Mathematics

CPI Links

MATHEMATICS

Standard 4.1 Number and Numerical Operations: All students will develop number sense and will perform standard numerical operations and estimations on all on all types of numbers in a variety of ways.

Numbers and arithmetic operations are what most of the general public think about when they think of mathematics; and, even though other areas like geometry, algebra, and data analysis have become increasingly important in recent years, numbers and operations remain at the heart of mathematical teaching and learning. Facility with numbers, the ability to choose the appropriate types of numbers and the appropriate operations for a given situation, and the ability to perform those operations as well as to estimate their results, are all skills that are essential for modern day life.

STRAND: Number Sense

You MUST CHOOSE only one of the following CPIs:

CPI 4.1.3A2: Demonstrate an understanding of whole number place value concepts		
Essence of the CPI: Understand the concept of whole number place value		
Matched Link	**Near Link**	**Far Link**
♦ **Given a 5-digit number, identify which number is in the ones, tens, hundreds, thousands, or ten thousands place** ♦ **Given different digits, make the largest 3-digit or 4-digit number possible**	♦ **Given three digit numbers, identify which number is in the ones, tens, and hundreds place.** ♦ **Use manipulatives (e.g., base ten blocks, unifix cubes, etc.) to model three digit numbers** ♦ **Given different digits, make the largest two digit number possible**	♦ **Identify one, two and three digit numbers** ♦ **Use manipulatives (e.g., base ten blocks, unifix cubes, etc.) to model one and two digit numbers** ♦ **Given a two digit number, identify which digit is in the ones and tens place**

OR

CPI 4.1.3A5: Understand the various uses of numbers. **• Counting, measuring, labeling (e.g., numbers on baseball uniforms)**		
Essence of the CPI: Understand that numbers have many uses		
Matched Link	**Near Link**	**Far Link**
♦ **Explain how numbers are used to represent specific information (e.g., numbers on classrooms so people can find the room, zip codes so mailmen can deliver mail, etc.)** ♦ **Determine coin amounts up to one dollar (pennies, nickels, dimes, and quarters)** ♦ **Skip count in real world applications (counting large quantities, counting money, telling time, etc.)**	♦ **Count coin amounts using pennies, nickels, and dimes.** ♦ **List 5 different ways numbers are used in everyday life (label classroom, zip codes, tell time, etc.)** ♦ **Determine the total value of coins (pennies, nickels, and dimes) counting by 1s, 5s, and 10s**	♦ **Identify numbers in the environment (room numbers, numbers on clocks, scales, etc.)** ♦ **Match coins to their value**

OR

CPI 4.1.3A6: Compare and order numbers **• Whole numbers through thousands** **• Commonly used fractions (denominators of 2, 3, 4, 5, 6, 8, 10) as part of a whole, as a subset of a set, and as a location on a number line**		
Essence of the CPI: Demonstrate an understanding of numbers by comparing and ordering numbers		
Matched Link	**Near Link**	**Far Link**
♦ **Compare and order 3-digit or 4-digit numbers** ♦ **Place commonly used fractions of different denominators in order on a number line**	♦ **Compare fractions (larger/smaller, more/less)** ♦ **Create a number line with whole numbers** ♦ **Order commonly used fractions of different denominators**	♦ **Compare 2-digit numbers (larger/smaller, more/less)** ♦ **Identify numbers on a number line** ♦ **Sequence whole numbers** ♦ **Identify fractions as a part of a whole, or as a subset of a set** ♦ **Order fractions with the same denominator**

Standard 4.2 Geometry and Measurement: All students will develop spatial sense and the ability to use geometric properties, relationships, and measurement to model, describe, and analyze phenomena.

Spatial sense is an intuitive feel for shape and space. Geometry and measurement both involve describing the shapes we see all around us in art, nature, and the things we make. Spatial sense, geometric modeling, and measurement can help us to describe and interpret our physical environment and to solve problems.

STRAND: Geometric Properties

You MUST CHOOSE only one of the following CPIs:

CPI 4.2.3A1: Identify and describe spatial relationships of two or more objects in space. **• Direction, orientation, and perspectives (e.g., which object is on your left when you are standing here?)** **• Relative shapes and sizes**		
Essence of the CPI: Understand spatial relationships of objects		
Matched Link	**Near Link**	**Far Link**
♦ **Describe objects using near, far, further, farthest** ♦ **Describe objects using big, bigger, biggest or small, smaller, smallest** ♦ **Describe objects location (left/right, inside/outside, above below) from different points of view (e.g., standing at the back of the room facing the front and then standing at front of the room facing the back)**	♦ **Order objects by size (smallest to largest)** ♦ **Compare objects using location (left/right, inside/outside, above/below)** ♦ **Compare objects using perspective (near/far)**	♦ **Match objects of similar shapes (▲~▲)** ♦ **Identify locations (i.e. left and right, in and out, above, below, etc.) in relation to self** ♦ **Compare relative sizes of objects (i.e. larger/smaller, wider/ narrower, taller/shorter, same, etc.)**

OR

CPI 4.2.3A2: Use properties of standard three-dimensional and two dimensional shapes to identify, classify, and describe them. **• Vertex, edge, face, side, angle** **• 3D figures – cube, rectangular prism, sphere, cone, cylinder, and pyramid** **• 2D figures – square, rectangle, circle, triangle, pentagon, hexagon, octagon**		
Essence of the CPI: Apply properties of 2D and 3D shapes to identify, classify and describe them		
Matched Link	**Near Link**	**Far Link**
♦ **Name two-dimensional figures and describe the figures by their sides and angles** ♦ **Name three-dimensional figures and describe them by their faces, edges, and vertices** ♦ **Describe the reasoning or categories that might be used when sorting shapes**	♦ **Identify a vertex, edge, face, side, and angle of geometric figures** ♦ **Determine the number of angles, faces, sides, edges, and/or vertices of given geometric figures Be specific**	♦ **Identify two-dimensional and 3-dimensional figures** ♦ **Identify face, side, vertex, and edge of geometric figures**

OR

CPI 4.2.3A3: Identify and describe relationships among two-dimensional shapes. **• Same size, same shape** **• Lines of symmetry**		
Essence of the CPI: Understand the relationships between 2D shapes		
Matched Link	**Near Link**	**Far Link**
♦ **Identify figures that have lines of symmetry and explain why** ♦ **Identify two-dimensional figures that appear to have the same size and shape**	♦ **Match two-dimensional figures of the same size and shape** ♦ **Identify figures that have lines of symmetry**	♦ **Match figures of the same shape**

Third (3rd) Grade APA CPI Links

STANDARD 4.3 Patterns and Algebra: All students will represent and analyze relationships among variable quantities and solve problems involving patterns, functions, and algebraic concepts and processes.

Algebra is a symbolic language used to express mathematical relationships. Students need to understand how quantities are related to one another, and how algebra can be used to concisely express and analyze those relationships. Modern technology provides tools for supplementing the traditional focus on algebraic procedures, such as solving equations, with a more visual perspective, with graphs of equations displayed on a screen. Students can then focus on understanding the relationship between the equation and the graph, and on what the graph represents in a real-life situation.

Algebra is a gatekeeper for the future study of mathematics, science, the social sciences, business, and a host of other areas. In the past, algebra has served as a filter, screening people out of these opportunities. For New Jersey to be part of the global society, it is important that algebra play a major role in a mathematics program that opens the gates for all students.

STRAND: Patterns

You MUST ASSESS the following CPI:

CPI 4.3.3A1: Recognize, describe, extend, and create patterns.

- Descriptions using words, number sentences/expressions, graphs, tables, variables (e.g., shape, blank, or letter)
- Sequences that stop or that continue infinitely
- Whole number patterns that grow or shrink as a result of repeatedly adding, subtracting, multiplying by, or dividing by a fixed number (e.g., 5, 8, 11, . . . or 800, 400, 200, . . .)
- Sequences can often be extended in more than one way (e.g., the next term after 1, 2, 4, . . . could be 8, or 7, or …)

Essence of the CPI: Recognize, describe, extend and create patterns

Matched Link	Near Link	Far Link
♦ **Create a pattern with a minimum of six terms using numbers by repeatedly adding or subtracting** ♦ **Extend a growing pattern by at least three terms using numbers (e.g., doubling 1, 2, 4, 8…)** ♦ **Given a pattern, explain what type of pattern it is (e.g., this is a pattern because it repeats AB, AB, AB)**	♦ **Create a repeating pattern with a minimum of six terms using objects, figures, colors, sound, etc.** ♦ **Extend a pattern by at least three terms using numbers by repeatedly adding a constant whole number (+1, +2, skip counting, etc.)**	♦ **Recognize a pattern by sorting sets into groups of pattern/not a pattern** ♦ **Extend a repeating pattern by at least three terms (e.g., ABAB; ABBABBA, etc.) using objects, figures, colors, sound, etc.**

Third (3rd) Grade APA CPI Links

STANDARD 4.4 Data Analysis, Probability, and Discrete Math: All students will develop an understanding of the concepts and techniques of data analysis, probability, and discrete mathematics, and will use them to model situations, solve problems, and analyze and draw appropriate inferences from data.

Data analysis, probability, and discrete mathematics are important interrelated areas of applied mathematics. Each provides students with powerful mathematical perspectives on everyday phenomena and with important examples of how mathematics is used in the modern world. Two important areas of discrete mathematics are addressed in this standard; a third area, iteration and recursion, is addressed in Standard 4.3 (Patterns and Algebra).

STRAND: Data Analysis

You MUST CHOOSE only one of the following CPIs:

CPI 4.4.3A1: Collect, generate, organize, and display data in response to questions, claims, or curiosity **• Data collected from the classroom environment**		
Essence of the CPI: Understand, use, and create data displays		
Matched Link	**Near Link**	**Far Link**
♦ **Create a class survey, collect data based on survey and make a graph based on the survey results**	♦ **Given a set of data, make a graph (bar graph, pictograph, table, etc.) to display the information** ♦ **Match a set of data to the correct graph or pictograph**	♦ **Identify two different ways to display specific data** ♦ **Collect data from the class (e.g., who is buying lunch and who brought lunch)**

OR

CPI 4.4.3A2: Read, interpret, construct, analyze, generate questions about, and draw inferences from displays of data **• Pictograph, bar graph, table**		
Essence of the CPI: Understand, use and analyze displays of data and be able to create questions about that data		
Matched Link	**Near Link**	**Far Link**
♦ **Using a bar graph draw inferences about the data (given a graph that indicates that only 2 people chose the Patriots as their favorite team, what was the least favorite team?)** ♦ **Given data displayed in either a bar graph or table , answer questions (such as "how many more…" and "how many less…")** ♦ **Create questions about data displayed in a bar graph or tally chart**	♦ **Answer basic questions using a graph (who had the most, least, etc.)** ♦ **Given data displayed in a pictograph, answer questions about the data.** ♦ **Create questions about data displayed in a pictograph**	♦ **Match a set of data to the correct graph or pictograph** ♦ **Identify a pictograph, bar graph and table** ♦ **Given a bar graph, answer more/less questions about the graph.**

Fourth (4th) Grade APA Prioritized CPI Links

MATHEMATICS

Standard 4.1 Number and Numerical Operations: All students will develop number sense and will perform standard numerical operations and estimations on all on all types of numbers in a variety of ways.

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STRAND: A Number Sense

You MUST CHOOSE only one of the following CPIs:

CPI 4.1.4A3 Demonstrate a sense of the relative magnitude of numbers		
Essence of the CPI: Understand that numbers can be very large or very small (whole numbers through 999,999; commonly used fractions; decimals through hundredths)		
Matched Link	**Near Link**	**Far Link**
♦ **Compare commonly used fractions of different denominators by determining which would be closest/furthest from zero(denominators of 2, 3, 4, 5, 6, 8, 10, 12 or 16)** ♦ **Order decimals representing tenths and hundredths from smallest to largest**	♦ **Order decimals representing tenths from smallest to largest** ♦ **Compare a fraction to a whole** ♦ **Compare a decimal to whole**	♦ **Identify numbers as big or small (10,000 = big, 1 = small)** ♦ **Match a representation of a number (whole number, fractional unit, decimal)to a situation**

OR

Fourth (4th) Grade APA Prioritized CPI Links

CPI 4.1.4A4 Understand the various uses of numbers • Counting, measuring, labeling (e.g., numbers on baseball uniforms), locating (e.g., Room 235 is on the second floor)		
Essence of the CPI: Understand that numbers have many uses		
Matched Link	**Near Link**	**Far Link**
♦ **Explain how numbers are used to show location (e.g., in the room # 214, the 2 tells you the room is on the second floor or in "pod 2", etc.)**	♦ **Explain how numbers are used to represent specific information (numbers on doors to locate rooms in the school)** ♦ **Skip count in real world applications (e.g., counting large, quantities, counting money, telling time, etc.)**	♦ **Use numbers to measure how much time an activity took (e.g., 3 minutes to walk to the cafeteria)** ♦ **Skip count by 2** ♦

OR

CPI 4.1.4A5 Use concrete and pictorial models to relate whole numbers, commonly used fractions, and decimals to each other and to represent equivalent forms of the same number.		
Essence of the CPI: Use models to represent equivalent forms of whole numbers, fractions and decimals		
Matched Link	**Near Link**	**Far Link**
♦ **Illustrate equivalent forms of fractions (e.g.,  ,  , etc.)** ♦ **Illustrate equivalent fractions and decimals** ♦ **Illustrate equivalent forms of fractions, decimals and whole numbers**	♦ **Using models, match a representation of a fraction to an equivalent representation of a decimal** ♦ **Using manipulatives or pictorial models, show how many fractions it takes to make a whole** ♦ **Using manipulatives or pictorial models, show how many decimals it takes to make a whole**	♦ **Match commonly used fractions to the corresponding models** ♦ **Match decimals to the corresponding models** ♦ **Match whole numbers to the corresponding models**

Fourth (4th) Grade APA Prioritized CPI Links

Standard 4.2 Geometry and Measurement: All students will develop spatial sense and the ability to use geometric properties, relationships, and measurement to model, describe, and analyze phenomena.

Spatial sense is an intuitive feel for shape and space. Geometry and measurement both involve describing the shapes we see all around us in art, nature, and the things we make. Spatial sense, geometric modeling, and measurement can help us to describe and interpret our physical environment and to solve problems.

STRAND: C Coordinate Geometry

You MUST CHOOSE only one of the following CPIs:

CPI 4.2.4C1 Locate and name points in the first quadrant on a coordinate grid.		
Essence of the CPI: Identify and locate points on a coordinate grid, first quadrant only.		
Matched Link	**Near Link**	**Far Link**
♦ **Use whole number ordered pairs to locate a point on a coordinate gride given the coordinates [e.g., ordered pair (4,2)]** ♦ **Given a point on thecoordinate grid, identify the coordinates (ordered pairs)**	♦ **Label the positive x and positive y axes of a coordinate grid** ♦ **Locate points on the positive x-axis of a coordinate grid** ♦ **Locate points on the positive y-axis of a coordinate grid**	♦ **Use a number line to count and order numbers horizontally on the x-axis** ♦ **Use a number line to count and order numbers vertically on t he y-axis**

OR

CPI 4.2.4C2 Use coordinates to give or follow directions from one point to another on a map or grid		
Essence of the CPI: Given a starting point, use coordinates to get from one point to another in the first quadrant of a map or grid		
Matched Link	**Near Link**	**Far Link**
♦ **Given the coordinates of starting point A and end point B, quantify the horizontal units moved and then vertical units moved to reach end point B** ♦ **State the coordinates of a starting point A and end point B and quantify the horizontal units moved and then vertical units moved to reach end point B**	♦ **Use coordinates to find and label a point on a grid over a map** ♦ **Identify the coordinates of a given point/place on a grid over a map**	♦ **Quantify the horizontal movement from start point to end point on a grid over a map** ♦ **Quantify the vertical movement from start point to end point on a grid over a map**

Fourth (4th) Grade APA Prioritized CPI Links

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STRAND: D Procedures

You MUST CHOOSE only one of the following CPIs:

CPI 4.3.4D1 Understand, name, and apply the properties of operations and numbers
- Commutative (e.g., 3 x 7 = 7 x 3)
- Identity element for multiplication is 1 (e.g., 1 x 8 = 8)
- Associative (e.g., 2 x 4 x 25 can be found by first multiplying 2 x 4 or 4 x 25)
- Division by zero is undefined
- Any number multiplied by zero is zero

Essence of the CPI: Identify, understand and use the following properties of operations: commutative property; identity element for multiplication; associative property; division by zero; multiplication by zero.

Matched Link	Near Link	Far Link
♦ **Use commutative and identity properties to solve multiplication problems** ♦ **Use associative property to solve 2 step multiplication problems**	♦ **Use manipulatives to demonstrate the following properties of multiplication: commutative, identity, associative, or multiplication by zero** ♦ **Match at least 3 different properties (commutative, identity, multiplication by zero, etc.) to examples of that property (3x7=7x3, 1x8=8, 8x0=0, etc.)**	♦ **Use manipulatives to show the commutative property of addition (2 + 1 = 1 + 2) and multiplication (3 x 9 = 9 x 3)** ♦ **Use fact families to identify which operations are commutative**

OR

Fourth (4th) Grade APA Prioritized CPI Links

CPI 4.3.4D2 Understand and use the concepts of equals, less than, and greater than in simple number sentences. • Symbols (=, <, >)		
Essence of the CPI: Understand and apply the concept of equals, less than, and greater than in number sentences		
Matched Link	**Near Link**	**Far Link**
♦ **Use =, <,** and > to complete simple number sentences (e.g., 4 + 3 ____ 3 + 5) ♦ **Create own number sentences using >, <, and =**	♦ **Use =, <,** and > to compare numbers (e.g., 5 > 7, 5 = 5)	♦ **Identify <, > and = signs** ♦ **Given two numbers identify which is greater, less, or the same** ♦ **Given two sets, identify which has more, less or the same amount**

Fourth (4th) Grade APA Prioritized CPI Links

STANDARD 4.4 Data Analysis, Probability, and Discrete Math: All students will develop an understanding of the concepts and techniques of data analysis, probability, and discrete mathematics, and will use them to model situations, solve problems, and analyze and draw appropriate inferences from data.

Data analysis, probability, and discrete mathematics are important interrelated areas of applied mathematics. Each provides students with powerful mathematical perspectives on everyday phenomena and with important examples of how mathematics is used in the modern world. Two important areas of discrete mathematics are addressed in this standard; a third area, iteration and recursion, is addressed in Standard 4.3 (Patterns and Algebra).

STRAND: C Discrete Mathematics – Systematic Listing and Counting

You MUST CHOOSE only one of the following CPIs:

CPI 4.4.4C1 Represent and classify data according to attributes, such as shape or color and relationships. • Venn diagram • Numerical and alphabetical order		
Essence of the CPI: Analyze information based on details such as shape, color or relationships		
Matched Link	**Near Link**	**Far Link**
♦ **Given a Venn diagram, analyze information and identify shared and distinct attributes** ♦ **Locate objects (in class, in school, etc.) based on attributes and list alphabetically (e.g., find all round white objects in the room: baseball, clock, dot sticker, etc.)**	♦ **Sort objects into groups based on 2 or more attributes (e.g., shape, color, and size, etc.)** ♦ **Create a venn diagram illustrating distinct attributes of given objects**	♦ **Identify what the different parts of a Venn diagram indicate (e.g., shared characteristics)** ♦ **Sort objects into groups based on one attribute** ♦ **Arrange objects in order according to properties of size (smallest to largest), or number (most to least; least to most), or length (shortest to longest), or weight (light to heavy) or texture (smooth to rough)**

OR

Fourth (4th) Grade APA Prioritized CPI Links

CPI 4.4.4C2 Represent all possibilities for a simple counting situation in an organized way and draw conclusions from this representation.

- Organized lists, charts, tree diagrams
- Dividing into categories (e.g., to find the total number of rectangles in a grid, find the number of rectangles of each size and add the results)

Essence of the CPI: List and understand all possibilities for a counting situation or Represent in an organized way, all possibilities in a counting situation

Matched Link	Near Link	Far Link
♦ **Create a tree diagram outlining all possibilities in a simple counting situation and then determine the number of possibilities** ♦ **Determine the number of possibilities in a simple counting situation using two different methods to compare the results**	♦ **Follow a simple 2 or 3 level tree diagram to list all possible answers in a simple counting situation**	♦ **Using manipulatives, generate all possibilities for a simple counting situation (e.g., all outfits involving two shirts and three pants)** ♦ **Use a pattern to systematically list all possibilities for a simple counting situation (e.g., given the letters BLUE, what are all the possible combinations?**

B	L	U	E
BLUE	LUEB	UEBL	EBLU
BUEL	LEBU	UBLE	ELUB
BELU	LBUE	ULEB	EUBL
…	…	…	...

etc.)

Fifth (5th) Grade APA Prioritized CPI Links

MATHEMATICS

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Numbers and arithmetic operations are what most of the general public think about when they think of mathematics; and, even though other areas like geometry, algebra, and data analysis have become increasingly important in recent years, numbers and operations remain at the heart of mathematical teaching and learning. Facility with numbers, the ability to choose the appropriate types of numbers and the appropriate operations for a given situation, and the ability to perform those operations as well as to estimate their results, are all skills that are essential for modern day life.

STRAND: Numerical Operations

You MUST CHOOSE only one of the following CPIs:

<table>
<tr><td colspan="3">CPI 4.1.5B2 Construct, use, and explain procedures for performing addition and subtraction with fractions and decimals with:
Pencil-and-paper
Mental math
calculator</td></tr>
<tr><td colspan="3">Essence of the CPI: Understand, use and explain procedures for adding and subtracting decimals and fractions</td></tr>
<tr><th>Matched Link</th><th>Near Link</th><th>Far Link</th></tr>
<tr><td>♦ Add or subtract fractions of different denominators using paper, pencil and student drawn models
♦ Add or subtract decimals with different place values using paper, pencil and student drawn models
♦ Explain the procedure for adding or subtracting decimals (e.g., list steps, write paragraph, illustrate, etc.)</td><td>♦ Use manipulatives to add or subtract decimals with different place values
♦ Order steps/procedures for adding or subtracting fractions with common denominators
♦ Order steps/procedures for adding or subtracting decimals</td><td>♦ Use manipulatives to add or subtract fractions with common denominators
♦ Use manipulatives to add or subtract decimals of the same place value
♦ Follow steps/procedures to add or subtract fractions with common denominators
♦ Follow steps/procedures to add or subtract decimals of the same place value</td></tr>
</table>

OR

Fifth (5th) Grade APA Prioritized CPI Links

CPI 4.1.5B3 Use an efficient and accurate pencil-and-paper procedure for division of a 3-digit number by a 2-digit number.		
Essence of the CPI: Divide 3-digit numbers by 2-digit numbers		
Matched Link	**Near Link**	**Far Link**
♦ **Evaluate division problems that have 2 digit divisors** ♦ **Divide numbers using student drawn models and/or mental math**	♦ **Evaluate problems that have single digit divisors** ♦ **Use manipulatives to model basic division problems (we have a pizza cut into 12 pieces and four students—how many pieces of pizza does each student get if they share equally?)**	♦ **Identify the divisor** ♦ **Identify the dividend** ♦ **Correctly set up a division problem (either on a calculator, paper/pencil, or numbers paired with objects)**

OR

CPI 4.1.5B5 Check the reasonableness of results of computations.		
Essence of the CPI: Check an answer to see if it makes sense		
Matched Link	**Near Link**	**Far Link**
♦ **After completing a problem use the inverse operation to check your work (10 x 3 = 30, 30/10 = 3)** ♦ **Use fact families to check the reasonableness of an answer and explain why the answer does or does not make sense** ♦ **Compute addition and subtraction with fractions and decimals by rounding up/down and check the reasonableness of this procedure**	♦ **Given a problem, approximate the answer and solve the problem to check the reasonableness**	♦ **Identify sum and difference** ♦ **Identify product and quotient** ♦ **Identify divisor and dividend** ♦ **Complete fact families**

Fifth (5th) Grade APA Prioritized CPI Links

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STRAND: Geometric Properties

You MUST CHOOSE only one of the following CPIs:

<table>
<tr><td colspan="3">CPI 4.2.5A2 Identify, describe, compare, and classify polygons.
Triangles by angles and sides
Quadrilaterals, including squares, rectangles, parallelograms, trapezoids, rhombi
Polygons by number of sides
Equilateral, equiangular, regular
All points equidistant from a given point form a circle</td></tr>
<tr><td colspan="3">Essence of the CPI: Identify, describe, compare, and classify polygons</td></tr>
<tr><th>Matched Link</th><th>Near Link</th><th>Far Link</th></tr>
<tr><td>♦ Match equilateral triangles, equilateral polygons and regular polygons to their definitions
♦ Compare and classify triangles (acute, right, obtuse)
♦ Compare and classify quadrilateral by attributes (e.g., angles and sides)</td><td>♦ Compare shapes by how many sides and angles they have
♦ Compare/sort regular and non-regular polygons
♦ Identify parallelograms and rhombi
♦ Match triangles by angles (e.g., acute, right, obtuse)
♦ Match triangles by sides (e.g., equilateral, scalene, isosceles)</td><td>♦ Match like shapes
♦ Identify rectangles, squares, and trapezoids
♦ Use manipulatives (e.g., geoboards; graph paper; etc.) to create different quadrilaterals
♦ Identify and name a regular triangle and a regular quadrilateral</td></tr>
</table>

OR

Fifth (5th) Grade APA Prioritized CPI Links

CPI 4.2.5A3 Identify similar figures		
Essence of the CPI: Identify the geometrical concept of similarity		
Matched Link	**Near Link**	**Far Link**
♦ **Provide examples of similar figures** ♦ **Identify figures as similar or congruent**	♦ **Match figures that appear to be the same shape but different sizes (corresponding angles that are congruent and sides that are proportional)**	♦ **Match regular shapes that appear to be the same shape but different size (e.g., squares, circles, equilateral triangles, etc.)**

OR

CPI 4.2.5A4 Understand and apply the concepts of congruence and symmetry (line and rotational)		
Essence of the CPI: Understand and apply the ideas of congruence and symmetry		
Matched Link	**Near Link**	**Far Link**
♦ **Identify congruent sides and angles between two figures** ♦ **Create lines of symmetry in congruent figures that have been rotated** ♦ **Illustrate and explain that a line of symmetry divides a figure into two congruent parts**	♦ **Match a figure to its reflection to demonstrate congruence** ♦ **Use manipulatives to demonstrate rotational symmetry**	♦ **Match figures that are the same size and shape (congruent)** ♦ **Draw lines of symmetry on various figures** ♦ **Distinguish congruent shapes from non-congruent shapes**

Fifth (5th) Grade APA Prioritized CPI Links

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STRAND: Functions and Relationships

You MUST CHOOSE only one of the following CPIs:

CPI 4.3.5B1 Describe arithmetic operations as functions, including combining operations and reversing them		
Essence of the CPI: Understand the concept of functions		
Matched Link	**Near Link**	**Far Link**
♦ **Complete input/output tables (both input and output cells)** ♦ **Complete an input/output table and explain the rule (relationship between the numbers) in words or with variables**	♦ **Complete a simple input/output table** ♦ **Combine two functions and find the output for a given input**	♦ **Define a mathematical relation** ♦ **Use a T-chart to solve a problem** ♦ **Define a function**

OR

CPI 4.3.5B2 Graph points satisfying a function from T-charts, from verbal rules, and from simple equations		
Essence of the CPI: Graph a function		
Matched Link	**Near Link**	**Far Link**
♦ **Complete a T-Chart and graph ordered pairs**	♦ **Create ordered pairs from a completed T-chart**	♦ **Given ordered pairs, graph points on a coordinate grid** ♦ **Locate points on a coordinate grid**

Fifth (5th) Grade APA Prioritized CPI Links

STANDARD 4.4 Data Analysis, Probability, and Discrete Math: All students will develop an understanding of the concepts and techniques of data analysis, probability, and discrete mathematics, and will use them to model situations, solve problems, and analyze and draw appropriate inferences from data.

Data analysis, probability, and discrete mathematics are important interrelated areas of applied mathematics. Each provides students with powerful mathematical perspectives on everyday phenomena and with important examples of how mathematics is used in the modern world. Two important areas of discrete mathematics are addressed in this standard; a third area, iteration and recursion, is addressed in Standard 4.3 (Patterns and Algebra).

STRAND: Data Analysis

You MUST CHOOSE only one of the following CPIs:

CPI 4.4.5A1 Collect, generate, organize and display data • Data generated from surveys		
Essence of the CPI: Collect, create, organize and display data		
Matched Link	**Near Link**	**Far Link**
♦ **Collect data from a survey and create a circle or line graph to display the data** ♦ **Create a survey, collect data based on survey and make a line or circle graph based on the survey results**	♦ **Collect data from a survey and organize the information in a frequency table** ♦ **Create a survey, collect data based on survey and make a bar graph based on the survey results**	♦ **Given a set of data, make a graph (bar graph, pictograph, table, etc.) to display the information** ♦ **Match a set of data to the correct bar graph or pictograph** ♦ **Conduct a survey** ♦ **Collect data from a survey**

OR

Fifth (5th) Grade APA Prioritized CPI Links

CPI 4.4.5A2 Read, interpret, select, construct, analyze, generate questions about, and draw inferences from displays of data. • Bar graph, line graph, circle graph, table • Range, median and mean		
Essence of the CPI: interpret, select, construct, analyze, generate questions about and draw inferences from displays of data		
Matched Link	**Near Link**	**Far Link**
♦ **Create a circle graph and answer inference questions about it (e.g., based on our preferences, what color would sell the most cars? Why?)** ♦ **Answer questions about range, median and mode from data displayed in a line or circle graph**	♦ **Answer simple questions about data displayed in a bar graph based on mean and/or median (who had more?, how many are ___?)**	♦ **Identify bar, line, and circle graphs** ♦ **Identify range, median and mean from an established set of data** ♦ **Answer simple questions about data displayed in a bar graph based on the mode (who had more?, who had less ___?)**

OR

CPI 4.4.5A3 Respond to questions about data and generate their own questions and hypotheses.		
Essence of the CPI: Create questions and hypotheses about data		
Matched Link	**Near Link**	**Far Link**
♦ **Create a hypothesis about data (e.g., why there might be an outlier in the data)** ♦ **Create questions about a set of data** ♦ **Make a prediction about an event (e.g., the election) based on data**	♦ **Answer questions about data that require equations (e.g., how many more? What is the mean? Etc.)** ♦ **Use a graph to prove or disprove a hypothesis**	♦ **Define a hypothesis** ♦ **Answer basic questions about data (how many? Which is the fewest?, etc.)**

Sixth (6th) Grade APA Prioritized CPI Links

MATHEMATICS

Standard 4.1 Number and Numerical Operations: All students will develop number sense and will perform standard numerical operations and estimations on all on all types of numbers in a variety of ways.

Numbers and arithmetic operations are what most of the general public think about when they think of mathematics; and, even though other areas like geometry, algebra, and data analysis have become increasingly important in recent years, numbers and operations remain at the heart of mathematical teaching and learning. Facility with numbers, the ability to choose the appropriate types of numbers and the appropriate operations for a given situation, and the ability to perform those operations as well as to estimate their results, are all skills that are essential for modern day life.

STRAND: Numerical Operations

You MUST CHOOSE only one of the following CPIs:

CPI 4.1.6 B1 Recognize the appropriate use of each arithmetic operation in problem situations.		
Essence of the CPI: Understand when to use arithmetic operations		
Matched Link	**Near Link**	**Far Link**
♦ **Given a word problem, identify which operation should be used** ♦ **Given a real life situation, identify which operation would be used to solve the problem, and set up the number sentence**	♦ **Match the operational symbol (+, —, x, etc.) to key terms in word problems (e.g., how many in all, how many more, total, times, etc.) to identify the operation**	♦ **Match the purpose of an operation to that operation (e.g., addition – combine; subtraction – separate; multiplication – combine groups; division – equal or fair sharing)**

OR

Sixth (6th) Grade APA Prioritized CPI Links

CPI 4.1.6B2 Construct, use, and explain procedures for performing calculations with fractions and decimals with: • Pencil-and-paper • Mental math • Calculator		
Essence of the CPI: Understand, use and explain how to calculate with fractions and decimals		
Matched Link	**Near Link**	**Far Link**
♦ **Multiply or divide fractions using paper, pencil and student drawn models** ♦ **Multiply or divide decimals using paper, pencil and student drawn models** ♦ **Construct and use procedures for solving word problems involving fractions** ♦ **Construct and use procedures for solving word problems involving decimals**	♦ **Use manipulatives to multiply or divide fractions** ♦ **Use manipluatives to multiply or divide decimals** ♦ **Add or subtract fractions of different denominators using paper, pencil and student drawn models** ♦ **Add or subtract decimals with different place values using paper, pencil and student drawn models**	♦ **Add and subtract fractions with like denominators** ♦ **Subtract fractions with like denominators** ♦ **Follow steps/procedures to add and subtract decimals with different place values**

OR

Sixth (6th) Grade APA Prioritized CPI Links

CPI 4.1.6B7 Understand and use the various relationships among operations and properties of operations.		
Essence of the CPI: Understand and use the rules (properties) and relationships of operations to solve problems.		
Matched Link	**Near Link**	**Far Link**
♦ **Recognize that the product of a number and its reciprocal is one** ♦ **Identify the use of the distributive property of multiplication over addition (e.g., 28x5=20x5+8x5) or multiplication over subtraction (e.g., 28x5=30x5-2x5)**	♦ **Use multiplication to check answers to division problems** ♦ **Use division to check answers to multiplication problems** ♦ **Given a numerical expression, use associative property to rewrite an equivalent numerical expression**	♦ **Identify the use of commutative and identity properties in addition and/or multiplication** ♦ **Identify the use of associative properties in addition and multiplication** ♦ **Identify that any number multiplied by zero is zero and that division by zero is undefined** ♦ **Given a numerical expression, use the commutative property (4 x 6 = 6 x 4) and the identity property (6 x 1 = 6) to rewrite an equivalent numerical expression**

Sixth (6th) Grade APA Prioritized CPI Links

Standard 4.2 Geometry and Measurement: All students will develop spatial sense and the ability to use geometric properties, relationships, and measurement to model, describe, and analyze phenomena.

Spatial sense is an intuitive feel for shape and space. Geometry and measurement both involve describing the shapes we see all around us in art, nature, and the things we make. Spatial sense, geometric modeling, and measurement can help us to describe and interpret our physical environment and to solve problems.

STRAND: D. Units of Measurement

You MUST CHOOSE only one of the following CPIs:

CPI 4.2.6D1 Select and use appropriate units to measure angles, area, surface area, and volume.		
Essence of the CPI: Select the appropriate units and use the appropriate units to measure angles, area, surface area and volume.		
Matched Link	**Near Link**	**Far Link**
♦ **Select and use the appropriate units to measure angles (e.g., degrees)** ♦ **Select and use the appropriate units to measure area (square units)** ♦ **Select and use the appropriate units to measure surface area (square units)** ♦ **Select and use the appropriate units to measure volume (cubic units)**	♦ **Identify appropriate measurement units for area, surface area, and volume**	♦ **Demonstrate an understanding of area (e.g., by covering a desk with square inch or square centimeter tiles)** ♦ **Demonstrate an understanding of volume (e.g., by filling a box with inch or centimeter cubes)** ♦ **Demonstrate an understanding of surface area (e.g., by covering all sides of a box with square inch or square centimeter tiles)**

OR

Sixth (6th) Grade APA Prioritized CPI Links

CPI 4.2.6D2 Use a scale to find a distance on a map or a length on a scale drawing.		
Essence of the CPI: Use scale on a map or scale drawing		
Matched Link	**Near Link**	**Far Link**
♦ **Use a scale on a scale drawing (map) to determine actual distances**	♦ **Calculate the distance between points on a map using a scale** ♦ **Calculate the length between points on a scale drawing using a scale**	♦ **Identify a scale on a map** ♦ **Identify a scale on a scale drawing**

OR

CPI 4.2.6D5 Use measurements and estimates to describe and compare phenomena.		
Essence of the CPI: Solve problems using measurements and estimates in practical situations.		
Matched Link	**Near Link**	**Far Link**
♦ **Use measurements of one phenomena to make estimates of another phenomena (e.g., using rain measurements, estimate how much snow might have fallen if the temperature had dropped below freezing)** ♦ **Solve real-life problems using estimated measurements (e.g., using past energy usage to estimate next month's energy bill).**	♦ **Estimate the distance from one point to another using standard units of measurement (e.g. inches, feet, yards)and compare it to the actual measurement (e.g., estimate how many yards it is from your desk to the wall)**	♦ **Estimate the distance from one point to another using non-standard units of measurement (e.g. compare the number of footsteps it takes to go from the classroom to the cafeteria vs. the classroom to the gym)**

Sixth (6th) Grade APA Prioritized CPI Links

STANDARD 4.3 Patterns and Algebra: All students will represent and analyze relationships among variable quantities and solve problems involving patterns, functions, and algebraic concepts and processes.

Algebra is a symbolic language used to express mathematical relationships. Students need to understand how quantities are related to one another, and how algebra can be used to concisely express and analyze those relationships. Modern technology provides tools for supplementing the traditional focus on algebraic procedures, such as solving equations, with a more visual perspective, with graphs of equations displayed on a screen. Students can then focus on understanding the relationship between the equation and the graph, and on what the graph represents in a real-life situation.

Algebra is a gatekeeper for the future study of mathematics, science, the social sciences, business, and a host of other areas. In the past, algebra has served as a filter, screening people out of these opportunities. For New Jersey to be part of the global society, it is important that algebra play a major role in a mathematics program that opens the gates for all students.

STRAND: C. Modeling

You MUST CHOOSE only one of the following CPIs:

<table>
<tr><td colspan="3">CPI 4.3.6C1 Use patterns, relations, and linear functions to model situations.
Using variables to represent unknown quantities
Using concrete materials, tables, graphs, verbal rules, algebraic expressions,/equations/inequalities</td></tr>
<tr><td colspan="3">Essence of the CPI: Use charts, patterns, algebraic expressions, and linear functions to model situations</td></tr>
<tr><th>Matched Link</th><th>Near Link</th><th>Far Link</th></tr>
<tr><td>♦ Given a word problem, model the situation and translate it into an algebraic expression, equation, or inequality</td><td>♦ Given a verbal rule (e.g., the pattern is plus 7, what is n?) write the situation algebraically (e.g., n=x+7).
♦ Given a completed function table that models a situation, represent the information in a line graph
♦ Create a function table to model a given situation (e.g., A person earns $12.00 a week, how many weeks will it take to save enough money to purchase an item that costs $50.00) and choose the correct number sentence that represents that problem</td><td>♦ Solve simple algebraic equations involving any one operation (e.g., 3 x n = 18 or 2x = 4 or 16 – c = 7)
♦ Complete a simple input/output table
♦ Evaluate algebraic expressions (if a=6, evaluate 3a)</td></tr>
</table>

OR

Sixth (6th) Grade APA Prioritized CPI Links

CPI 4.3.6C2 Draw freehand sketches of graphs that model real phenomena and use such graphs to predict and interpret events.

- Changes over time
- Relations between quantities
- Rates of change (e.g., when is plant growing slowly/rapidly, when is temperature dropping most rapidly/slowly)

Essence of the CPI: Use graphs to represent, predict and interpret real phenomena

Matched Link	Near Link	Far Link
♦ **Create a graph that shows a relationship (e.g., pay and hours worked) and describe how change in one physical quantity can produce a corresponding change in another (e.g., the more I work, the more I get paid)**	♦ **Given a graph change over time (e.g., the daily temperature, growth/height over a period of time, etc.)**	♦ **Create a graph that shows a relationship between two things (e.g., supply and demand) answer questions about how one variable (supply) affects the other (demand)**

Sixth (6th) Grade APA Prioritized CPI Links

STANDARD 4.4 Data Analysis, Probability, and Discrete Math: All students will develop an understanding of the concepts and techniques of data analysis, probability, and discrete mathematics, and will use them to model situations, solve problems, and analyze and draw appropriate inferences from data.

Data analysis, probability, and discrete mathematics are important interrelated areas of applied mathematics. Each provides students with powerful mathematical perspectives on everyday phenomena and with important examples of how mathematics is used in the modern world. Two important areas of discrete mathematics are addressed in this standard; a third area, iteration and recursion, is addressed in Standard 4.3 (Patterns and Algebra).

STRAND: Discrete Mathematics- Systematic Listing and Counting

You MUST CHOOSE only one of the following CPIs:

<table>
<tr><td colspan="3">CPI 4.4.6C1 Solve counting problems and justify that all possibilities have been enumerated without duplication.
Organized lists, charts, tree diagrams, tables
Venn diagrams</td></tr>
<tr><td colspan="3">Essence of the CPI: Solve and explain counting problems</td></tr>
<tr><th>Matched Link</th><th>Near Link</th><th>Far Link</th></tr>
<tr><td>♦ Create an organized list of all possibilities and show that all possibilities are present without duplication</td><td>♦ Complete a 4-level tree diagram, at the least, outlining all possibilities in a counting situation and show that all possibilities are present without duplication
♦ Illustrate a counting problem using a Venn diagram</td><td>♦ Follow a simple 3 level tree diagram to list all possible answers
♦ Given a Venn diagram, analyze information and identify shared and distinct attributes</td></tr>
</table>

OR

Sixth (6th) Grade APA Prioritized CPI Links

CPI 4.4.6C2 Apply the multiplication principle of counting.

- Simple situations (e.g., you can make 3 x 4 = 12 outfits using 3 shirts and 4 skirts).
- Number of ways a specified number of items can be arranged in order (concept of permutation)
- Number of ways of selecting a slate of officers from a class (e.g., if there are 23 students and 3 officers, the number is 23 x 22 x 21)

Essence of the CPI: Apply the multiplication principle of counting

Matched Link	Near Link	Far Link
♦ **Apply the multiplication principle of counting in real life situations** ♦ **Determine the number of ways of arranging in order a small group selection from a large group example** **Example: If we have 5 runners in a race and 3 place medals will be given, we will find that** • **5 runners can possibly win first place** • **4 runners are now available to win 2nd place** • **3 runners are now available to win 3rd place** ♦ **Explain mathematically how many ways we can arrange in order the runners for 1st, 2nd, 3rd place medals** **5 x 4 x 3 = 60 possible arrangements 1st 2nd 3rd**	♦ **Use manipulatives to show how many different ways a set of items can be arranged (e.g., 2 shirts and 4 pairs of pants) and then determine the simple multiplication problem that represents the situation** ♦ **Match examples and non-examples of the concept of permutation**	♦ **Use manipulatives to show how many different ways a set of items can be arranged (e.g., 2 shirts and 4 pairs of pants)** ♦ **Evaluate a factorial expression (e.g., 4!=4x3x2x1)**

OR

Sixth (6th) Grade APA Prioritized CPI Links

CPI 4.4.6C3 List the possible combinations of two elements chosen from a given set (e.g., forming a committee of two from a group of 12 students, finding how many handshakes there will be among ten people if everyone shakes each other person's hand once).		
Essence of the CPI: List possible combinations of the elements from a single set		
Matched Link	**Near Link**	**Far Link**
♦ **List the possible combinations of two elements chosen from a set of 10 or more (e.g., list all possibilities for 2 officers elected from the class)**	♦ **List all possible combinations of two elements chosen from a set of 5**	♦ **Identify all members of a set** ♦ **Match pairs of objects from a set**

Seventh (7th) Grade APA Prioritized CPI Links

MATHEMATICS

Standard 4.1 Number and Numerical Operations: All students will develop number sense and will perform standard numerical operations and estimations on all on all types of numbers in a variety of ways.

Numbers and arithmetic operations are what most of the general public think about when they think of mathematics; and, even though other areas like geometry, algebra, and data analysis have become increasingly important in recent years, numbers and operations remain at the heart of mathematical teaching and learning. Facility with numbers, the ability to choose the appropriate types of numbers and the appropriate operations for a given situation, and the ability to perform those operations as well as to estimate their results, are all skills that are essential for modern day life.

STRAND: A. Number Sense

You MUST CHOOSE only one of the following CPIs:

CPI 4.1.7A3 Understand and use ratios, proportions, and percents (including percents greater than 100 and less than 1) in a variety of situations.		
Essence of the CPI: Understand and use ratios, proportions and percents		
Matched Link	**Near Link**	**Far Link**
♦ **Given a situation represent it as a ratio and as a percent** ♦ **Establish (write) a proportion that describes a given situation**	♦ **Match equivalent ratios (e.g., 8:12, $\frac{4}{6}$ and 2 to 3)** ♦ **Demonstrate percents greater than 100 and less than 1 as "out of 100" (e.g., 110% shade all of one grid and ten of a second grid)** ♦ **Given a situation (in words or with manipulatives), represent it as a percent**	♦ **Match equal ratios written in different ways (e.g., 3:2 = 3 to 2)** ♦ **Demonstrate percents as "out of 100" (e.g., shading the appropriate number of squares on a 100 block to show 10%)** ♦ **Given a situation (in words or with manipulatives), represent it as a ratio** ♦ **Identify situations in which percents are used (% daily requirement, sales tax, etc.)**

OR

Seventh (7th) Grade APA Prioritized CPI Links

CPI 4.1.7A5 Use whole numbers, fractions, decimals, and percents to represent equivalent forms of the same number.		
Essence of the CPI: Show equivalent forms of whole numbers, fractions, decimals and percents		
Matched Link	**Near Link**	**Far Link**
♦ **Convert percents to their equivalent decimal and fraction forms**	♦ **Match equivalent forms of fractions, decimals and percents** ♦ **Convert fractions to percents and percents to fractions** ♦ **Convert decimals to percents and percents to decimals**	♦ **Use manipulatives or pictorial models to represent equivalent forms of fractions to percents (e.g., 2/2=100%=1 whole)** ♦ **Use manipulatives or pictorial models to represent equivalent forms of decimals to fractions (e.g., 0.2 = 2/10=4/20=0.20=20/100; etc.)**

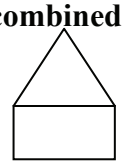
Seventh (7th) Grade APA Prioritized CPI Links

Standard 4.2 Geometry and Measurement: All students will develop spatial sense and the ability to use geometric properties, relationships, and measurement to model, describe, and analyze phenomena.

Spatial sense is an intuitive feel for shape and space. Geometry and measurement both involve describing the shapes we see all around us in art, nature, and the things we make. Spatial sense, geometric modeling, and measurement can help us to describe and interpret our physical environment and to solve problems.

STRAND: E. Measuring Geometric Objects

You MUST CHOOSE only one of the following CPIs:

<table>
<tr><td colspan="3">CPI 4.2.7E1 Develop and apply strategies for finding perimeter and area.
• Geometric figures made by combining triangles, rectangles and circles or parts of circles
• Estimation of area using grids of various sizes</td></tr>
<tr><td colspan="3">Essence of the CPI: Use and explain ways to find perimeter and area</td></tr>
<tr><th>Matched Link</th><th>Near Link</th><th>Fr Link</th></tr>
<tr><td>♦ Find the perimeter of combined shapes
 
♦ Find the area of combined shapes and explain
♦ Estimate the area of combined shapes using a grid and check your answer</td><td>♦ Calculate the area of a triangle, rectangle and square
♦ Calculate the circumference of a circle
♦ Calculate the area of a circle
♦ Estimate the area of a triangle, rectangle, and/or square using a grid and check your answer</td><td>♦ Calculate the perimeter of simple two-dimensional shapes
♦ Identify when to use area and when to use perimeter</td></tr>
</table>

OR

Seventh (7th) Grade APA Prioritized CPI Links

CPI 4.2.7E2 Recognize that the volume of a pyramid or cone is one-third of the volume of the prism or cylinder with the same base and height (e.g., use rice to compare volumes of figures with the same base and length)		
Essence of the CPI: Understand the relationship between pyramid and prism, cone and cylinder.		
Matched Link	**Near Link**	**Far Link**
♦ **Compare volumes of figures with the same base and height and then answer questions about their comparative volumes** ♦ **Given the volume of a pyramid or cone, find the volume of the prism or cylinder with the same base and height, and explain how the answer was determined.**	♦ **Use manipulatives to compare the volume of a pyramid to a prism and a cylinder to a cone**	♦ **Use manipulatives (rice, water, beans, etc.) to compare volumes of 3-dimensional objects**

Seventh (7th) Grade APA Prioritized CPI Links

STANDARD 4.3 Patterns and Algebra: All students will represent and analyze relationships among variable quantities and solve problems involving patterns, functions, and algebraic concepts and processes.

Algebra is a symbolic language used to express mathematical relationships. Students need to understand how quantities are related to one another, and how algebra can be used to concisely express and analyze those relationships. Modern technology provides tools for supplementing the traditional focus on algebraic procedures, such as solving equations, with a more visual perspective, with graphs of equations displayed on a screen. Students can then focus on understanding the relationship between the equation and the graph, and on what the graph represents in a real-life situation.

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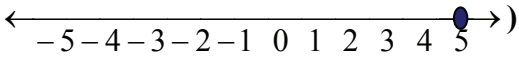
STRAND: D. Procedures

You MUST CHOOSE only one of the following CPIs:

<table>
<tr><td colspan="3">CPI 4.3.7D1 Use graphing techniques on a number line.
• Absolute value
• Arithmetic operations represented by vectors (arrows) (e.g., “-3 + 6” is “left 3, right 6”)</td></tr>
<tr><td colspan="3">Essence of the CPI: Understand absolute value and vectors and use them to graph on a number line</td></tr>
<tr><th>Matched Link</th><th>Near Link</th><th>Far Link</th></tr>
<tr><td>♦ Graph a simple expression (e.g., -3 + 6 is “left 3, right 6” starting at 0 on a number line)
♦ Graph absolute value of a number on a number line (e.g., $|-5|$
 
</td><td>♦ Use a number line to solve addition and subtraction problems
♦ Match the absolute value of a number to its value on a number line</td><td>♦ Graph points on a number line that include negative integers
♦ Identify the direction and number you would move to get to a given point on a number line [e.g., starting at zero, given (-3) move left 3 points (indicate through words, pictures, or movement, etc.)]</td></tr>
</table>

OR

Seventh (7th) Grade APA Prioritized CPI Links

CPI 4.3.7D2 Solve simple linear equations informally and graphically. • Multi-step, integer coefficients only (although answers may not be integers) • Using paper-and-pencil, calculators, graphing calculators, spreadsheets, and other technology		
Essence of the CPI: Solve linear equations informally		
Matched Link	**Near Link**	**Far Link**
♦ **Solve (paper and pencil; calculator, etc.) multi-step linear equations (4x + 7 = y when x=5).** ♦ **Solve simple linear equations (e.g. y = x + 3, y = 2x + 5) using a T-chart.** ♦ **Graph the solution of simple linear equations, given the independent variable (i.e. the value of x)**	♦ **Use manipulatives to solve simple linear equations with a variable on both sides of the equation** ♦ **Given a simple linear equation (e.g., y = 7x; 35 = 7x; etc.) and a partially completed T-chart with x given, solve for y** ♦ **Given a simple linear equation and a completed t-chart, graph the results**	♦ **Use manipulatives to solve simple linear equations with variable on one side of an equation (e.g., 4n = 12)**

OR

CPI 4.3.7D3 Create, evaluate, and simplify algebraic expressions involving variables. • Order of operations, including appropriate use of parentheses • Substitution of a number for a variable		
Essence of the CPI: Create, evaluate and simplify algebraic expressions with variables		
Matched Link	**Near Link**	**Far Link**
♦ **Evaluate an expression by substituting a number for a variable, using order of operations, including parenthesis [e.g., 4n – (2+n) when given n=5]**	♦ **Evaluate an expression by substituting a number for a variable, using multiplication , addition and subtraction (e.g., 4n+7 when given n=3)**	♦ **Simplify an expression using order of operations (e.g., (5-3)3; 2x3+6; etc.)** ♦ **Evaluate an expression by substituting a number for a variable, using addition and subtraction (e.g., 5+x when given x=2)**

Seventh (7th) Grade APA Prioritized CPI Links

STANDARD 4.4 Data Analysis, Probability, and Discrete Math: All students will develop an understanding of the concepts and techniques of data analysis, probability, and discrete mathematics, and will use them to model situations, solve problems, and analyze and draw appropriate inferences from data.

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STRAND: B. Probability

You MUST CHOOSE only one of the following CPIs:

CPI 4.4.7B3 Estimate probabilities and make predictions based on experimental and theoretical probabilities.		
Essence of the CPI: Use experimental and theoretical probabilities to make predictions		
Matched Link	**Near Link**	**Far Link**
♦ **Make a prediction based on theoretical probability and then compare experimental and theoretical probabilities** (theoretical probability of getting "heads" in a coin toss is 1out of 2, predict what will happen if you flip the coin 10 times based on theoretical probability and compare to what actually happens based on experimental probability) ♦ **Compare experimental and theoretical probabilities and explain why they might differ**	♦ **Collect probability data while conducting a simple experiment** (rolling dice, flipping a coin, etc.) **and answer questions about the data** ♦ **Given data from experimental probability** (e.g., choosing items from a bag, etc.)**, make a prediction on contents** (the likely number of the color of items in a bag)	♦ **Complete a chart to find experimental probability** (e.g., flipping a coin or rolling a die) ♦ **Match the numerical representation of a probability to the experience/event** [e.g., given the probability of red marbles as 3 to 5 , P(red marble) = $\frac{3}{5}$, choose the bag of marbles with 3 red and 2 blue marbles)

OR

Seventh (7th) Grade APA Prioritized CPI Links

CPI 4.4.7B4 Play and analyze probability-based games, and discuss the concepts of fairness and expected value.		
Essence of the CPI: Understand what probability has to do with describing "fairness" and expected outcomes in games		
Matched Link	**Near Link**	**Far Link**
♦ **Play a probability-based game (anything with a spinner or dice) and use probability to answer questions about fairness**	♦ **Demonstrate understanding of the connection between random and fairness** ♦ **Demonstrate understanding of the connection between independent outcomes and fairness**	♦ **Define and identify independent outcomes in probability** ♦ **Identify a situation that would cause a bias result (e.g., spinner on a tilt)** ♦ **Identify a situation that would cause a random result (spinner on a flat desk)** ♦ **Compare situations that would cause bias results versus random results**

Eighth (8th) Grade APA Prioritized CPI Links

MATHEMATICS

Standard 4.1 Number and Numerical Operations: All students will develop number sense and will perform standard numerical operations and estimations on all on all types of numbers in a variety of ways.

Numbers and arithmetic operations are what most of the general public think about when they think of mathematics; and, even though other areas like geometry, algebra, and data analysis have become increasingly important in recent years, numbers and operations remain at the heart of mathematical teaching and learning. Facility with numbers, the ability to choose the appropriate types of numbers and the appropriate operations for a given situation, and the ability to perform those operations as well as to estimate their results, are all skills that are essential for modern day life.

STRAND: Number Sense

You MUST CHOOSE only one of the following CPIs:

CPI 4.1.8A2 Demonstrate a sense of the relative magnitudes of numbers		
Essence of the CPI: Understand the proportional value of the number system and that numbers can be very large or very small		
Matched Link	**Near Link**	**Far Link**
♦ **Identify the relative magnitude of numbers by comparing their absolute value (e.g., $\|-7\|=\|7\|$; $\|-7\|>\|5\|$; etc.)** ♦ **Determine where the product, sum, difference, etc. of two integers would be on a number line (e.g. given a number line with points A and B identified, determine where the product of A and B would be on the number line)** ♦ **Given two rational numbers (e.g., 0.1, .02, etc.) determine which operation would yield the largest/smallest number (e.g., 0.1 divided by 0.2, the sum of 0.1 and 0.2, the product of 0.1 and 0.2, or 0.1 raised to the second power)**	♦ **When adding positive and negative numbers, identify whether the answer will be positive or negative** ♦ **Convert numbers from scientific notation to standard form** ♦ **Identify scientific notation and standard notation and explain their appropriate uses** ♦ **Identify numbers that have the same absolute value** ♦ **Demonstrate the relative magnitude of rational numbers based on its distance from zero (absolute value on a number line)**	♦ **Match a number in scientific notation to standard notation** ♦ **Given a situation, match a representation of a number (e.g., scientific notation, fraction, decimal, etc.) to a situation (to the extreme)**

OR

Eighth (8th) Grade APA Prioritized CPI Links

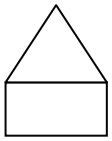
CPI 4.1.8A4 Compare and order numbers of all named types.		
Essence of the CPI: Compare and order numbers		
Matched Link	**Near Link**	**Far Link**
♦ **Order numbers represented in scientific notation and with numbers written in standard notation.** ♦ **Compare and order numbers in exponential form with numbers written in scientific notation**	♦ **Compare and order fractions, decimals and percents** ♦ **Order numbers written in exponential form** ♦ **Determine the relative location of a rational number between two whole numbers on a number line**	♦ **Order positive and negative integers** ♦ **Order numbers written in absolute value notation** ♦ **Order numbers written in square root notation** ♦ **Order decimals**

Eighth (8th) Grade APA Prioritized CPI Links

Standard 4.2 Geometry and Measurement: All students will develop spatial sense and the ability to use geometric properties, relationships, and measurement to model, describe, and analyze phenomena.
Spatial sense is an intuitive feel for shape and space. Geometry and measurement both involve describing the shapes we see all around us in art, nature, and the things we make. Spatial sense, geometric modeling, and measurement can help us to describe and interpret our physical environment and to solve problems.

STRAND: Measuring Geometric Objects

You MUST CHOOSE only one of the following CPIs:

CPI 4.2.8E1 Develop and apply strategies for finding perimeter and area. • Geometric figures made by combining triangles, rectangles and circles or part of circles • Estimation of area using grids of various sizes • Impact of a dilation on the perimeter and area of a 2-dimensional figure		
Essence of the CPI: Understand and use strategies for calculating perimeter and area		
Matched Link	**Near Link**	**Far Link**
♦ **Find the perimeter of a figure and its dilation and compare the two** ♦ **Find the area of a figure and its dilation and compare the two**	♦ **Find the perimeter of combined shapes (e.g.,)** ♦ **Estimate the area of combined shapes using a grid and check your answer** 	♦ **Calculate the area of a triangle, rectangle and square** ♦ **Calculate the circumference of a circle** ♦ **Calculate the area of a circle** ♦ **Identify a dilation of a 2-dimensional figure**

OR

Eighth (8th) Grade APA Prioritized CPI Links

CPI 4.2.8E3 Develop and apply strategies and formulas for finding the surface area and volume of a three-dimensional figure.

- Volume-prism, cone, pyramid
- Surface area-prism (triangular or rectangular base), pyramid (triangular or rectangular base)
- Impact of a dilation on the surface area and volume of a three-dimensional figure

Essence of the CPI: Understand and use strategies and formulas for calculating surface area and volume

Matched Link	Near Link	Far Link
♦ **Find the surface area of rectangular and triangular prisms** ♦ **Find the surface area of a pyramid with triangular and rectangular bases** ♦ **Find the volume of prisms, cones and pyramids** ♦ **Calculate the volume of a three-dimensional figure and its dilation and compare the two**	♦ **Calculate the volume of figures with same and different bases and heights** ♦ **Find the surface area of a rectangular prism** ♦ **Find the surface area of a triangular prism** ♦ **Find the surface area of a rectangular pyramid** ♦ **Find the surface area of a triangular pyramid**	♦ **Identify a three-dimensional figure and the dilation of the figure** ♦ **Classify prisms as having rectangular or triangular bases** ♦ **Classify pyramids as having a triangular or rectangular base** ♦ **Find area of a triangle**

OR

CPI 4.2.8E4 Use formulas to find the volume and surface area of a sphere.

Essence of the CPI: Use formulae to find volume and surface area of a sphere

Matched Link	Near Link	Far Link
♦ **Find the surface area of a sphere** ♦ **Find the volume of a sphere using formulae [e.g., V = $\frac{4}{3}\pi r^3$ or $\frac{2}{3}$ (V of cylinder) or V =($\pi r^2 h$) $\frac{2}{3}$]**	♦ **Show the difference between surface area and volume of a sphere (e.g., volume = filling a sphere and surface area = covering a sphere)** ♦ **Match surface area and volume to the appropriate model/scenario**	♦ **Identify a sphere** ♦ **Identify the radius and diameter of a sphere**

Eighth (8th) Grade APA Prioritized CPI Links

STANDARD 4.3 Patterns and Algebra: All students will represent and analyze relationships among variable quantities and solve problems involving patterns, functions, and algebraic concepts and processes.

Algebra is a symbolic language used to express mathematical relationships. Students need to understand how quantities are related to one another, and how algebra can be used to concisely express and analyze those relationships. Modern technology provides tools for supplementing the traditional focus on algebraic procedures, such as solving equations, with a more visual perspective, with graphs of equations displayed on a screen. Students can then focus on understanding the relationship between the equation and the graph, and on what the graph represents in a real-life situation.

Algebra is a gatekeeper for the future study of mathematics, science, the social sciences, business, and a host of other areas. In the past, algebra has served as a filter, screening people out of these opportunities. For New Jersey to be part of the global society, it is important that algebra play a major role in a mathematics program that opens the gates for all students.

STRAND: Patterns

You MUST CHOOSE only one of the following CPIs:

CPI 4.3.8A1 Recognize, describe, extend, and create patterns involving whole numbers, rational numbers, and integers.

- Descriptions using tables, verbal and symbolic rules, graphs, simple equations or expressions
- Finite and infinite sequences
- Arithmetic sequences (i.e., sequences generated by repeated addition of a fixed number, positive or negative)
- Geometric sequences (i.e., sequences generated by repeated multiplication by a fixed positive ratio, greater than 1 or less than 1)
- Generating sequences by using calculators to repeatedly apply a formula

Essence of the CPI: Identify, extend and create number patterns

Matched Link	Near Link	Far Link
♦ **Create a pattern involving integers (by developing rules and following them** (e.g., Next = Now + -3) ♦ **Identify the rule and extend a pattern involving rational numbers** ♦ **Given a graph, create a table to show the pattern of change in the dependent (y) and independent (x) variable** ♦ **Describe and analyze infinite sequences such as Pascal's Triangle*** ♦ **Describe analyze and extend the Fibonacci sequence** (1,1,2,3,5,8,13…)*	♦ **Identify and extend a pattern using formal iterative formulas** (e.g., Next = Now +3; Next = Now + Previous; etc.) ♦ **Describe and extend a pattern involving rational numbers**	♦ **Recognize and describe a basic number pattern** (1, 2, 3 represents a +1 pattern) ♦ **Describe a pattern involving rational numbers** (by developing rules and following them –e.g., +7)

Eighth (8th) Grade APA Prioritized CPI Links

STANDARD 4.4 Data Analysis, Probability, and Discrete Math: All students will develop an understanding of the concepts and techniques of data analysis, probability, and discrete mathematics, and will use them to model situations, solve problems, and analyze and draw appropriate inferences from data.

Data analysis, probability, and discrete mathematics are important interrelated areas of applied mathematics. Each provides students with powerful mathematical perspectives on everyday phenomena and with important examples of how mathematics is used in the modern world. Two important areas of discrete mathematics are addressed in this standard; a third area, iteration and recursion, is addressed in Standard 4.3 (Patterns and Algebra).

STRAND: Discrete Mathematics-Vertex-Edge Graphs and Algorithms

You MUST CHOOSE only one of the following CPIs:

CPI 4.4.8D1 Use vertex-edge graphs and algorithmic thinking to represent and find solutions to practical problems.

- Finding the shortest network connecting specified sites
- Finding a minimal route that includes every street (e.g., for trash pick-up)
- Finding the shortest route on a map from one site to another
- Finding the shortest circuit on a map that makes a tour of specified sites
- Limitations of computers (e.g., the number of routes for a delivery truck visiting *n* sites is *n!*, so finding the shortest circuit by examining all circuits would overwhelm capacity of any computer, now or in the future, even if n is less than 100)

Essence of the CPI: Use vertex-edge graphs to solve problems

Matched Link	Near Link	Far Link
♦ **Use a vertex-edge graph to find the shortest route (e.g., a map or flight path)** ♦ **Use a vertex-edge graph to find the shortest route that includes every possible edge (e.g., garbage trucks or snow removal)** ♦ **Use a vertex-edge graph to find the shortest distance from point A to point D going through points B and C**	♦ **Determine if vertex-edge graph is a path or a circuit** ♦ **Follow paths on a vertex-edge graph (e.g., go from point A to point D going through points B and C)**	♦ **Identify a vertex and an edge on a vertex-edge graph** ♦ **Identify the vertex that share the most edges on a vertex-edge graph (greatest degree)**

MATHEMATICS

Standard 4.1 Number and Numerical Operations: All students will develop number sense and will perform standard numerical operations and estimations on all on all types of numbers in a variety of ways.

Numbers and arithmetic operations are what most of the general public think about when they think of mathematics; and, even though other areas like geometry, algebra, and data analysis have become increasingly important in recent years, numbers and operations remain at the heart of mathematical teaching and learning. Facility with numbers, the ability to choose the appropriate types of numbers and the appropriate operations for a given situation, and the ability to perform those operations as well as to estimate their results, are all skills that are essential for modern day life.

STRAND: A. Number Sense

You MUST CHOOSE only one of the following CPIs:

CPI 4.1.12B1 Extend understanding and use of operations to real numbers and algebraic procedures		
Essence of the CPI: Understand how to use (apply) operations to real numbers and algebraic procedures		
Matched Link	**Near Link**	**Far Link**
♦ **Add or subtract square roots (e.g., $\sqrt{2}+3\sqrt{2}=4\sqrt{2}$)** ♦ **Multiply and divide square roots** ♦ **Solve problems with roots using order of operations**	♦ **Solve problems using order of operations with real numbers** ♦ **Find the missing side of right triangles using Pythagorean theorem and determine if the side length is rational or irrational** ♦ **Identify whether radical expressions can be combined using addition and subtraction (e.g., example $\sqrt{2}+3\sqrt{2}$; non-example $\sqrt{2}+\sqrt{5}$)**	♦ **Identify square roots with the same radicand (e.g., $\sqrt{4}$, radicand is 4)** ♦ **Convert large numbers to scientific notation** ♦ **Identify which square roots have whole number square roots (e.g., 1,4,9,16,25, etc.) and which have non-whole number square roots (e.g., 2, 3, 5, 6, 7, etc.)**

OR

CPI 4.1.12B3 Perform operations on matrices. • Addition and subtraction • Scalar multiplication		
Essence of the CPI: Perform simple matrix arithmetic		
Matched Link	**Near Link**	**Far Link**
♦ **Multiply a matrix by a constant** ♦ **Add and subtract 2 matrices**	♦ **Add 2 matrices** ♦ **Subtract 2 matrices**	♦ **Determine if two matrices can be added or subtracted (must have same dimensions—e.g., identical number of columns and rows)**

High School APA Prioritized CPI Links

Standard 4.2 Geometry and Measurement: All students will develop spatial sense and the ability to use geometric properties, relationships, and measurement to model, describe, and analyze phenomena.

Spatial sense is an intuitive feel for shape and space. Geometry and measurement both involve describing the shapes we see all around us in art, nature, and the things we make. Spatial sense, geometric modeling, and measurement can help us to describe and interpret our physical environment and to solve problems.

STRAND: C. Coordinate Geometry

You MUST CHOOSE only one of the following CPIs:

CPI 4.2.12C1 Use coordinate geometry to represent and verify properties of lines.

- Distance between two points
- Midpoint and slope of a line segment
- Finding the intersection of two lines
- Lines with the same slope are parallel
- Lines that are perpendicular have slopes whose product is -1

Essence of the CPI: Use coordinate geometry to quantify the relationship between lines

Matched Link	Near Link	Far Link
♦ **Use a coordinate grid to show that lines with the same slope are parallel** ♦ **Use a coordinate grid to show that relationship between lines with slopes whose product is -1 are perpendicular**	♦ **Find the slope of a line on a coordinate grid** ♦ **Find the distance between two points on horizontal lines and the distance between two points on vertical lines a coordinate grid** ♦ **Find the midpoint of a line segment on a coordinate plane**	♦ **Define positive and negative slope and represent each on a coordinate plane** ♦ **Distinguish parallel, perpendicular, and intersecting lines on a coordinate plane**

OR

CPI 4.2.12C2 Show position and represent motion in the coordinate plane using vectors.

- Addition and subtraction of vectors

Essence of the CPI: Use vectors to show position and motion in a coordinate plane

Matched Link	Near Link	Far Link
♦ **Add and subtract vectors** ♦ **Sketch the sum/difference of two vectors using a parallelogram**	♦ **Describe the length and direction of a given vector**	♦ **Identify the direction of a vector**

High School APA Prioritized CPI Links

STANDARD 4.3 Patterns and Algebra: All students will represent and analyze relationships among variable quantities and solve problems involving patterns, functions, and algebraic concepts and processes.

Algebra is a symbolic language used to express mathematical relationships. Students need to understand how quantities are related to one another, and how algebra can be used to concisely express and analyze those relationships. Modern technology provides tools for supplementing the traditional focus on algebraic procedures, such as solving equations, with a more visual perspective, with graphs of equations displayed on a screen. Students can then focus on understanding the relationship between the equation and the graph, and on what the graph represents in a real-life situation.

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STRAND: Functions and Relationships

You MUST CHOOSE only one of the following CPIs:

CPI 4.3.12B2 Analyze and explain the general properties and behavior of functions or relations using algebraic and graphing techniques.

- Slope of a line or curve
- Domain and range
- Intercepts
- Continuity
- Maximum/minimum
- Estimating roots of equations
- Intersecting points as solutions of systems of equations
- Solutions of systems of linear inequalities using graphing techniques
- Rates of change

Essence of the CPI: Understand and explain the functions using graphing and algebraic techniques

Matched Link	Near Link	Far Link
♦ **Given a function (e.g. y=2x+5) determine the slope and y-intercept** ♦ **Graph a quadratic function and find its maximum or minimum**	♦ **Graph a quadratic function (e.g., $y=x^2$, $y=2x^2$, etc.).** ♦ **Given a graphed line, identify the x- and y-intercept**	♦ **Graph a simple linear function (y=x-3)** ♦ **Using the vertical line test, determine if a set of points on a graph is a function or not (if a vertical line passes through two different points of the graph then it is not a function)** ♦ **Identify if a graph of a function has a maximum or minimum**

OR

CPI 4.3.12B3 Understand and perform transformations on commonly-used functions. • Translations, reflections, dilations • Effects on linear and quadratic graphs of parameter changes in equations • Using graphing calculators or computers for more complex functions		
Essence of the CPI: Understand and perform transformations on commonly-used algebraic functions		
Matched Link	**Near Link**	**Far Link**
♦ **Given the equations, graph the linear functions and identify the transformation** ♦ **Given the equations, graph the quadratic functions and identify the transformation**	♦ **Match an algebraic rule to the graph of the function** ♦ **Match a graph of a function to its dilation** ♦ **Match the algebraic rule for the translation of a function to its graph (e.g., $y=x^2$ and $y=x^2+2$)** ♦ **Match the algebraic rule for the reflection of a function to its graph (e.g. $y=x^2$ and $y=-x^2$)**	♦ **Match the graph of a function to its reflection** ♦ **Match the graph of a function to its translation**

High School APA Prioritized CPI Links

STANDARD 4.4 Data Analysis, Probability, and Discrete Math: All students will develop an understanding of the concepts and techniques of data analysis, probability, and discrete mathematics, and will use them to model situations, solve problems, and analyze and draw appropriate inferences from data.

Data analysis, probability, and discrete mathematics are important interrelated areas of applied mathematics. Each provides students with powerful mathematical perspectives on everyday phenomena and with important examples of how mathematics is used in the modern world. Two important areas of discrete mathematics are addressed in this standard; a third area, iteration and recursion, is addressed in Standard 4.3 (Patterns and Algebra).

STRAND: Data Analysis

You MUST CHOOSE only one of the following CPIs:

CPI 4.4.12A1 Use surveys and sampling techniques to generate data and draw conclusions about large groups. • Advantages/disadvantages of sample selection methods (e.g., convenience sampling, responses to survey, random sampling)		
Essence of the CPI: Draw conclusions about large groups by using surveys and sampling techniques		
Matched Link	**Near Link**	**Far Link**
♦ **Critique mathematical conclusions drawn from different sampling types (random, convenience, voluntary, etc.)** ♦ **Use survey or sampling techniques to draw mathematical conclusions about large groups (e.g., looking at exit poll results, who do you think will be the next president) and defend your conclusions**	♦ **Draw mathematical conclusions about a larger group based on a convenience survey or sampling and display results in a graph** ♦ **Draw mathematical conclusions about a larger group based on a random survey or sampling and display results in a graph**	♦ **Identify different ways to collect data (e.g., convenience sampling, random sampling, voluntary sampling, etc.)** ♦ **List pros and cons of different sampling types (e.g., convenience sampling is easiest but does not assure a mix of different types of people)**

OR

CPI 4.4.12A2 Evaluate the use of data in real-world contexts.

- Accuracy and reasonableness of conclusions drawn
- Bias in conclusions drawn (e.g., influence of how data is displayed)
- Statistical claims based on sampling

Essence of the CPI: Critique conclusions drawn from data

Matched Link	Near Link	Far Link
♦ **Compare the accuracy and reasonableness of two conclusions on the same topic, based on their relative sample sizes** ♦ **Critique conclusions by determining if the sample/statistics are biased** ♦ **Given different displays of data, draw mathematical conclusions about bias**	♦ **Identify bias in real-world samples**	♦ **Select the best representation of data given a choice of three (e.g., box-and-whisker plot, scatter plot, circle graph, table, etc.) and explain why** ♦ **List ways samples or statistics can be biased (e.g., sampling bias, display bias, etc.)**