ISTEP+ Performance Level Descriptors
Mathematics – Grade 10

Grade 10
Pass+

Pass+ students demonstrate advanced mathematical and problem-solving skills. Students solve multi-step problems with rational and irrational numbers, exponents, and square roots and demonstrate knowledge in the areas of geometry, measurement, data analysis, statistics, and probability. *Pass*+ students display highly developed skills with algebra concepts and functions, including writing and solving linear and compound inequalities, quadratics, and systems of linear equations. *Pass*+ students solve sophisticated problems, support their solutions, and generalize the results to other situations.

Some examples of specific knowledge, skills, and abilities for Grade 10 students scoring at the *Pass*+ level include:

- Solve multi-step mathematical and real-world problems with non-integral solutions involving systems of linear equations and systems of linear inequalities by identifying and applying a suitable technique (e.g., graphing, substitution, elimination), interpret solutions, and determine the reasonableness of solutions.
- Write compound linear inequalities based on number line representation and create a number line representation based on compound linear inequalities.
- Identify and apply suitable methods of factoring polynomials and quadratics to solve mathematical and real-world problems.
- Translate fluently among different representations of numeric and algebraic expressions with positive exponents and square roots and among different representations of quadratic and exponential equations.
- Explore real-world problems represented by quadratic equations with non-integral solutions and analyze relationships among solutions, zeros, *x*-intercepts, and factors.
- Apply definition and attributes of functions to solve mathematical and real-world problems.
- Apply concepts and principles of probability in compound, real-world contexts.
- Evaluate the characteristics of surveys and experiments and make inferences from sample results.
- Identify and analyze misleading representations of data and statistics.
- Analyze and solve mathematical problems by applying principles and techniques, such as sequencing, prioritizing, and identifying relevant information, breaking complex problems into simpler ones, using words and symbols to support solutions, using simpler problems to solve more difficult ones, drawing mathematical conclusions, and determining the reasonableness of solutions.

Grade 10
Pass

Pass students demonstrate proficient mathematical and problem-solving skills. Students are capable of solving problems with linear and compound inequalities, quadratics, and systems of equations, and they are competent in the areas of geometry, measurement, data analysis, and statistics. *Pass* students are skilled with algebra concepts, such as writing and solving linear, exponential and quadratic equations. *Pass* students experience success when solving problems, communicating ideas, and applying mathematical knowledge to a variety of situations.

Some examples of specific knowledge, skills, and abilities for Grade 10 students scoring at the *Pass* level include:

- Solve mathematical and real-world problems with integral and non-integral solutions involving rational and irrational numbers and integer exponents and square roots.
- Solve mathematical and real-world problems with integral and non-integral solutions involving the volume of cones, spheres, and pyramids and the surface area of spheres.
- Solve multi-step problems with integral and non-integral solutions involving the Pythagorean Theorem.
- Solve multi-step problems with integral and non-integral solutions involving transformations (dilations, translations, rotations, reflections) of objects and shapes.
- Analyze and model bivariate measurement data in mathematical and real-world problems using scatter plots and lines of best fit and use lines of best fit to make predictions, extrapolate, and interpolate.
- Understand and apply concepts and principles of probability in basic mathematical and real-world contexts, represent sample spaces, determine probabilities of compound events, identify random and non-random sampling methods, and describe strategies for minimizing sampling bias.
- Recognize and describe the characteristics of well-designed surveys and experiments.
- Apply principles and techniques related to bivariate measurement data in basic mathematical and real-world contexts, graph bivariate data, and use equations to model linear relationships informally and using technology.
- Identify and describe non-neutral aspects of statistics and data within specific problem contexts.
- Apply principles and techniques related to linear equations to solve multi-step mathematical and real-world problems with integral and non-integral solutions, solve linear equations with coefficients represented as variables, compare properties of linear functions represented using different methods (e.g., tables,

graphs, verbal descriptions, or equations), and translate fluently among representations.
- Apply concepts, notation, and representations related to functions to solve mathematical and real-world problems with rational solutions, identify domain and range, sketch and analyze graphs representing functions, identify independent/dependent variables, and make predictions about the relationship.
- Solve mathematical and real-world problems involving systems of linear equations by identifying and applying a suitable technique (e.g., graphing, substitution, elimination).
- Rewrite and evaluate rational numeric expressions with positive rational exponents using the properties of exponents and simplify completely the square root of non-perfect square integers and algebraic monomials.
- Factor a given polynomial completely and use a given technique to factor a quadratic equation.
- Represent and solve mathematical and real-world problems with rational solutions involving quadratic and exponential equations.
- Solve mathematical problems by breaking complex problems into simpler ones, identifying relevant information, using a variety of strategies, using words and symbols to support solutions, using simpler problems to solve more difficult ones, and determining the reasonableness of solutions.

Grade 10
Did Not Pass

Did Not Pass students demonstrate limited mathematical and problem-solving skills. Students may have difficulty when solving problems with linear and compound inequalities, quadratics, and systems of equations, and the complexity of algebra may be an obstacle for *Did Not Pass* students. Also, math topics including geometry, measurement, data analysis, and statistics can be stumbling blocks for students. *Did Not Pass* students may have difficulty making decisions about how to approach problem-solving situations, how to communicate their ideas, and how to apply mathematical knowledge to other situations.

Some examples of specific knowledge, skills, and abilities for Grade 10 students scoring at the *Did Not Pass* level include:

- Solve problems involving rational and irrational numbers and integer exponents and classify the result of performing operations on rational and irrational numbers as rational or irrational.
- Solve real-world problems involving the volume of cones, spheres, and pyramids and the surface area of spheres.
- Solve problems with rational solutions involving the Pythagorean Theorem.

- Solve problems using one or two transformations (dilations, translations, rotations, reflections) of objects and shapes on a coordinate plane.
- Demonstrate partial understanding of concepts and principles of probability, including probabilities of compound events and the multiplication counting principle.
- Answer questions to describe the characteristics of surveys and experiments.
- Answer questions to describe bivariate data represented in a scatter plot and describe basic patterns of association in problems involving bivariate data.
- Understand the general concept of non-neutral aspects of statistics and data.
- Apply principles and techniques related to linear equations to solve mathematical and real-world problems, interpret the slope and *y*-intercept in the context of the problem, and represent linear relationships using different methods (e.g., graphs from equations, equations from graphs, and equations from tables).
- Perform preliminary steps in solving linear equations with rational numbers, distinguish linear and nonlinear relationships represented by tables, graphs, verbal descriptions, or equations, solve linear inequalities in one variable in mathematical and real-world problems, and represent and interpret solutions on a number line.
- Understand concepts, notation, and representations related to functions.
- Solve mathematical problems with rational solutions involving systems of linear equations using a designated technique (e.g., graphing, substitution, elimination).
- Rewrite and evaluate rational numeric expressions with positive rational exponents using the properties of exponents and simplify partially the square root of non-perfect square integers and algebraic monomials.
- Factor a given polynomial partially.
- Represent mathematical and real-world problems with integral solutions involving quadratic and exponential equations.
- Set up and partially solve quadratic equations in one variable using a designated technique.
- Set up and partially solve mathematical problems by identifying relevant information in problems, using different strategies, making calculations, and determining the reasonableness of solutions.