National Center and State Collaborative

Mathematics Instructional Families – Patterns, Relations and Functions

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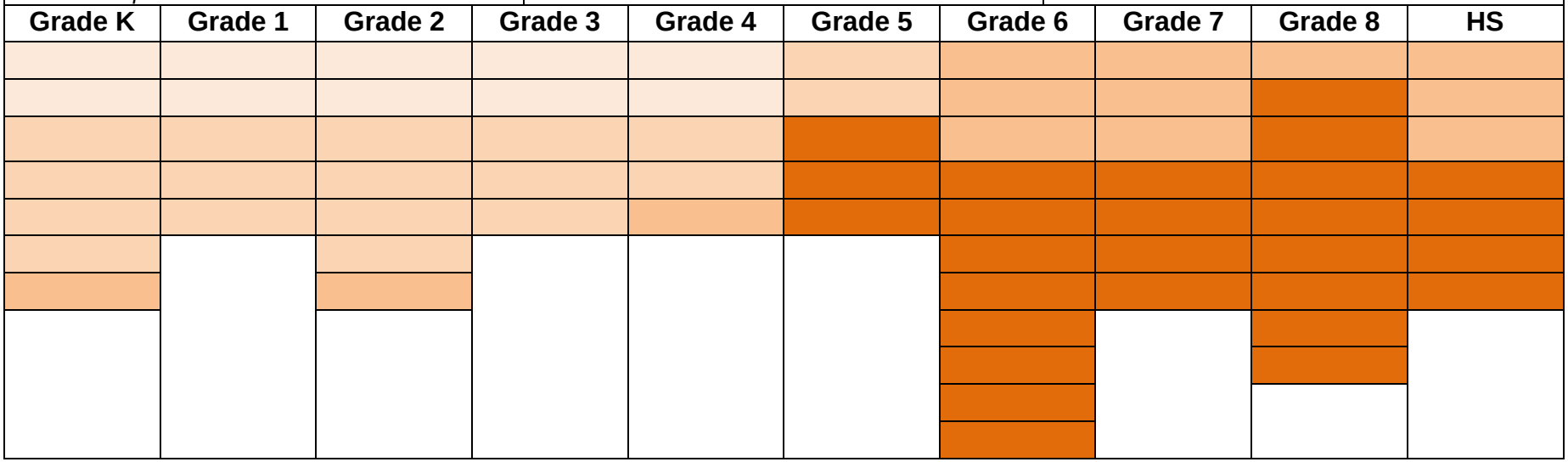
View of Learning Targets and Families across Grades

Distribution of Instructional Families: Patterns, Relations and Functions

(K-4) Elementary School Learning Targets	(5-8) Middle School Learning Targets	(9-12) High School Learning Targets
Use concrete, pictorial, and symbolic representations to identify, describe, compare, and model situations that involve change.	*Describe and compare situations that involve change and use the information to draw conclusions:* • *Model contextual situations using multiple representations;* • *Calculate rates of change for real-world situations (constant)*	*Approximate, calculate, model, and interpret change:* • *Use graphical and numerical data resulting from complex situations;* • *Model complex real-world phenomena to make predictions and provide explanations*
Give examples, interpret, and analyze repeating and growing patterns and functions involving the four basic operations	*Give examples, interpret, and analyze a variety of mathematical patterns, relations, and explicit and recursive functions*	*Use trends and analyze a variety of mathematical patterns, relations, and explicit and recursive functions.*



Representing and Modeling Problems	Describing and Extending Patterns	Problem Solving and Using Variables	Proportional Relationships and Graphing

View of Learning Targets, Families, and Access Points by Grade-band

Overview of Access Points: Patterns, Relations and Functions

Representing and Modeling Problems	Describing and Extending Patterns	Problem Solving and Using Variables		
(K-4) Elementary School Learning Targets				
Use concrete, pictorial, and symbolic representations to identify, describe, compare, and model situations that involve change.				
Give examples, interpret, and analyze repeating and growing patterns and functions involving the four basic operations				
Grade K	**Grade 1**	**Grade 2**	**Grade 3**	**Grade 4**
MAFS.K.OA.1.AP.1a Model with objects or communicate which groups of objects model "add___" or "take away" within 5 objects.	MAFS.1.OA.1.AP.1c Solve one-step addition and subtraction word problems where the change or result is unknown (4 + _ = 7) or (4 + 3 = __), within 20 using objects, drawings or pictures.	MAFS.2.OA.1.AP.1a Solve addition and subtraction word problems within 100 using objects, drawings, or pictures.	MAFS.3.OA.1.AP.1c Use objects to model multiplication involving up to five groups with up to five objects in each.	MAFS.4.OA.1.AP.1a Use objects to model multiplication involving up to five groups with up to five objects in each and write equations to represent the models.
MAFS.K.OA.1.AP.2a Solve one-step addition and subtraction word problems, and add and subtract within 10 using objects, drawings or pictures.		MAFS.2.OA.1.AP.1b Use pictures, drawings or objects to represent the steps of a problem.	MAFS.3.OA.1.AP.2b Use objects to model division situations involving up to five groups, with up to five objects in each group, and interpret the results.	MAFS.4.OA.3.AP.5a Generate a pattern when given a rule.
MAFS.K.OA.1.AP.1a Model with objects or communicate which groups of objects model "add___" or "take away" within 5 objects.		*MAFS.2.OA.1.AP.1c Write or select an equation representing the problems and its solution.*	MAFS.3.OA.2.AP.5a Recognize multiplication as communicative and associative.	MAFS.4.OA.3.AP.5b Extend a numerical pattern when the rule is provided.
			MAFS.3.OA.4.AP.9a Identify and describe the rule for a numerical pattern where numbers increase by 2, 5 or 10.	MAFS.4.OA.1.AP.2a Solve multiplicative comparisons with an unknown using up to two-digit numbers with information presented in a graph or word problem (e.g., an orange hat costs $3. A purple hat costs two times as much. How much does the purple hat cost? [3 x 2 = p]).

			MAFS.3.OA.4.AP.9b Select or name the three next terms in a numerical pattern where numbers increase by 2, 5 or 10. MAFS.3.OA.4.AP.9c Identify multiplication patterns in a real-world setting.	

Overview of Access Points: Patterns, Relations and Functions

Describing and Extending Patterns	Problem Solving and Using Variables	Proportional Relationships and Graphing	
(5-8) Middle School Learning Targets			
Describe and compare situations that involve change and use the information to draw conclusions: • *Model contextual situations using multiple representations;* • *Calculate rates of change for real-world situations (constant)*			
Give examples, interpret, and analyze a variety of mathematical patterns, relations, and explicit and recursive functions			
Grade 5	**Grade 6**	**Grade 7**	**Grade 8**
MAFS.5.OA.2.AP.3a Given two pattern descriptions involving the same context (e.g., collecting marbles), determine the first five terms and compare the values.	MAFS.6.EE.2.AP.7b Solve real-world, single-step linear equations involving positive rational numbers.	MAFS.7.EE.2.AP.3a Solve real-world, multi-step problems using positive and negative rational numbers (whole numbers, fractions and decimals).	MAFS.8.EE.3.AP.7a Simplify linear equations and solve for one variable.
MAFS.5.OA.2.AP.3b Graph ordered pairs on a coordinate plane when given a table that follows patterns rules.	MAFS.6.NS.2.AP.6a Use a variable to represent numbers and write expressions when solving real-world problems.	MAFS.7.EE.2.AP.4a Set up equations with one variable based on real-world problems.	MAFS.8.EE.2.AP.5a Define rise/run (slope) for linear equations plotted on a coordinate plane.
MAFS.5.NF.2.AP.5a Determine whether the product will increase or decrease based on the multiple using visual fraction models.	MAFS.6.EE.3.AP.9b Write an expression that illustrates the relationship between two variables from a provided table.	MAFS.7.EE.2.AP.4b Solve equations with one variable based on real-world problems.	MAFS.8.F.1.AP.3a Identify graphed functions as linear or not linear.
	MAFS.6.RP.1.AP.1b Describe the ratio relationship between two quantities for a given situation using visual representations.	MAFS.7.RP.1.AP.3b Find percentages in real-world contexts.	MAFS.8.F.2.AP.5c Describe or select the relationship between two plotted graphs.
	MAFS.6.EE.3.AP.9a Write an equation using variables to represent two quantities where one variable represents the dependent variable and the second represents the independent variable.		MAFS.8.F.2.AP.4a Identify rise/run (m) as slope and identify the coordinates of the y-intercept.
	MAFS.6.RP.1.AP.1a Write or select a ratio to match a given statement and representation.		MAFS.8.F.2.AP.5a Sketch a graph that exhibits the slope and y-intercept provided.

Describing and Extending Patterns	Problem Solving and Using Variables	Proportional Relationships and Graphing	
(5-8) Middle School Learning Targets			
Describe and compare situations that involve change and use the information to draw conclusions: • *Model contextual situations using multiple representations;* • *Calculate rates of change for real-world situations (constant)*			
Give examples, interpret, and analyze a variety of mathematical patterns, relations, and explicit and recursive functions			
Grade 5	**Grade 6**	**Grade 7**	**Grade 8**
	MAFS.6.RP.1.AP.2a Determine the unit rate in a variety of contextual situations		MAFS.8.SP.1.AP.3a Interpret the slope and the y-intercept of a line in the context of data plotted from a real-world situation.
	MAFS.6.RP.1.AP.3a Use ratios and reasoning to solve real-world mathematical problems (e.g., by reasoning about tables of equivalent ratios, tape diagrams, double number line diagrams, or equations).		

Overview of Access Points: Patterns, Relations and Functions

Problem Solving and Using Variables	Proportional Relationships and Graphing
(9-12) High School Learning Targets	
Approximate, calculate, model, and interpret change: • *Use graphical and numerical data resulting from complex situations;* • *Model complex real-world phenomena to make predictions and provide explanations*	
Use trends and analyze a variety of mathematical patterns, relations, and explicit and recursive functions.	
HS	
MAFS.912.A-CED.1.AP.1a Create linear, quadratic, rational, and exponential equations and inequalities in one variable and use them in a contextual situation to solve problems.	
MAFS.912.A-REI.1.AP.1a Solve equations with one or two variables and explain the process.	
MAFS.912.A-REI.2.AP.3a Solve linear equations in one variable, including coefficients represented by letters.	
MAFS.912.A-CED.1.AP.2a Graph equations in two or more variables on coordinate axes with labels and scales.	
	MAFS.912.S-ID.3.AP.7a Interpret the meaning of the slope and y-intercept in context.
	MAFS.912.F-LE.1.AP.1b In a linear situation using graphs or numbers, predict the change in rate based on a given change in one variable (e.g., If I have been adding sugar at a rate of 1T per cup of water, what happens to my rate if I switch to 2T of sugar for every cup of water?).
	MAFS.912.F-LE.1.AP.1a Select the appropriate graphical representation of a linear model based on real-world events.
	MAFS.912.F-LE.1.AP.3a Compare graphs of linear, exponential, and quadratic growth graphed on the same coordinate plane.

View by Instructional Families Florida Standard Domains

Instructional Families: Patterns, Relations and Functions

Operations and Algebraic Thinking; Measurement and Data	Operations and Algebraic Thinking	Operations and Algebraic Thinking; Expressions and Equations; Seeing Structure in Expressions; Creating Equations; Reasoning with Equations and Inequalities	Operations and Algebraic Thinking; Number Operations-Fractions; Ratios and Proportional Relationships; Expressions and Equations; Functions; Interpreting Categorical and Quantitative Data; Linear, Quadratic and Exponential Models
Representing and Modeling Problems	**Describing and Extending Patterns**	**Problem Solving and Using Variables**	**Proportional Relationships and Graphing**
MAFS.K.OA.1.AP.1a Model with objects or communicate which groups of objects model "add___" or "take away" within 5 objects.	MAFS.3.OA.4.AP.9a Identify and describe the rule for a numerical pattern where numbers increase by 2, 5 or 10.	MAFS.K.OA.1.AP.1a Model with objects or communicate which groups of objects model "add___" or "take away" within 5 objects.	MAFS.5.OA.2.AP.3b Graph ordered pairs on a coordinate plane when given a table that follows patterns rules.
MAFS.K.OA.1.AP.2a Solve one-step addition and subtraction word problems, and add and subtract within 10 using objects, drawings or pictures.	MAFS.3.OA.4.AP.9b Select or name the three next terms in a numerical pattern where numbers increase by 2, 5 or 10.	MAFS.2.OA.1.AP.1c Write or select an equation representing the problems and its solution.	MAFS.5.NF.2.AP.5a Determine whether the product will increase or decrease based on the multiple using visual fraction models
MAFS.1.OA.1.AP.1c Solve one-step addition and subtraction word problems where the change or result is unknown (4 + _ = 7) or (4 + 3 = __), within 20 using objects, drawings or pictures.	MAFS.3.OA.4.AP.9c Identify multiplication patterns in a real-world setting.	MAFS.4.OA.1.AP.2a Solve multiplicative comparisons with an unknown using up to two-digit numbers with information presented in a graph or word problem (e.g., an orange hat costs $3. A purple hat costs two times as much. How much does the purple hat cost? [3 x 2 = p]).	MAFS.6.RP.1.AP.1b Describe the ratio relationship between two quantities for a given situation using visual representations. MAFS.6.EE.3.AP.9a Write an equation using variables to represent two quantities where one variable represents the dependent variable and the second represents the independent variable.
MAFS.2.OA.1.AP.1a Solve addition and subtraction word problems within 100 using objects, drawings, or pictures.		MAFS.6.EE.2.AP.7b Solve real-world, single-step linear equations involving positive rational numbers.	MAFS.6.RP.1.AP.1a Write or select a ratio to match a given statement and representation.
MAFS.2.OA.1.AP.1b Use pictures, drawings or objects to represent the steps of a problem.		MAFS.6.NS.2.AP.6a Use a variable to represent numbers and write expressions when solving real-world problems.	MAFS.6.RP.1.AP.2a Determine the unit rate in a variety of contextual situations

MAFS.3.OA.1.AP.1c Use objects to model multiplication involving up to five groups with up to five objects in each.		MAFS.6.EE.3.AP.9b Write an expression that illustrates the relationship between two variables from a provided table	MAFS.6.RP.1.AP.3a Use ratios and reasoning to solve real-world mathematical problems (e.g., by reasoning about tables of equivalent ratios, tape diagrams, double number line diagrams, or equations).
MAFS.3.OA.1.AP.2b Use objects to model division situations involving up to five groups, with up to five objects in each group, and interpret the results.*3.OA.2*		MAFS.7.EE.2.AP.3a Solve real-world, multi-step problems using positive and negative rational numbers (whole numbers, fractions and decimals).	MAFS.7.RP.1.AP.3b Find percentages in real-world contexts.
MAFS.3.OA.2.AP.5a Recognize multiplication as communicative and associative.		MAFS.7.EE.2.AP.4a Set up equations with one variable based on real-world problems.	MAFS.8.EE.2.AP.5a Define rise/run (slope) for linear equations plotted on a coordinate plane.
MAFS.4.OA.1.AP.1a Use objects to model multiplication involving up to five groups with up to five objects in each and write equations to represent the models.		MAFS.7.EE.2.AP.4b Solve equations with one variable based on real-world problems.	MAFS.8.F.1.AP.3a Identify graphed functions as linear or not linear.
		MAFS.8.EE.3.AP.7a Simplify linear equations and solve for one variable.	MAFS.8.F.2.AP.5c Describe or select the relationship between two plotted graphs.
		MAFS.912.A-CED.1.AP.1a Create linear, quadratic, rational, and exponential equations and inequalities in one variable and use them in a contextual situation to solve problems.	MAFS.8.F.2.AP.4a Identify rise/run (m) as slope and identify the coordinates of the y-intercept.
		MAFS.912.A-REI.1.AP.1a Solve equations with one or two variables and explain the process.	MAFS.8.F.2.AP.5a Sketch a graph that exhibits the slope and y-intercept provided.
		MAFS.912.A-REI.2.AP.3a Solve linear equations in one variable, including coefficients represented by letters.	MAFS.8.SP.1.AP.3a Interpret the slope and the y-intercept of a line in the context of data plotted from a real-world situation.
		MAFS.912.A-CED.1.AP.2a Graph equations in two or more variables on coordinate axes with labels and scales.	MAFS.912.S-ID.3.AP.7a Interpret the meaning of the slope and y-intercept in context.

			MAFS.912.F-LE.1.AP.1b In a linear situation using graphs or numbers, predict the change in rate based on a given change in one variable (e.g., If I have been adding sugar at a rate of 1T per cup of water, what happens to my rate if I switch to 2T of sugar for every cup of water?).
			MAFS.912.F-LE.1.AP.1a Select the appropriate graphical representation of a linear model based on real-world events.
			MAFS.912.F-LE.1.AP.3a Compare graphs of linear, exponential, and quadratic growth graphed on the same coordinate plane.