Grade 10 ISTEP+ Mathematics Standards Addressed

Assessment Part	Assessment Guidance		Standard
Part 1 and/or Part 2	✓+	PS.1:	**Make sense of problems and persevere in solving them:** Mathematically proficient students start by explaining to themselves the meaning of a problem and looking for entry points to its solution. They analyze givens, constraints, relationships, and goals. They make conjectures about the form and meaning of the solution and plan a solution pathway, rather than simply jumping into a solution attempt. They consider analogous problems and try special cases and simpler forms of the original problem in order to gain insight into its solution. They monitor and evaluate their progress and change course if necessary. Mathematically proficient students check their answers to problems using a different method, and they continually ask themselves, "Does this make sense?" and "Is my answer reasonable?" They understand the approaches of others to solving complex problems and identify correspondences between different approaches. Mathematically proficient students understand how mathematical ideas interconnect and build on one another to produce a coherent whole.
Part 1 and/or Part 2	✓+	PS.2:	**Reason abstractly and quantitatively:** Mathematically proficient students make sense of quantities and their relationships in problem situations. They bring two complementary abilities to bear on problems involving quantitative relationships: the ability to decontextualize—to abstract a given situation and represent it symbolically and manipulate the representing symbols as if they have a life of their own, without necessarily attending to their referents—and the ability to contextualize, to pause as needed during the manipulation process in order to probe into the referents for the symbols involved. Quantitative reasoning entails habits of creating a coherent representation of the problem at hand; considering the units involved; attending to the meaning of quantities, not just how to compute them; and knowing and flexibly using different properties of operations and objects.
Part 1 and/or Part 2	✓+	PS.3:	**Construct viable arguments and critique the reasoning of others:** Mathematically proficient students understand and use stated assumptions, definitions, and previously established results in constructing arguments. They make conjectures and build a logical progression of statements to explore the truth of their conjectures. They analyze situations by breaking them into cases and recognize and use counterexamples. They organize their mathematical thinking, justify their conclusions and communicate them to others, and respond to the arguments of others. They reason inductively about data, making plausible arguments that take into account the context from which the data arose. Mathematically proficient students are also able to compare the effectiveness of two plausible arguments, distinguish correct logic or reasoning from that which is flawed, and—if there is a flaw in an argument—explain what it is. They justify whether a given statement is true always, sometimes, or never. Mathematically proficient students participate and collaborate in a mathematics community. They listen to or read the arguments of others, decide whether they make sense, and ask useful questions to clarify or improve the arguments.
Part 1 and/or Part 2	✓+	PS.4:	**Model with mathematics:** Mathematically proficient students apply the mathematics they know to solve problems arising in everyday life, society, and the workplace using a variety of appropriate strategies. They create and use a variety of representations to solve problems and to organize and communicate mathematical ideas. Mathematically proficient students apply what they know and are comfortable making assumptions and approximations to simplify a complicated situation, realizing that these may need revision later. They are able to identify important quantities in a practical situation and map their relationships using such tools as diagrams, two-way tables, graphs, flowcharts and formulas. They analyze those relationships mathematically to draw conclusions. They routinely interpret their mathematical results in the context of the situation and reflect on whether the results make sense, possibly improving the model if it has not served its purpose.

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Part 1 and/or Part 2	✓+	PS.5:	**Use appropriate tools strategically:** Mathematically proficient students consider the available tools when solving a mathematical problem. These tools might include pencil and paper, models, a ruler, a protractor, a calculator, a spreadsheet, a computer algebra system, a statistical package, or dynamic geometry software. Mathematically proficient students are sufficiently familiar with tools appropriate for their grade or course to make sound decisions about when each of these tools might be helpful, recognizing both the insight to be gained and their limitations. Mathematically proficient students identify relevant external mathematical resources, such as digital content, and use them to pose or solve problems. They use technological tools to explore and deepen their understanding of concepts and to support the development of learning mathematics. They use technology to contribute to concept development, simulation, representation, reasoning, communication and problem solving.
Part 1 and/or Part 2	✓+	PS.6:	**Attend to precision:** Mathematically proficient students communicate precisely to others. They use clear definitions, including correct mathematical language, in discussion with others and in their own reasoning. They state the meaning of the symbols they choose, including using the equal sign consistently and appropriately. They express solutions clearly and logically by using the appropriate mathematical terms and notation. They specify units of measure and label axes to clarify the correspondence with quantities in a problem. They calculate accurately and efficiently and check the validity of their results in the context of the problem. They express numerical answers with a degree of precision appropriate for the problem context.
Part 1 and/or Part 2	✓+	PS.7:	**Look for and make use of structure:** Mathematically proficient students look closely to discern a pattern or structure. They step back for an overview and shift perspective. They recognize and use properties of operations and equality. They organize and classify geometric shapes based on their attributes. They see expressions, equations, and geometric figures as single objects or as being composed of several objects.
Part 1 and/or Part 2	✓+	8.PS.8:	**Look for and express regularity in repeated reasoning:** Mathematically proficient students notice if calculations are repeated and look for general methods and shortcuts. They notice regularity in mathematical problems and their work to create a rule or formula. Mathematically proficient students maintain oversight of the process, while attending to the details as they solve a problem. They continually evaluate the reasonableness of their intermediate results.

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Part 1 and/or Part 2	✓	8.NS.1:	Give examples of rational and irrational numbers and explain the difference between them. Understand that every number has a decimal expansion; for rational numbers, show that the decimal expansion terminates or repeats, and convert a decimal expansion that repeats into a rational number.
Part 2 Only	✓	8.NS.2:	Use rational approximations of irrational numbers to compare the size of irrational numbers, plot them approximately on a number line, and estimate the value of expressions involving irrational numbers.
Part 2 Only	✓	8.NS.3:	Given a numeric expression with common rational number bases and integer exponents, apply the properties of exponents to generate equivalent expressions.
Part 2 Only	✓	8.NS.4:	Use square root symbols to represent solutions to equations of the form x^2 = p, where p is a positive rational number.
Part 1 and/or Part 2	✓+	8.C.1:	Solve real-world problems with rational numbers by using multiple operations.
Part 2 Only	✓-	8.C.2:	Solve real-world and other mathematical problems involving numbers expressed in scientific notation, including problems where both decimal and scientific notation are used. Interpret scientific notation that has been generated by technology, such as a scientific calculator, graphing calculator, or excel spreadsheet.
Part 2 Only	✓-	A1.RNE.1:	Understand the hierarchy and relationships of numbers and sets of numbers within the real number system.
Part 1 and/or Part 2	✓	A1.RNE.2:	Explain why the sum or product of two rational numbers is rational; that the sum of a rational number and an irrational number is irrational; and that the product of a nonzero rational number and an irrational number is irrational.
Part 2 Only	✓	A1.RNE.3:	Rewrite and evaluate numeric expressions with positive rational exponents using the properties of exponents.
Part 2 Only	✓	A1.RNE.4:	Simplify square roots of non-perfect square integers and algebraic monomials.
Part 2 Only	✓	A1.RNE.5:	Simplify algebraic rational expressions, with numerators and denominators containing monomial bases with integer exponents, to equivalent forms.
Part 1 and/or Part 2	✓	A1.RNE.6:	Factor common terms from polynomials and factor polynomials completely. Factor the difference of two squares, perfect square trinomials, and other quadratic expressions.
Part 2 Only	✓	A1.RNE.7:	Understand polynomials are closed under the operations of addition, subtraction, and multiplication with integers; add, subtract, and multiply polynomials and divide polynomials by monomials.

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Assessment Part	Assessment Guidance		**Standard**
Part 2 Only	✓	8.GM.1:	Identify, define and describe attributes of three-dimensional geometric objects (right rectangular prisms, cylinders, cones, spheres, and pyramids). Explore the effects of slicing these objects using appropriate technology and describe the two-dimensional figure that results.
Part 2 Only	✓	8.GM.2:	Solve real-world and other mathematical problems involving volume of cones, spheres, and pyramids and surface area of spheres.
Part 2 Only	✓–	8.GM.3:	Verify experimentally the properties of rotations, reflections, and translations, including: lines are mapped to lines, and line segments to line segments of the same length; angles are mapped to angles of the same measure; and parallel lines are mapped to parallel lines.
Part 1 and/or Part 2	✓	8.GM.4:	Understand that a two-dimensional figure is congruent to another if the second can be obtained from the first by a sequence of rotations, reflections, and translations. Describe a sequence that exhibits the congruence between two given congruent figures.
Part 2 Only	✓–	8.GM.5:	Understand that a two-dimensional figure is similar to another if the second can be obtained from the first by a sequence of rotations, reflections, translations, and dilations. Describe a sequence that exhibits the similarity between two given similar figures.
Part 1 and/or Part 2	✓	8.GM.6:	Describe the effect of dilations, translations, rotations, and reflections on two-dimensional figures using coordinates.
Part 2 Only	✓–	8.GM.7:	Use inductive reasoning to explain the Pythagorean relationship.
Part 2 Only	✓	8.GM.8:	Apply the Pythagorean Theorem to determine unknown side lengths in right triangles in real-world and other mathematical problems in two dimensions.
Part 1 and/or Part 2	✓	8.GM.9:	Apply the Pythagorean Theorem to find the distance between two points in a coordinate plane.

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Assessment Part	Assessment Guidance		Standard
Part 1 and/or Part 2	✓	8.DSP.1:	Construct and interpret scatter plots for bivariate measurement data to investigate patterns of association between two quantitative variables. Describe patterns such as clustering, outliers, positive or negative association, linear association, and nonlinear association.
Part 2 Only	✓-	8.DSP.2:	Know that straight lines are widely used to model relationships between two quantitative variables. For scatter plots that suggest a linear association, informally fit a straight line, and describe the model fit by judging the closeness of the data points to the line.
Part 1 and/or Part 2	✓+	8.DSP.3:	Write and use equations that model linear relationships to make predictions, including interpolation and extrapolation, in real-world situations involving bivariate measurement data; interpret the slope and y-intercept.
Part 2 Only	✓-	8.DSP.4:	Understand that, just as with simple events, the probability of a compound event is the fraction of outcomes in the sample space for which the compound event occurs. Understand and use appropriate terminology to describe independent, dependent, complementary, and mutually exclusive events.
Part 2 Only	✓	8.DSP.5:	Represent sample spaces and find probabilities of compound events (independent and dependent) using methods, such as organized lists, tables, and tree diagrams.
Part 2 Only	✓	8.DSP.6:	For events with a large number of outcomes, understand the use of the multiplication counting principle. Develop the multiplication counting principle and apply it to situations with a large number of outcomes.
Part 2 Only	✓+	A1.DS.1:	Distinguish between random and non-random sampling methods, identify possible sources of bias in sampling, describe how such bias can be controlled and reduced, evaluate the characteristics of a good survey and well-designed experiment, design simple experiments or investigations to collect data to answer questions of interest, and make inferences from sample results.
Part 1 and/or Part 2	✓	A1.DS.2:	Graph bivariate data on a scatter plot and describe the relationship between the variables.
Part 2 Only	✓	A1.DS.3:	Use technology to find a linear function that models a relationship for a bivariate data set to make predictions; interpret the slope and y-intercept, and compute (using technology) and interpret the correlation coefficient.
Part 1 and/or Part 2	✓-	A1.DS.4:	Distinguish between correlation and causation.
Part 2 Only	✓	A1.DS.5:	Understand that patterns of association can also be seen in bivariate categorical data by displaying frequencies and relative frequencies in a two-way table. Construct and interpret a two-way table summarizing data on two categorical variables collected from the same subjects. Use relative frequencies calculated for rows or columns (including joint, marginal, and conditional relative frequencies) to describe possible associations and trends in the data.
Part 2 Only	✓	A1.DS.6:	Understand that statistics and data are non-neutral and designed to serve a particular interest. Analyze the possibilities for whose interest might be served and how the representations might be misleading.

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Assessment Part	Assessment Guidance		Standard
Part 2 Only	✓	8.AF.1:	Solve linear equations with rational number coefficients fluently, including equations whose solutions require expanding expressions using the distributive property and collecting like terms. Represent real-world problems using linear equations and inequalities in one variable and solve such problems.
Part 1 and/or Part 2	✓	8.AF.2:	Give examples of linear equations in one variable with one solution, infinitely many solutions, or no solutions. Show which of these possibilities is the case by transforming a given equation into simpler forms, until an equivalent equation of the form x = a, a = a, or a = b results (where a and b are different numbers).
Part 2 Only	✓	8.AF.3:	Understand that a function assigns to each x-value (independent variable) exactly one y-value (dependent variable), and that the graph of a function is the set of ordered pairs (x,y).
Part 1 and/or Part 2	✓	8.AF.4:	Describe qualitatively the functional relationship between two quantities by analyzing a graph (e.g., where the function is increasing or decreasing, linear or nonlinear, has a maximum or minimum value). Sketch a graph that exhibits the qualitative features of a function that has been verbally described.
Part 2 Only	✓	8.AF.5:	Interpret the equation y = mx + b as defining a linear function, whose graph is a straight line; give examples of functions that are not linear. Describe similarities and differences between linear and nonlinear functions from tables, graphs, verbal descriptions, and equations.
Part 1 and/or Part 2	✓	8.AF.6:	Construct a function to model a linear relationship between two quantities given a verbal description, table of values, or graph. Recognize in y = mx + b that m is the slope (rate of change) and b is the y-intercept of the graph, and describe the meaning of each in the context of a problem.
Part 1 and/or Part 2	✓	8.AF.7:	Compare properties of two linear functions given in different forms, such as a table of values, equation, verbal description, and graph (e.g., compare a distance-time graph to a distance-time equation to determine which of two moving objects has greater speed).
Part 1 and/or Part 2	✓	8.AF.8:	Understand that solutions to a system of two linear equations correspond to points of intersection of their graphs because points of intersection satisfy both equations simultaneously. Approximate the solution of a system of equations by graphing and interpreting the reasonableness of the approximation.
Part 2 Only	✓	A1.F.1:	Understand that a function from one set (called the domain) to another set (called the range) assigns to each element of the domain exactly one element of the range. Understand that if f is a function and x is an element of its domain, then f(x) denotes the output of f corresponding to the input x. Understand the graph of f is the graph of the equation y = f(x).
Part 1 and/or Part 2	✓+	A1.F.2:	Describe qualitatively the functional relationship between two quantities by analyzing a graph (e.g., where the function is increasing or decreasing, linear or nonlinear, has a maximum or minimum value). Sketch a graph that exhibits the qualitative features of a function that has been verbally described. Identify independent and dependent variables and make predictions about the relationship.
Part 2 Only	✓	A1.F.3:	Identify the domain and range of relations represented in tables, graphs, verbal descriptions, and equations.
Part 1 and/or Part 2	✓	A1.F.4:	Understand and interpret statements that use function notation in terms of a context; relate the domain of the function to its graph and to the quantitative relationship it describes.

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Assessment Part	Assessment Guidance		Standard
Part 1 and/or Part 2	✓+	A1.L.1:	Understand that the steps taken when solving linear equations create new equations that have the same solution as the original. Solve fluently linear equations and inequalities in one variable with integers, fractions, and decimals as coefficients. Explain and justify each step in solving an equation, starting from the assumption that the original equation has a solution. Justify the choice of a solution method.
Part 1 and/or Part 2	✓+	A1.L.2:	Represent real-world problems using linear equations and inequalities in one variable and solve such problems. Interpret the solution and determine whether it is reasonable.
Part 1 and/or Part 2	✓	A1.L.3:	Represent real-world and other mathematical problems using an algebraic proportion that leads to a linear equation and solve such problems.
Part 2 Only	✓	A1.L.4:	Represent linear functions as graphs from equations (with and without technology), equations from graphs, and equations from tables and other given information (e.g., from a given point on a line and the slope of the line).
Part 1 and/or Part 2	✓+	A1.L.5:	Represent real-world problems that can be modeled with a linear function using equations, graphs, and tables; translate fluently among these representations, and interpret the slope and intercepts.
Part 1 and/or Part 2	✓	A1.L.6:	Translate among equivalent forms of equations for linear functions, including slope-intercept, point-slope, and standard. Recognize that different forms reveal more or less information about a given situation.
Part 1 and/or Part 2	✓	A1.L.7:	Represent real-world problems using linear inequalities in two variables and solve such problems; interpret the solution set and determine whether it is reasonable. Solve other linear inequalities in two variables by graphing.
Part 2 Only	✓	A1.L.8:	Solve compound linear inequalities in one variable, and represent and interpret the solution on a number line. Write a compound linear inequality given its number line representation.
Part 2 Only	✓-	A1.L.9:	Solve absolute value linear equations in one variable.
Part 2 Only	✓-	A1.L.10:	Graph absolute value linear equations in two variables.
Part 2 Only	✓	A1.L.11:	Solve equations and formulas for a specified variable, including equations with coefficients represented by variables.

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Assessment Part	Assessment Guidance		Standard
Part 2 Only	✓	A1.SEI.1:	Understand the relationship between a solution of a pair of linear equations in two variables and the graphs of the corresponding lines. Solve pairs of linear equations in two variables by graphing; approximate solutions when the coordinates of the solution are non-integer numbers.
Part 2 Only	✓	A1.SEI.2:	Understand that, given a system of two equations in two variables, replacing one equation by the sum of that equation and a multiple of the other produces a system with the same solutions. Solve pairs of linear equations in two variables using substitution and elimination.
Part 1 and/or Part 2	✓+	A1.SEI.3:	Write a system of two linear equations in two variables that represents a real-world problem and solve the problem with and without technology. Interpret the solution and determine whether the solution is reasonable.
Part 2 Only	✓	A1.SEI.4:	Represent real-world problems using a system of two linear inequalities in two variables and solve such problems; interpret the solution set and determine whether it is reasonable. Solve other pairs of linear inequalities by graphing with and without technology.
Part 2 Only	✓	A1.QE.1:	Distinguish between situations that can be modeled with linear functions and with exponential functions. Understand that linear functions grow by equal differences over equal intervals, and that exponential functions grow by equal factors over equal intervals. Compare linear functions and exponential functions that model real-world situations using tables, graphs, and equations.
Part 2 Only	✓-	A1.QE.2:	Represent real-world and other mathematical problems that can be modeled with exponential functions using tables, graphs, and equations of the form y = ab^x (for integer values of x > 1, rational values of b > 0 and b ≠ 1); translate fluently among these representations and interpret the values of a and b.
Part 1 and/or Part 2	✓	A1.QE.3:	Graph exponential and quadratic equations in two variables with and without technology.
Part 2 Only	✓	A1.QE.4:	Solve quadratic equations in one variable by inspection (e.g., for x^2 = 49), finding square roots, using the quadratic formula, and factoring, as appropriate to the initial form of the equation.
Part 1 and/or Part 2	✓	A1.QE.5:	Represent real-world problems using quadratic equations in one or two variables and solve such problems with and without technology. Interpret the solution and determine whether it is reasonable.
Part 2 Only	✓	A1.QE.6:	Use the process of factoring to determine zeros, lines of symmetry, and extreme values in real-world and other mathematical problems involving quadratic functions; interpret the results in the real-world contexts.
Part 1 and/or Part 2	✓	A1.QE.7:	Describe the relationships among the solutions of a quadratic equation, the zeros of the function, the x-intercepts of the graph, and the factors of the expression.

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Assessment Part	Assessment Guidance		Standard

NOTES:

✓+	**Critical Content and should be taught 50% - 75% Instructional Time**
✓	**Important Content and should be taught 25% - 50% Instructional Time**
✓-	**Additional Content and should be taught 5% - 10% Instructional Time**

Some concepts covered in the Algebra I standards will address, and many times will go beyond, concepts found in the Grade 8 standards. This is especially true in the Linear Equations, Inequalities, and Functions and Data Analysis, Statistics, and Probability reporting categories.

Grade 8 content that does not overlap with Algebra I content should be taught and will be assessed at a high school level of rigor.

Grade 8 content is included with the Grade 10 mathematics assessment to not only allow for content that goes beyond Algebra I, but to also ensure that all students in the state of Indiana have had access to the content that may be assessed.

All standards denoted with an * are eligible to be assessed on Part 1 of the ISTEP+ assessment.