

Lexia Cross Trainer™: Logical Reasoning ©2005 correlated to Principals and Standards for School Mathematics Grade 9 through Grade 12	
Principals and Standards for School Mathematics Grade 9 through Grade 12	Lexia Cross Trainer™: Logical Reasoning ©2005

Number and Operations:	
<i>Understand numbers, ways of representing numbers, relationships among numbers, and number systems</i>	
a) Develop a deeper understanding of very large and very small numbers and of various representations of them	This specific skill is not addressed by <i>Cross Trainer™: Logical Reasoning</i> .
b) Compare and contrast the properties of numbers and number systems, including the rational and real numbers, and understand complex numbers as solutions to quadratic equations that do not have real solutions	While actual numbers are not employed in <i>Cross-Trainer™</i> , the program places students in problem-solving environments where they have the opportunity to construct their own understanding of these concepts. Specifically these skills are addressed in: <i>Satellite</i> .
c) Understand vectors and matrices as systems that have some of the properties of the real-number system	<i>World Cup</i>
d) Use number-theory arguments to justify relationships involving whole numbers	While actual numbers are not employed in <i>Cross-Trainer™</i> , the program places students in problem-solving environments where they have the opportunity to construct their own understanding of these concepts. Specifically these skills are addressed in: <i>Satellite</i> .
<i>Understand meanings of operations and how they relate to one another.</i>	
a) Judge the effects of such operations as multiplication, division, and computing powers and roots on the magnitudes of quantities	This specific skill is not addressed by <i>Cross Trainer™: Logical Reasoning</i> .
b) Develop an understanding of properties of, and representations for, the addition and multiplication of vectors and matrices	<i>World Cup</i>
c) Develop an understanding of permutations and combinations as counting techniques	<i>Bridge Builder, Fishing Derby, Stepping Stones, World Cup</i>
<i>Compute fluently and make reasonable estimates.</i>	

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a) Develop fluency in operations with real numbers, vectors, and matrices, using mental computation or paper-and-pencil calculations for simple cases and technology for more-complicated cases	<i>Bridge Builder, Satellite, Stepping Stones, World Cup</i>
b) Judge the reasonableness of numerical computations and their results	<i>Satellite, World Cup</i>

Algebra:	
<i>Understand patterns, relations, and functions.</i>	
a) Generalize patterns using explicitly defined and recursively defined functions	<i>Satellite</i>
b) Understand relations and functions and select, convert flexibly among, and use various representations for them	<i>Satellite</i>
c) Analyze functions of one variable by investigating rates of change, intercepts, zeros, asymptotes, and local and global behavior	While actual numbers are not employed in <i>Cross-Trainer™</i> , the program places students in problem-solving environments where they have the opportunity to construct their own understanding of these concepts. Specifically these skills are addressed in: <i>Bridge Builder</i>
d) Understand and perform transformations such as arithmetically combining, composing, and inverting commonly used functions, using technology to perform such operations on more-complicated symbolic expressions	<i>Satellite</i>
e) Understand and compare the properties of classes of functions, including exponential, polynomial, rational, logarithmic, and periodic functions	This specific skill is not addressed by <i>Cross Trainer™: Logical Reasoning</i> .
f) Interpret representations of functions of two variables	This specific skill is not addressed by <i>Cross Trainer™: Logical Reasoning</i> .

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<i>Represent and analyze mathematical situations and structures using algebraic symbols.</i>	
a) Understand the meaning of equivalent forms of expressions, equations, inequalities, and relations	<i>Satellite</i>
b) Write equivalent forms of equations, inequalities, and systems of equations and solve them with fluency—mentally or with paper and pencil in simple cases and using technology in all cases	While actual numbers are not employed in <i>Cross-Trainer™</i> , the program places students in problem-solving environments where they have the opportunity to construct their own understanding of these concepts. Specifically these skills are addressed in: <i>Satellite</i>
c) Use symbolic algebra to represent and explain mathematical relationships	<i>Satellite</i>
e) Use a variety of symbolic representations, including recursive and parametric equations, for functions and relations	<i>Satellite</i>
f) Judge the meaning, utility, and reasonableness of the results of symbol manipulations, including those carried out by technology	<i>Satellite</i>
<i>Use mathematical models to represent and understand quantitative relationships</i>	
a) Identify essential quantitative relationships in a situation and determine the class or classes of functions that might model the relationships	<i>Fishing Derby, Satellite, Stepping Stones, World Cup</i>
b) Use symbolic expressions, including iterative and recursive forms, to represent relationships arising from various contexts	<i>Satellite</i>
c) Draw reasonable conclusions about a situation being modeled	<i>Bridge Builder, Fishing Derby, Satellite, Stepping Stones, World Cup</i>
<i>Analyze change in various contexts</i>	

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a) Approximate and interpret rates of change from graphical and numerical data	While actual numbers are not employed in <i>Cross-Trainer™</i> , the program places students in problem-solving environments where they have the opportunity to construct their own understanding of these concepts. Specifically these skills are addressed in: <i>Bridge Builder, Stepping Stones</i>
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Geometry:

Analyze characteristics and properties of two- and three-dimensional geometric shapes and develop mathematical arguments about geometric relationships

a) Analyze properties and determine attributes of two- and three-dimensional objects	<i>Bridge Builder, Fishing Derby, Satellite, Stepping Stones, World Cup</i>
b) Explore relationships (including congruence and similarity) among classes of two- and three-dimensional geometric objects, make and test conjectures about them, and solve problems involving them	<i>Bridge Builder, Stepping Stones, World Cup</i>
c) Establish the validity of geometric conjectures using deduction, prove theorems, and critique arguments made by others	<i>Fishing Derby, Satellite, Stepping Stones, World Cup</i>
d) Use trigonometric relationships to determine lengths and angle measures	This specific skill is not addressed by <i>Cross-Trainer™: Logical Reasoning</i> .

Specify locations and describe spatial relationships using coordinate geometry and other representational systems

a) Use Cartesian coordinates and other coordinate systems, such as navigational, polar, or spherical systems, to analyze geometric situations	<i>Bridge Builder, Fishing Derby, Stepping Stones, World Cup</i>
b) Investigate conjectures and solve problems involving two- and three-dimensional objects represented with Cartesian coordinates	<i>Bridge Builder, Fishing Derby, Stepping Stones, World Cup</i>

Apply transformations and use symmetry to analyze mathematical situations

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a) Understand and represent translations, reflections, rotations, and dilations of objects in the plane by using sketches, coordinates, vectors, function notation, and matrices	<i>Bridge Builder, World Cup</i>
b) Use various representations to help understand the effects of simple transformations and their compositions	<i>Bridge Builder, Fishing Derby, Stepping Stones, World Cup</i>
<i>Use visualization, spatial reasoning, and geometric modeling to solve problems</i>	
a) Draw and construct representations of two- and three-dimensional geometric objects using a variety of tools	This specific skill is not addressed by <i>Cross Trainer™: Logical Reasoning.</i>
b) Visualize three-dimensional objects and spaces from different perspectives and analyze their cross sections	This specific skill is not addressed by <i>Cross Trainer™: Logical Reasoning.</i>
c) Use vertex-edge graphs to model and solve problems	This specific skill is not addressed by <i>Cross Trainer™: Logical Reasoning.</i>
d) Use geometric models to gain insights into, and answer questions in, other areas of mathematics	<i>Bridge Builder, Fishing Derby, Satellite, Stepping Stones, World Cup</i>
e) Use geometric ideas to solve problems in, and gain insights into, other disciplines and other areas of interest such as art and architecture	<i>Bridge Builder, Fishing Derby, Satellite, Stepping Stones, World Cup</i>
Measurement:	
<i>Understand measurable attributes of objects and the units, systems, and processes of measurement</i>	
a) Make decisions about units and scales that are appropriate for problem situations involving measurement	This specific skill is not addressed by <i>Cross Trainer™: Logical Reasoning.</i>
<i>Apply appropriate techniques, tools, and formulas to determine measurements</i>	
a) Analyze precision, accuracy, and approximate error in measurement situations	This specific skill is not addressed by <i>Cross Trainer™: Logical Reasoning.</i>

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b) Understand and use formulas for the area, surface area, and volume of geometric figures, including cones, spheres, and cylinders	This specific skill is not addressed by <i>Cross Trainer™: Logical Reasoning</i> .
c) Apply informal concepts of successive approximation, upper and lower bounds, and limit in measurement situations	This specific skill is not addressed by <i>Cross Trainer™: Logical Reasoning</i> .
d) Use unit analysis to check measurement computations	This specific skill is not addressed by <i>Cross Trainer™: Logical Reasoning</i> .

Data Analysis and Probability:

Formulate questions that can be addressed with data and collect, organize, and display relevant data to answer them.

a) Understand the differences among various kinds of studies and which types of inferences can legitimately be drawn from each	<i>Bridge Builder, Fishing Derby, Stepping Stones, World Cup</i>
b) Know the characteristics of well-designed studies, including the role of randomization in surveys and experiments	This specific skill is not addressed by <i>Cross Trainer™: Logical Reasoning</i> .
c) Understand the meaning of measurement data and categorical data, of univariate and bivariate data, and of the term variable	<i>Bridge Builder, Fishing Derby, Stepping Stones, World Cup</i>
d) Understand histograms, parallel box plots, and scatterplots and use them to display data	This specific skill is not addressed by <i>Cross Trainer™: Logical Reasoning</i> .
e) Compute basic statistics and understand the distinction between a statistic and a parameter	This specific skill is not addressed by <i>Cross Trainer™: Logical Reasoning</i> .

Select and use appropriate statistical methods to analyze data

a) For univariate measurement data, be able to display the distribution, describe its shape, and select and calculate summary statistics	This specific skill is not addressed by <i>Cross Trainer™: Logical Reasoning</i> .
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b) For bivariate measurement data, be able to display a scatterplot, describe its shape, and determine regression coefficients, regression equations, and correlation coefficients using technological tools	This specific skill is not addressed by <i>Cross Trainer™: Logical Reasoning</i> .
c) Display and discuss bivariate data where at least one variable is categorical	This specific skill is not addressed by <i>Cross Trainer™: Logical Reasoning</i> .
d) Recognize how linear transformations of univariate data affect shape, center, and spread	This specific skill is not addressed by <i>Cross Trainer™: Logical Reasoning</i> .
e) Identify trends in bivariate data and find functions that model the data or transform the data so that they can be modeled	This specific skill is not addressed by <i>Cross Trainer™: Logical Reasoning</i> .
<i>Develop and evaluate inferences and predictions that are based on data</i>	
a) Use simulations to explore the variability of sample statistics from a known population and to construct sampling distributions	<i>World Cup</i>
b) Understand how sample statistics reflect the values of population parameters and use sampling distributions as the basis for informal inference	This specific skill is not addressed by <i>Cross Trainer™: Logical Reasoning</i> .
c) Evaluate published reports that are based on data by examining the design of the study, the appropriateness of the data analysis, and the validity of conclusions	This specific skill is not addressed by <i>Cross Trainer™: Logical Reasoning</i> .
d) Understand how basic statistical techniques are used to monitor process characteristics in the workplace	This specific skill is not addressed by <i>Cross Trainer™: Logical Reasoning</i> .
<i>Understand and apply basic concepts of probability</i>	

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a) Understand the concepts of sample space and probability distribution and construct sample spaces and distributions in simple cases	This specific skill is not addressed by <i>Cross Trainer™: Logical Reasoning</i> .
b) Use simulations to construct empirical probability distributions	This specific skill is not addressed by <i>Cross Trainer™: Logical Reasoning</i> .
c) Compute and interpret the expected value of random variables in simple cases	This specific skill is not addressed by <i>Cross Trainer™: Logical Reasoning</i> .
d) Understand the concepts of conditional probability and independent events	This specific skill is not addressed by <i>Cross Trainer™: Logical Reasoning</i> .
e) Understand how to compute the probability of a compound event	This specific skill is not addressed by <i>Cross Trainer™: Logical Reasoning</i> .
Problem Solving:	
a) Build new mathematical knowledge through problem solving	<i>Bridge Builder, Fishing Derby, Satellite, Stepping Stones, World Cup</i>
b) Solve problems that arise in mathematics and in other contexts	<i>Bridge Builder, Fishing Derby, Satellite, Stepping Stones, World Cup</i>
c) Apply and adapt a variety of appropriate strategies to solve problems	<i>Bridge Builder, Fishing Derby, Satellite, Stepping Stones, World Cup</i>
d) Monitor and reflect on the process of mathematical problem solving	<i>Bridge Builder, Fishing Derby, Satellite, Stepping Stones, World Cup</i>
Reasoning and Proof:	
a) Recognize reasoning and proof as fundamental aspects of mathematics	<i>Bridge Builder, Fishing Derby, Satellite, Stepping Stones, World Cup</i>
b) Make and investigate mathematical conjectures	<i>Bridge Builder, Fishing Derby, Satellite, Stepping Stones, World Cup</i>
c) Develop and evaluate mathematical arguments and proofs	<i>Bridge Builder, Fishing Derby, Satellite, Stepping Stones, World Cup</i>
d) Select and use various types of reasoning and methods of proof	<i>Bridge Builder, Fishing Derby, Satellite, Stepping Stones, World Cup</i>
Communication:	
a) Organize and consolidate their mathematical thinking through communication	<i>Bridge Builder, Fishing Derby, Satellite, Stepping Stones, World Cup</i>

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b) Communicate their mathematical thinking coherently and clearly to peers, teachers, and others	<i>Bridge Builder, Fishing Derby, Satellite, Stepping Stones, World Cup</i>
c) Analyze and evaluate the mathematical thinking and strategies of others	<i>Fishing Derby</i>
d) Use the language of mathematics to express mathematical ideas precisely	<i>Satellite</i>

Connections:

a) Recognize and use connections among mathematical ideas	<i>Bridge Builder, Fishing Derby, Satellite, Stepping Stones, World Cup</i>
b) Understand how mathematical ideas interconnect and build on one another to produce a coherent whole	<i>Bridge Builder, Fishing Derby, Satellite, Stepping Stones, World Cup</i>
c) Recognize and apply mathematics in contexts outside of mathematics	<i>Bridge Builder, Fishing Derby, Satellite, Stepping Stones, World Cup</i>

Representation:

a) Create and use representations to organize, record, and communicate mathematical ideas	<i>Bridge Builder, Fishing Derby, Satellite, Stepping Stones, World Cup</i>
b) Select, apply, and translate among mathematical representations to solve problems	<i>Bridge Builder, Fishing Derby, Satellite, Stepping Stones, World Cup</i>
c) Use representations to model and interpret physical, social, and mathematical phenomena	<i>Bridge Builder, Fishing Derby, Satellite, Stepping Stones, World Cup</i>