Didax Virtual Manipulatives](https://www.didax.com/math/virtual-manipulatives.html)
* [Didax Free Activity Guides for Virtual Manipulatives](https://www.didax.com/virtual-manipulatives-activities)
* [GeoGebra Virtual Manipulatives](https://www.geogebra.org/m/NPDu3rCm)
* [Geometry Playground](https://www.maa.org/press/periodicals/loci/resources/geometry-playground)
* [Houghton Mifflin and Harcourt iTools](https://www-k6.thinkcentral.com/content/hsp/math/hspmath/na/common/itools_int_9780547584997_/main.html)
* [Interactive Mathematics Applications](https://www.intmath.com/help/interactive-math-applications.php)
* [Interactivate Tools](http://www.shodor.org/interactivate/tools/)
* [Key Curriculum Geometers Sketchpad](https://www.keycurriculum.com/training)
* [Mathed Applets](https://www.mathed.page/applets.html)
* [Mathies Learning Tools](https://www.mathies.ca/learningTools.php#gsc.tab=0)
* [Mathigon Polypad](https://mathigon.org/polypad)
* [Math Playground Math Manipulatives](https://www.mathplayground.com/math_manipulatives.html)
* [Mathsbot Manipulatives](https://mathsbot.com/manipulativeMenu)
* [McGraw Hill (Glencoe) Virtual Manipulatives](http://www.glencoe.com/sites/common_assets/mathematics/ebook_assets/vmf/VMF-Interface.html)
* [National Library of Virtual Manipulatives](http://nlvm.usu.edu/en/nav/vlibrary.html)
* [NCTM Illuminations Interactives](https://illuminations.nctm.org/)
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| **TERM 1****UNIT OF STUDY**(REAL-WORLD APPLICATION)**** | **MS CCR STANDARDS** | **STANDARDS FOR MATHEMATICAL PRACTICE (SMPs)** | CORE ACADEMIC **VOCABULARY TERMS** |
| --- | --- | --- | --- |
| **Unit 1: Algebraic Expressions**(This is a base unit in which students learn to represent the value of an expression for all the values a variable can take on. For example, a student spends 99¢ to download a song. Write a representation to show how much he/she spends on x number of songs.) | 1 Interpret key features of an expression (*i.e., terms, factors, and coefficients*). *A-SSE.1a- Identify the different parts of the expression and explain their meaning within the context of a problem.* | * **SMP 2** Reason abstractly and quantitatively.
* **SMP 3** Construct viable arguments and critique the reasoning of others.
* **SMP 6** Attend to precision.
* **SMP 7** Look for and make use of structure.
 | Algebraic Expression BaseCoefficientConstant Exponent FactorTermVariable |
|  | **2 Create expressions that can be modeled by a real-world context.**  | * **SMP 1** Make sense of problems and persevere in solving them.
* **SMP 2** Reason abstractly and quantitatively.
* **SMP 3** Construct viable arguments and critique the reasoning of others.
* **SMP 4** Model with Mathematics.
* **SMP 7** Look for and make use of structure.
 | Algebraic Equation |
|  | **3 Use the structure of an expression to identify ways to rewrite it.** ***A-SSE.2 Use the structure of an expression to identify ways to rewrite it. For example, see x4 – y4 as (x2)2 – (y2)2, thus recognizing it as a difference of squares that can be factored as (x2 – y2) (x2 + y2).*** | * **SMP 4** Model with Mathematics.
* **SMP 7** Look for and make use of structure.
 | Distributive PropertyFactor Greatest Common Factor (GCF) |
|  | **4 Simplify and evaluate numerical and algebraic expressions.*****7.EE.1 Apply properties of operations as strategies to add, subtract, factor, and expand linear expressions with rational coefficients.*** | * **SMP 2** Reason abstractly and quantitatively.
* **SMP 6** Attend to precision.
* **SMP 7** Look for and make use of structure.
* **SMP 8** Look for and express regularity in repeated reasoning.
 | Equivalent ExpressionsInverseLike TermsSimplest Form |
| **Unit 2: Extending Expressions to Polynomials** (The main purpose of this skill is to teach students how to recognize and combine like terms. This can be represented by grocery stores not allowing different fruit to be bagged in the same produce bag.) | 31 Describe and identify a polynomial of degree one, two, three and four by examining a polynomial expression or a graph.  | * **SMP 1** Make sense of problems and persevere in solving them.
* **SMP 2** Reason abstractly and quantitatively.
* **SMP 3** Construct viable arguments and critique the reasoning of others.
* **SMP 7** Look for and make use of structure.
* **SMP 8** Look for and express regularity in repeated reasoning.
 | Binomial Degree of A MonomialDegree of A Polynomial MonomialPolynomialTrinomial |
|  | **32 Add and subtract polynomials using appropriate strategies (e.g. by using Algebra Tiles).**  | * **SMP 1** Make sense of problems and persevere in solving them.
* **SMP 2** Reason abstractly and quantitatively.
* **SMP 3** Construct viable arguments and critique the reasoning of others.
* **SMP 7** Look for and make use of structure.
* **SMP 8** Look for and express regularity in repeated reasoning.
 | Associative Property Commutative Property |
|  | **33 Factor polynomials using the greatest common factor and factor quadratics that have only rational zeros.** | * **SMP 2** Reason abstractly and quantitatively.
* **SMP 3** Construct viable arguments and critique the reasoning of others.
* **SMP 7** Look for and make use of structure.
 | Difference of Two Squares FactoringFactoring by GroupingGreatest Common Factor (GCF) |
|  | **34 Justify why some polynomials are prime over the rational number system.**  | * **SMP 2** Reason abstractly and quantitatively.
* **SMP 3** Construct viable arguments and critique the reasoning of others.
 | Prime Polynomial |
| **Unit 3: Linear Equations** (Students learn to write and solve equations and inequalities to find solutions to everyday problems, such as calculating the cost of renting a car.) | 5 Compare and contrast an expression and an equation and give examples of each. | * **SMP 2** Reason abstractly and quantitatively.
* **SMP 3** Construct viable arguments and critique the reasoning of others.
 | Algebraic EquationAlgebraic ExpressionCoefficientConstantVariable |
|  | **6 Given an equation, solve for a specified variable of degree one (*i.e. isolate a variable*). *6.EE.7 Solve real-world and mathematical problems by writing and solving equations of the form x + p = q and px = q for cases in which p, q and x are all nonnegative rational numbers., 7.EE.4 Use variables to represent quantities in a real-world or mathematical problem, and construct simple equations and inequalities to solve problems by reasoning about the quantities.*** | * **SMP 1** Make sense of problems and persevere in solving them.
* **SMP 2** Reason abstractly and quantitatively.
* **SMP 3** Construct viable arguments and critique the reasoning of others.
* **SMP 4** Model with Mathematics.
* **SMP 7** Look for and make use of structure.
 | Addition Property of EqualityDivision Property of Equality Inverse OperationIsolateMultiplication Property of EqualitySubtraction Property of Equality |
|  | **7 Fluently solve and check multi-step equations and inequalities with an emphasis on the distributive property, variables on both sides, and rational coefficients. Explain each step when solving a multistep equation and inequality. Justify each step using the properties of real numbers.** | * **SMP 1** Make sense of problems and persevere in solving them.
* **SMP 2** Reason abstractly and quantitatively.
* **SMP 3** Construct viable arguments and critique the reasoning of others.
* **SMP 4** Model with Mathematics.
* **SMP 7** Look for and make use of structure.
 | Addition Property of EqualityDistributive PropertyDivision Property of Equality Inverse OperationIsolateLike TermsMultiplication Property of EqualitySubtraction Property of Equality |
|  | **8 Solve word problems leading to equations of the form px + q = r and p (x + q) = r, where p, q, and r are specific rational numbers. Solve equations of these forms fluently. *7.EE.4a Solve word problems leading to equations of the form px + q = r and p (x + q) = r, where p, q, and r are specific rational numbers. Solve equations of these forms fluently. Compare an algebraic solution to an arithmetic solution, identifying the sequence of the operations used in each approach. For example, the perimeter of a rectangle is 54 cm. Its length is 6 cm. What is its width?*** | * **SMP 1** Make sense of problems and persevere in solving them.
* **SMP 2** Reason abstractly and quantitatively.
* **SMP 3** Construct viable arguments and critique the reasoning of others.
* **SMP 4** Model with Mathematics.
* **SMP 5** Use appropriate tools strategically.
* **SMP 6** Attend to precision.
* **SMP 7** Look for and make use of structure.
 | Addition Property of EqualityCombine Like TermsDistributive PropertyDivision Property of Equality Inverse OperationIsolateMultiplication Property of EqualitySubtraction Property of Equality |
|  | **10 Graph the solution point of an equation and the solution set of an inequality in one variable on a horizontal number line. For inequalities, be able to interpret and write the solution set in a variety of ways (e.g., set notation).** | * **SMP 1** Make sense of problems and persevere in solving them.
* **SMP 2** Reason abstractly and quantitatively.
* **SMP 3** Construct viable arguments and critique the reasoning of others.
* **SMP 4** Model with Mathematics.
* **SMP 5** Use appropriate tools strategically.
* **SMP 6** Attend to precision.
* **SMP 7** Look for and make use of structure.
 | Number LineSolution PointSolution Set |
|  | **11 Justify when linear equations in one variable will yield one solution, infinitely many solutions, or no solution. *8.EE.7a Perform operations with numbers expressed in scientific notation, including problems where both decimal and scientific notation are used. Use scientific notation and choose units of appropriate size for measurements of very large or very small quantities (e.g., use millimeters per year for seafloor spreading). Interpret scientific notation that has been generated by technology.*** | * **SMP 4** Model with Mathematics.
* **SMP 6** Attend to precision.
 | InfiniteLinear Equations Solution(S) |

| **TERM 2****UNIT OF STUDY**(REAL-WORLD APPLICATION)**** | **MS CCR STANDARDS** | **STANDARDS FOR MATHEMATICAL PRACTICE (SMPs)** | CORE ACADEMIC **VOCABULARY TERMS** |
| --- | --- | --- | --- |
| **Unit 4: Solving Equations in Geometry**(Students will explore the relationships among the sides of right triangles and within the formulas used to calculate the volume and surface area of three-dimensional figures, which can be used in architecture, construction, and woodworking and also by companies in designing packaging for their products.) | 36 Explain and apply the Pythagorean Theorem to determine unknown side lengths in right triangles in real-world and mathematical problems in two and three dimensions. *8.G.7 Apply the Pythagorean Theorem to determine unknown side lengths in right triangles in real-world and mathematical problems in two and three dimensions.* | * **SMP 4** Model with Mathematics.
* **SMP 6** Attend to precision.
 | DiagonalHypotenuseIrrational NumberLeg Pythagorean TheoremPythagorean TripleRight AngleRight TriangleSquare RootSquare (Exponent) Theorem |
|  | **37 Apply the Pythagorean Theorem to find the distance between two points in a coordinate system. *8.G.8 Apply the Pythagorean Theorem to find the distance between two points in a coordinate system.*** | * **SMP 2** Reason abstractly and quantitatively.
* **SMP 3** Construct viable arguments and critique the reasoning of others.
* **SMP 4** Model with Mathematics.
* **SMP 7** Look for and make use of structure.
* **SMP 8** Look for and express regularity in repeated reasoning.
 | DiagonalHypotenuseIrrational NumberLeg Pythagorean TheoremPythagorean TripleRight AngleRight TriangleSquare RootSquare (Exponent) Theorem |
|  | **38 Fluently use formulas and/or appropriate measuring tools to find length and angle measures, perimeter, area, volume, and surface area of polygons, circles, spheres, cones, cylinders, pyramids, and composite or irregular figures. Use them to solve real-world and mathematical problems. *8.G.9 Know the formulas for the volumes of cones, cylinders, and spheres and use them to solve real-world and mathematical problems.*** | * **SMP 2** Reason abstractly and quantitatively.
* **SMP 3** Construct viable arguments and critique the reasoning of others.
* **SMP 4** Model with Mathematics.
* **SMP 5** Use appropriate tools strategically.
* **SMP 6** Attend to precision.
* **SMP 7** Look for and make use of structure.
* **SMP 8** Look for and express regularity in repeated reasoning.
 | BaseConeCylinderDiameterHeightPi PrismRadiusVolume |
|  | **39 Solve real-world and mathematical problems involving two- and three-dimensional objects composed of triangles, quadrilaterals, polygons, cubes, and right prisms. *7.G.6 Solve real-world and mathematical problems involving area, volume, and surface area of two- and three-dimensional objects composed of triangles, quadrilaterals, polygons, cubes, and right prisms.*** | * **SMP 1** Make sense of problems and persevere in solving them.
* **SMP 2** Reason abstractly and quantitatively.
* **SMP 3** Construct viable arguments and critique the reasoning of others.
* **SMP 4** Model with Mathematics.
* **SMP 5** Use appropriate tools strategically.
* **SMP 6** Attend to precision.
* **SMP 7** Look for and make use of structure.
* **SMP 8** Look for and express regularity in repeated reasoning.
 | AreaBaseHeightPerimeterPrismRectangular PrismTriangular Prism Volume |
| **Unit 5: Inequalities in one Variable** (This is similar to solving and graphing equations in one variable, only inequalities are used more in everyday life when working with constraints such as calculating how many products you can buy when on a set budget.) | **7 Fluently solve and check multi-step equations and inequalities with an emphasis on the distributive property, variables on both sides, and rational coefficients. Explain each step when solving a multistep equation and inequality. Justify each step using the properties of real numbers.** | * **SMP 1** Make sense of problems and persevere in solving them.
* **SMP 2** Reason abstractly and quantitatively.
* **SMP 3** Construct viable arguments and critique the reasoning of others.
* **SMP 7** Look for and make use of structure.
* **SMP 8** Look for and express regularity in repeated reasoning.
 | Addition Property of EqualityCombine Like TermsDistributive PropertyDivision Property of Equality InequalitiesInverse OperationIsolateMultiplication Property of Equality Subtraction Property of Equality |
|  | **9 Solve word problems leading to inequalities of the form px + q > r or px + q < r, where p, q, and r are specific rational numbers. Solve inequalities of these forms fluently. *7.EE.4b Solve word problems leading to inequalities of the form px + q > r or px + q < r, where p, q, and r are specific rational numbers. Graph the solution set of the inequality and interpret it in the context of the problem. For example: As a salesperson, you are paid $50 per week plus $3 per sale. This week you want your pay to be at least $100. Write an inequality for the number of sales you need to make and describe the solutions.*** | * **SMP 1** Make sense of problems and persevere in solving them.
* **SMP 2** Reason abstractly and quantitatively.
* **SMP 4** Model with Mathematics.
* **SMP 6** Attend to precision.
* **SMP 7** Look for and make use of structure.
 | Addition Property of EqualityCombine Like TermsDistributive PropertyDivision Property of Equality InequalitiesInverse OperationIsolateMultiplication Property of Equality Subtraction Property of Equality |
|  | **10 Graph the solution point of an equation and the solution set of an inequality in one variable on a horizontal number line. For inequalities, be able to interpret and write the solution set in a variety of ways (*e.g., set notation*).** | * **SMP 1** Make sense of problems and persevere in solving them.
* **SMP 2** Reason abstractly and quantitatively.
* **SMP 4** Model with Mathematics.
* **SMP 6** Attend to precision.
* **SMP 7** Look for and make use of structure.
 | Closed Circle (With Respect to Graphing)Number LineOpen Circle (With Respect to Graphing)Shading |
| **Unit 6 Introduction of Functions**(This skill allows students to explore comparing different sets of data and how they can relate to each other, such as a worker’s pay based on the number of hours worked.) | **12 Understand that a function from one set (called the domain) to another set (called the range) assigns to each element of the domain exactly one element of the range. Use function notation, where appropriate. *F-IF.1 Understand that a function from one set (called the domain) to another set (called the range) assigns to each element of the domain exactly one element of the range. If f is a function and x is an element of its domain, then f(x) denotes the output of f corresponding to the input x. The graph of f is the graph of the equation y = f(x)., F-IF.2 Use function notation, evaluate functions for inputs in their domains, and interpret statements that use function notation in terms of a context.*** | * **SMP 2** Reason abstractly and quantitatively.
* **SMP 4** Model with Mathematics.
* **SMP 6** Attend to precision.
* **SMP 8** Look for and express regularity in repeated reasoning.
 | ConstraintsContinuousDiscreteDomainElement FunctionFunction NotationInputOutputRangeRelationSet (Notation) |
|  | **13 Compare and contrast a function and a relation. Use appropriate strategies to assess whether a given situation represents a function or a relation (e.g., the vertical line test).** | * **SMP 1** Make sense of problems and persevere in solving them.
* **SMP 2** Reason abstractly and quantitatively.
* **SMP 3** Construct viable arguments and critique the reasoning of others.
* **SMP 5** Use appropriate tools strategically.
* **SMP 7** Look for and make use of structure.
* **SMP 8** Look for and express regularity in repeated reasoning.
 | Nonlinear Vertical Line Test |
|  | **14 Relate the domain of a function to its graph and, where applicable, to the quantitative relationship it describes. *F-IF.7 Graph functions expressed symbolically and show key features of the graph, by hand in simple cases and using technology for more complicated cases.*** | * **SMP 1** Make sense of problems and persevere in solving them.
* **SMP 2** Reason abstractly and quantitatively.
* **SMP 3** Construct viable arguments and critique the reasoning of others.
* **SMP 5** Use appropriate tools strategically.
* **SMP 7** Look for and make use of structure.
* **SMP 8** Look for and express regularity in repeated reasoning.
 | DomainRange |
| **Unit 7: Linear Functions**(Students learn this skill to be able to interpret a pattern in data or the lack thereof, such as estimating a specific player’s stats or fluctuation in weight.) | **15 Determine the rate of change of a linear function from a description of a relationship or from two (x, y) values, including reading these from a table or from a graph. Use the rate of change to determine if two lines are parallel, perpendicular, or neither. *8.F.4 Construct a function to model a linear relationship between two quantities. Determine the rate of change and initial value of the function from a description of a relationship or from two (x, y) values, including reading these from a table* *or from a graph. Interpret the rate of change and initial value of a linear function in terms of the situation it models, and in terms of its graph or a table of values.*** | * **SMP 1** Make sense of problems and persevere in solving them.
* **SMP 2** Reason abstractly and quantitatively.
* **SMP 3** Construct viable arguments and critique the reasoning of others.
* **SMP 4** Model with Mathematics.
* **SMP 5** Use appropriate tools strategically.
* **SMP 6** Attend to precision.
* **SMP 7** Look for and make use of structure.
* **SMP 8** Look for and express regularity in repeated reasoning.
 | Initial ValueLinear FunctionNegative SlopeNo (Zero) SlopePositive SlopeRate of ChangeRise RunSlope Undefined Slope Y-Intercept |
|  | **16 Interpret the rate of change and initial value of a linear function in terms of the situation it models, and in terms of its graph or a table of values. *8.F.4 Construct a function to model a linear relationship between two quantities. Determine the rate of change and initial value of the function from a description of a relationship or from two (x, y) values, including reading these from a table or from a graph. Interpret the rate of change and initial value of a linear function in terms of the situation it models, and in terms of its graph or a table of values.*** | * **SMP 1** Make sense of problems and persevere in solving them.
* **SMP 2** Reason abstractly and quantitatively.
* **SMP 3** Construct viable arguments and critique the reasoning of others.
* **SMP 4** Model with Mathematics.
* **SMP 5** Use appropriate tools strategically.
* **SMP 6** Attend to precision.
* **SMP 7** Look for and make use of structure.
* **SMP 8** Look for and express regularity in repeated reasoning.
 | Initial ValueLinear FunctionNegative SlopeNo (Zero) SlopePositive SlopeRate of ChangeRise RunSlope Undefined Slope Y-Intercept |
|  | **17 Create and graph the equation of a linear function given the rate of change and y-intercept. Compare and contrast up to three linear functions written in a various form (i.e., point-slope, slope-intercept, standard form).** | * **SMP 2** Reason abstractly and quantitatively.
* **SMP 3** Construct viable arguments and critique the reasoning of others.
* **SMP 4** Model with Mathematics.
* **SMP 7** Look for and make use of structure.
 | Coordinate PlaneCoordinatesOrdered PairsPoint-Slope Form of a Linear FunctionProportional RelationshipsRate of ChangeSlopeSlope-Intercept Form of a Linear Function Standard Form of a Linear Function Y-Intercept |
|  | **18 Given two points, a graph, a table of values, a mapping, or a real-world context determine the linear function that models this information. Fluently convert between the point-slope, slope-intercept, and standard form of a line.** | * **SMP 1** Make sense of problems and persevere in solving them.
* **SMP 5** Use appropriate tools strategically.
* **SMP 6** Attend to precision.
* **SMP 7** Look for and make use of structure.
 | Point-Slope Form of a Linear FunctionRate of ChangeSlopeSlope-Intercept Form of a Linear FunctionStandard Form of a Linear Function Y-Intercept |
|  | **19 Create and identify the parent function for linear and quadratic functions in the Coordinate Plane.** | * **SMP 1** Make sense of problems and persevere in solving them.
* **SMP 2** Reason abstractly and quantitatively.
* **SMP 3** Construct viable arguments and critique the reasoning of others.
* **SMP 4** Model with Mathematics.
* **SMP 5** Use appropriate tools strategically.
* **SMP 6** Attend to precision.
* **SMP 7** Look for and make use of structure.
* **SMP 8** Look for and express regularity in repeated reasoning.
 | DilationLinear FunctionParent FunctionQuadratic FunctionReflectionRotation TransformationTranslation |
|  | **20 Compare the properties of two functions each represented in a different way (algebraically, graphically, numerically in tables, or by verbal descriptions). *For example, given a linear function represented by a table of values and a linear function represented by an algebraic expression, determine which function has the greater rate of change. (Limited to linear and quadratic functions only.) 8.F.2 Compare properties of two functions each represented in a different way (algebraically, graphically, numerically in tables, or by verbal* *descriptions). For example, given a linear function represented by a table of values and a linear function represented by an algebraic expression, determine which function has the greater rate of change.*** | * **SMP 1** Make sense of problems and persevere in solving them.
* **SMP 2** Reason abstractly and quantitatively.
* **SMP 3** Construct viable arguments and critique the reasoning of others.
* **SMP 4** Model with Mathematics.
* **SMP 5** Use appropriate tools strategically.
* **SMP 6** Attend to precision.
* **SMP 7** Look for and make use of structure.
* **SMP 8** Look for and express regularity in repeated reasoning.
 | Initial ValueLinear FunctionMapping Negative SlopeNo (Zero) SlopePositive SlopeRate of ChangeRise RunSlope Undefined Slope Y-Intercept |
|  | **21 Describe the following characteristics of linear and quadratic parent functions by inspection: domain/range, increasing/decreasing intervals, intercepts, symmetry, and asymptotic behavior. Identify each characteristic in set notation or words, where appropriate. *Algebra III, standard 8 Determine characteristics of graphs of parent functions (domain/range, increasing/decreasing intervals, intercepts, symmetry, end behavior, and asymptotic behavior).*** | * **SMP 1** Make sense of problems and persevere in solving them.
* **SMP 2** Reason abstractly and quantitatively.
* **SMP 3** Construct viable arguments and critique the reasoning of others.
* **SMP 7** Look for and make use of structure.
 | DomainIntervalRangeSymmetryX-InterceptY-Intercept |
|  | **26 Perform simple translations on linear functions given in a variety of forms (e.g., two points, a graph, a table of values, a mapping, slope-intercept form, or standard form). Explain the impact on the parent function when the slope is greater than one or less than one and the effect of increasing/decreasing the y-intercept.** | * **SMP 1** Make sense of problems and persevere in solving them.
* **SMP 2** Reason abstractly and quantitatively.
* **SMP 3** Construct viable arguments and critique the reasoning of others.
* **SMP 7** Look for and make use of structure.
 | FunctionHorizontalSlope TransformationTranslationVerticalY-Intercept |
|  | **35 Use the zeros of a polynomial to construct a rough graph of the function. *A-APR.3 Identify zeros of polynomials when suitable factorizations are available and use the zeros to construct a rough graph of the function defined by the polynomial*.** | * **SMP 2** Reason abstractly and quantitatively.
* **SMP 3** Construct viable arguments and critique the reasoning of others.
* **SMP 4** Model with Mathematics.
* **SMP 7** Look for and make use of structure.
 | DegreeFactor ParabolaQuadratic FunctionsVertexX-InterceptsZeros of The Function |

| **TERM 3****UNIT OF STUDY**(REAL-WORLD APPLICATION)**** | **MS CCR STANDARDS** | **STANDARDS FOR MATHEMATICAL PRACTICE (SMPs)** | CORE ACADEMIC **VOCABULARY TERMS** |
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| **Unit 8: Measures of Central** **Tendency and Spread**(This unit will help students to understand how to extract information from data that can lead to analyses and predictions. Mean is used often in sports comparisons, median in economics, and mode in retail supply.) | 40 Without technology, fluently calculate the measures of central tendency (mean, median, mode), measures of spread (range, interquartile range), and understand the impact of extreme values (outliers) on each of these values. *6.SP.5 Recognize a statistical question as one that anticipates variability in the data related to the question and accounts for it in the answers. , 8.SP.1 Construct and interpret scatter plots for bivariate measurement data to investigate patterns of association between two quantities. Describe patterns such as clustering, outliers, positive or negative association, linear association, and nonlinear association, S-ID.3 Interpret differences in shape, center, and spread in the context of the data sets, accounting for possible effects of extreme data points (outliers.* Justify which measure is appropriate to use when describing a data set or a real-world context. | * **SMP 2** Reason abstractly and quantitatively.
* **SMP 3** Construct viable arguments and critique the reasoning of others.
* **SMP 4** Model with Mathematics.
* **SMP 6** Attend to precision.
* **SMP 7** Look for and make use of structure.
* **SMP 8** Look for and express regularity in repeated reasoning.
 | Box-And-Whisker PlotInterquartile RangeMeanMedianModeOutlier Range |
| **Unit 9: Scatter Plots**(Very similar to functions, students learn this skill to be able to interpret a pattern in data or the lack thereof, such as estimating the amount of sunlight needed for optimal plant growth.) | 41 Construct and interpret scatter plots for bivariate measurement data to investigate patterns of association between two quantities. Describe patterns such as clustering, outliers, positive or negative association, linear association, and nonlinear association. *8.SP.1Construct and interpret scatter plots for bivariate measurement data to investigate patterns of association between two quantities. Describe patterns such as clustering, outliers, positive or negative association, linear association, and nonlinear association.* | * **SMP 2** Reason abstractly and quantitatively.
* **SMP 4** Model with Mathematics.
* **SMP 5** Use appropriate tools strategically.
* **SMP 7** Look for and make use of structure.
 | AssociationCorrelationLine of Best FitNegative Correlation No CorrelationPositive CorrelationScatter Plot |
|  | 42 Know when it is and is not appropriate to use a linear model to make predictions about a data set beyond a given set of values. Explain extrapolation and interpolation and the impact both have on predicted values. | * **SMP 2** Reason abstractly and quantitatively.
* **SMP 3** Construct viable arguments and critique the reasoning of others.
* **SMP 4** Model with Mathematics.
* **SMP 7** Look for and make use of structure.
 | Line of Best FitLinear Extrapolation Linear Interpolation |
|  | 43 For scatter plots that suggest a linear association, informally fit a straight line, and predict the equation for the line of best fit. *8.SP.2 Know that straight lines are widely used to model relationships between two quantitative variables. For scatter plots that suggest a linear association, informally fit a straight line, and informally assess the model fit by judging the closeness of the data points to the line.* | * **SMP 1** Make sense of problems and persevere in solving them.
* **SMP 4** Model with Mathematics.
 | Line of Best FitSlopeSlope-Intercept Form of An Equation Y-Intercept |
|  | 44 Justify the relationship between the correlation coefficient and the rate of change for the line of best fit. | * **SMP 1** Make sense of problems and persevere in solving them.
* **SMP 4** Model with Mathematics.
 | Line of Best FitSlopeSlope-Intercept Form of An Equation Y-Intercept |
|  | 45 Understand the difference between correlation and causation and identify real-world contexts that depict each of them. *S-ID.9 Distinguish between correlation and causation.* | * **SMP 2** Reason abstractly and quantitatively.
* **SMP 3** Construct viable arguments and critique the reasoning of others.
* **SMP 8** Look for and express regularity in repeated reasoning.
 | Causation CorrelationScatter Plot |
| **Unit 10: Linear Inequalities in Two Variables**(This skill helps students to find values both inside and outside of a set of constraints to find a desired outcome. Business use these models to calculate the maximum profit and/or the minimum loss when producing a certain product.) | **23 With accuracy, graph the solutions to a linear inequality in two variables as a half-plane, and graph the solution set to a system of linear inequalities in two variables as the intersection of the corresponding half-planes on the same Coordinate Plane. *A-REI.12 Graph the solutions to a linear inequality in two variables as a half-plane (excluding the boundary in the case of a strict inequality), and graph the solution set to a system of linear inequalities in two variables as the intersection of the corresponding half-planes.* Construct graphs of linear inequalities and systems of linear inequalities without technology. Use appropriate strategies to verify points that may or may not belong to the solution set.** | * **SMP 4** Model with Mathematics.
* **SMP 5** Use appropriate tools strategically.
* **SMP 6** Attend to precision.
* **SMP 7** Look for and make use of structure.
 | Boundary Line of a Linear InequalityCoordinate PlaneHalf-PlaneIntersection Linear InequalitySlopeSlope-Intercept Form of a Linear InequalitySystem of Inequalities Y-Intercept |

| **TERM 4****UNIT OF STUDY**(REAL-WORLD APPLICATION)**** | **MS CCR STANDARDS** | **STANDARDS FOR MATHEMATICAL PRACTICE (SMPs)** | CORE ACADEMIC **VOCABULARY TERMS** |
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| **Unit 11: Systems of Linear** **Functions in Two Variables**(This skill teaches students to recognize patterns in functions. This concept is used in calculating federal and state tax liability for corporations.) | **15 Determine the rate of change of a linear function from a description of a relationship or from two (x, y) values, including reading these from a table or from a graph. Use the rate of change to determine if two lines are parallel, perpendicular, or neither. *8.F.4 Construct a function to model a linear relationship between two quantities. Determine the rate of change and initial value of the function from a description of a relationship or from two (x, y) values, including reading these from a table* *or from a graph. Interpret the rate of change and initial value of a linear function in terms of the situation it models, and in terms of its graph or a table of values.*** | * **SMP 7** Look for and make use of structure.
* **SMP 8** Look for and express regularity in repeated reasoning.
 | Linear FunctionParallelPerpendicularRate of ChangeReciprocal Slope |
|  | **22 Graph a system of two functions, *f(*x) and *g*(x), on the same Coordinate Plane by hand for simple cases, and with technology for complicated cases. Explain the relationship between the point(s) of intersection and the solution to the system. Determine the solution(s) using technology, a table of values, substitution, or successive approximations. (Limited to linear and quadratic functions only.) *8.EE.7b Solve linear equations with rational number coefficients, including equations whose solutions require expanding expressions using the distributive property and collecting like terms., A-REI.6 Solve systems of linear equations exactly and approximately (e.g., with graphs), focusing on pairs of linear equations in two variables., A-REI.11 Explain why the x-coordinates of the points where the graphs of the equations y = f(x) and y = g(x) intersect are the solutions of* *the equation f(x) = g(x); find the solutions approximately, e.g., using technology to graph the functions, make tables of values, or find successive approximations. Include cases where f(x) and/or g(x) are linear, polynomial, rational, absolute value, exponential, and logarithmic functions.*** | * **SMP 4** Model with Mathematics.
* **SMP 5** Use appropriate tools strategically.
* **SMP 7** Look for and make use of structure.
* **SMP 8** Look for and express regularity in repeated reasoning.
 | Coordinate PlaneFunctions Quadratic FunctionsSolution Systems of Linear Functions |
|  | **24 Identify real-world contexts that can be modeled by a system of inequalities in two variables. (Limited to three inequalities.)** | * **SMP 4** Model with Mathematics.
* **SMP 5** Use appropriate tools strategically.
* **SMP 6** Attend to precision.
* **SMP 7** Look for and make use of structure.
 | Closed BoundaryCoordinate PlaneHalf-PlaneIntersectionLinear InequalityOpen BoundarySlopeSlope-Intercept Form of a Linear InequalitySystem of Inequalities Y-Intercept |
|  | **25 Identify when systems of equations and inequalities have constraints. *A-CED.3 Represent constraints by equations or inequalities, and by systems of equations and/or inequalities, and interpret solutions as viable or nonviable options in a modeling context. For example, represent inequalities describing nutritional and cost constraints on combinations of different foods.*** | * **SMP 4** Model with Mathematics.
* **SMP 5** Use appropriate tools strategically.
* **SMP 6** Attend to precision.
* **SMP 7** Look for and make use of structure.
 | Constraints Systems of EquationsSystems of Inequalities |
| **Unit 12: Quadratic Equations**(This skill demonstrates the characteristics of a parabola. This can be represented by tossing a ball in the air, shooting a rocket, tossing a stone off a cliff, etc.) | **28 Identify and graph real-world contexts that can be modeled by a quadratic equation.** | * **SMP 2** Reason abstractly and quantitatively.
* **SMP 4** Model with Mathematics.
* **SMP 8** Look for and express regularity in repeated reasoning.
 | Axis of SymmetryMaximum Value Minimum ValueParabola Quadratic EquationsVertex |
|  | **29 Solve quadratic equations in standard form by factoring, graphing, tables, and the Quadratic Formula. Know when the Quadratic Formula might yield complex solutions and the location of the solutions in relationship to the x-axis. Know suitable alternatives for the terminology “solution of a quadratic” and when each is appropriate to use.** | * **SMP 1** Make sense of problems and persevere in solving them.
* **SMP 2** Reason abstractly and quantitatively.
* **SMP 4** Model with Mathematics.
* **SMP 6** Attend to precision.
* **SMP 7** Look for and make use of structure.
 | CoefficientCompleting the SquareConstant Discriminant FactoringQuadratic FormulaStandard Form of a Quadratic EquationSquare Root PropertyZero Product Property |
| **Unit 13: Quadratic Functions**(This skill compares the graphs of quadratics after undergoing a transformation. This can be used to calculate different trajectories of rockets or the arc of a missed and made basketball shot.) | **19 Create and identify the parent function for linear and quadratic functions in the Coordinate Plane.** | * **SMP 1** Make sense of problems and persevere in solving them.
* **SMP 8** Look for and express regularity in repeated reasoning.
 | DilationHorizontalReflectionTranslationVertexVertical |
|  | **21 Describe the following characteristics of linear and quadratic parent functions by inspection: domain/range, increasing/decreasing intervals, intercepts, symmetry, and asymptotic behavior. Identify each characteristic in set notation or words, where appropriate. *Algebra III, standard 8 Determine characteristics of graphs of parent functions (domain/range, increasing/decreasing intervals, intercepts, symmetry, end behavior, and asymptotic behavior).*** | * **SMP 1** Make sense of problems and persevere in solving them.
* **SMP 2** Reason abstractly and quantitatively.
* **SMP 6** Attend to precision.
* **SMP 7** Look for and make use of structure.
 | Asymptote DomainInterceptsIntervalsLine of SymmetryRange |
|  | **27 Given the graph of function in the form *f(*x) + k, k*f*(x), *f*(kx), or *f*(x + k) , where k belongs to the set of integers, identify the domain/range, increasing/decreasing intervals, intercepts, symmetry, and asymptotic behavior, where appropriate. *F-BF.3 Identify the effect on the graph of replacing f(x) by f(x) + k, k f(x), f(kx), and f(x + k) for specific values of k (both positive and negative); find the value of k given the graphs. Experiment with cases and illustrate an explanation of the effects on the graph using technology. Include recognizing even and odd functions from their graphs and algebraic expressions for them.* Identify each characteristic in set notation or as an inequality, where appropriate. (Limited to linear and quadratic functions only.)** | * **SMP 2** Reason abstractly and quantitatively.
* **SMP 3** Construct viable arguments and critique the reasoning of others.
* **SMP 4** Model with Mathematics.
 | Asymptote DomainRangeIntervalsInterceptsLine of Symmetry |
|  | **30 Understand the relationship between the constants of a quadratic equation and the attributes of the graph. Recognize the relationship between the value of the discriminant and the type and number of solutions (i.e., predict the characteristics of a graph given the equation).** | * **SMP 1** Make sense of problems and persevere in solving them.
* **SMP 7** Look for and make use of structure.
 | ConstantDiscriminantQuadratic FormulaX-Intercepts |

1. *https://tntp.org/assets/documents/TNTP\_The-Opportunity-Myth\_Web.pdf* [↑](#footnote-ref-2)