

Curriculum Survey of Essential Skills National Rank Order

Mathematics

International Center for Leadership in Education (January 12, 2000) Mathematics Topic Statements	National Ranking	Priority		
		High	Medium	Low
		1-35	36-70	71-87
Perform <i>operations with signed</i> (positive and negative) <i>numbers</i> , including decimals, ratios, percents, and fractions.	1	X		
Understand the characteristics of <i>parallel, perpendicular, and intersecting lines</i> .	2	X		
Understand <i>basic algebraic properties</i> (i.e., commutative: $ab = ba$; associative: $ab(c) = a(bc)$; and distributive: $a(b+c) = (ab)+(ac)$).	3	X		
Understand the characteristics and terminology of <i>angles</i> , e.g., degree measure, classification of angles by measure (acute, right, obtuse, and straight), supplementary and complementary angles, and vertical angles.	4	X		
Understand the best procedures for statistical <i>data collection, organization, and display</i> including making estimates and predictions and drawing inferences.	5	X		
Understand the characteristics and applications of the <i>undefined terms of geometry</i> (i.e., point, line, and plane).	6	X		
Understand the <i>use of variables</i> in expressions such as $4x$, $x+2$, and $2x-1$, solve for the variable, and know how to represent expressions such as "twice the number" or "four more than the number" using variables.	7	X		
Understand the correct <i>order of operations</i> for performing algebraic computations.	8	X		
Know how to compute the <i>distance between two points</i> (i.e., length of a line segment) on a coordinate plane.	9	X		
Understand the <i>properties of circles</i> (e.g., radius, arc, diameter, chord, secant, tangent, etc.).	10	X		
Use addition and multiplication to <i>simplify an algebraic expression</i> by identifying the order of operations and techniques necessary to carry out the operations (e.g., $5-3(x-2) = 5-3x+6 = 11-3x$).	11	X		
Analyze the <i>truth value of simple sentences</i> by stating whether a simple objective statement (closed sentence) is true or false, or whether a statement containing pronouns or variables (open sentence) becomes true or false upon replacement of those pronouns or variables.	12	X		
Compute the <i>perimeter and area of two-dimensional figures</i> .	13	X		
Understand the <i>angle relationships in triangles</i> (i.e., acute, obtuse, right, interior, and exterior).	14	X		
Understand the characteristics of <i>measures of central tendency</i> (i.e., mean, median, and mode).	15	X		
Understand the <i>properties and classification of triangles</i> by sides (i.e., scalene, isosceles, and equilateral).	16	X		
Compute the <i>volume of three-dimensional figures</i> (solids).	17	X		
Know the <i>basic trigonometric functions</i> and ratios.	18	X		
Understand the definitions and properties of <i>rational and irrational numbers</i> .	19	X		

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Understand the characteristic differences between <i>theoretical and empirical probability</i> (e.g., the theoretic probability of rolling a six and a die is 1/6; empirical probability is derived from repeated experimentation or accumulated statistics).	20	X		
Use the <i>Pythagorean theorem</i> to compute side lengths of right triangles.	21	X		
Understand <i>factoring</i> a composite number into its prime factors, and how to find the largest monomial factor of a polynomial to write the polynomial as the product of the monomial and a polynomial.	22	X		
Know the components and properties of the <i>rectangular coordinate system</i> , (i.e., x - y axis, origin, quadrants, abscissa (x-coordinate) and ordinate (y-coordinate), and the general representation of a point (x,y)).	23	X		
Understand the basic properties and <i>laws of exponents and scientific notation</i> .	24	X		
Determine the <i>probability of single and compound events</i> using the basic premise that the probability of an event is equal to the number of ways it can occur divided by the total number of outcomes.	25	X		
Understand the <i>properties and classification of polygons</i> (e.g., triangle, quadrilaterals, pentagon, hexagon, etc.) as well as knowledge of geometric shapes.	26	X		
Understand the <i>properties and classification of quadrilaterals</i> by orientation (e.g., parallelogram, rectangle, rhombus, square, and trapezoid).	27	X		
Use geometric methods (e.g., an unmarked straightedge and compass) to complete <i>basic geometric constructions</i> (e.g., perpendicular bisector of a line segment, angle bisector, etc.).	28	X		
Know the <i>classification and properties of solid figures</i> such as prisms, rectangular solids, pyramids, right circular cylinders, cones, and spheres.	29	X		
Know how to <i>measure circle quantities</i> (e.g., area, angle formed by two secants, circumference, length of segments, etc.).	30	X		
Analyze the <i>truth value of compound sentences</i> that include the connectives AND (conjunction), OR (disjunction), IF-THEN (conditional), and IF AND ONLY IF (bi-conditional) and summarize by creating truth tables.	31	X		
Use <i>direct proof and indirect proof</i> sequencing techniques to reach a conclusion. Direct proof uses the Laws of Reasoning to create an orderly arrangement of steps leading to a conclusion. Indirect proof uses an initial assumption that the conclusion is false, and through a series of logically sound reasoning steps the statement may be proved otherwise.	32	X		
Use the technique of <i>dimensional analysis</i> to convert units of measure (e.g., convert km/hr to m/min) including drawing to scale and applying ratios. Understand and use various techniques for estimating, making and converting measure; and using these to perform dimensional analysis.	33	X		
Know the equation for the <i>slope of a line</i> and compute slope given the coordinates of two points.	34	X		
Find the <i>solution of linear equations and inequalities</i> where the variable appears on both sides and in which one or both sides must be simplified before solving the equation (e.g., solve $x+2(x-3) = -4x+5$ for x).	35	X		
Understand the characteristics of <i>measures of dispersion</i> (i.e., range, mean	36		X	

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deviation, variance, and standard deviation).				
Perform addition of polynomials to express them in their simplest form (e.g., $(2a+2)+(3a-1) = 5a+1$).	37		X	
Know how to compute the midpoint of a line segment between two points on a coordinate plane.	38		X	
Execute basic operations with complex numbers (i.e., addition, multiplication, and inverse), and graphically interpret complex numbers using the complex plane.	39		X	
Understand appropriate terminology used to define relations and functions and their properties (e.g., domain, range, function composition, inverses, etc.).	40		X	
Perform multiplication of polynomials by understanding the meaning of a positive, integral exponent, and using exponents correctly when multiplying powers with like bases.	41		X	
Understand the concepts and applications of quartiles (i.e., distributing groups into four equal frequencies) and percentiles (i.e., distributing individuals into one-hundred groups of equal frequency).	42		X	
Know how to determine combinations (i.e., the various grouping a set may be arranged in without regard to order).	43		X	
Perform operations with radicals such as addition, subtraction, multiplication, and division of two or more irrational numbers and express as the square root of a positive integer or as the product of a rational number and the square root of a positive integer.	44		X	
Know the equation of a line and interpret graphically using the slope-intercept form (i.e., $y = mx+b$), and the point-slope form (i.e., $y-b = m(x-a)$).	45		X	
Perform division of a polynomial by a monomial by knowing how to divide powers with like bases, use integral exponents to express decimal numbers in scientific notation, use the rules for the division of powers with like bases to simplify fractions with monomial denominators, and reduce fractions to lowest terms.	46		X	
Know how to represent the solution set of an open sentence (e.g., $x < -1$) on a number line.	47		X	
Understand the concepts and apply the uses of functions and limits (i.e., conduct limiting processes using functions to investigate infinite series and sequences).	48		X	
Apply transformation concepts to understand and create congruent and similar figures .	49		X	
Use the process of integration (i.e., anti-derivatives) to determine areas, volumes, and distances.	50		X	
Understand the concepts and uses of matrices in modeling (i.e., finite graphs (structures) can be represented geometrically and interpreted algebraically in the form of a matrix).	51		X	
Find the solution of proportions with monomial monomial and binomial terms (e.g., $x/(x-2) = 6/5$, therefore, $x = 12$).	52		X	
Apply the zero property of multiplication to find the solution of quadratic equations .	53		X	

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Perform the <i>general solution of triangles</i> by using the law of sines and law of cosines to obtain the angle and side length measurements of any triangle.	54		X	
Understand the concepts of <i>symmetry and transformations</i> and graphically apply line reflections, rotation, translations, and dilation.	55		X	
Use the <i>Counting Principle</i> to determine the probability of events occurring jointly (e.g., if one activity can occur in any of m ways and another in any one of n ways, then the total number of ways both activities can occur is mn).	56		X	
Understand the concepts of <i>right triangle trigonometry</i> and solve right triangles using basic trigonometric ratios (sine, cosine, tangent).	57		X	
Be able to <i>prove trigonometric identities and solve equations</i> (linear and quadratic).	58		X	
Understand the characteristics of <i>maxima and minima</i> and be able to mathematically determine maximum and minimum points on a graph or curve.	59		X	
Understand the concept of <i>the imaginary unit, i</i> , and know how to simplify square roots involving a negative radicand.	60		X	
Understand the concepts <i>recurrence relations</i> and how they are applicable to such things as compound interest and annuity.	61		X	
Understand the characteristics of <i>algorithms</i> and how they are used for finding the greatest common denominator of two numbers and the solutions of quadratic equations.	62		X	
Use the process of <i>differentiation</i> (i.e., derivatives) to determine tangents, maxima and minima, velocity, and acceleration.	63		X	
Know how to express a linear function (e.g., $y = 1/3x+5$) using the <i>functional notation</i> $f(x) = 1/3x+5$, and determine the ordered pairs.	64		X	
Know the <i>standard form of a complex number</i> is expressed as $a + bi$ where a and b are real numbers, and represent graphically on the complex plane where the horizontal axis is the real axis and the vertical axis is the imaginary axis.	65		X	
Know how to determine <i>permutations</i> (i.e., arrangements of a set where order matters).	66a		X	
Understand the concepts and theories of <i>random distribution</i> .	66b		X	
Apply arithmetic methods for obtaining a <i>rational approximation of an irrational number</i> (e.g., radical).	68		X	
Graph the <i>exponential function</i> and understand its characteristics.	69		X	
Understand the characteristics and uses of <i>vectors</i> (e.g., representations of velocity and force) and perform basic operations on vectors (e.g., vector addition and scalar multiplication). A vector is a physical element possessing magnitude and direction.	70		X	
Know how to find the <i>graphic solution of systems of linear equations</i> (e.g., find the point(s) common to a quadratic-linear pair).	71			X
Understand the characteristics and uses of <i>finite sequence and series</i> (e.g., it allows a systematic and useful means of quantifying things).	72			X
Understand <i>inverse functions</i> as the set of ordered pairs obtained by interchanging the first and second elements of each pair belonging to a one-on-one function. Use one-on-one functions to create symmetric figures consisting of the graphs of a function and its inverse function.	73			X
Understand the trigonometric properties of <i>the unit circle</i> and sketch the graphs of basic circular functions (i.e., $y = \sin x$, $y = \cos x$, and $y = \tan x$)	74			X

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where the measure of the angle x is expressed in radians.				
Understand the concepts of direct and opposite <i>isometries</i> (i.e., transformations that preserve distance such as reflections, rotations, translations, and glide reflections, and be able to graphically apply them.	75			X
Find the <i>solution of quadratic equations with imaginary roots</i> and understand the characteristics of the roots.	76			X
Apply <i>summation notation</i> to taking the sum of an expression using limits (e.g., take the sum of $3i+1$, from $i = 1$ to 5).	77			X
Graph the <i>logarithmic function</i> and understand its characteristics.	78			X
Prove <i>tautologies</i> (i.e., compound statements that are always true regardless of the truth value of the individual statements) by constructing truth tables.	79			X
Understand the concepts of <i>radian measure</i> and be able to convert between angles and radians.	80			X
Solve and graphically sketch problems involving two variables that exhibit <i>direct and indirect variation</i> .	81			X
Know how to find the <i>graphic solution of systems of linear inequalities</i> (e.g., graph the solution set or region of the coordinate plane common to both inequalities).	82			X
Use <i>Bernoulli experiments</i> to find the probability of exactly r successes in n trials of an experiment.	83			X
Understand the concepts and uses of the <i>binomial theorem</i> .	84			X
Understand the definition of <i>locus</i> (i.e., the set of all points and only those points that satisfy a given condition or conditions) in a plane and be able to write the equation of a locus.	85			X
Know how to graphically sketch <i>basic conic sections</i> (e.g., circles and parabolas) using their equations, and graphically solve systems of equations.	86			X
Understand the properties and uses of the <i>polar form of complex numbers</i> .	87			X