



INDIANA
DEPARTMENT *of*
EDUCATION

2026 Indiana Academic Standards **MATHEMATICS**

QUANTITATIVE REASONING

Indiana Department of Education

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Indianapolis, IN 46204



Indiana Academic Standards Context and Purpose

Introduction

The Indiana Academic Standards (IAS) for Quantitative Reasoning are the result of a process designed to identify, evaluate, synthesize, and create high-quality, rigorous learning expectations for Indiana students.

Pursuant to Indiana Code [\(IC\) 20-31-3-3](#), the Indiana Department of Education (IDOE) facilitated the formal revision of the IAS for K-12 Mathematics. The standards are designed to ensure that all Indiana students, upon graduation, are prepared with essential knowledge and skills needed to access employment, enrollment, or enlistment leading to service. Select standards identified as essential for mastery by the end of the course are indicated with gray shading and an “E.”

What are the Indiana Academic Standards and How Should They Be Used?

The Indiana Academic Standards (IAS) are designed to help educators, parents, students, and community members understand the necessary content for each grade level or course, and within each content area domain. All standards are required to be taught and should form the basis for strong core instruction for all students enrolled in the designated grade level or course. The standards identify the minimum academic content or skills that Indiana students need in order to be prepared for success after graduation, but they are not an exhaustive list.

While the IAS establish key expectations for knowledge and skills and should be used as the basis for curriculum, the standards by themselves do not constitute a curriculum. It is the responsibility of the local school corporation to select and formally adopt curricular tools that align with the IAS. Additionally, corporation and school leaders should consider the appropriate instructional sequence of the IAS as well as the length of time needed to teach each one. Every standard has a unique place in the continuum of learning, but each one will not require the same amount of time and attention. A deep understanding of the vertical articulation of the IAS will enable educators to make the best instructional decisions. The IAS must also be complemented by robust, evidence-based instructional practices to support overall student development. By utilizing strategic and intentional instructional practices, other areas such as STEM and employability skills can be integrated with the IAS.

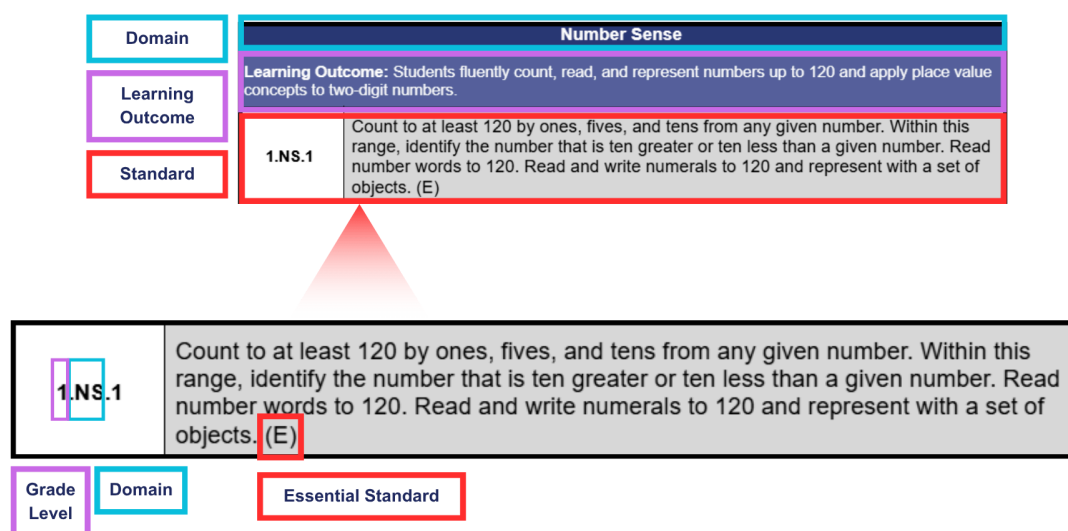
Indiana Academic Standards for Mathematics Structure

The IAS for K-12 Mathematics are composed of three main components to communicate each content expectation:

Domain: A broad content area within the IAS that organizes related knowledge and skills into coherent instructional categories.

Learning Outcome: The specific, measurable demonstration of what a student knows or can do after instruction aligned to the standard.

Standard: A required, minimum expectation for the knowledge and skills students must learn in a given grade level or course to ensure readiness for employment, enrollment, or enlistment leading to service.



Instructional Resources

Indiana's high school [Instructional Frameworks](#) provide course-specific guidance for planning, instruction, and support. They include the following key components aligned to educator needs: clarification of expectations within each standard, academic vocabulary, evidence statements, common misconceptions, "Looking Back" and "Looking Ahead" standards, instructional resources, and universal supports.

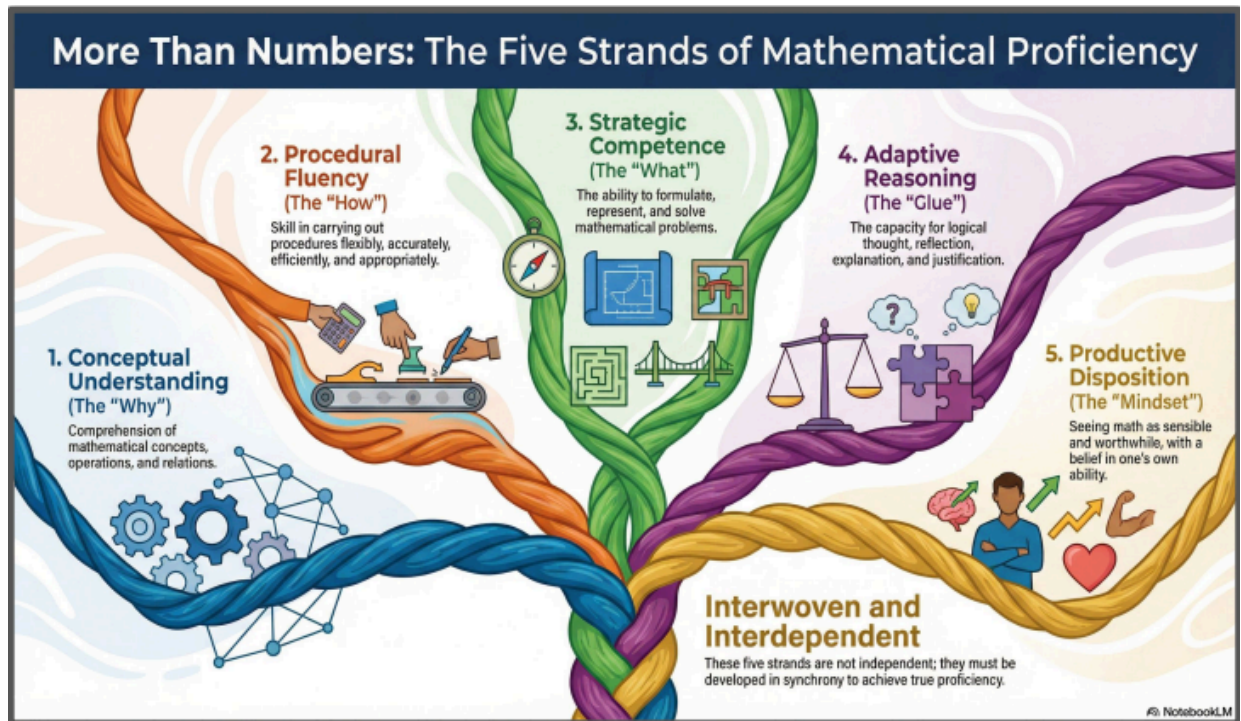
Indiana's high-school assessment framework is anchored by the statewide SAT administration for grade 11. The SAT is not a one-to-one assessment of all IAS but rather measures college readiness within key mathematical domains. Alignment resources, including the [Indiana SAT PLD Map: Math](#) and the high-school tab within the [Indiana Assessment Framework: Mathematics](#), support educators in understanding the relationship between Indiana standards and assessed SAT content. Because SAT items often require multiple skills simultaneously,

educators should use Performance Level Descriptors (PLDs) to understand how assessed skills relate to the IAS. The PLDs describe Below, Approaching, and At College Ready expectations for each assessed standard, supporting instructional planning and scaffolding.

Building Coherent Mathematics Instruction

Strands of Mathematical Proficiency: [The Five Strands of Mathematical Proficiency](#), identified by the National Research Council, describe the core capabilities students need to deeply understand and use mathematics. When these strands are intentionally woven into daily instruction and assessment, educators support classrooms where students not only learn mathematical content but also develop the confidence and skills to apply it with purpose.

Rather than functioning as separate skills, the Five Strands operate together as an interconnected system. Each strand strengthens and reinforces the others, creating a comprehensive foundation to help students make sense of mathematics, flexibly use what they know, reason through problems, and persist when learning becomes challenging. When braided together, the Five Strands form a durable structure that supports students' long-term mathematical growth and success.



Acknowledgments

IDOE appreciates the time, dedication, and expertise offered by Indiana’s K-12 educators, higher education professors, representatives from business and industry, families, and other stakeholders who contributed to the development of the Indiana Academic Standards. We wish to especially acknowledge the committee members, as well as participants in the public comment period, who dedicated many hours to the review and evaluation of these standards designed to prepare Indiana students for success after graduation.

Mathematics Process Standards

The mathematics process standards describe the ways students engage with mathematics content essential in guiding them to develop conceptual understanding, synthesize skills, and apply their learning in meaningful contexts. These standards are not isolated skills, but habits of mind and practices that empower students to reason, communicate, and solve problems across all areas of mathematics. They also support students in becoming confident, flexible thinkers who can transfer their mathematical understanding to new situations and disciplines. IDOE provides [detailed guidance](#) on the Process Standards and their role in mathematics instruction to further support educators and families.

Process Standard 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.

Process Standard 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.

Process Standard 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 always true, 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.

Process Standard 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.

Process Standard 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.

Process Standard 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.

Process Standard 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.

Process Standard 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.

Quantitative Reasoning

Standards identified as essential for mastery by the end of the course are indicated with gray shading and an “E.”

Numeracy	
QR.N.1	Represent and interpret quantities in equivalent forms (fractions, decimals, and percentages) to investigate and describe quantitative relationships and solve realworld problems in a variety of contexts. Compare the size of quantities in different forms arising in authentic real-world contexts. Interpret the meaning of numerical expressions in different forms. Recognize misleading or incorrect uses of numerical expressions and justify why different forms may be more useful for particular purposes.
QR.N.2	Apply prior understanding of quantities, ratios, rates, proportions, and percentages to solve multistep problems in authentic contexts. Calculate and compare percentage rates, successive percentage changes, and absolute and relative change; interpret the results; justify which measure is more informative for the decision at hand; and critique misleading uses of percentages. (E)
QR.N.3	Interpret numbers in different forms in terms of authentic contexts to solve real-world problems, such as interpreting a growth rate less than 1%. Compare and precisely communicate with numbers in different forms (including words, fractions, decimals, standard notation, and scientific notation), such as comparing relative and absolute changes in quantities.
QR.N.4	Compare magnitudes of numbers in context, such as the population of the US compared to the population of the world, and perform such comparisons when numbers are in different forms (including words, fractions, decimals, standard notation, and scientific notation). Include comparisons involving scale factors, such as explaining that scaling a figure by k multiplies every length by k , area by k^2 , and volume by k^3 .
QR.N.5	Represent very large and very small numbers in different forms, to an appropriate precision. Emphasize calculations involving quantities commonly expressed using scientific notation, especially when these numbers represent rates or real-world contexts.
QR.N.6	Use estimation skills, and know why, how, and when to estimate results. Identify and use numeric benchmarks for estimating calculations (e.g., using 25% as an estimate for 23%). Identify and use contextual benchmarks for comparison to other numbers (e.g., using the US population as a benchmark) to evaluate reasonableness of statistical claims or giving context to numbers. Check for reasonableness using both types of benchmarks.
QR.N.7	Use dimensional analysis to model and solve multistep authentic problems involving compound rates and multiple units, such as converting between currencies, calculating the cost of gasoline to drive a given car a given distance, or calculating dosages of medicine. Identify and interpret units throughout the calculation, determine when approximation is appropriate, and justify the result and its reasonableness in context. (E)

Ratio and Proportional Reasoning	
QR.RP.1	Solve real-life problems requiring interpretation and comparison of complex numerical summaries which extend beyond simple measures of center, such as problems requiring interpreting and/or comparing weighted averages, indices, coding, and ranking. Evaluate claims based on complex numeric summaries. (E)
QR.RP.2	Use percentages as rates per 100 to communicate quantitative comparisons clearly. Identify the reference whole or base, explain how a change in base affects interpretation, and critique misleading or incorrect percentage claims in authentic contexts.
QR.RP.3	Solve real-life problems requiring interpretation and comparison of various representations of ratios, (i.e., fractions, decimals, rate, and percentages), such as problems that involve non-standard ratios (e.g., media and risk reporting) or part-to-part versus part-to-whole ratios taken from meaningful context.
QR.RP.4	Analyze growth and decay using absolute and relative change and make comparisons using absolute and relative difference. (E)
QR.RP.5	Distinguish between proportional and non-proportional situations and, when appropriate, apply proportional reasoning in complex, real-world contexts. Determine and justify when proportional techniques do not apply. In proportional situations, determine the constant of proportionality and develop a symbolic model (e.g., $y = kx$), and apply the model to solve real-world problems.
QR.RP.6	Determine the constant of proportionality in proportional situations (both real-life and mathematical), leading to a symbolic model for the situation (i.e., an equation based upon a rate of change, $y = kx$). Apply the model to solve real-life problems.
Modeling	
QR.M.1	Analyze and critique mathematical models and be able to describe their limitations, including distinguishing between correlation and causation and determine whether interpolation and/or extrapolation are appropriate. Identify when there is insufficient information given to create an appropriate model.
QR.M.2	Use models, including those created with spreadsheets, to generate and analyze approximate solutions, such as using functional models to project future population or to explore financial applications (e.g., credit card debt, installment savings, amortization schedules, and loan scenarios). Identify patterns and determine how changing parameters affects the results. (E)
QR.M.3	Select, create, and interpret deterministic linear and exponential models for real-world situations where relationships show no variability (e.g., interest accumulation, loan amortization). Analyze and interpret parameters, justify the chosen function, and support conclusions or decisions based on the data. (E)
QR.M.4	Use technological tools to fit and compare models to bivariate data exhibiting variability. Analyze model accuracy, evaluate limitations, and justify conclusions or decisions based on the data.

QR.M.5	Apply geometric concepts to model situations and solve problems such as those arising in art, architecture, and other fields.
QR.M.6	Use a variety of network models represented graphically to organize data in quantitative situations, make informed decisions, and solve problems, such as in scheduling or routing situations that can be modeled using different methods (e.g., vertex-edge graphs using critical paths, Euler paths, or minimal spanning trees). (E)
Probabilistic Reasoning to Assess Risk	
QR.P.1	Determine the nature and number of elements in a finite sample space to model the outcomes of real-world events using counting techniques, and build the sample space by making lists, tables, or tree diagrams.
QR.P.2	Use simulation to estimate probabilities, and make predictions about the long-run behavior of a variable.
QR.P.3	Evaluate the validity of claims based on empirical, theoretical, and subjective probabilities. Draw conclusions or make decisions related to risk, pay-off, expected value, and false negatives/positives in various probabilistic contexts. (E)
QR.P.4	Use data displays and models, such as two-way tables, tree diagrams, Venn diagrams, and area models, to determine probabilities (including conditional probabilities) and use these probabilities to make informed decisions. (E)
Statistics	
QR.S.1	Analyze statistical information from studies, surveys, and polls (including when reported in condensed form or using summary statistics) to make informed judgments as to the validity of claims or conclusions, such as when interpreting and comparing the results of polls using margin of error.
QR.S.2	Identify limitations, strengths, or lack of information in studies, including data collection methods (e.g., sampling, experimental, observational) and possible sources of bias, and identify errors or misuses of statistics to justify particular conclusions. Describe the role of random selection and random assignment in the design of statistical studies. (E)
QR.S.3	Create and use visual displays of multivariate real world data using technology (e.g., scatterplots with overlaid categorical variable, bubble charts, scatterplot matrices, mosaic plots, and quantitative thematic maps).
QR.S.4	Interpret and analyze visual representations of data, and describe strengths, limitations, and fallacies of various graphical displays. (E)
QR.S.5	Read, interpret, draw, and justify conclusions from data summarized numerically using measures of center and spread in tables and graphical displays like line graphs, bar graphs, scatterplots, and histograms (e.g., explain why the mean may not represent a typical salary; explain the difference between bar graphs and histograms; critique a graphical display by recognizing that the choice of scale can distort information). (E)
QR.S.6	Summarize, represent, and interpret data sets on a single quantitative variable using plots and statistics appropriate to the shape of the data distribution to represent it.
QR.S.7	Compare center, shape, and spread of two or more data sets and interpret the differences in context.

2026 Indiana Academic Standards: Quantitative Reasoning

QR.S.8	Use properties of distributions, including uniform and normal distributions, to analyze data and answer questions.
QR.S.9	Recognize when data are normally distributed and use the mean and standard deviation of the data to fit it to a normal distribution.
QR.S.10	Examine the considerations involved in collecting and managing data, including privacy protections and responsible data practices, and identify potential concerns that may arise in specific situations.