## Grade 2.1 Numbers and Operations PreK-12

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<tr>
<th>Grade</th>
<th>Big Idea</th>
<th>Essential Questions</th>
<th>Concepts</th>
<th>Competencies</th>
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<th>Eligible Content</th>
<th>Vocabulary</th>
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</thead>
<tbody>
<tr>
<td>Pre-K</td>
<td>Mathematical relationships among numbers can be represented, compared, and communicated.</td>
<td>How is mathematics used to quantify, compare, represent, and model numbers? How can mathematics support effective communication?</td>
<td>Numerical Sequence</td>
<td>Rote count to 20. Name numerals up to 10. Represent a number of objects with a written numeral 0-10.</td>
<td>CC.2.1.PREK.A.1</td>
<td>Above Addition Below Beside Between Circle Cone Cube Cylinder Equal Greater than Length Less than Measure Numeral Rectangle Sphere Square</td>
<td></td>
</tr>
<tr>
<td>Pre-K</td>
<td>Patterns exhibit relationships that can be extended, described, and generalized.</td>
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<td>Pre-K</td>
<td>Mathematical relationships among numbers can be represented, compared, and communicated.</td>
<td>How is mathematics used to quantify, compare, represent, and model numbers? How can mathematics support effective communication?</td>
<td>Object Quantity</td>
<td>Recognize small quantities up to 6. Use a one-to-one correspondence when counting to 10. State the total number of objects counted, demonstrating understanding that that number named tells the number of objects counted.</td>
<td>CC.2.1.PREK.A.2</td>
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<td>Pre-K</td>
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<tr>
<td>K</td>
<td>Mathematical relationships among numbers can be represented, compared, and communicated. Numerical quantities, calculations, and measurements can be estimated or analyzed by using appropriate strategies and tools.</td>
<td>How is mathematics used to quantify, compare, represent, and model numbers? How can mathematics support effective communication? What does it mean to estimate or analyze numerical quantities?</td>
<td>Numerical Sequence</td>
<td>Rote count to 100. Count forward beginning from a given number within the known sequence (instead of having to begin at 1). Name numerals 0 – 20. Represent a number of objects with a written numeral 0-20.</td>
<td>CC.2.1.K.A.1</td>
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**Vocabulary**

Above Addition Below Beside Between Circle Cone Cube Cylinder Equal Greater than Length Less than Measure Numeral Rectangle Sphere Square Subtraction Three dimensional shapes Triangle Two dimensional shapes Weight
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<tr>
<td>K</td>
<td>Mathematical relationships among numbers can be represented, compared, and communicated. Patterns exhibit relationships that can be extended, described, and generalized.</td>
<td>How is mathematics used to quantify, compare, represent, and model numbers? How can mathematics support effective communication? How can patterns be used to describe relationships in mathematical situations?</td>
<td>Object Quantity</td>
<td>Uses one-to-one correspondence when counting to 20. State the total number of objects counted, demonstrating understanding that that last number named tells the number of objects counted. Understand that each successive number name refers to a quantity that is one larger.</td>
<td>CC.2.1.K.A.2</td>
<td></td>
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<td>K</td>
<td>Mathematical relationships among numbers can be represented, compared, and communicated. Numerical quantities, calculations, and measurements can be estimated or analyzed by using appropriate strategies and tools.</td>
<td>How is mathematics used to quantify, compare, represent, and model numbers? How can mathematics support effective communication? When is it appropriate to estimate versus calculate? What makes a tool and/or strategy appropriate for a given task?</td>
<td>Number Comparison</td>
<td>Identify whether the number of objects in one group is greater than, less than, or equal to the number of objects in another group, e.g., by using matching and counting strategies. Compare two numbers between 1 and 10 presented as written numerals.</td>
<td>CC.2.1.K.A.3</td>
<td></td>
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</tr>
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<td>K</td>
<td>Mathematical relationships among numbers can be represented, compared, and communicated. Patterns exhibit relationships that can be extended, described, and generalized.</td>
<td>How is mathematics used to quantify, compare, represent, and model numbers? How can mathematics support effective communication? How can recognizing repetition or regularity assist in solving problems more efficiently?</td>
<td>Place Value</td>
<td>Compose and decompose numbers up to 19 into ten and ones by using objects or drawings, and record each composition or decomposition by a drawing or equation.</td>
<td>CC.2.1.K.B.1</td>
<td></td>
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</tr>
<tr>
<td>1</td>
<td>Mathematical relationships among numbers can be represented, compared, and</td>
<td>How is mathematics used to quantify, compare, represent, and model numbers?</td>
<td>Numerical Sequence</td>
<td>Count to 120, starting at any number less than 120.</td>
<td>CC.2.1.1.B.1</td>
<td></td>
<td>Addend Addition Analog</td>
</tr>
</tbody>
</table>
### PA Core Standards for Mathematics
#### 2.1 Numbers and Operations PreK-12

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<tr>
<td></td>
<td>Mathematical relationships among numbers can be represented, compared, and communicated.</td>
<td>How is mathematics used to quantify, compare, represent, and model numbers? How can mathematics support effective communication? How are relationships represented mathematically? What does it mean to estimate or analyze numerical quantities? What makes a tool and/or strategy appropriate for a given task?</td>
<td>Place Value</td>
<td>Compare two two-digit numbers based on meanings of the tens and ones digits, recording the results of comparisons with the symbols $&gt;$, $=$, and $&lt;$. Add within 100, including adding a two-digit number and a one-digit number, and adding a two-digit number and a multiple of 10 using concrete models or drawings. Relate the strategy to a written method and explain the reasoning used. Subtract multiples of 10 in the range 10-90, using concrete models or drawings. Relate the strategy to a written method and explain the reasoning used.</td>
<td>CC.2.1.1.B.2 CC.2.1.1.B.3</td>
<td>A.M. Addend Analog/digital</td>
<td></td>
</tr>
<tr>
<td>1</td>
<td>Mathematical relationships among numbers can be represented, compared, and communicated.</td>
<td>Mathematical relationships can be represented as expressions, equations and inequalities in mathematical situations. Numerical quantities, calculations, and measurements can be estimated or analyzed by using appropriate strategies and tools. Patterns exhibit relationships that can be extended, described, and generalized.</td>
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<tr>
<td>2</td>
<td>Mathematical relationships among numbers can be represented, compared, and communicated.</td>
<td>How is mathematics used to quantify, compare, represent, and model numbers?</td>
<td></td>
<td>Understand that the three digits of a three-digit number represent amounts of</td>
<td>CC.2.1.2.B.1 CC.2.1.2.B.2</td>
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</tr>
</tbody>
</table>

- Circle
- Compare
- compose/
- Cone
- Counting on
- Cube
- Cylinder
- Data
- decompose
- Equal to
- Fourths
- Fractions –
- Greater than
- Half circles
- Half-hour
- Halves
- Hour
- Length
- Less than
- Making ten
- Ones
- Place value
- Quarter-circles
- Quarters
- Rectangle
- Rectangular Prism
- Square
- Subtraction
- Sum
- Tens
- Trapezoids
- Triangle

OCT 2016
## PA Core Standards for Mathematics
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<td>PreK</td>
<td>Mathematical relationships can be represented as expressions, equations and inequalities in mathematical situations.</td>
<td>How is mathematics used to quantify, compare, represent, and model numbers?</td>
<td>Addition and Subtraction</td>
<td>Add up to four two-digit numbers using strategies based on place value and properties of operations.</td>
<td>CC.2.1.2.B.3</td>
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<td></td>
<td>Numerical quantities, calculations, and measurements can be estimated or analyzed by using appropriate strategies and tools.</td>
<td>How are relationships represented mathematically?</td>
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<td></td>
<td>Mathematical relationships among numbers can be represented, compared, and communicated.</td>
<td>What makes a tool and/or strategy appropriate for a given task?</td>
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<tr>
<td></td>
<td>Mathematical relationships can be represented as expressions, equations and inequalities in mathematical situations.</td>
<td>How can mathematics support effective communication?</td>
<td>hundreds, tens, and ones.</td>
<td></td>
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</tr>
<tr>
<td>2</td>
<td>Numerical quantities, calculations, and measurements can be estimated or analyzed by using appropriate strategies and tools.</td>
<td>How are relationships represented mathematically?</td>
<td>Compare two three-digit numbers based on meanings of the hundreds, tens, and ones digits, using &gt;, =, and &lt; symbols to record the results of comparisons.</td>
<td></td>
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<tr>
<td></td>
<td>Mathematical relationships can be represented as expressions, equations and inequalities in mathematical situations.</td>
<td>What does it mean to estimate or analyze numerical quantities?</td>
<td>Count within 1000; skip-count by 5s, 10s, and 100s.</td>
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<td></td>
<td>Numerical quantities, calculations, and measurements can be estimated or analyzed by using appropriate strategies and tools.</td>
<td>What makes a tool and/or strategy appropriate for a given task?</td>
<td>Read and write numbers to 1000 using base-ten numerals, number names, and expanded form.</td>
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<td>Mathematical relationships among numbers can be represented, compared, and communicated.</td>
<td>How can recognizing repetition or regularity assist in solving problems more efficiently?</td>
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### Vocabulary
- Angles
- Bar graph
- Centimeter
- Compose
- Decompose
- Dime
- Dollar
- Equation
- Equivalent
- Estimate
- Even
- Expanded form
- Faces
- Feet
- Fractions – Thirds
- Hexagon
- Hundreds
- Inch
- Line plot
- Meter
- Money
- Nickel
- Odd
- P.M.
- Penny
- Pentagon
- Picture graph
- Place value
- Quadrilateral
- Quarter
- Sum
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<td>How is mathematics used to quantify, compare, represent, and model numbers? How can mathematics support effective communication? How are relationships represented mathematically? What does it mean to estimate or analyze numerical quantities? What makes a tool and/or strategy appropriate for a given task? When is it appropriate to estimate versus calculate? How can patterns be used to describe relationships in mathematical situations?</td>
<td>Place Value and Properties of Operations</td>
<td>Perform multi-digit arithmetic. Demonstrate fluency of addition and subtraction. Round whole numbers to the nearest ten or hundred.</td>
<td>CC.2.1.3.B.1 M03.A-T.1.1.1 M03.A-T.1.1.2 M03.A-T.1.1.3 M03.A-T.1.1.4</td>
<td>M03.A-T.1.1.1 M03.A-T.1.1.2 M03.A-T.1.1.3 M03.A-T.1.1.4</td>
<td>Area Denominator Division Equivalent fractions Estimate Fraction Linear Liquid Volume Mass Numerator Pattern Pentagon Perimeter Pictograph Polygon Quadrilateral Rhombus Round Square Unit Tally Chart Temperature</td>
</tr>
<tr>
<td>3</td>
<td>Mathematical relationships among numbers can be represented, compared, and communicated.</td>
<td>Mathematical relationships can be represented as expressions, equations, and inequalities in mathematical situations. Numerical quantities, calculations, and measurements can be estimated or analyzed by using appropriate strategies and tools. Patterns exhibit relationships that can be extended, described, and generalized.</td>
<td>Fractions</td>
<td>Develop an understanding of fractions as numbers. Represent fractions on a number line. Represent and generate equivalent fractions. Compare fractions with the same numerator or same denominator.</td>
<td>CC.2.1.3.C.1 M03.A-F.1.1.1 M03.A-F.1.1.2 M03.A-F.1.1.3 M03.A-F.1.1.4 M03.A-F.1.1.5</td>
<td>M03.A-F.1.1.1 M03.A-F.1.1.2 M03.A-F.1.1.3 M03.A-F.1.1.4 M03.A-F.1.1.5</td>
<td>Numerator Denominator Place Value and Properties of Operations Fraction Linear Liquid Volume Mass Numerator Pattern Pentagon Perimeter Pictograph Polygon Quadrilateral Rhombus Round Square Unit Tally Chart Temperature</td>
</tr>
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#### PA Core Standards for Mathematics

- Grade 3
- Big Idea: Mathematical relationships among numbers can be represented, compared, and communicated.
- Essential Questions:
  - How is mathematics used to quantify, compare, represent, and model numbers?
  - How can mathematics support effective communication?
  - How are relationships represented mathematically?
  - What does it mean to estimate or analyze numerical quantities?
  - What makes a tool and/or strategy appropriate for a given task?
  - When is it appropriate to estimate versus calculate?
  - How can patterns be used to describe relationships in mathematical situations?

- Concepts:
  - Place Value and Properties of Operations

- Competencies:
  - Perform multi-digit arithmetic.
  - Demonstrate fluency of addition and subtraction.
  - Round whole numbers to the nearest ten or hundred.

- Standard:
  - CC.2.1.3.B.1

- Eligible Content:
  - M03.A-T.1.1.1
  - M03.A-T.1.1.2
  - M03.A-T.1.1.3
  - M03.A-T.1.1.4

- Vocabulary:
  - Area
  - Denominator
  - Division
  - Equivalent fractions
  - Estimate
  - Fraction
  - Linear
  - Liquid
  - Volume
  - Mass
  - Numerator
  - Pattern
  - Pentagon
  - Perimeter
  - Pictograph
  - Polygon
  - Quadrilateral
  - Rhombus
  - Round
  - Square Unit
  - Tally Chart
  - Temperature
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#### 2.1 Numbers and Operations PreK-12

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| 4     | Mathematical relationships among numbers can be represented, compared, and communicated.  
Mathematical relationships can be represented as expressions, equations and inequalities in mathematical situations.  
Numerical quantities, calculations, and measurements can be estimated or analyzed by using appropriate strategies and tools.  
Patterns exhibit relationships that can be extended, described, and generalized. | How is mathematics used to quantify, compare, represent, and model numbers?  
How can mathematics support effective communication?  
How are relationships represented mathematically?  
What does it mean to estimate or analyze numerical quantities?  
When is it appropriate to estimate versus calculate?  
What makes a tool and/or strategy appropriate for a given task?  
How can patterns be used to describe relationships in mathematical situations? | Place Value and Properties of Operations | Demonstrate an understanding of multi-digit whole numbers.  
Compare and round multi-digit numbers.  
Perform multi-digit arithmetic. | CC.2.1.4.B.1  
CC.2.1.4.B.2 | M04.A-T.1.1.1  
M04.A-T.1.1.2  
M04.A-T.1.1.3  
M04.A-T.1.1.4  
M04.A-T.2.1.1  
M04.A-T.2.1.2  
M04.A-T.2.1.3  
M04.A-T.2.1.4 | Acute Angle  
Angle  
Decimal  
Decimal Fraction  
Equivalence  
Factor  
Line  
Line of symmetry  
Mixed Number  
Multiple  
Obtuse Triangle  
Point  
Ray  
Right Angle  
Symmetry  
Unit Fraction  
Weight |
| 4 | Mathematical relationships among numbers can be represented, compared, and communicated.  
Mathematical relationships can be represented as expressions, equations and inequalities in mathematical situations.  
Numerical quantities, calculations, and measurements can be estimated or analyzed by using appropriate strategies and tools. | How is mathematics used to quantify, compare, represent, and model numbers?  
How can mathematics support effective communication?  
How are relationships represented mathematically?  
What does it mean to estimate or analyze numerical quantities?  
What makes a tool and/or strategy appropriate for a given task? | Fractions | Demonstrate an understanding of fraction equivalence.  
Compare and order fractions.  
Solve problems involving fractions and mixed numbers. | CC.2.1.4.C.1  
CC.2.1.4.C.2 | M04.A-F.1.1.1  
M04.A-F.1.1.2  
M04.A-F.2.1.1  
M04.A-F.2.1.2  
M04.A-F.2.1.3  
M04.A-F.2.1.4  
M04.A-F.2.1.5  
M04.A-F.2.1.6  
M04.A-F.2.1.7 | |
| 4 | Mathematical relationships | How is mathematics used to quantify, compare, represent, and model numbers?  
How can mathematics support effective communication?  
How are relationships represented mathematically?  
What does it mean to estimate or analyze numerical quantities?  
What makes a tool and/or strategy appropriate for a given task? | Decimals | Use decimal notation for | CC.2.1.4.C.3 | M04.A-F.3.1.1 | |
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<td>5</td>
<td>Mathematical relationships among numbers can be represented, compared, and communicated. Mathematical relationships can be represented as expressions, equations, and inequalities in mathematical situations. Numerical quantities, calculations, and measurements can be estimated or analyzed by using appropriate strategies and tools. Patterns exhibit relationships that can be extended, described, and generalized.</td>
<td>How is mathematics used to quantify, compare, represent, and model numbers? How can mathematics support effective communication? How are relationships represented mathematically? What does it mean to estimate or analyze numerical quantities? When is it appropriate to estimate versus calculate? What makes a tool and/or strategy appropriate for a given task? How can patterns be used to describe relationships in mathematical situations?</td>
<td>Place Value and Properties of Operations</td>
<td>Demonstrate an understanding of rounding as it pertains to whole numbers and decimals. Read, write and compare decimals. Use whole numbers and decimals to compute accurately.</td>
<td>CC.2.1.5.B.1 CC.2.1.5.B.2</td>
<td>M05.A-T.1.1.1 M05.A-T.1.1.2 M05.A-T.1.1.3 M05.A-T.1.1.4 M05.A-T.1.1.5 M05.A-T.2.1.1 M05.A-T.2.1.2 M05.A-T.2.1.3</td>
<td>Braces Brackets Coordinate Plane Cubic Units Decimal Place Value (through thousandths) Measurement Units Numerical Expressions Order of Operations Origin Parentheses Scaling (resizing) Unit Fraction Volume X-axis X-coordinate Y-axis Y-coordinate</td>
</tr>
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<td>Mathematical relationships among numbers can be represented, compared, and communicated.</td>
<td>How is mathematics used to quantify, compare, represent, and model numbers?</td>
<td>Fractions</td>
<td>Add, Subtract, Multiply and Divide fractions to solve problems.</td>
<td>CC.2.1.5.C.1</td>
<td>M05.A-F.1.1.1</td>
<td>M05.A-F.2.1.1</td>
</tr>
<tr>
<td></td>
<td></td>
<td>How can mathematics support effective communication?</td>
<td></td>
<td>Explain operations as they pertain to fractions.</td>
<td>CC.2.1.5.C.2</td>
<td>M05.A-F.2.1.1</td>
<td>M05.A-F.2.1.2</td>
</tr>
<tr>
<td></td>
<td></td>
<td>How are relationships represented mathematically?</td>
<td></td>
<td></td>
<td>M05.A-F.2.1.3</td>
<td>M05.A-F.2.1.1</td>
<td>M05.A-F.2.1.3</td>
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<td></td>
<td></td>
<td>What does it mean to estimate or analyze numerical quantities?</td>
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<td></td>
<td></td>
<td>M05.A-F.2.1.1</td>
<td>M05.A-F.2.1.4</td>
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<tr>
<td></td>
<td></td>
<td>What makes a tool and/or strategy appropriate for a given task?</td>
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<td></td>
<td>M05.A-F.2.1.1</td>
<td>M05.A-F.2.1.1</td>
<td>M05.A-F.2.1.4</td>
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<td>5</td>
<td>Mathematical relationships among numbers can be represented, compared, and communicated.</td>
<td>How is mathematics used to quantify, compare, represent, and model numbers?</td>
<td>Decimals</td>
<td>Read, write and compare decimals.</td>
<td>CC.2.1.5.B.2</td>
<td>M05.A-T.2.1.1</td>
<td>M05.A-T.2.1.2</td>
</tr>
<tr>
<td></td>
<td></td>
<td>How can mathematics support effective communication?</td>
<td></td>
<td>Use whole numbers and decimals to compute accurately.</td>
<td></td>
<td>M05.A-T.2.1.2</td>
<td>M05.A-T.2.1.3</td>
</tr>
<tr>
<td></td>
<td></td>
<td>What does it mean to estimate or analyze numerical quantities?</td>
<td></td>
<td></td>
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<td>M05.A-T.2.1.3</td>
<td>M05.A-T.2.1.3</td>
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<tr>
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<td>When is it appropriate to estimate versus calculate?</td>
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<td>M05.A-T.2.1.3</td>
<td>M05.A-T.2.1.3</td>
</tr>
<tr>
<td>6</td>
<td>Mathematical relationships among numbers can be represented, compared, and communicated.</td>
<td>How is mathematics used to quantify, compare, represent and model numbers?</td>
<td>Ratios, Proportions, and Percent</td>
<td>Represent ratio relationships in various forms.</td>
<td>CC.2.1.6.D.1</td>
<td>M06.A-R.1.1.1</td>
<td>Absolute value</td>
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<td>Determine unit rates in context.</td>
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<td>M06.A-R.1.1.2</td>
<td>Algebraic expressions</td>
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<td>M06.A-R.1.1.3</td>
<td>Box and whisker plots</td>
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<td>M06.A-R.1.1.4</td>
<td>Coefficient</td>
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</table>
## PA Core Standards for Mathematics
### 2.1 Numbers and Operations PreK-12

<table>
<thead>
<tr>
<th>Grade</th>
<th>Big Idea</th>
<th>Essential Questions</th>
<th>Concepts</th>
<th>Competencies</th>
<th>Standard</th>
<th>Eligible Content</th>
<th>Vocabulary</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>Mathematical relationships can be represented as expressions, equations and inequalities in mathematical situations.</td>
<td>How can mathematics support effective communication?  How are relationships represented mathematically?  How can expressions, equations and inequalities be used to quantify, solve, model and/or analyze mathematical situations?  What makes a tool and/or strategy appropriate for a given task?  How can patterns be used to describe relationships in mathematical situations?</td>
<td>Number Theory Concepts and Operations</td>
<td>Interpret and compute quotients of fraction.  Solve problems using ratio and rate reasoning.  Convert measurement units using equivalent ratios.</td>
<td>CC.2.1.6.E.1  M06.A-R.1.1.5  M06.A-R.1.1.3  M06.A-R.1.1.4  M06.A-R.1.1.5  M06.A-N.1.1.1</td>
<td>Compound polygon  Dependent variable  Distributive property  Dot plots  Exponent  Greatest Common Factor  Independent variable  Inequality  Integer  Interquartile range  Irregular Polygon  Least Common Multiple  Mean  Mean absolute deviation</td>
<td></td>
</tr>
<tr>
<td>6</td>
<td>Mathematical relationships among numbers can be represented, compared, and communicated.  Numerical quantities, calculations, and measurements can be estimated or analyzed by using appropriate strategies and tools.</td>
<td>How is mathematics used to quantify, compare, represent, and model numbers?  How can mathematics support effective communication?  What does it mean to estimate or analyze numerical quantities?  What makes a tool and/or strategy appropriate for a given task?</td>
<td>Integers and Other Rational Numbers</td>
<td>Solve problems and compute fluently with whole numbers and decimals.  Find common multiples and factors including greatest common factor and least common multiple.  Use the distributive property to express a sum of two numbers.</td>
<td>CC2.1.6.E.2  CC.2.1.6.E.3</td>
<td>M06.A-N.2.1.1  M06.A-N.2.2.1  M06.A-N.2.1.1  M06.A-N.2.2.1</td>
<td></td>
</tr>
<tr>
<td>6</td>
<td>Mathematical relationships among numbers can be represented, compared, and communicated.  Mathematical relationships can be represented as expressions, equations and inequalities in mathematical situations.</td>
<td>How is mathematics used to quantify, compare, represent, and model numbers?  How can mathematics support effective communication?  How are relationships represented mathematically?</td>
<td>Integers and Other Rational Numbers</td>
<td>Use positive and negative numbers to represent quantities in real world contexts.  Plot integers and other rational numbers on a number line and on a coordinate graph.  Interpret the opposite and</td>
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</tbody>
</table>

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## PA Core Standards for Mathematics
### 2.1 Numbers and Operations PreK-12

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<tbody>
<tr>
<td>7</td>
<td>Mathematical relationships among numbers can be represented, compared, and communicated.</td>
<td>How is mathematics used to quantify, compare, represent, and model numbers? How can mathematics support effective communication? How are relationships represented mathematically? How can expressions, equations and inequalities be used to quantify, solve, model and/or analyze mathematical situations? What does it mean to estimate or analyze numerical quantities? What makes a tool and/or strategy appropriate for a given task? How can recognizing repetition or regularity assist in solving problems more efficiently?</td>
<td>Ratios, Proportions, and Percent</td>
<td>Compute unit rates associated with ratios of fractions. Recognize and represent proportional relationships between quantities. Use proportional relationships to solve multistep ratio and percent problems.</td>
<td>CC.2.1.7.D.1</td>
<td>M07.A-R.1.1.1 M07.A-R.1.1.2 M07.A-R.1.1.3 M07.A-R.1.1.4 M07.A-R.1.1.5 M07.A-R.1.1.6</td>
<td>Acute triangle Adjacent angles Alternate exterior angles Alternate interior angles Chace event Circumference Complementary angles Compound event Corresponding angles Data distribution decrease Equally likely Equilateral triangle Independent event Isosceles triangle Likely event Linear expression Obtuse triangle Outcome Percent increase and decrease Percent increase and population Probability Process of chance Proportion Random sample Relative frequency Repeating decimal Scale drawing Scalene triangle</td>
</tr>
</tbody>
</table>

| 7     | Mathematical relationships among numbers can be represented, compared, and communicated. Mathematical relationships can be represented as expressions, equations, and inequalities in mathematical situations. Numerical quantities, calculations, and measurements can be estimated or analyzed by using appropriate strategies and tools. Patterns exhibit relationships that can be extended, described, and generalized. | How can expressions, equations and inequalities be used to quantify, solve, model and/or analyze mathematical situations? What makes a tool and/or strategy appropriate for a given task? How can recognizing repetition or regularity assist in solving problems more efficiently? | Rational Numbers | Solve real-world and mathematical problems involving the four operations with rational numbers. | CC.2.1.7.E.1 | M07.A-N.1.1.1 M07.A-N.1.1.2 M07.A-N.1.1.3 | |
### PA Core Standards for Mathematics  
#### 2.1 Numbers and Operations PreK-12

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</thead>
</table>
|       | expressions, equations and inequalities in mathematical situations.  
Numerical quantities, calculations, and measurements can be estimated or analyzed by using appropriate strategies and tools.  
Patterns exhibit relationships that can be extended, described, and generalized. | How is mathematics used to quantify, compare, represent, and model numbers?  
How can mathematics support effective communication?  
How are relationships represented mathematically?  
How can expressions, equations and inequalities be used to quantify, solve, model and/or analyze mathematical situations?  
What does it mean to estimate or analyze numerical quantities?  
What makes a tool and/or strategy appropriate for a given task?  
How can patterns be used to describe relationships in mathematical situations? | Rational Numbers and Irrational Numbers | Distinguish between rational and irrational numbers using their properties.  
Convert a terminating or repeating decimal into a rational number.  
Use rational approximations of irrational numbers to compare the size of irrational numbers. | CC.2.1.8.E.1  
CC.2.1.8.E.4 | M08.A-N.1.1.1  
M08.A-N.1.1.2  
M08.A-N.1.1.3  
M08.A-N.1.1.4  
M08.A-N.1.1.5 | Bivariate data  
Clustering  
Coefficient  
Cone  
Congruence  
Congruent figures  
Cube root  
Cylinder  
Dilations  
Function  
Irrational number  
Line of best fit  
Linear association  
Linear equation  
Negative correlation  
Non-Linear association  
Outlier  
Perfect cube  
Perfect square  
Positive correlation  
Pythagorean theorem  
Rate of change  
Rational number  
Reflection |
# PA Core Standards for Mathematics
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<tr>
<td>ALG 1</td>
<td>Mathematical relationships among numbers can be represented, compared, and communicated.</td>
<td>How is mathematics used to quantify, compare, represent, and model numbers?</td>
<td>Rational and Irrational Numbers</td>
<td>Represent and/or use numbers in equivalent forms (integers, fractions, decimals, percent’s, square roots, exponents).</td>
<td>CC.2.1.HS.F.1 CC.2.1.HS.F.2</td>
<td>A1.1.1.1.1 A1.1.1.1.2 A1.1.1.3.1</td>
<td>Additive Inverse</td>
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<td>Mathematical relationships can be represented as expressions, equations and inequalities in mathematical situations.</td>
<td>How can mathematics support effective communication?</td>
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<td>Additive Property of Equality</td>
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<td>Numerical quantities, calculations, and measurements can be estimated or analyzed by using appropriate strategies and tools.</td>
<td>How are relationships represented mathematically?</td>
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<td>Algorithm</td>
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<td>Patterns exhibit relationships that can be extended, described, and generalized.</td>
<td>What does it mean to estimate or analyze numerical quantities?</td>
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<td>Arithmetic Sequence</td>
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<td>How can expressions, equations and inequalities be used to quantify, solve, model and/or analyze mathematical situations?</td>
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<td>Associative Property</td>
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<td>What makes a tool and/or strategy appropriate for a given task?</td>
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<td>How can patterns be used to describe relationships in mathematical situations?</td>
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<td>Degree (of polynomial)</td>
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<td>Domain (of Relation or Function)</td>
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<td>Estimation Strategy</td>
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<tbody>
<tr>
<td>ALG 1</td>
<td>Mathematical relationships among numbers can be represented, compared, and communicated.</td>
<td>How is mathematics used to quantify, compare, represent, and model numbers? How can mathematics support effective communication? How are relationships represented mathematically? How can expressions, equations and inequalities be used to quantify, solve, model and/or analyze mathematical situations? What does it mean to estimate or analyze numerical quantities? What makes a tool and/or strategy appropriate for a given task?</td>
<td>Real Number System</td>
<td>Apply and extend the properties of exponents to solve problems with rational exponents. Apply number theory concepts to show relationships between real numbers in problem-solving settings. Use exponents, roots, and/or absolute values to solve problems.</td>
<td>CC.2.1.HS.F.1 CC.2.1.HS.F.2 CC.2.1.HS.F.3</td>
<td>A1.1.1.1.1 A1.1.1.1.2 A1.1.1.3.1 A1.1.2.1.1 A1.1.2.1.2 A1.1.2.1.3 A1.2.1.2.1 A1.2.1.2.2</td>
<td>Exponential Equation Exponential Expression Exponential Function Exponential Growth/Decay Extrapolate Frequency Function Geometric Sequence Greatest Common Factor Half-Plane Independent Events Independent Variable Index Interpolate Interquartile Range Inverse (of a Relation) Inverse Operation Maximum Value (of a Graph) Measure of Central Tendencies Measure of Dispersion Minimum Value (of a Graph) Multiplicative Inverse Multiplicative Property of Equality Multiplicative Property of Zero Mutually Exclusive (rational v. irrational) Mutually Exclusive Event Negative Exponent Odds Outlier Point-Slope Form Polynomial Function</td>
</tr>
<tr>
<td>ALG 1</td>
<td>Mathematical relationships among numbers can be represented, compared, and communicated.</td>
<td>How is mathematics used to quantify, compare, represent, and model numbers? How can mathematics support effective communication? How are relationships represented mathematically? How can expressions, equations and inequalities be used to quantify, solve, model and/or analyze mathematical situations? What makes a tool and/or strategy appropriate for a given task?</td>
<td>Equations and Inequalities</td>
<td>Interpret solutions to linear equations and inequalities. Interpret solutions to linear systems of equations and inequalities.</td>
<td>CC.2.1.HS.F.3 CC.2.1.HS.F.4 CC.2.1.HS.F.5</td>
<td>A1.1.2.1.1 A1.1.2.1.2 A1.1.2.1.3 A1.2.1.2.1 A1.2.1.2.2 A1.1.3.1.1 A1.1.3.1.2 A1.1.3.2.1 A1.1.3.2.2</td>
<td>Measure of Central Tendencies Measure of Dispersion Minimum Value (of a Graph) Multiplicative Inverse Multiplicative Property of Equality Multiplicative Property of Zero Mutually Exclusive (rational v. irrational) Mutually Exclusive Event Negative Exponent Odds Outlier Point-Slope Form Polynomial Function</td>
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<tr>
<td>ALG 2</td>
<td>Mathematical relationships among numbers can be represented, compared, and communicated. Mathematical relationships can be represented as expressions, equations and inequalities in mathematical</td>
<td>How is mathematics used to quantify, compare, represent, and model numbers? How can mathematics support effective communication? How are relationships represented mathematically?</td>
<td>Complex Number System</td>
<td>Represent and/or use imaginary numbers in equivalent forms. Simplify/evaluate expressions involving imaginary numbers. Perform arithmetic operations and apply to complex numbers.</td>
<td>CC.2.1.HS.F.6 CC.2.1.HS.F.7</td>
<td>A2.1.1.1 A2.1.1.2 A2.1.1.2.1 A2.1.1.2.2</td>
<td>Asymptote Binomial Combination Common Logarithm Complex Number System Compound Events Dependent/Independent Events</td>
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</table>
|       | situations.  
Numerical quantities, calculations, and measurements can be estimated or analyzed by using appropriate strategies and tools. | How can expressions, equations and inequalities be used to quantify, solve, model and/or analyze mathematical situations?  
What does it mean to estimate or analyze numerical quantities?  
What makes a tool and/or strategy appropriate for a given task? | Polynomial and Rational Expressions | Perform arithmetic operations on polynomials.  
Understand the relationship between zeros and factors of polynomials.  
Rewrite rational expressions.  
Simplify/factor expressions involving polynomials. | CC.2.1.HS.F.1  
CC.2.1.HS.D.1  
CC.2.1.HS.D.2  
CC.2.1.HS.D.3  
CC.2.1.HS.D.4  
CC.2.1.HS.D.5  
CC.2.1.HS.D.6 | Dilation  
Exponential  
Exponential Decay  
Exponential Function  
Exponential Growth  
Expression  
Geometric Sequence  
Imaginary Number  
Intervals  
Intercept  
Logarithm  
Natural Logarithm  
Negative Exponents  
Observational Study  
Outcomes  
Perfect Square  
Trinomial  
Permutation  
Polynomial  
Polynomial Identity  
Probability  
Quadratic Formula  
Quadratic Function  
Radical Functions  
Rational Functions  
Reflection  
Regression Models  
Root Functions  
Sample Survey  
Scatterplot  
Standard Deviation  
Statistical Experiment  
Transformation  
Translations  
Trinomial  
Unit Circle |
| ALG 2 | Mathematical relationships among numbers can be represented, compared, and communicated.  
Mathematical relationships can be represented as expressions, equations and inequalities in mathematical situations.  
Numerical quantities, calculations, and measurements can be estimated or analyzed by using appropriate strategies and tools. | How is mathematics used to quantify, compare, represent, and model numbers?  
How can mathematics support effective communication?  
How are relationships represented mathematically?  
How can expressions, equations and inequalities be used to quantify, solve, model and/or analyze mathematical situations?  
What makes a tool and/or strategy appropriate for a given task? | Equations and Inequalities | Create and/or solve equations (including literal, polynomial, rational, radical, exponential, and logarithmic) both algebraically and graphically.  
Use and/or explain reasoning while solving equations, and justify the solution method. | CC.2.1.HS.F.1  
CC.2.1.HS.D.1  
CC.2.1.HS.D.2 | A2.1.2.1.3  
A2.1.2.1.4  
A2.1.2.2.2  
A2.1.3.1.1  
A2.1.3.1.3  
A2.1.3.1.4  
A2.1.3.2.1  
A2.1.3.2.2  
A2.2.2.1.2 |
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#### 2.1 Numbers and Operations PreK-12

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<tbody>
<tr>
<td></td>
<td>situations. Numerical quantities, calculations, and measurements can be estimated or analyzed by using appropriate strategies and tools.</td>
<td>How can expressions, equations and inequalities be used to quantify, solve, model and/or analyze mathematical situations? What makes a tool and/or strategy appropriate for a given task?</td>
<td>Determine how a change in one variable relates to a change in a second variable. Use exponents, roots, and/or absolute values to represent equivalent forms or to solve problems.</td>
<td></td>
<td>A2.2.2.1.3</td>
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