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

| Grade | Big Idea | Essential Questions | Concepts | Competencies | Standard | Eligible Content | Vocabulary |
|---|---|---|---|---|---|---|---|
| **Pre-K** | Mathematical relationships among numbers can be represented, compared, and communicated. | How is mathematics used to quantify, compare, represent, and model numbers?<br><br>How can mathematics support effective communication? | Numerical Sequence | Rote count to 20.<br><br>Name numerals up to 10.<br><br>Represent a number of objects with a written numeral 0-10. | CC.2.1.PREK.A.1 | | Above<br>Addition<br>Below<br>Beside<br>Between<br>Circle<br>Cone<br>Cube<br>Cylinder<br>Equal<br>Greater than<br>Length<br>Less than<br>Measure<br>Numeral<br>Rectangle<br>Sphere<br>Square<br>Subtraction<br>Three dimensional shapes<br>Triangle<br>Two dimensional shapes<br>Weight |
| **Pre-K** | Mathematical relationships among numbers can be represented, compared, and communicated.<br><br>Patterns exhibit relationships that can be extended, described, and generalized. | How is mathematics used to quantify, compare, represent, and model numbers?<br><br>How can mathematics support effective communication?<br><br>How can patterns be used to describe relationships in mathematical situations? | Object Quantity | Recognize small quantities up to 6.<br><br>Use a one-to-one correspondence when counting to 10.<br><br>State the total number of objects counted, demonstrating understanding that that number named tells the number of objects counted. | CC.2.1.PREK.A.2 | | |
| **Pre-K** | Mathematical relationships among numbers can be represented, compared, and communicated. | How is mathematics used to quantify, compare, represent, and model numbers?<br><br>How can mathematics support effective communication? | Number Comparison | Identify whether the number of objects in one group is greater than, less than or equal to the number of objects in another group up to 10.<br><br>Compare two numbers between 1 and 5 when presented as written numerals. | CC.2.1.PREK.A.3 | | |
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| **K** | Mathematical relationships among numbers can be represented, compared, and communicated.<br><br>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?<br><br>How can mathematics support effective communication?<br><br>What does it mean to estimate or analyze numerical quantities? | Numerical Sequence | Rote count to 100.<br><br>Count forward beginning from a given number within the known sequence (instead of having to begin at 1).<br><br>Name numerals 0 – 20.<br><br>Represent a number of objects with a written numeral 0-20. | CC.2.1.K.A.1 | | Addition<br>Area<br>Capacity<br>Circle<br>Cone<br>Corners (vertices)<br>Cube<br>Cylinder<br>Digit<br>Equal<br>Greater than |

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| **K** | Mathematical relationships among numbers can be represented, compared, and communicated.<br><br>Patterns exhibit relationships that can be extended, described, and generalized. | How is mathematics used to quantify, compare, represent, and model numbers?<br><br>How can mathematics support effective communication?<br><br>How can patterns be used to describe relationships in mathematical situations? | Object Quantity | Uses one-to-one correspondence when counting to 20.<br><br>State the total number of objects counted, demonstrating understanding that that last number named tells the number of objects counted.<br><br>Understand that each successive number name refers to a quantity that is one larger. | CC.2.1.K.A.2 | | Length<br>Less than<br>Ones<br>Place value<br>Quantity<br>Rectangle<br>Sides<br>Sphere<br>Square<br>Subtraction<br>Tens<br>Total<br>Triangle<br>Weight |
| **K** | Mathematical relationships among numbers can be represented, compared, and communicated.<br><br>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?<br><br>How can mathematics support effective communication?<br><br>When is it is appropriate to estimate versus calculate?<br><br>What makes a tool and/or strategy appropriate for a given task? | Number Comparison | 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.<br><br>Compare two numbers between 1 and 10 presented as written numerals. | CC.2.1.K.A.3 | | |
| **K** | Mathematical relationships among numbers can be represented, compared, and communicated.<br><br>Patterns exhibit relationships that can be extended, described, and generalized. | How is mathematics used to quantify, compare, represent, and model numbers?<br><br>How can mathematics support effective communication?<br><br>How can recognizing repetition or regularity assist in solving problems more efficiently? | Place Value | 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. | CC.2.1.K.B.1 | | |
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| **1** | Mathematical relationships among numbers can be represented, compared, and | How is mathematics used to quantify, compare, represent, and model numbers? | Numerical Sequence | Count to 120, starting at any number less than 120. | CC.2.1.1.B.1 | | Addend<br>Addition<br>Analog |

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| | communicated.<br><br>Mathematical relationships can be represented as expressions, equations and inequalities in mathematical situations.<br><br>Numerical quantities, calculations, and measurements can be estimated or analyzed by using appropriate strategies and tools. | How can mathematics support effective communication?<br><br>How are relationships represented mathematically?<br><br>What does it mean to estimate or analyze numerical quantities?<br><br>What makes a tool and/or strategy appropriate for a given task? | | Read and write numerals up to 120 and represent a number of objects with a written numeral. | | | Circle<br>Compare<br>compose/<br>Cone<br>Counting on<br>Cube<br>Cylinder<br>Data<br>decompose<br>Equal to<br>Fourths<br>Fractions –<br>Greater than<br>Half circles |
| **1** | Mathematical relationships among numbers can be represented, compared, and communicated.<br><br>Mathematical relationships can be represented as expressions, equations and inequalities in mathematical situations.<br><br>Numerical quantities, calculations, and measurements can be estimated or analyzed by using appropriate strategies and tools.<br><br>Patterns exhibit relationships that can be extended, described, and generalized. | How is mathematics used to quantify, compare, represent, and model numbers?<br><br>How can mathematics support effective communication?<br><br>How are relationships represented mathematically?<br><br>What does it mean to estimate or analyze numerical quantities?<br><br>What makes a tool and/or strategy appropriate for a given task?<br><br>How can recognizing repetition or regularity assist in solving problems more efficiently? | Place Value | Compare two two-digit numbers based on meanings of the tens and ones digits, recording the results of comparisons with the symbols >, =, and <.<br><br>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.<br><br>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. | CC.2.1.1.B.2<br>CC.2.1.1.B.3 | | Half-hour<br>Halves<br>Hour<br>Length<br>Less than<br>Making ten<br>Ones<br>Place value<br>Quarter-circles<br>Quarters<br>Rectangle<br>Rectangular Prism<br>Square<br>Subtraction<br>Sum<br>Tens<br>Trapezoids<br>Triangle |
| | | | | | | | |
| **2** | Mathematical relationships among numbers can be represented, compared, and | How is mathematics used to quantify, compare, represent, and model numbers? | Place Value | Understand that the three digits of a three-digit number represent amounts of | CC.2.1.2.B.1<br>CC.2.1.2.B.2 | | A.M.<br>Addend<br>Analog/digital |

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| | communicated.<br><br>Mathematical relationships can be represented as expressions, equations and inequalities in mathematical situations.<br><br>Numerical quantities, calculations, and measurements can be estimated or analyzed by using appropriate strategies and tools.<br><br>Patterns exhibit relationships that can be extended, described, and generalized. | How can mathematics support effective communication?<br><br>How are relationships represented mathematically?<br><br>What does it mean to estimate or analyze numerical quantities?<br><br>What makes a tool and/or strategy appropriate for a given task?<br><br>How can recognizing repetition or regularity assist in solving problems more efficiently? | | hundreds, tens, and ones.<br><br>Compare two three-digit numbers based on meanings of the hundreds, tens, and ones digits, using >, =, and < symbols to record the results of comparisons.<br><br>Count within 1000; skip-count by 5s, 10s, and 100s.<br><br>Read and write numbers to 1000 using base-ten numerals, number names, and expanded form. | | | Angles<br>Bar graph<br>Centimeter<br>Compose<br>Decompose<br>Dime<br>Dollar<br>Equation<br>Equivalent<br>Estimate<br>Even<br>Expanded form<br>Faces<br>Feet<br>Fractions – Thirds<br>Hexagon<br>Hundreds<br>Inch<br>Line plot<br>Meter<br>Money<br>Nickel<br>Odd<br>P.M.<br>Penny<br>Pentagon<br>Picture graph<br>Place value<br>Quadrilateral<br>Quarter<br>Sum |
| **2** | Mathematical relationships among numbers can be represented, compared, and communicated.<br><br>Mathematical relationships can be represented as expressions, equations and inequalities in mathematical situations.<br><br>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?<br><br>How can mathematics support effective communication?<br><br>How are relationships represented mathematically?<br><br>What does it mean to estimate or analyze numerical quantities?<br><br>What makes a tool and/or strategy appropriate for a given task? | Addition and Subtraction | Add up to four two-digit numbers using strategies based on place value and properties of operations.<br><br>Add and subtract within 1000.<br><br>Understand that in adding or subtracting three-digit numbers, one adds or subtracts hundreds and hundreds, tens and tens, ones and ones; and sometimes it is necessary to compose or decompose tens or hundreds.<br><br>Explain why addition and subtraction strategies work, using place value and the properties of operations. | CC.2.1.2.B.3 | | |
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| Grade | Big Idea | Essential Questions | Concepts | Competencies | Standard | Eligible Content | Vocabulary |
|---|---|---|---|---|---|---|---|
| 3 | Mathematical relationships among numbers can be represented, compared, and communicated.<br><br>Mathematical relationships can be represented as expressions, equations and inequalities in mathematical situations.<br><br>Numerical quantities, calculations, and measurements can be estimated or analyzed by using appropriate strategies and tools.<br><br>Patterns exhibit relationships that can be extended, described, and generalized. | How is mathematics used to quantify, compare, represent, and model numbers?<br>How can mathematics support effective communication?<br><br>How are relationships represented mathematically?<br><br>What does it mean to estimate or analyze numerical quantities?<br><br>What makes a tool and/or strategy appropriate for a given task?<br><br>When is it is appropriate to estimate versus calculate?<br><br>How can patterns be used to describe relationships in mathematical situations? | Place Value and Properties of Operations | Perform multi-digit arithmetic.<br><br>Demonstrate fluency of addition and subtraction.<br><br>Round whole numbers to the nearest ten or hundred. | CC.2.1.3.B.1 | M03.A-T.1.1.1<br>M03.A-T.1.1.2<br>M03.A-T.1.1.3<br>M03.A-T.1.1.4 | Area<br>Denominator<br>Division<br>Equivalent fractions<br>Estimate<br>Fraction<br>Linear<br>Liquid Volume<br>Mass<br>Numerator<br>Pattern<br>Pentagon<br>Perimeter<br>Pictograph<br>Polygon<br>Quadrilateral<br>Rhombus<br>Round<br>Square Unit<br>Tally Chart<br>Temperature |
| 3 | Mathematical relationships among numbers can be represented, compared, and communicated.<br><br>Mathematical relationships can be represented as expressions, equations and inequalities in mathematical situations.<br><br>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?<br><br>How can mathematics support effective communication?<br><br>How are relationships represented mathematically?<br><br>What does it mean to estimate or analyze numerical quantities?<br><br>What makes a tool and/or strategy appropriate for a given task? | Fractions | Develop an understanding of fractions as numbers.<br><br>Represent fractions on a number line.<br><br>Represent and generate equivalent fractions.<br><br>Compare fractions with the same numerator or same denominator. | CC.2.1.3.C.1 | M03.A-F.1.1.1<br>M03.A-F.1.1.2<br>M03.A-F.1.1.3<br>M03.A-F.1.1.4<br>M03.A-F.1.1.5 | |
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# 2.1 Numbers and Operations PreK-12

| Grade | Big Idea | Essential Questions | Concepts | Competencies | Standard | Eligible Content | Vocabulary |
|---|---|---|---|---|---|---|---|
| 4 | Mathematical relationships among numbers can be represented, compared, and communicated.<br><br>Mathematical relationships can be represented as expressions, equations and inequalities in mathematical situations.<br><br>Numerical quantities, calculations, and measurements can be estimated or analyzed by using appropriate strategies and tools.<br><br>Patterns exhibit relationships that can be extended, described, and generalized. | How is mathematics used to quantify, compare, represent, and model numbers?<br><br>How can mathematics support effective communication?<br><br>How are relationships represented mathematically?<br><br>What does it mean to estimate or analyze numerical quantities?<br><br>When is it is appropriate to estimate versus calculate?<br><br>What makes a tool and/or strategy appropriate for a given task?<br><br>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.<br><br>Compare and round multi-digit numbers.<br><br>Perform multi-digit arithmetic. | CC.2.1.4.B.1<br>CC.2.1.4.B.2 | M04.A-T.1.1.1<br>M04.A-T.1.1.2<br>M04.A-T.1.1.3<br>M04.A-T.1.1.4<br>M04.A-T.2.1.1<br>M04.A-T.2.1.2<br>M04.A-T.2.1.3<br>M04.A-T.2.1.4 | Acute Angle<br>Angle<br>Decimal<br>Decimal Fraction<br>Equivalence<br>Factor<br>Line<br>Line of symmetry<br>Line Segment<br>Mixed Number<br>Multiple<br>Obtuse Triangle<br>Point<br>Ray<br>Right Angle<br>Symmetry<br>Unit Fraction<br>Weight |
| 4 | Mathematical relationships among numbers can be represented, compared, and communicated.<br><br>Mathematical relationships can be represented as expressions, equations and inequalities in mathematical situations.<br><br>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?<br><br>How can mathematics support effective communication?<br><br>How are relationships represented mathematically?<br><br>What does it mean to estimate or analyze numerical quantities?<br><br>What makes a tool and/or strategy appropriate for a given task? | Fractions | Demonstrate an understanding of fraction equivalence.<br><br>Compare and order fractions.<br><br>Solve problems involving fractions and mixed numbers. | CC.2.1.4.C.1<br>CC.2.1.4.C.2 | M04.A-F.1.1.1<br>M04.A-F.1.1.2<br>M04.A-F.2.1.1<br>M04.A-F.2.1.2<br>M04.A-F.2.1.3<br>M04.A-F.2.1.4<br>M04.A-F.2.1.5<br>M04.A-F.2.1.6<br>M04.A-F.2.1.7 | |
| 4 | Mathematical relationships | How is mathematics used to quantify, | Decimals | Use decimal notation for | CC.2.1.4.C.3 | M04.A-F.3.1.1 | |

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| | among numbers can be represented, compared, and communicated.<br><br>Mathematical relationships can be represented as expressions, equations and inequalities in mathematical situations.<br><br>Numerical quantities, calculations, and measurements can be estimated or analyzed by using appropriate strategies and tools. | compare, represent, and model numbers?<br><br>How can mathematics support effective communication?<br><br>How are relationships represented mathematically?<br><br>What does it mean to estimate or analyze numerical quantities?<br><br>What makes a tool and/or strategy appropriate for a given task? | | decimal fractions.<br><br>Compare decimal fractions.<br><br>Compare decimals. | | M04.A-F.3.1.2<br>M04.A-F.3.1.3 | |
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| 5 | Mathematical relationships among numbers can be represented, compared, and communicated.<br><br>Mathematical relationships can be represented as expressions, equations, and inequalities in mathematical situations.<br><br>Numerical quantities, calculations, and measurements can be estimated or analyzed by using appropriate strategies and tools.<br><br>Patterns exhibit relationships that can be extended, described, and generalized. | How is mathematics used to quantify, compare, represent, and model numbers?<br><br>How can mathematics support effective communication?<br><br>How are relationships represented mathematically?<br><br>What does it mean to estimate or analyze numerical quantities?<br><br>When is it is appropriate to estimate versus calculate?<br><br>What makes a tool and/or strategy appropriate for a given task?<br><br>How can patterns be used to describe relationships in mathematical situations? | Place Value and Properties of Operations | Demonstrate an understanding of rounding as it pertains to whole numbers and decimals.<br><br>Read, write and compare decimals.<br><br>Use whole numbers and decimals to compute accurately. | CC.2.1.5.B.1<br><br>CC.2.1.5.B.2 | M05.A-T.1.1.1<br>M05.A-T.1.1.2<br>M05.A-T.1.1.3<br>M05.A-T.1.1.4<br>M05.A-T.1.1.5<br><br>M05.A-T.2.1.1<br>M05.A-T.2.1.2<br>M05.A-T.2.1.3 | Braces<br>Brackets<br>Coordinate Plane<br>Cubic Units<br>Decimal Place Value (through thousandths)<br>Measurement Systems<br>Measurement Units<br>Numerical Expressions<br>Order of Operations<br>Origin<br>Parentheses<br>Scaling (resizing)<br>Unit Fraction<br>Volume<br>X-axis<br>X-coordinate<br>Y-axis<br>Y-coordinate |

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| 5 | Mathematical relationships among numbers can be represented, compared, and communicated.<br><br>Mathematical relationships can be represented as expressions, equations, and inequalities in mathematical situations.<br><br>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?<br><br>How can mathematics support effective communication?<br><br>How are relationships represented mathematically?<br><br>What does it mean to estimate or analyze numerical quantities?<br><br>What makes a tool and/or strategy appropriate for a given task? | Fractions | Add, Subtract, Multiply and Divide fractions to solve problems.<br><br>Explain operations as they pertain to fractions. | CC.2.1.5.C.1<br><br>CC.2.1.5.C.2 | M05.A-F.1.1.1<br><br>M05.A-F.2.1.1<br>M05.A-F.2.1.2<br>M05.A-F.2.1.3<br>M05.A-F.2.1.4 | |
| 5 | Mathematical relationships among numbers can be represented, compared, and communicated.<br><br>Mathematical relationships can be represented as expressions, equations, and inequalities in mathematical situations.<br><br>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?<br><br>How can mathematics support effective communication?<br><br>How are relationships represented mathematically?<br><br>What does it mean to estimate or analyze numerical quantities?<br><br>When is it is appropriate to estimate versus calculate? | Decimals | Read, write and compare decimals.<br><br>Use whole numbers and decimals to compute accurately. | CC.2.1.5.B.2 | M05.A-T.2.1.1<br>M05.A-T.2.1.2<br>M05.A-T.2.1.3 | |
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| 6 | Mathematical relationships among numbers can be represented, compared, and communicated. | How is mathematics used to quantify, compare, represent and model numbers? | Ratios, Proportions, and Percent | Represent ratio relationships in various forms.<br><br>Determine unit rates in context. | CC.2.1.6.D.1 | M06.A-R.1.1.1<br>M06.A-R.1.1.2<br>M06.A-R.1.1.3<br>M06.A-R.1.1.4 | Absolute value<br>Algebraic expressions<br>Box and whisker plots<br>Coefficient |

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| | Mathematical relationships can be represented as expressions, equations and inequalities in mathematical situations.<br><br>Numerical quantities, calculations, and measurements can be estimated or analyzed by using appropriate strategies and tools.<br><br>Patterns exhibit relationships that can be extended, described, and generalized. | How can mathematics support effective communication?<br><br>How are relationships represented mathematically?<br><br>How can expressions, equations and inequalities be used to quantify, solve, model and/or analyze mathematical situations?<br><br>What makes a tool and/or strategy appropriate for a given task?<br><br>How can patterns be used to describe relationships in mathematical situations? | | Interpret and compute quotients of fraction.<br><br>Solve problems using ratio and rate reasoning.<br><br>Convert measurement units using equivalent ratios. | CC.2.1.6.E.1 | M06.A-R.1.1.5<br>M06.A-R.1.1.3<br>M06.A-R.1.1.4<br>M06.A-R.1.1.5<br>M06.A-N.1.1.1 | Compound polygon<br>Dependent variable<br>Distributive property<br>Dot plots<br>Exponent<br>Greatest Common Factor<br>Independent variable<br>Inequality<br>Integer<br>Interquartile range<br>Irregular Polygon<br>Least Common Multiple<br>Mean<br>Mean absolute deviation |
| **6** | Mathematical relationships among numbers can be represented, compared, and communicated.<br><br>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?<br><br>How can mathematics support effective communication?<br><br>What does it mean to estimate or analyze numerical quantities?<br><br>What makes a tool and/or strategy appropriate for a given task? | Number Theory Concepts and Operations | Solve problems and compute fluently with whole numbers and decimals.<br><br>Find common multiples and factors including greatest common factor and least common multiple.<br><br>Use the distributive property to express a sum of two numbers. | CC2.1.6.E.2<br><br>CC.2.1.6.E.3 | M06.A-N.2.1.1<br>M06.A-N.2.2.1<br><br>M06.A-N.2.2.1<br>M06.A-N.2.2.2 | |
| **6** | Mathematical relationships among numbers can be represented, compared, and communicated.<br><br>Mathematical relationships can be represented as expressions, equations and inequalities in mathematical situations. | How is mathematics used to quantify, compare, represent, and model numbers?<br><br>How can mathematics support effective communication?<br><br>How are relationships represented mathematically? | Integers and Other Rational Numbers | Use positive and negative numbers to represent quantities in real world contexts.<br><br>Plot integers and other rational numbers on a number line and on a coordinate graph.<br><br>Interpret the opposite and | CC.2.1.6.E.4 | M06.A-N.3.1.1<br>M06.A-N.3.1.2<br>M06.A-N.3.1.3<br>M06.A-N.3.2.1<br>M06.A-N.3.2.2<br>M06.A-N.3.2.3 | |

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|---|---|---|---|---|---|---|---|
| | 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?<br><br>What makes a tool and/or strategy appropriate for a given task? | | absolute value of an integer as its distance from zero on a number line<br><br>Compare and order rational numbers. | | | |
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| 7 | Mathematical relationships among numbers can be represented, compared, and communicated.<br><br>Mathematical relationships can be represented as expressions, equations and inequalities in mathematical situations.<br><br>Numerical quantities, calculations, and measurements can be estimated or analyzed by using appropriate strategies and tools.<br><br>Patterns exhibit relationships that can be extended, described, and generalized. | How is mathematics used to quantify, compare, represent, and model numbers?<br><br>How can mathematics support effective communication?<br><br>How are relationships represented mathematically?<br><br>How can expressions, equations and inequalities be used to quantify, solve, model and/or analyze mathematical situations?<br><br>What does it mean to estimate or analyze numerical quantities?<br><br>What makes a tool and/or strategy appropriate for a given task?<br><br>How can recognizing repetition or regularity assist in solving problems more efficiently? | Ratios, Proportions, and Percent | Compute unit rates associated with ratios of fractions.<br><br>Recognize and represent proportional relationships between quantities.<br><br>Use proportional relationships to solve multistep ratio and percent problems. | CC.2.1.7.D.1 | M07.A-R.1.1.1<br>M07.A-R.1.1.2<br>M07.A-R.1.1.3<br>M07.A-R.1.1.4<br>M07.A-R.1.1.5<br>M07.A-R.1.1.6 | Acute triangle<br>Adjacent angles<br>Alternate exterior angles<br>Alternate interior angles<br>Chance event<br>Circumference<br>Complementary angles<br>Compound event<br>Corresponding angles<br>Data distribution<br>decrease<br>Equally likely<br>Equilateral triangle<br>Independent event<br>Isosceles triangle<br>Likely event<br>Linear expression<br>Obtuse triangle<br>Outcome<br>Percent increase and<br>Population<br>Probability |
| 7 | Mathematical relationships among numbers can be represented, compared, and communicated.<br><br>Mathematical relationships can be represented as | How can mathematics support effective communication?<br><br>How are relationships represented mathematically?<br><br>How can expressions, equations and | 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<br>M07.A-N.1.1.2<br>M07.A-N.1.1.3 | Process of chance<br>Proportion<br>Random sample<br>Relative frequency<br>Repeating decimal<br>Scale drawing<br>Scalene triangle |

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|---|---|---|---|---|---|---|---|
| | expressions, equations and inequalities in mathematical situations.<br><br>Numerical quantities, calculations, and measurements can be estimated or analyzed by using appropriate strategies and tools.<br><br>Patterns exhibit relationships that can be extended, described, and generalized. | inequalities be used to quantify, solve, model and/or analyze mathematical situations?<br><br>What does it mean to estimate or analyze numerical quantities?<br><br>What makes a tool and/or strategy appropriate for a given task?<br><br>How can recognizing repetition or regularity assist in solving problems more efficiently? | | | | | |
| | | | | | | | |
| **8** | Mathematical relationships among numbers can be represented, compared, and communicated.<br><br>Mathematical relationships can be represented as expressions, equations and inequalities in mathematical situations.<br><br>Numerical quantities, calculations, and measurements can be estimated or analyzed by using appropriate strategies and tools.<br><br>Patterns exhibit relationships that can be extended, described, and generalized. | How is mathematics used to quantify, compare, represent, and model numbers?<br><br>How can mathematics support effective communication?<br><br>How are relationships represented mathematically?<br><br>How can expressions, equations and inequalities be used to quantify, solve, model and/or analyze mathematical situations?<br><br>What does it mean to estimate or analyze numerical quantities?<br><br>What makes a tool and/or strategy appropriate for a given task?<br><br>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.<br><br>Convert a terminating or repeating decimal into a rational number.<br><br>Use rational approximations of irrational numbers to compare the size of irrational numbers. | CC.2.1.8.E.1<br>CC.2.1.8.E.4 | M08.A-N.1.1.1<br>M08.A-N.1.1.2<br>M08.A-N.1.1.3<br>M08.A-N.1.1.4<br>M08.A-N.1.1.5 | Bivariate data<br>Clustering<br>Coefficient<br>Cone<br>Congruence<br>Congruent figures<br>Cube root<br>Cylinder<br>Dilations<br>Function<br>Irrational number<br>Line of best fit<br>Linear association<br>Linear equation<br>Negative correlation<br>Non-Linear association<br>Outlier<br>Perfect cube<br>Perfect square<br>Positive correlation<br>Pythagorean theorem<br>Rate of change<br>Rational number<br>Reflection |

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

| Grade | Big Idea | Essential Questions | Concepts | Competencies | Standard | Eligible Content | Vocabulary |
|---|---|---|---|---|---|---|---|
| | | | | | | | Relation<br>Rotation<br>Scatterplot<br>Scientific notation<br>Similarity<br>Simultaneous linear equations<br>Slope<br>Sphere<br>Square root<br>Transformation<br>Translation<br>Two-way table<br>y-intercept |
| | | | | | | | |
| **ALG 1** | Mathematical relationships among numbers can be represented, compared, and communicated.<br><br>Mathematical relationships can be represented as expressions, equations and inequalities in mathematical situations.<br><br>Numerical quantities, calculations, and measurements can be estimated or analyzed by using appropriate strategies and tools.<br><br>Patterns exhibit relationships that can be extended, described, and generalized. | How is mathematics used to quantify, compare, represent, and model numbers?<br><br>How can mathematics support effective communication?<br><br>How are relationships represented mathematically?<br><br>What does it mean to estimate or analyze numerical quantities?<br><br>How can expressions, equations and inequalities be used to quantify, solve, model and/or analyze mathematical situations?<br><br>What makes a tool and/or strategy appropriate for a given task?<br><br>How can patterns be used to describe relationships in mathematical situations? | Rational and Irrational Numbers | Represent and/or use numbers in equivalent forms (integers, fractions, decimals, percent's, square roots, exponents). | CC.2.1.HS.F.1<br>CC.2.1.HS.F.2 | A1.1.1.1.1<br>A1.1.1.1.2<br>A1.1.1.3.1 | Additive Inverse<br>Additive Property of Equality<br>Algorithm<br>Arithmetic Sequence<br>Associative Property<br>Asymptote<br>Bar Graph<br>Binomial<br>Bivariate Data<br>Boundary Line<br>Bounded Region<br>Circle Graph<br>Coefficient<br>Commutative Property<br>Composite Number<br>Compound Event<br>Compound Inequality<br>Degree (of polynomial)<br>Dependent Events<br>Domain (of Relation or Function)<br>Equivalent<br>Estimation Strategy |

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

| Grade | Big Idea | Essential Questions | Concepts | Competencies | Standard | Eligible Content | Vocabulary |
|---|---|---|---|---|---|---|---|
| **ALG 1** | Mathematical relationships among numbers can be represented, compared, and communicated.<br><br>Mathematical relationships can be represented as expressions, equations and inequalities in mathematical situations.<br><br>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?<br><br>How can mathematics support effective communication?<br><br>How are relationships represented mathematically?<br><br>How can expressions, equations and inequalities be used to quantify, solve, model and/or analyze mathematical situations?<br><br>What does it mean to estimate or analyze numerical quantities?<br><br>What makes a tool and/or strategy appropriate for a given task? | Real Number System | Apply and extend the properties of exponents to solve problems with rational exponents.<br><br>Apply number theory concepts to show relationships between real numbers in problem-solving settings.<br><br>Use exponents, roots, and/or absolute values to solve problems. | CC.2.1.HS.F.1<br>CC.2.1.HS.F.2<br>CC.2.1.HS.F.3 | A1.1.1.1.1<br>A1.1.1.1.2<br>A1.1.1.3.1<br>A1.1.2.1.1<br>A1.1.2.1.2<br>A1.1.2.1.3<br>A1.2.1.2.1<br>A1.2.1.2.2 | Exponential Equation<br>Exponential Expression<br>Exponential Function<br>Exponential Growth/Decay<br>Extrapolate<br>Frequency<br>Function<br>Geometric Sequence<br>Greatest Common Factor<br>Half-Plane<br>Independent Events<br>Independent Variable<br>Index<br>Interpolate<br>Interquartile Range<br>Inverse (of a Relation)<br>Inverse Operation<br>Maximum Value (of a Graph)<br>Measure of Central Tendencies<br>Measure of Dispersion<br>Minimum Value (of a Graph)<br>Multiplicative Inverse<br>Multiplicative Property of Equality<br>Multiplicative Property of Zero<br>Mutually Exclusive (rational v. irrational)<br>Mutually Exclusive Event<br>Negative Exponent<br>Odds<br>Outlier<br>Point-Slope Form<br>Polynomial Function |
| **ALG 1** | Mathematical relationships among numbers can be represented, compared, and communicated.<br><br>Mathematical relationships can be represented as expressions, equations and inequalities in mathematical situations.<br><br>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?<br><br>How can mathematics support effective communication?<br>How are relationships represented mathematically?<br><br>How can expressions, equations and inequalities be used to quantify, solve, model and/or analyze mathematical situations?<br><br>What makes a tool and/or strategy appropriate for a given task? | Equations and Inequalities | Interpret solutions to linear equations and inequalities.<br><br>Interpret solutions to linear systems of equations and inequalities. | CC.2.1.HS.F.3<br>CC.2.1.HS.F.4<br>CC.2.1.HS.F.5 | A1.1.2.1.1<br>A1.1.2.1.2<br>A1.1.2.1.3<br>A1.2.1.2.1<br>A1.2.1.2.2<br>A1.1.2.2.1<br>A1.1.2.2.2<br>A1.1.3.1.1<br>A1.1.3.1.2<br>A1.1.3.1.3<br>A1.1.3.2.1<br>A1.1.3.2.2 | |

| Grade | Big Idea | Essential Questions | Concepts | Competencies | Standard | Eligible Content | Vocabulary |
|---|---|---|---|---|---|---|---|
| | | | | | | | Positive Exponents<br>Probability of Compound Events<br>Quadrants<br>Quadratic Functions<br>Quartile<br>Radical Expression<br>Range (of Data)<br>Range (of Relation or Function)<br>Rate (of Change)<br>Relation<br>Repeating Decimal<br>Scatterplot<br>Simple Event<br>Simplest form (of an Expression)<br>Slope-Intercept Form<br>Standard Form (of a Linear Equation)<br>Substitution Method<br>Systems of Linear Equations<br>Systems of Linear Inequalities<br>Terminating Decimal<br>Test Point<br>Trinomial<br>Unbounded Region |
| | | | | | | | |
| **ALG 2** | Mathematical relationships among numbers can be represented, compared, and communicated.<br><br>Mathematical relationships can be represented as expressions, equations and inequalities in mathematical | How is mathematics used to quantify, compare, represent, and model numbers?<br><br>How can mathematics support effective communication?<br><br>How are relationships represented mathematically? | Complex Number System | Represent and/or use imaginary numbers in equivalent forms.<br><br>Simplify/evaluate expressions involving imaginary numbers.<br><br>Perform arithmetic operations and apply to complex numbers. | CC.2.1.HS.F.6<br>CC.2.1.HS.F.7 | A2.1.1.1.1<br>A2.1.1.1.2<br>A2.1.1.2.1<br>A2.1.1.2.2 | Asymptote<br>Binomial<br>Combination<br>Common Logarithm<br>Complex Number System<br>Compound Events<br>Dependent/Independent Events |

| Grade | Big Idea | Essential Questions | Concepts | Competencies | Standard | Eligible Content | Vocabulary |
|---|---|---|---|---|---|---|---|
| | situations.<br><br>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?<br><br>What does it mean to estimate or analyze numerical quantities?<br><br>What makes a tool and/or strategy appropriate for a given task? | | | | | Dilation<br>Exponential<br>Exponential Decay<br>Exponential Function<br>Exponential Growth<br>Expression<br>Geometric Sequence<br>Imaginary Number<br>Intervals<br>Intercept<br>Logarithm<br>Natural Logarithm |
| **ALG 2** | Mathematical relationships among numbers can be represented, compared, and communicated.<br><br>Mathematical relationships can be represented as expressions, equations and inequalities in mathematical situations.<br><br>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?<br><br>How can mathematics support effective communication?<br><br>How are relationships represented mathematically?<br><br>How can expressions, equations and inequalities be used to quantify, solve, model and/or analyze mathematical situations?<br><br>What makes a tool and/or strategy appropriate for a given task? | Polynomial and Rational Expressions | Perform arithmetic operations on polynomials.<br><br>Understand the relationship between zeros and factors of polynomials.<br><br>Rewrite rational expressions.<br><br>Simplify/factor expressions involving polynomials. | CC.2.1.HS.F.1<br>CC.2.1.HS.D.1<br>CC.2.1.HS.D.2<br>CC.2.1.HS.D.3<br>CC.2.1.HS.D.4<br>CC.2.1.HS.D.5<br>CC.2.1.HS.D.6 | A2.1.2.1.2<br>A2.1.3.1.2<br>A2.1.2.2.1<br>A2.1.2.2.2 | Negative Exponents<br>Observational Study<br>Outcomes<br>Perfect Square Trinomial<br>Permutation<br>Polynomial<br>Polynomial Identity<br>Probability<br>Quadratic Formula<br>Quadratic Function<br>Radical Functions<br>Rational Functions<br>Reflection<br>Regression Models<br>Root Functions<br>Sample Survey<br>Scatterplot<br>Standard Deviation<br>Statistical Experiment<br>Transformation<br>Translations<br>Trinomial<br>Unit Circle |
| **ALG 2** | Mathematical relationships among numbers can be represented, compared, and communicated.<br><br>Mathematical relationships can be represented as expressions, equations and inequalities in mathematical | How is mathematics used to quantify, compare, represent, and model numbers?<br><br>How can mathematics support effective communication?<br><br>How are relationships represented mathematically? | Equations and Inequalities | Create and/or solve equations (including literal, polynomial, rational, radical, exponential, and logarithmic) both algebraically and graphically.<br><br>Use and/or explain reasoning while solving equations, and justify the solution method. | CC.2.1.HS.F.1<br>CC.2.1.HS.D.1<br>CC.2.1.HS.D.2 | A2.1.2.1.3<br>A2.1.2.1.4<br>A2.1.2.2.2<br>A2.1.3.1.1<br>A2.1.3.1.3<br>A2.1.3.1.4<br>A2.1.3.2.1<br>A2.1.3.2.2<br>A2.2.2.1.2 | |

| Grade | Big Idea | Essential Questions | Concepts | Competencies | Standard | Eligible Content | Vocabulary |
|---|---|---|---|---|---|---|---|
| | situations.<br><br>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?<br><br>What makes a tool and/or strategy appropriate for a given task? | | Determine how a change in one variable relates to a change in a second variable.<br><br>Use exponents, roots, and/or absolute values to represent equivalent forms or to solve problems. | | A2.2.2.1.3 | |
| | | | | | | | |