

Branford Draft of Big Picture of Mathematics Transfer Goals (based on Mathematical Practices)

Transfer Goals	MP #s	Student-Friendly Transfer Goals
1. Based on an understanding of any problem: initiate a plan (using a variety of methods/strategies appropriately), execute it and evaluate the reasonableness and accuracy of the solution.	1, 3, 4, 5, 6, 8	<ul style="list-style-type: none"> <li>● K-12: I can use what I know to solve new problems.</li> <li>● K-4: After working carefully to solve the problem, I can check my answer to see if it makes sense</li> <li>● 5-12: After working carefully to solve the problem, I can verify that my calculations are accurate and my solutions are reasonable.</li> </ul>
2. Demonstrate perseverance by attempting the problem, monitor and evaluate the progress and change course if necessary.	1, 2	<ul style="list-style-type: none"> <li>● K-4: I don't give up if I get stuck. I can change my thinking when my strategy isn't working.</li> <li>● 5-12: I can demonstrate perseverance as I work to overcome difficulties and obstacles.</li> </ul>
3. Justify reasoning or understanding by using appropriate, precise math language. (your own solution or someone else's).	3, 6	<ul style="list-style-type: none"> <li>● K-4: I can explain/show my work using words, symbols, pictures, charts, graphs, and units of measure.</li> <li>● 5-12: I can support my ideas clearly and concisely using proper mathematical language/notation.</li> <li>● K-4: I can agree or disagree with different ideas and strategies, and explain why.</li> <li>● 5-12: I can justify the reasonableness and accuracy of someone else's solution/attempt using accurate and precise mathematical language.</li> </ul>
4. Investigate and explain how mathematical structures or patterns relate to one another in the context of a problem or in a broader sense.	2, 7	<ul style="list-style-type: none"> <li>● K-4: I can solve problems by thinking about patterns and my experience with similar problems.</li> <li>● 5-12: I can solve problems by looking for and using rules, patterns, and my experience with similar problems.</li> </ul>
5. Demonstrate automaticity in basic computation and critical vocabulary so they can focus on the more sophisticated aspects of the problem.	6, 7	<ul style="list-style-type: none"> <li>● K-4: I can consistently use my math facts and words efficiently.</li> <li>● 5-12: I can accurately and efficiently recall basic math facts, formulas, and critical vocabulary.</li> </ul>

**Teacher notes:**

**Math language:** ie symbols, models, specifying units of measurement, explicit use of definitions.

**Broader sense:** ie addition leads to multiplication and then multiplication leads to exponents

Essential Questions	Related Transfer Goals	Understandings
<i>Q1: What do I “see” when I look at this problem?</i>	<b>1, 4, 5</b>	<ul style="list-style-type: none"> <li>● U1: Effective problem solvers work to understand the problem by picturing what is happening and figuring out relevant information and unknowns.</li> </ul>
<i>Q2: Have I solved a problem like this before?</i>	<b>1, 4, 5</b>	<ul style="list-style-type: none"> <li>● U2: Every problem can be categorized based on a similar structure and set of characteristics.</li> <li>● U3: Recognition of patterns and structures fosters efficiency in solving problems.</li> </ul>
<i>Q3: What’s my plan to solve the problem? Does the plan make sense? Is there another way?</i>	<b>1, 2</b>	<ul style="list-style-type: none"> <li>● U4: Mathematicians determine a plan, while remaining open to alternate approaches and revising as necessary, to efficiently and effectively solve problems.</li> </ul>
<i>Q4: How does my answer/solution compare to others?</i>	<b>3</b>	<ul style="list-style-type: none"> <li>● U5: Effective justifications are based on logical mathematical thinking and appropriate representations/vocabulary.</li> <li>● U6: Analyzing someone else’s mathematical thinking creates clarity about a problem, its model, and the viability of a solution.</li> </ul>
<i>Q5: What am I learning? How can I get better at this?</i>	<b>2</b>	<ul style="list-style-type: none"> <li>● U7: Mathematicians grow from their experiences, becoming more skillful and flexible in how they approach problem-solving, and more committed to seeing the problem through.</li> </ul>

Content Thread and Related Transfer Goals	Understandings	Essential Questions
<p><i>(K) Counting and Cardinality</i>  <i>(K-5) Number and Operations in Base 10</i>  <i>(3-5) Number and Operations - Fractions</i>  <i>(6-7) Ratio and Proportional Relationships</i>  <i>(6-8) Number Systems</i>  <i>(9-12) Number and Quantity</i></p> <p>Represent quantities/expressions in multiple ways without changing their value.</p> <p>Compose and decompose numbers to establish relationships and perform operations, and solve problems (<i>within the real and complex number system</i>)</p>	<p>U8: Objects and sets of objects are represented in a number system.</p> <p>U9: The value of a number is quantified by the placement of its digits.</p> <p>U10: Every number/quantity has a structure that can be used to perform operations and compare values.</p> <p>U11: Mathematical values or situations can be modeled in multiple ways.</p> <p>U12: Symbols can be used to represent numerical descriptions and relationships.</p>	<p>Q6: How do I represent this object, number, or set of objects/numbers in multiple ways?</p> <p>Q7: How do I properly justify the classification of this quantity/expression?</p> <p>Q8: How do I use what I know about numbers to solve problems?</p>

**Teacher Notes:** Is there a way we can define number sense in order to have a common definition. Can we define what the “structure of numbers” includes -digit, place value, fractions & decimals, rounding?

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<p><b><i>Operations and Algebraic Thinking</i></b> <i>(Gr. K-5)</i></p> <p><b><i>Expressions and Equations</i></b> <i>(Gr. 6-8)</i></p> <p><b><i>Algebra</i></b> <i>(Gr. 9-12)</i></p> <p><b><i>Functions</i></b> <i>(Gr. 8-12)</i></p> <p><b>Compose and decompose numbers to establish relationships, perform operations, and solve problems.</b></p> <p><b>Describe and/or solve problems using algebraic expressions, equations, inequalities, and functions.</b></p> <p><b>Use operations, functions or equations to model relationships.</b></p> <p><b>Classify, interpret, or compare functions/ equations.</b></p>	<p>U13: Numbers, objects, or elements may repeat in predictable ways (patterns).</p> <p>U14: The same value/expression/equations can be expressed/represented in multiple ways.</p> <p>U15: The relationship among operations and their properties can be used to understand and solve problems.</p> <p>U16: Properties of operations promote computational automaticity.</p> <p>U17: Expressions, equations, inequalities, functions and graphs use symbols to represent quantities, operations, and their relationships.</p> <p>U18: <b>(Gr. 8+)</b> A function can represent how quantities relate to one another.</p> <p>U19: The application of properties and order of operations can simplify expressions, solve equations, and combine functions.</p> <p>U20: Trigonometric functions can be composed and decomposed to model a cyclical pattern and to solve problems.</p>	<p>Q9: How can I use rules or patterns to make sense of operations or relationships?</p> <p>Q10: How can I represent numbers/relationships in different ways?</p> <p>Q11: How can I best represent the given information?</p> <p>Q12: How can I apply the properties of math to solve problems?</p> <p>Q13: How can I classify/evaluate functions?</p> <p>Q14: What is the relationship between these values/expressions/operations/functions?</p>

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<p style="text-align: center;"><b><i>Geometry (K-12)</i></b></p> <ul style="list-style-type: none"> <li>● Identify, describe, classify and compare objects/shapes based on their attributes.</li> <li>● Compose objects/shapes in a variety of ways for various purposes</li> <li>● Identify properties of an object or the relationship between objects based on shape, location, and measurements</li> <li>● Apply appropriate mathematical principles, theorems or formulas to solve problems</li> </ul>	<p>The students will understand that:</p> <ul style="list-style-type: none"> <li>● U21: Objects in the world can be described by their shapes and properties.</li> <li>● U22: Shapes can be categorized using properties and attributes.</li> <li>● U23: Shapes can be composed of other shapes</li> <li>● U24: (Gr. 5+) The properties of a shape do not change based on its size or orientation or when it is reflected, rotated, or translated. (Coordinate Plane)</li> <li>● U25: (Gr. 7+) Geometry can be used to describe or solve problems involving ratios and proportional relationships.</li> <li>● U26: (Gr. 9+) Trigonometry is based on the relationship between sides and the angles in any triangle.</li> </ul>	<ul style="list-style-type: none"> <li>● Q15: How can I identify and describe a shape by its attributes?</li> <li>● Q16: How do the similarities and differences of shapes' attributes help me to categorize them?</li> <li>● Q17: What can I learn about shapes by composing them?</li> <li>● Q18: How can I determine if shapes are congruent, similar or neither?</li> <li>● Q19: (9+) Under what circumstances can trigonometric functions help me solve problems?</li> </ul>

**Teacher notes: Congruent shapes/objects are the same size and shape.**

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<p><b><i>Measurement and Data Statistics and Probability (6-12)</i></b></p> <ul style="list-style-type: none"> <li>Describe, classify, and compare measurements of objects.</li> <li>Represent, summarize, and interpret data to clarify and solve problems.</li> <li>Establish the presence of a pattern/ correlation in order to make predictions.</li> </ul>	<ul style="list-style-type: none"> <li>U27: A variety of tools can be used to measure and describe the world around us.</li> <li>U28: Measurements can be compared, combined, and converted.</li> <li>U29: Measurements with the same unit can be used to recognize patterns and solve problems.</li> <li>U30: The organization and the display of data makes it possible to recognize patterns, trends, and relationships.</li> </ul> <p>(Gr. 6+)</p> <ul style="list-style-type: none"> <li>U31: (Gr. 6+) A data set is summarized by its statistical measures (central tendency, variability, etc.).</li> <li>U32: (Gr. 6+) Data sets may have correlation or be independent of one another.</li> <li>U33: (Gr. 6+) Collected data and its measures can be used to predict future data.</li> <li>U34: (Gr. 6+) Measures of the likelihood of future events can be determined through the combination of independent or dependent events.</li> </ul>	<ul style="list-style-type: none"> <li>Q20: What measurement units and tools are most appropriate given the problem? How precise do I need to be?</li> <li>Q21: How do I effectively organize and display data? What does this data set tell me?</li> <li>Q22: (Gr. 6+) What measurements are appropriate to describe the properties of the data set?</li> <li>Q23: (Gr. 6+) What is the relationship between data sets? Is there a correlation?</li> <li>Q24: (2+) What predictions can be made based on the patterns I see/knowledge of past events in the data set?</li> </ul>

**Teacher Notes:** Measurements in the “world around us” include objects, data, money, and time.