Curriculum Overview

Standards & Skills

You CAN Do The Rubik's Cube
Instructional Curriculum
How to Solve the Rubik's Cube

Part 1 - Curriculum Overview

Part 2 - Skills & Standards

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Acknowledgments:

The "How to Solve the Rubik's Cube" lesson plans are intended as a comprehensive instructional guide for teachers and educators based on the You CAN Do The Rubik's Cube solution guide. We wish to thank all our friends in the Rubik's community for their support and inspiration.

About the Author:

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**Overview**

Each lesson has a brief one sentence overview of the focus of the lesson.

The You CAN Do the Rubik's Cube Instructional Curriculum can be taught over the course of 6, 7, 8, 9 or 10 weeks.

- **For the 6 week course:**
  - Week 1: Lesson 1
  - Week 2: Lessons 2 & 3
  - Week 3: Lesson 4
  - Week 4: Lessons 5 & 6
  - Week 5: Lessons 7 & 8
  - Week 6: Review Lesson

- **For the 7 week course:**
  - Week 1: Lesson 1 Part A
  - Week 2: Lesson 1 Part B
  - Week 3: Lessons 2 & 3
  - Week 4: Lesson 4
  - Week 5: Lessons 5 & 6
  - Week 6: Lesson 7 & 8
  - Week 7: Review Lesson
  
  - Note: The 7-week course can be designed by using any variation of separating and/or combining double lessons.

- **For the 8 week course:**
  - Note: The 8-week course can be designed by using the 7-week course and separating another double lesson.

- **For the 9 week course:**
  - Note: The 9-week course can be designed by using the 7-week course and separating two other double lessons.

- **For the 10 week course:**
  - Week 1: Lesson 1 Part A
  - Week 2: Lesson 1 Part B
  - Week 3: Lesson 2
  - Week 4: Lesson 3
  - Week 5: Lesson 4
  - Week 6: Lesson 5
  - Week 7: Lesson 6
  - Week 8: Lesson 7
  - Week 9: Lesson 8
  - Week 10: Review Lesson

**CD ROM**

Included on the Inside Front Cover of this booklet is a CD-ROM containing a digital copy of the complete You CAN Do The Rubik's Cube Instructional Curriculum including each PowerPoint presentation and appendices for easy printing.

**Materials**

For each lesson, a list of materials is noted on the right column of the first page of the lesson. In general, the following are needed for each lesson:

- Class set of Rubik’s Cubes and Solution Guides
- Crayons/Markers/Colored Pencils
- *(Optional)* Method for viewing PowerPoint
- *(Optional)* PowerPoint files for each lesson
OBJECTIVES
• Each lesson has three objectives, based on Bloom’s Taxonomy. The objectives include the information taught in the Lesson Extensions.

SOLUTION GUIDE
• Each lesson coordinates with a STAGE from the You CAN Do The Cube Solution Guide. This section notes the stage. The explanation of steps to achieve each stage, while adopted from the Solution Guide, are sometimes adjusted to meet the needs for whole class instruction.

STANDARDS & SKILLS:
• Each lesson has been cross-referenced with the Common Core Standards, National Expectations, and the Framework for 21st Century Learning. The list of standards and skills by grade level are listed on the first page of each booklet. Complete details regarding all standards begins on page 5 of this booklet.

GOAL
• This section of the lesson shows a cube image of the end goal of the lesson.

GRAY BOXES
Some lessons contain gray boxes with instructions for combining lessons. If you wish to combine certain lesson together, follow instructions in the gray boxes.

WHOLE CLASS LESSON

LESSON VOCABULARY
• The Lesson Vocabulary pertains to the cube and some mathematical terms necessary to understand the instructions to solve the Rubik’s Cube.

LESSON FOCUS
• This section of each lesson contains the instructions for achieving the goal of that lesson. In the Lesson Focus, there are specific teacher instructions, such as; Ask, Tell, Say, Check, Explain, Show. For example:
  • Tell students:
    • __________________________
    • __________________________
• These instructions are meant to guide your dialogue during lessons in order to give more direct and accurate instructions based on how students learn overall.
• At the end of each Lesson Focus, the GOAL is noted by text and picture.
DIFFERENTIATION – LEVELED GROUP ACTIVITIES

Each lesson contains activities for differentiation, should you decide to expand the scope of your lesson to leveled instructions and group work. Selecting an activity (or group) for each student can vary from week to week. Below are the descriptions of each group. The activities for these groups, with the exception of M-Modify, are designed to be done mostly on their own, though some groups may need teacher assistance.

The purpose of grouping for differentiation is to allow the teacher to move freely from small group to small group to enable more one-on-one attention. Suggested group size: no more than 4-6 students per group. With 4-6 students per group, a class may be comprised of several A or T groups.

Special Note: English Learners may fall into any of the four MATH groups based on their understanding. The handouts with graphics will assist in helping the EL students communicate and understand the lesson.

M – Modify the lesson for understanding
This group level is designed for students who have special learning needs or need consistent one-on-one assistance. This group may or may not have activities that will promote achieving the end of lesson goal. The activities will always incorporate the cube and steps toward becoming familiar, manipulating, and/or solving the cube.

A – Apply the lesson to repeated practice
This group level is designed for students who are “at-level” with respect to solving the cube. These students may or may not be “at-level” mathematically. Each lesson will have pre-requisite instructions for selecting students for this group. This group will focus on repeated practice of the lesson instructions.

T – Re-Teach the lesson for mastery
This group level is designed for students who need extra help understanding and following the lesson instructions. This group will focus on the lesson instructions at a slower pace and/or with teacher assistance.

H – Higher level learning for enrichment
This group level is designed for students who have mastered the lesson instructions and, without moving ahead of the class, are ready for more difficult activities. This group should be able to work without teacher assistance.

DIFFERENTIATION APPENDICES
- Each MATH Group differentiation activity is marked by MATH Group and Lesson number.
- For example, the activity for the H group in lesson one is marked: Appendix 1.H.
Curriculum Overview

**Review**
- Each lesson has condensed lesson instructions for a quick review at the end of a session.

**Lesson Extension**
- This section relates the lesson instructions for solving the Rubik's Cube to a mathematical concept at various elementary grade levels. Depending upon the purpose of your "How To Solve the Rubik's Cube" course, this section may be optional.

**Rubik’s Trivia**
- Each lesson has a question and answer about the history of the Rubik’s Cube. This section is designed for fun facts and class interaction.

**Evaluation**
- Based on the objectives at the beginning of each lesson, the Evaluation section is a recap checklist for the teacher to monitor what the students were able to accomplish in each session.

**Home Connection**
- Each lesson is accompanied with a review page that can be copied and sent home with the students. The review page has the objectives, algorithms for each lesson, Rubik’s Trivia, and the Lesson Extension so the students and their parents can practice and learn together. This section is meant to promote parent and family involvement to further promote student success.

**Power Point**
- Each lesson has a coordinating Power Point that includes graphics and condensed instructions that follow the chronology of the lesson. Using the Power Points, in conjunction with the verbal lessons, offers a visual learning tool that assists in meeting the needs of all students and all levels, including English Learners, Special Needs, At-Risk, At-Level, and Gifted.
- In each lesson, you will find a notation, such as PPS, indicating the slide number that correlates to a specific part of the lesson.
- If you do not have access to Power Point, a hard copy of each slide has been provided for use under a document camera. The hard copies can also be photo copied onto transparencies for use on an overhead projector.

**Reference Sheet**
- On the inside back cover of each booklet you will find the Quarter Turn Reference sheet. This sheet can be copied and given to students to use during lessons or to take home for practice and review.
Standards & Skills
COMMON CORE - KINDERGARTEN

COUNTING AND CARDINALITY (K.CC)

- Count to tell the number of objects.

  5. Count to answer “how many?” questions about as many as 20 things arranged in a line, a rectangular array, or a circle, or as many as 10 things in a scattered configuration; given a number from 1–20, count out that many objects.

OPERATIONS AND ALGEBRAIC THINKING (K.OA)

- Understand addition as putting together and adding to, and understand subtraction as taking apart and taking from.

  5. Fluently add and subtract within 5.

MEASUREMENT AND DATA (K.MD)

- Describe and compare measurable attributes.

  1. Describe measurable attributes of objects, such as length or weight. Describe several measurable attributes of a single object.

GEOMETRY (K.G)

- Identify and describe shapes (squares, circles, triangles, rectangles, hexagons, cubes, cones, cylinders, and spheres).

  1. Describe objects in the environment using names of shapes, and describe the relative positions of these objects using terms such as above, below, beside, in front of, behind, and next to.

  3. Identify shapes as two-dimensional (lying in a plane, “flat”) or three-dimensional (“solid”). Analyze, compare, create, and compose shapes.

  4. Analyze and compare two- and three-dimensional shapes, in different sizes and orientations, using informal language to describe their similarities, differences, parts (e.g., number of sides and vertices/“corners”) and other attributes (e.g., having sides of equal length).
Operations and Algebraic Thinking (1.OA)

- Understand and apply properties of operations and the relationships between addition and subtraction.

4. Understand subtraction as an unknown-addend problem. For example, subtract $10 - 8$ by finding the number that makes $10$ when added to $8$.

- Work with addition and subtraction equations.

7. Understand the meaning of the equal sign, and determine if equations involving addition and subtraction are true or false. For example, which of the following equations are true and which are false? $6 = 6$, $7 = 8 - 1$, $5 + 2 = 2 + 5$, $4 + 1 = 5 + 2$.

Measurement and Data (1.MD)

- Tell and write time.

3. Tell and write time in hours and half-hours using analog and digital clocks.

Geometry (1.G)

- Reason with shapes and their attributes.

1. Distinguish between defining attributes (e.g., triangles are closed and three-sided) versus non-defining attributes (e.g., color, orientation, overall size); build and draw shapes to possess defining attributes.
**Common Core - Grade Two**

**Operations and Algebraic Thinking (2.OA)**

- **Represent and solve problems involving addition and subtraction.**
  1. Use addition and subtraction within 100 to solve one- and two-step word problems involving situations of adding to, taking from, putting together, taking apart, and comparing, with unknowns in all positions, e.g., by using drawings and equations with a symbol for the unknown number to represent the problem.
  2. Add and subtract with 20.
  3. Fluently add and subtract within 20 using mental strategies. By end of Grade 2, know from memory all sums of two one-digit numbers.

**Number and Operations in Base Ten (2.NBT)**

- **Use place value understanding and properties of operations to add and subtract.**
  5. Fluently add and subtract within 100 using strategies based on place value, properties of operations, and/or the relationship between addition and subtraction.

**Measurement and Data (2.MD)**

- **Measure and estimate lengths in standard units.**
  1. Measure the length of an object by selecting and using appropriate tools such as rulers, yardsticks, meter sticks, and measuring tapes.
  2. Relate addition and subtraction to length.
  3. Represent whole numbers as lengths from 0 on a number line diagram with equally spaced points corresponding to the numbers 0, 1, 2, and represent whole-number sums and differences within 100 on a number line diagram.
  4. Work with time and money.
  5. Tell and write time from analog and digital clocks to the nearest five minutes, using a.m. and p.m.

**Geometry (2.G)**

- **Reason with shapes and their attributes.**
  2. Partition a rectangle into rows and columns of same-size squares and count to find the total number of them.
COMMON CORE - GRADE THREE

MEASUREMENT AND DATA (3.MD)

• Solve problems involving measurement and estimation of intervals of time, liquid volumes, and masses of objects.

1. Tell and write time to the nearest minute and measure time intervals in minutes. Solve word problems involving addition and subtraction of time intervals in minutes, e.g., by representing the problem on a number line diagram.

GEOMETRY (3.G)

• Reason with shapes and their attributes.

1. Understand that shapes in different categories (e.g., rhombuses, rectangles, and others) may share attributes (e.g., having four sides), and that the shared attributes can define a larger category (e.g., quadrilaterals). Recognize rhombuses, rectangles, and squares as examples of quadrilaterals, and draw examples of quadrilaterals that do not belong to any of these subcategories.

COMMON CORE - GRADE FOUR

OPERATIONS AND ALGEBRAIC THINKING (4.OA)

• Generate and analyze patterns.

5. Generate a number or shape pattern that follows a given rule. Identify apparent features of the pattern that were not explicit in the rule itself.

NUMBER AND OPERATIONS – FRACTIONS (4.NF)

• Extend understanding of fraction equivalence and ordering.

1. Explain why a fraction \( \frac{a}{b} \) is equivalent to a fraction \( \frac{(n \times a)}{(n \times b)} \) by using visual fraction models, with attention to how the number and size of the parts differ even though the two fractions themselves are the same size. Use this principle to recognize and generate equivalent fractions.

• Understand decimal notation for fractions, and compare decimal fractions.

5. Express a fraction with denominator 10 as an equivalent fraction with denominator 100, and use this technique to add two fractions with respective denominators 10 and 100. For example, express \( \frac{3}{10} \) as \( \frac{30}{100} \), and add \( \frac{3}{10} + \frac{4}{100} = \frac{34}{100} \).

6. Use decimal notation for fractions with denominators 10 or 100. For example, rewrite 0.62 as \( \frac{62}{100} \); describe a length as 0.62 meters; locate 0.62 on a number line diagram.

GEOMETRY (4.G)

• Draw and identify lines and angles, and classify shapes by properties of their lines and angles.

1. Draw points, lines, line segments, rays, angles (right, acute, obtuse), and perpendicular and parallel lines. Identify these in two-dimensional figures.

3. Recognize a line of symmetry for a two-dimensional figure as a line across the figure such that the figure can be folded along the line into matching parts. Identify line-symmetric figures and draw lines of symmetry.
**COMMON CORE - GRADE FIVE**

**NUMBER AND OPERATIONS – FRACTIONS (5.NF)**

- **Apply and extend previous understandings of multiplication and division to multiply and divide fractions.**

4. Apply and extend previous understandings of multiplication to multiply a fraction or whole number by a fraction.
   - b. Find the area of a rectangle with fractional side lengths by tiling it with unit squares of the appropriate unit fraction side lengths, and show that the area is the same as would be found by multiplying the side lengths. Multiply fractional side lengths to find areas of rectangles, and represent fraction products as rectangular areas.

**MEASUREMENT AND DATA (5.MD)**

- **Geometric measurement: understand concepts of volume and relate volume to multiplication and to addition.**

3. Recognize volume as an attribute of solid figures and understand concepts of volume measurement.
   - a. A cube with side length 1 unit, called a “unit cube,” is said to have “one cubic unit” of volume, and can be used to measure volume.
   - b. A solid figure which can be packed without gaps or overlaps using $n$ unit cubes is said to have a volume of $n$ cubic units.

**GEOMETRY (5.G)**

- **Classify two-dimensional figures into categories based on their properties.**

3. Understand that attributes belonging to a category of two-dimensional figures also belong to all subcategories of that category. *For example, all rectangles have four right angles and squares are rectangles, so all squares have four right angles.*

4. Classify two-dimensional figures in a hierarchy based on properties.
**COMMON CORE - GRADE SIX**

**THE NUMBER SYSTEM (6.NS)**

- **Compute fluently with multi-digit numbers and find common factors and multiples.**
  3. Fluently add, subtract, multiply, and divide multi-digit decimals using the standard algorithm for each operation.

- **Apply and extend previous understandings of numbers to the system of rational numbers.**
  5. Understand that positive and negative numbers are used together to describe quantities having opposite directions or values (e.g., temperature above/below zero, elevation above/below sea level, credits/debits, positive/negative electric charge); use positive and negative numbers to represent quantities in real-world contexts, explaining the meaning of 0 in each situation.

  6. Understand a rational number as a point on the number line. Extend number line diagrams and coordinate axes familiar from previous grades to represent points on the line and in the plane with negative number coordinates.
    - a. Recognize opposite signs of numbers as indicating locations on opposite sides of 0 on the number line; recognize that the opposite of the opposite of a number is the number itself, e.g., \(-(-3) = 3\), and that 0 is its own opposite.

**EXPRESSION AND EQUATIONS (6.EE)**

- **Apply and extend previous understandings of arithmetic to algebraic expressions.**
  2. Write, read, and evaluate expressions in which letters stand for numbers.
    - a. Write expressions that record operations with numbers and with letters standing for numbers. *For example, express the calculation “Subtract y from 5” as 5 \(- y*."

**GEOMETRY (6.G)**

- **Solve real-world and mathematical problems involving area, surface area, and volume.**
  2. Find the volume of a right rectangular prism with fractional edge lengths by packing it with unit cubes of the appropriate unit fraction edge lengths, and show that the volume is the same as would be found by multiplying the edge lengths of the prism. Apply the formulas \(V = l \times w \times h\) and \(V = b \times h\) to find volumes of right rectangular prisms with fractional edge lengths in the context of solving real-world and mathematical problems.

  4. Represent three-dimensional figures using nets made up of rectangles and triangles, and use the nets to find the surface area of these figures. Apply these techniques in the context of solving real-world and mathematical problems.
National Math Standards and Expectations

**Process**
Pre-K–12 Expectations

**Problem Solving**
Instructional programs from pre-kindergarten through grade 12 should enable all students to:
- 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.

**Reasoning and Proof**
Instructional programs from pre-kindergarten through grade 12 should enable all students to:
- Recognize reasoning and proof as fundamental aspects of mathematics.
- Select and use various types of reasoning and methods of proof.

**Communication**
Instructional programs from pre-kindergarten through grade 12 should enable all students to:
- Organize and consolidate their mathematical thinking through communication.
- Communicate their mathematical thinking coherently and clearly to peers, teachers, and others.
- Analyze and evaluate the mathematical thinking and strategies of others.

**Connections**
Instructional programs from pre-kindergarten through grade 12 should enable all students to:
- 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**
Instructional programs from pre-kindergarten through grade 12 should enable all students to:
- 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.
NUMBER AND OPERATIONS

UNDERSTAND NUMBERS, WAYS OF REPRESENTING NUMBERS, RELATIONSHIPS AMONG NUMBERS, AND NUMBER SYSTEMS

Pre-K–2 Expectations: In pre-K through grade 2 all students should:
• count with understanding and recognize "how many" in sets of objects.
• understand and represent commonly used fractions, such as ¼, ⅓, and ½.

Grades 3–5 Expectations: In grades 3–5 all students should:
• develop understanding of fractions as parts of unit wholes, as parts of a collection, as use on number lines, and as divisions of whole numbers.

UNDERSTAND MEANINGS OF OPERATIONS AND HOW THEY RELATE TO ONE ANOTHER

Pre-K–2 Expectations: In pre-K through grade 2 all students should:
• understand situations that entail multiplication and division, such as equal groupings of objects and sharing equally.
• understand various meanings of addition and subtraction of whole numbers and the relationship between the two operations.
• understand the effects of adding and subtracting whole numbers.

Grades 3–5 Expectations: In grades 3–5 all students should:
• identify and use relationships between operations, such as division as the inverse of multiplication, to solve problems.

Grades 6–8 Expectations: In grades 6–8 all students should:
• understand and use the inverse relationships of addition and subtraction, multiplication and division, and squaring and finding square roots to simplify computations and solve problems.

COMPUTE FLUENTLY AND MAKE REASONABLE ESTIMATES

Grades 6–8 Expectations: In grades 6–8 all students should:
• develop and analyze algorithms for computing with fractions, decimals, and integers and develop fluency in their use.

ALGEBRA

UNDERSTAND PATTERNS, RELATIONS, AND FUNCTIONS

Pre-K–2 Expectations: In pre-K through grade 2 all students should:
• sort, classify, and order objects by size, number, and other properties.
• recognize, describe, and extend patterns such as sequences of sounds and shapes or simple numeric patterns and translate from one representation to another.
• analyze how both repeating and growing patterns are generated.

Grades 3–5 Expectations: In grades 3–5 all students should:
• describe, extend, and make generalizations about geometric and numeric patterns.
• represent and analyze patterns and functions, using words, tables, and graphs.

Grades 6–8 Expectations: In grades 6–8 all students should:
• represent, analyze, and generalize a variety of patterns with tables, graphs, words, and, when possible, symbolic rules.

REPRESENT AND ANALYZE MATHEMATICAL SITUATIONS AND STRUCTURES USING ALGEBRAIC SYMBOLS

Pre-K–2 Expectations: In pre-K through grade 2 all students should:
• use concrete, pictorial, and verbal representations to develop an understanding of invented and conventional symbolic notations.
GEOMETRY

ANALYZE CHARACTERISTICS AND PROPERTIES OF TWO- AND THREE-DIMENSIONAL GEOMETRIC SHAPES AND DEVELOP MATHEMATICAL ARGUMENTS ABOUT GEOMETRIC RELATIONSHIPS

Pre-K–2 Expectations: In pre-K through grade 2 all students should:
• recognize, name, build, draw, compare, and sort two- and three-dimensional shapes.
• describe attributes and parts of two- and three-dimensional shapes.

Grades 3–5 Expectations: In grades 3–5 all students should:
• identify, compare, and analyze attributes of two- and three-dimensional shapes and develop vocabulary to describe the attributes.
• classify two- and three-dimensional shapes according to their properties and develop definitions of classes of shapes such as triangles and pyramids.
• explore congruence and similarity.

Grades 6–8 Expectations: In grades 6–8 all students should:
• precisely describe, classify, and understand relationships among types of two- and three-dimensional objects using their defining properties.
• understand relationships among the angles, side lengths, perimeters, areas, and volumes of similar objects.

SPECIFY LOCATIONS AND DESCRIBE SPATIAL RELATIONSHIPS USING COORDINATE GEOMETRY AND OTHER REPRESENTATIONAL SYSTEMS

Pre-K–2 Expectations: In pre-K through grade 2 all students should:
• describe, name, and interpret relative positions in space and apply ideas about relative position.

Grades 3–5 Expectations: In grades 3–5 all students should:
• describe location and movement using common language and geometric vocabulary.

APPLY TRANSFORMATIONS AND USE SYMMETRY TO ANALYZE MATHEMATICAL SITUATIONS

Pre-K–2 Expectations: In pre-K through grade 2 all students should:
• recognize and apply slides, flips, and turns.
• recognize and create shapes that have symmetry.

Grades 3–5 Expectations: In grades 3–5 all students should:
• predict and describe the results of sliding, flipping, and turning two-dimensional shapes.
• identify and describe line and rotational symmetry in two- and three-dimensional shapes and designs.

Grades 6–8 Expectations: In grades 6–8 all students should:
• describe sizes, positions, and orientations of shapes under informal transformations such as flips, turns, slides, and scaling.
• examine the congruence, similarity, and line or rotational symmetry of objects using transformations.

USE VISUALIZATION, SPATIAL REASONING, AND GEOMETRIC MODELING TO SOLVE PROBLEMS

Pre-K–2 Expectations: In pre-K through grade 2 all students should:
• create mental images of geometric shapes using spatial memory and spatial visualization.
• recognize and represent shapes from different perspectives.
• relate ideas in geometry to ideas in number and measurement.
• recognize geometric shapes and structures in the environment and specify their location.
USE VISUALIZATION, SPATIAL REASONING, AND GEOMETRIC MODELING TO SOLVE PROBLEMS

Grades 3–5 Expectations: In grades 3–5 all students should:
- identify and build a three-dimensional object from two-dimensional representations of that object.
- use geometric models to solve problems in other areas of mathematics, such as number and measurement; the classroom or in everyday life.
- create and describe mental images of objects, patterns, and paths.
- recognize geometric ideas and relationships and apply them to other disciplines and to problems that arise in the classroom or in everyday life.

Grades 6–8 Expectations: In grades 6–8 all students should:
- use two-dimensional representations of three-dimensional objects to visualize and solve problems such as those involving surface area and volume.
- use geometric models to represent and explain numerical and algebraic relationships.
- use visual tools such as networks to represent and solve problems.
- recognize and apply geometric ideas and relationships in areas outside the mathematics classroom, such as art, science, and everyday life.

MEASUREMENT

UNDERSTAND MEASURABLE ATTRIBUTES OF OBJECTS AND THE UNITS, SYSTEMS, AND PROCESSES OF MEASUREMENT

Pre-K–2 Expectations: In pre-K through grade 2 all students should:
- recognize the attributes of length, volume, weight, area, and time.
- understand how to measure using non-standard and standard units.
- select an appropriate unit and tool for the attribute being measured.

Grades 3–5 Expectations: In grades 3–5 all students should:
- understand such attributes as length, area, weight, volume, and size of angle and select the appropriate type of unit for measuring each attribute.

Grades 6–8 Expectations: In grades 6–8 all students should:
- understand both metric and customary systems of measurement.
- understand, select, and use units of appropriate size and type to measure angles, perimeter, area, surface area, and volume.

APPLY APPROPRIATE TECHNIQUES, TOOLS, AND FORMULAS TO DETERMINE MEASUREMENTS

Pre-K–2 Expectations: In pre-K through grade 2 all students should:
- use tools to measure.

Grades 3–5 Expectations: In grades 3–5 all students should:
- select and apply appropriate standard units and tools to measure length, area, volume, weight, time, temperature, and the size of angles.
- develop strategies to determine the surface areas and volumes of rectangular solids.

Grades 6–8 Expectations: In grades 6–8 all students should:
- use common benchmarks to select appropriate methods for estimating measurements.
- select and apply techniques and tools to accurately find length, area, volume, and angle measures to appropriate levels of precision.
- develop strategies to determine the surface area and volume of selected prisms, pyramids, and cylinders.
DATA ANALYSIS AND PROBABILITY

FORMULATE QUESTIONS THAT CAN BE ADDRESSED WITH DATA AND COLLECT, ORGANIZE, AND DISPLAY RELEVANT DATA TO ANSWER THEM

Pre-K–2 Expectations: In pre-K through grade 2 all students should:
• sort and classify objects according to their attributes and organize data about the objects.
21st Century Learning

The “How to Solve the Rubik’s Cube” Curriculum collectively meets the following Frameworks for 21st Century Learning.

Learning and Innovation Skills

Creativity and Innovation

- Work Creatively with others
  - View failure as an opportunity to learn; understand that creativity and innovation is a long-term, cyclical process of small successes and frequent mistakes.

Critical Thinking and Problem Solving

- Use Systems Thinking
  - Analyze how parts of a whole interact with each other to produce overall outcomes in complex situations.
- Make Judgments and Decisions
  - Reflect critically on learning experiences and processes.
- Solve Problems
  - Solve different kinds of non-familiar problems in both conventional and innovative ways.
  - Identify and ask significant questions that clarify various points of view and lead to better solutions.

Communication and Collaboration

- Communicate Clearly
  - Listen effectively to decipher meaning, including knowledge, values, attitudes and intentions.
  - Communicate effectively in diverse environments (including multi-lingual).
- Collaborate with Others
  - Demonstrate ability to work effectively and respectfully with diverse teams.
  - Exercise flexibility and willingness to be helpful in making necessary compromises to accomplish a common goal.
  - Assume shared responsibility for collaborative work, and value the individual contributions made by each team member.

Information, Media & Technology Skills

Information Literacy

- Use and Manage Information
  - Manage the flow of information from a wide variety of sources.
**LIFE AND CAREER SKILLS**

**FLEXIBILITY AND ADAPTABILITY**
- Be Flexible
  - Incorporate feedback effectively.
  - Deal positively with praise, setbacks, and criticism.

**INITIATIVE AND SELF-DIRECTION**
- Manage Goals and Time
  - Balance tactical (short-term) and strategic (long-term) goals.
  - Utilize time and manage workload efficiently.
- Work Independently
  - Monitor, define, prioritize and complete tasks without direct oversight.
- Be Self-directed learners
  - Go beyond basic mastery of skills and/or curriculum to explore and expand one’s own learning and opportunities to gain expertise.

**SOCIAL AND CROSS-CULTURAL SKILLS**
- Interact Effectively with Others
  - Know when it is appropriate to listen and when to speak.
- Work Effectively in Diverse Teams
  - Respect cultural differences and work effectively with people from a range of social and cultural backgrounds.
  - Respond open-mindedly to different ideas and values.

**PRODUCTIVITY AND ACCOUNTABILITY**
- Manage Projects
  - Set and meet goals, even in the face of obstacles and competing pressures.
- Produce Results
  - Demonstrate additional attributes associated with producing high quality products including the abilities to:
    - Work positively and ethically.
    - Manage time and projects effectively.
    - Multi-task.
    - Participate actively, as well as be reliable and punctual.
    - Present oneself professionally and with proper etiquette.
    - Collaborate and cooperate effectively with teams.
    - Respect and appreciate team diversity.
    - Be accountable for results.

**LEADERSHIP AND RESPONSIBILITY**
- Guide and Lead Others
  - Leverage strengths of others to accomplish a common goal.
  - Inspire others to reach their very best via example and selflessness.
- Be Responsible to Others
  - Act responsibly with the interests of the larger community in mind.
Everyone's favorite puzzle is now your students' favorite MATH LESSON

Math Education Kits are perfect for:
- Grades 3-12
- General Math, Pre Algebra, Algebra, Geometry and STEM
- Before/After School Programs

Enhance students' learning with the Rubik's Cube Math Education Program!

Tested and Trusted
- Includes Geometry, Algebra and General Math Lessons developed by educators, reviewed by educational consultants and classroom tested
- Lessons aligned to National Expectations, Common Core and State Math Standards

Student Benefits
- Promotes 21st Century Skills like problem solving, critical thinking, perseverance and encourages logical thinking
- Helps to visualize Math concepts
- Makes learning Math more fun

Fun, Challenging Activity
- Reward students after exams
- Fun activity after completing Math unit
- Start a Rubik's Cube Club
- Hold a Competition

PLUS post your Competition on our website and receive a "Competition Pack" FREE

Learn more at www.YouCanDoTheCube.com