

Summer 2008



INDIANA'S CORE STANDARDS:

Core Academic Concepts Across the K–12 Continuum
A Companion to Indiana's Academic Standards

MATHEMATICS

Kindergarten – Grade 12

Effective curriculum, instruction and assessment do not happen by accident. They are the result of many people planning together, working together and sharing responsibility for the success of all students.

A great deal of work has gone into developing resources to help educators plan curriculum, instruction and assessment. What has made the development process so successful is the grassroots involvement of people statewide. The collaborative efforts and dedication of teachers, administrators, state educational organizations, parents, business leaders, higher education faculty, Indiana Department of Education staff, Board of Education members, Indiana's Education Roundtable and the public have contributed to the creation of quality resources for our teachers.

To continue this work, Indiana has adopted *Core Standards: Core Academic Concepts Across the K-12 Continuum*. The *Core Standards*, a complement to *Indiana's Academic Standards*, explicitly highlight the “big ideas” for each grade level and content area, give proper weight to concepts central to advancement across subsequent grade levels, allow for instructionally-supportive assessments, and encourage the integration of curricula across content areas. The *Core Standards* build upon *Indiana's Academic Standards* by integrating multiple Standard Indicators into a small number of instructionally-coherent targets that reflect priorities for each school year or course.

It is our sincerest hope that the *Core Standards* help teachers' efforts in defining and developing curriculum, selecting instruction, assessing student outcomes and integrating content areas when appropriate to support the success of Indiana's students.

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Purpose of the Core Standards

The Core Standards invite new ways of aligning K-12 curriculum and assessment to *Indiana's Academic Standards*.

Core Standards in the Classroom

The teachers can use the Core Standards to:

- help students focus on the key concepts (the most important Standard Indicators necessary for understanding the “big ideas”) of each grade level and content area;
- help parents understand the most important concepts to be learned at each grade level;
- inform decision-making when planning and delivering instruction and designing assessment;
- create more focused goals for student performance at the end of each school year; and
- communicate to administrators, school officials and the public that Indiana continues to strive for high standards in education.

Core Standards in the Education Community

The public can use the Core Standards to:

- gain a clearer understanding of what is expected of Indiana students and teachers;
- enhance discussions of ways to integrate curriculum, instruction and assessment;
- engage in conversations regarding professional development within the K-12 environment;
- explore collaborative opportunities between K-12 teachers and higher education faculty; and
- discuss conceptual learning across and outside the education community.

THE CORE STANDARDS:

- Highlight the most important concepts presented in each grade level and content area by integrating multiple Standard Indicators from *Indiana's Academic Standards*;
- outline a manageable number of concepts that all students must understand and be able to do at the end of the year;
- emphasize the concepts that are central to each grade and are connected to subsequent grade levels;
- set challenging and explicit goals that delineate which Standard Indicators should receive the most instructional time;
- support the development of assessment that is focused on concepts that are central to a grade level or content area;
- enable teachers to assess critical skills in greater depth and use student responses to guide further instruction; and
- provide the opportunity to integrate multiple content areas in the classroom by analyzing the connections among the manageable lists of concepts in each grade level and content area.



Four small blue squares of varying shades are arranged horizontally in the top right corner.

PROCESS STANDARDS

These Process Standards from the National Council of Teachers of Mathematics address problem-solving skills and are to be used in conjunction with the *Core Standards*.

PROCESS STANDARDS

To Accompany the Core Standards

Indiana's *Core Standards* for Mathematics describe the key content for students in each grade level and course. Students must develop conceptual understanding of this content. The American Diploma Project noted that, "beyond acquiring procedural mathematical skills with their clear methods and boundaries, students need to master the more subjective skills of reading, interpreting, representing and 'mathematizing' a problem" (2004, 55). The National Council of Teachers of Mathematics has described five Process Standards that "highlight ways of acquiring and using content knowledge" (2000, 29). The following Process Standards should be addressed throughout the learning and teaching of Indiana's Core Standards for Mathematics in all grade levels.

Problem Solving

- Build new mathematical knowledge through problem solving.
- Solve problems that arise in mathematics and in other contexts.
- Apply and adapt a variety of appropriate strategies to solve problems.
- Monitor and reflect on the process of mathematical problem solving.

Communication

- Organize and consolidate mathematical thinking through communication.
- Communicate mathematical thinking coherently and clearly to peers, teachers and others.
- Analyze and evaluate the mathematical thinking and strategies of others.
- Use the language of mathematics to express mathematical ideas precisely.

Reasoning and Proof

- Recognize reasoning and proof as fundamental aspects of mathematics.
- Make and investigate mathematical conjectures.
- Develop and evaluate mathematical arguments and proofs.
- Select and use various types of reasoning and methods of proof.

PROCESS STANDARDS

Connections

- Recognize and use connections among mathematical ideas.
- Understand how mathematical ideas interconnect and build on one another to produce a coherent whole.
- Recognize and apply mathematics in contexts outside of mathematics.

Representation

- Create and use representations to organize, record and communicate mathematical ideas.
- Select, apply and translate among mathematical representations to solve problems.
- Use representations to model and interpret physical, social and mathematical phenomena.

Technology

Technology should be used as an essential tool in mathematics education to support and extend the mathematics curriculum. Technology can contribute to concept development, simulation, representation, communication and problem solving. The challenge is to ensure that technology supports—but is not a substitute for—the development of skills with basic operations, quantitative reasoning and problem-solving skills. Elementary students must learn how to perform thoroughly the basic arithmetic operations independent of the use of a calculator. Graphing calculators must be used to enhance middle school and high school students' understanding and skills rather than replace them. The focus must be on learning mathematics, using technology as a tool rather than as an end in itself.

References

- American Diploma Project. 2004. *Ready or Not: Creating a High School Diploma that Counts*. Washington, DC: Achieve, Inc.
- National Council of Teachers of Mathematics. 2000. *Principles and Standards for School Mathematics*. Reston, VA: NCTM.
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CORE STANDARDS

The *Core Standards* represent ideas that are broad in scope and encompass multiple Standard Indicators. Students should be proficient in these *Core Standards* in order to successfully move on to the next levels of Mathematics.

Core Standards for Kindergarten Mathematics

CORE STANDARD	1
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Number Sense and Computation

Counting to 20

Count objects and use symbols (numerals and pictures) and names to represent whole numbers up to 20. Find the number that is one more than or one less than any whole number up to 20. Recognize numbers from 10 to 20 and represent them as groups of tens and ones. Show equivalent forms of the same number (up to 20) using objects, diagrams and numerals.

[Standard Indicators: K.1.6, K.1.7]

CORE STANDARD	2
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Geometry and Measurement

Comparing and Classifying Objects

Identify, describe, sort, compare and classify objects by shape, size, number of vertices and other attributes.

[Standard Indicators: K.3.1, K.4.1, K.4.2]

Comparing Measures

Make direct comparisons of the length, capacity, weight and temperature of objects and recognize which object is shorter, longer, taller, lighter, heavier, warmer, cooler or holds more.

[Standard Indicator: K.5.1]

Core Standards for Grade 1 Mathematics

CORE
STANDARD

1

Number Sense and Computation

Whole Numbers

Count, read, write and compare whole numbers up to 100. Recognize numbers up to 100 and represent them as groups of tens and ones.

[Standard Indicators: 1.1.1, 1.1.2, 1.1.3, 1.1.4, 1.1.5]

Addition and Subtraction

Model addition and subtraction using objects. Demonstrate fluency with addition facts (for totals up to 20) and the corresponding subtraction facts. Solve problems involving addition and subtraction.

[Standard Indicators: 1.2.1, 1.2.2, 1.2.4, 1.2.5, 1.2.6, 1.2.7, 1.3.1]

CORE
STANDARD

2

Geometry and Measurement

Geometric Shapes

Identify, describe, compare, sort and draw triangles, rectangles, squares and circles.

[Standard Indicators: 1.4.1, 1.4.2, 1.4.7]

Linear Measurement

Estimate and measure the length of an object to the nearest inch and centimeter.

[Standard Indicator: 1.5.4]

Core Standards for Grade 2 Mathematics

CORE STANDARD	1
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Number Sense and Computation

Place Value

Understand and use the relationship among whole numbers, including place value, to identify and compare numbers up to 1000.

[Standard Indicators: 2.1.1, 2.1.2, 2.1.3, 2.1.4, 2.1.5, 2.1.7]

Addition and Subtraction

Add and subtract whole numbers less than 1000 using efficient methods. Understand and show the inverse relationship between addition and subtraction.

[Standard Indicators: 2.2.1, 2.2.2, 2.2.3, 2.2.4, 2.2.6, 2.3.1, 2.3.4]

CORE STANDARD	2
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Geometry and Measurement

Common Shapes and Objects

Recognize, identify, and describe attributes of common shapes and solids (e.g., the same size and type of shape; number of sides, edges, vertices; location).

[Standard Indicators: 2.4.2, 2.4.4, 2.4.5]

Linear Measurement

Understand and use units of linear measurement and relationships within a particular system to solve problems. Measure lengths in standard units (e.g., inches, feet and yards) and metric units (e.g., centimeters and meters) and select appropriate units to estimate and measure lengths.

[Standard Indicators: 2.5.1, 2.5.2, 2.5.3]

Core Standards for Grade 3 Mathematics

CORE STANDARD	1
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Number Sense and Computation

Place Value

Understand and use the relationship among whole numbers, including place value, to identify and compare numbers up to 10,000.

[Standard Indicators: 3.1.1, 3.1.2, 3.1.3, 3.1.4, 3.1.5, 3.1.7, 3.3.7]

Interpreting and Modeling Fractions

Interpret and model fractions as parts of a whole, parts of a group, and points and distances on a number line. Solve problems that involve comparing and ordering fractions.

[Standard Indicators: 3.1.8, 3.1.10]

Addition and Subtraction

Understand and use standard algorithms for addition and subtraction.

[Standard Indicators: 3.2.1, 3.2.8, 3.3.1, 3.3.2]

Multiplication and Division

Understand the meaning of multiplication and division of whole numbers and show the relationship between them. Find values for number sentences containing multiplication and/or division.

[Standard Indicators: 3.2.2, 3.2.3, 3.2.4, 3.2.5, 3.3.1, 3.3.2, 3.3.4, 3.3.5]

CORE STANDARD	2
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Geometry and Measurement

Points and Lines

Identify, describe and draw points, lines and line segments.

[Standard Indicators: 3.4.6, 3.4.7]

Length, Weight and Unit Conversions

Choose and use appropriate units and tools to estimate and measure length and weight.

Carry out simple unit conversions within a measurement system.

[Standard Indicators: 3.5.1, 3.5.2, 3.5.6, 3.5.7, 3.5.8, 3.5.9, 3.5.11, 3.5.12]

Core Standards for Grade 4 Mathematics

CORE STANDARD	1
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Number Sense and Computation

Place Value

Understand and use the relationship among whole numbers, including place value, to identify and compare numbers. Interpret and model decimals as parts of a whole, parts of a group, and points and distances on a number line.

[Standard Indicators: 4.1.1, 4.1.2, 4.1.4, 4.1.8, 4.1.9]

Multiplication and Division Facts

Demonstrate fluency with multiplication facts for numbers up to 10 and related division facts.

[Standard Indicator: 4.2.4]

Multiplying Whole Numbers

Multiply numbers up to 100 by single-digit numbers and by 10, solving problems written horizontally and vertically.

[Standard Indicators: 4.2.1, 4.2.5, 4.2.6, 4.2.7, 4.2.12, 4.3.5, 4.3.7]

Addition and Subtraction of Fractions

Model addition and subtraction of simple fractions.

[Standard Indicator: 4.2.8]

CORE STANDARD	2
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Geometry and Measurement

Angles and Lines

Identify, describe and draw parallel and perpendicular lines, and right, acute, obtuse and straight angles.

[Standard Indicators: 4.4.1, 4.4.2]

Rectangles

Find and use the perimeter and area of rectangles, including squares.

[Standard Indicators: 4.5.3, 4.5.4]

Core Standards for Grade 5 Mathematics

CORE STANDARD	1
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Number Sense and Computation

Multiplication and Division of Whole Numbers

Multiply and divide whole numbers. Understand and use standard algorithms for multiplication and division.

[Standard Indicator: 5.2.1]

Comparing Fractions, Decimals and Percents

Compare fractions, decimals and common percents.

[Standard Indicators: 5.1.3, 5.1.4, 5.1.7]

Addition and Subtraction of Fractions and Decimals

Understand and perform addition and subtraction with fractions, including fractions with different denominators and mixed numbers. Add and subtract decimals, including money in decimal notation.

[Standard Indicators: 5.2.2, 5.2.5, 5.2.7, 5.5.7]

CORE STANDARD	2
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Geometry and Measurement

Polygons

Measure angles and describe angles in degrees, and identify, classify and draw polygons and triangles.

[Standard Indicators: 5.4.1, 5.4.2, 5.4.3, 5.4.4]

Shapes and Solids

Find and use the perimeter and area of triangles, parallelograms and trapezoids, and the surface area and volume of rectangular prisms.

[Standard Indicators: 5.5.1, 5.5.2, 5.5.3, 5.5.4]

CORE STANDARD	3
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Algebra and Functions

Variables

Evaluate simple algebraic expressions.

[Standard Indicators: 5.3.1, 5.3.2]

Coordinate Grids

Use two-dimensional coordinate grids to represent points in the first quadrant that fit linear equations. Draw the line determined by the points.

[Standard Indicators: 5.3.4, 5.3.5]

Core Standards for Grade 6 Mathematics

CORE STANDARD	1
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Number Sense and Computation

Positive and Negative Numbers

Understand and apply the concept of positive and negative numbers. Add, subtract, multiply and divide positive and negative integers. Represent negative numbers, and computation with negative numbers, on a number line.

[Standard Indicators: 6.1.1, 6.1.3, 6.2.1, 6.2.2]

Percent Representations

Use percents to represent parts of a whole. Represent numbers as fractions, decimals and percents.

[Standard Indicators: 6.1.4, 6.1.5]

Multiplication and Division of Fractions and Decimals

Understand and perform multiplication and division with positive decimals and fractions.

[Standard Indicators: 6.2.3, 6.2.4, 6.2.5, 6.5.10]

Ratio and Rate

Solve simple ratio and rate problems using multiplication and division.

[Standard Indicators: 6.1.6, 6.2.6, 6.2.7, 6.2.8]

CORE STANDARD	2
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Geometry and Measurement

Angles and Polygons

Use properties of complementary, supplementary and vertical angles, and properties of triangles and quadrilaterals to find missing angles.

[Standard Indicators: 6.4.1, 6.4.2, 6.4.4]

Shapes and Solids

Find and use the circumference and area of circles and the surface area of right prisms and cylinders.

[Standard Indicators: 6.5.4, 6.5.8]

Core Standards for Grade 6 Mathematics (cont.)CORE
STANDARD**3****Algebra and Functions***Linear Equations*

Write and solve one-step equations and inequalities in one variable.

[Standard Indicators: 6.3.1, 6.3.3, 6.3.6]

Linear Functions

Write equations of linear functions representing a given situation and graph the resulting ordered pairs of integers on a coordinate grid.

[Standard Indicators: 6.3.7, 6.3.8]