New York State Learning Standards for Mathematics

Linked to the *Fantasy Sports and Mathematics'* Series

(Grades 5 and up)

Note: The portion of any standard that is in italics (and not in bold) is not covered.

Grade 5

Problem Solving Strand

Students will apply and adapt a variety of appropriate strategies to solve problems.

5.PS.14 Analyze problems by observing patterns

5.PS.15 Make organized lists or charts to solve numerical problems

Reasoning and Proof Strand

Students will recognize reasoning and proof as fundamental aspects of mathematics.

5.RP.2 Understand that mathematical statements can be supported, using models, facts, and relationships to explain their thinking

Communication Strand

Students will communicate their mathematical thinking coherently and clearly to peers, teachers, and others.

5.CM.4 Share organized mathematical ideas through the manipulation of *objects*, numerical tables, *drawings, pictures*, charts, graphs, tables, diagrams, models, and symbols in written and verbal form

Students will use the language of mathematics to express mathematical ideas precisely.

5.CM.9 Increase their use of mathematical vocabulary and language when communicating with others

Connections Strand

Students will recognize and use connections among mathematical ideas.

5.CN.1 Understand and make connections and conjectures in their everyday experiences to mathematical ideas

5.CN.2 Explore and explain the relationship between mathematical ideas

5.CN.3 Connect and apply mathematical information to solve problems

Students will recognize and apply mathematics in contexts outside of mathematics.

5.CN.6 Recognize and provide examples of the presence of mathematics in their daily lives

Representation Strand

Students will create and use representations to organize, record, and communicate mathematical ideas.

5.R.1 Use *physical objects, drawings*, charts, tables, graphs, symbols, equations, or *objects* created using technology as representations

5.R.2 Explain, describe, and defend mathematical ideas using representations

Students will use representations to model and interpret physical, social, and mathematical phenomena.

5.R.7 Use mathematics to show and understand physical phenomena (e.g., determine the perimeter of a bulletin board)

5.R.8 Use mathematics to show and understand social phenomena (e.g., construct tables to organize data showing book sales)

5.R.9 Use mathematics to show and understand mathematical phenomena (e.g., find the missing value that makes the equation true: $(3 + 4) + 5 = 3 + (4 + \_\_\_)$

Number Sense and Operations Strand

Students will understand numbers, multiple ways of representing numbers, relationships among numbers, and number systems.

Number Systems

5.N.4 Create equivalent fractions, given a fraction

5.N.5 Compare and order fractions including unlike denominators (with and *without* the use of a number line) *Note: Commonly used fractions such as those that might be indicated on ruler, measuring cup, etc.*

5.N.6 Understand the concept of ratio

5.N.7 Express ratios in different forms

5.N.8 *Read*, write, and order decimals to thousandths

5.N.9 Compare fractions using <, >, or =

5.N.10 Compare decimals using <, >, or =

5.N.11 *Understand that percent means part of 100*, and write percents as fractions and decimals

Number Theory

5.N.12 Recognize that some numbers are only divisible by one and themselves (prime) and others have multiple divisors (composite)

5.N.13 Calculate multiples of a whole number and the least common multiple of two numbers

5.N.14 Identify the factors of a given number

5.N.15 Find the common factors and the greatest common factor of two numbers

Students will understand meanings of operations and procedures, and how they relate to one another.

Operations

5.N.19 Simplify fractions to lowest terms

	5.N.20	Convert improper fractions to mixed numbers, and mixed numbers to improper fractions
	5.N.21	Use a variety of strategies to add and subtract fractions with like denominators
	5.N.22	Add and subtract mixed numbers with like denominators
	5.N.23	Use a variety of strategies to add, subtract, *multiply, and divide* decimals to thousandths

Algebra Strand

Students will perform algebraic procedures accurately.

Variables and Expressions	5.A.3	Substitute assigned values into variable expressions and evaluate using order of operations
Equations and Inequalities	5.A.4	Solve simple one-step equations using basic whole-number facts
	5.A.5	Solve and explain simple one-step equations using inverse operations involving whole numbers

Geometry Strand

Students will use visualization and spatial reasoning to analyze characteristics and properties of geometric shapes.

Shapes	5.G.1	Calculate the perimeter of regular *and irregular* polygons

Measurement Strand

Students will determine what can be measured and how, using appropriate methods and formulas.

Units of Measurement	5.M.2	Identify customary equivalent units of length
	5.M.4	Identify equivalent metric units of length
	5.M.5	Convert measurement within a given system

Tools and Methods 5.M.6 Determine the tool and technique to measure with an appropriate level of precision: lengths and angles

Students will use units to give meaning to measurements.

Units 5.M.7 Calculate elapsed time in hours and minutes

5.M.8 Measure and draw angles using a protractor

Statistics and Probability Strand

Students will collect, organize, display, and analyze data.

Collection of Data 5.S.1 Collect and record data from a variety of sources (e.g., newspapers, *magazines, polls, charts, and surveys*)

Organization and Display of Data 5.S.2 Display data in a line graph to show an increase or decrease over time

Analysis of Data 5.S.3 Calculate the mean for a given set of data and use to describe a set of data

Students will make predictions that are based upon data analysis.

Predictions from Data 5.S.4 Formulate conclusions and *make predictions* from graphs

Students will understand and apply concepts of probability.

Probability

5.S.7 *Create a sample space and* determine the probability of a single event, given a simple experiment (e.g., rolling a number cube)

Grade 6

Problem Solving Strand

Students will apply and adapt a variety of appropriate strategies to solve problems.

6.PS.14 Analyze problems by observing patterns

6.PS.15 Make *organized lists* or charts to solve numerical problems

Reasoning and Proof Strand

Students will recognize reasoning and proof as fundamental aspects of mathematics.

6.RP.2 Understand that mathematical statements can be supported, using models, facts, and relationships to explain their thinking

Students will communicate their mathematical thinking coherently and clearly to peers, teachers, and others.

6.CM.4 Share organized mathematical ideas through the manipulation of *objects*, numerical tables, *drawings, pictures*, charts, graphs, tables, diagrams, *models*, and symbols in written and verbal form

Students will use the language of mathematics to express mathematical ideas precisely.

6.CM.9 Increase their use of mathematical vocabulary and language when communicating with others

Connections Strand

Students will recognize and use connections among mathematical ideas.

6.CN.1 Understand and make connections and conjectures in their everyday experiences to mathematical ideas

6.CN.2 Explore and explain the relationship between mathematical ideas

6.CN.3 Connect and apply mathematical information to solve problems

Students will recognize and apply mathematics in contexts outside of mathematics.

6.CN.6 Recognize and provide examples of the presence of mathematics in their daily lives

Representation Strand

Students will create and use representations to organize, record, and communicate mathematical ideas.

6.R.1 Use *physical objects*, drawings, charts, tables, graphs, symbols, equations, or *objects* created using technology as representations

6.R.2 Explain, describe, and defend mathematical ideas using representations

Students will use representations to model and interpret physical, social, and mathematical phenomena.

6.R.7 Use mathematics to show and understand physical phenomena (e.g., determine the perimeter of a bulletin board)

6.R.8 Use mathematics to show and understand social phenomena (e.g., construct tables to organize data showing book sales)

6.R.9 Use mathematics to show and understand mathematical phenomena (e.g., Find the missing value: $(3 + 4) + 5 = 3 + (4 + \_\_\_)$

Number Sense and Operations Strand

Students will understand numbers, multiple ways of representing numbers, relationships among numbers, and number systems.

Number Systems

6.N.2 Define and identify the commutative and associative properties of addition and multiplication

6.N.3 Define and identify the distributive property of multiplication over addition

6.N.4 Define and identify the identity and inverse properties of addition and multiplication

6.N.7 Express equivalent ratios as a proportion

6.N.9 Solve proportions using equivalent fractions

6.N.11 *Read*, write, and identify percents of a whole (0% to 100%)

6.N.12 Solve percent problems involving percent, rate, *and base*

6.N.14 Locate rational numbers on a number line (including positive and negative)

6.N.15 Order rational numbers (including positive and negative)

Students will understand meanings of operations and procedures, and how they relate to one another.

Operations

6.N.16 Add and subtract fractions with unlike denominators

6.N.17 Multiply and divide fractions with unlike denominators

6.N.18 Add, subtract, multiply, and divide mixed numbers with unlike denominators

6.N.19 Identify the multiplicative inverse (reciprocal) of a number

6.N.20 Represent fractions as terminating or repeating decimals

6.N.21 Find multiple representations of rational numbers (fractions, decimals, and percents 0 to 100)

6.N.22 Evaluate numerical expressions using order of operations (may include exponents of two and three)

6.N.23 Represent repeated multiplication in exponential form

6.N.25 Evaluate expressions having exponents where the power is an exponent of one, two, or three

Algebra Strand

Students will perform algebraic procedures accurately.

Variables and Expressions

6.A.2 Use substitution to evaluate algebraic expressions (may include exponents of one, two and three)

Equations and Inequalities

6.A.4 Solve and *explain* two-step equations involving whole numbers using inverse operations

6.A.5 Solve simple proportions within context

Geometry Strand

Students will use visualization and spatial reasoning to analyze characteristics and properties of geometric shapes.

Shapes

6.G.7 Determine the area and circumference of a circle, using the appropriate formula

Statistics and Probability Strand

Students will collect, organize, display, and analyze data.

6.S.4 Determine and justify the most appropriate graph to display a given set of data (*pictograph*, bar graph, line graph, histogram, or circle graph)

Analysis of Data

6.S.5 Determine the mean, mode and median for a given set of data

6.S.6 Determine the range for a given set of data

6.S.7 Read and interpret graphs

Students will understand and apply concepts of probability.

Probability

6.S.10 Determine the probability of dependent events

6.S.11 Determine the number of possible outcomes for a compound event by using the fundamental counting principle and *use this to determine the probabilities of events when the outcomes have equal probability*

Grade 7

Problem Solving Strand

Students will solve problems that arise in mathematics and in other contexts.

7.PS.4 Observe patterns and *formulate generalizations*

Students will apply and adapt a variety of appropriate strategies to solve problems.

7.PS.10 Use proportionality to model problems

Reasoning and Proof Strand

Students will make and investigate mathematical conjectures.

7.RP.2 Use mathematical strategies to reach a conclusion

Communication Strand

Students will communicate their mathematical thinking coherently and clearly to peers, teachers, and others.

7.CM.4 Share organized mathematical ideas through the manipulation of *objects*, numerical tables, *drawings, pictures*, charts, graphs, tables, diagrams, models and symbols in written and verbal form

Students will use the language of mathematics to express mathematical ideas precisely.

7.CM.9 Increase their use of mathematical vocabulary and language when communicating with others

Connections Strand

Students will recognize and use connections among mathematical ideas.

7.CN.1 Understand and make connections among multiple representations of the same mathematical idea

Students will recognize and apply mathematics in contexts outside of mathematics.

7.CN.6 Recognize and provide examples of the presence of mathematics in their daily lives

Representation Strand

Students will create and use representations to organize, record, and communicate mathematical ideas.

7.R.1 Use *physical objects*, *drawings*, charts, tables, graphs, symbols, equations, or *objects created* using technology as representations

Students will use representations to model and interpret physical, social, and mathematical phenomena.

7.R.9 Use mathematics to show and understand physical phenomena (e.g., make and interpret scale drawings of figures or scale models of objects)

7.R.10 Use mathematics to show and understand social phenomena (e.g., determine profit from sale of yearbooks)

7.R.11 Use mathematics to show and understand mathematical phenomena (e.g., use tables, graphs, and equations to show a pattern underlying a function)

Number Sense and Operations Strand

Students will understand numbers, multiple ways of representing numbers, relationships among numbers, and number systems.

Number Systems

7.N.3 Place rational and irrational numbers (approximations) on a number line and *justify the placement of the numbers*

7.N.5 Write numbers in scientific notation

7.N.6 Translate numbers from scientific notation into standard form

Number Theory

7.N.8 Find the common factors and greatest common factor of two or more numbers

7.N.9 Determine multiples and least common multiple of two or more numbers

7.N.10 Determine the prime factorization of a given number and write in exponential form

Students will understand meanings of operations and procedures, and how they relate to one another.

Operations

7.N.12 Add, subtract, multiply, and divide integers

7.N.13 Add and subtract two integers (with and without the use of a number line)

7.N.14 Develop a conceptual understanding of negative and zero exponents with a base of ten and relate to fractions and decimals (e.g., $10^{-2} = .01 = 1/100$)

Algebra Strand

Students will perform algebraic procedures accurately.

Equations and Inequalities

7.A.4 Solve multi-step equations by combining like terms, using the distributive property, or moving variables to one side of the equation

Students will recognize, use, and represent algebraically patterns, relations, and functions.

Patterns, Relations, and Functions

7.A.10 Write an equation to represent a function from a table of values

Geometry Strand

Students will use visualization and spatial reasoning to analyze characteristics and properties of geometric shapes.

Shapes

7.G.1 Calculate the radius or diameter, given the circumference or area of a circle

Students will identify and justify geometric relationships, formally and informally.

Geometric Relationships

7.G.8 Use the Pythagorean Theorem to determine the unknown length of a side of a right triangle

Measurement Strand

Students will determine what can be measured and how, using appropriate methods and formulas.

Units of Measurement	*7.M.5*	*Calculate unit price using proportions*
	7.M.6	Compare unit prices
	7.M.8	Draw central angles in a given circle using a protractor (circle graphs)

Statistics and Probability Strand

Students will collect, organize, display, and analyze data.

Collection of Data	7.S.1	Identify and collect data using a variety of methods
Organization and Display of Data	7.S.2	Display data in a circle graph
Analysis of Data	7.S.4	Calculate the range for a given set of data
	7.S.6	Read and interpret data represented graphically (*pictograph*, bar graph, histogram, line graph, *double line/bar graphs* or circle graph)

Students will understand and apply concepts of probability.

Probability		
	7.S.10	Predict the outcome of an experiment

Grade 8

Problem Solving Strand

Students will solve problems that arise in mathematics and in other contexts.

8.PS.4 Observe patterns and *formulate generalizations*

Students will apply and adapt a variety of appropriate strategies to solve problems.

8.PS.10 Use proportionality to model problems

Reasoning and Proof Strand

Students will make and investigate mathematical conjectures.

8.RP.2 Use mathematical strategies to reach a conclusion

Communication Strand

Students will communicate their mathematical thinking coherently and clearly to peers, teachers, and others.

8.CM.4 Share organized mathematical ideas through the manipulation of *objects*, numerical tables, *drawings, pictures*, charts, graphs, tables, diagrams, models and symbols in written and verbal form

Students will use the language of mathematics to express mathematical ideas precisely.

8.CM.9 Increase their use of mathematical vocabulary and language when communicating with others

Connections Strand

Students will recognize and use connections among mathematical ideas.

8.CN.1 Understand and make connections among multiple representations of the same mathematical idea

Students will understand how mathematical ideas interconnect and build on one another to produce a coherent whole.

8.CN.4 Model situations mathematically, using representations to draw conclusions and *formulate new situations*

Students will recognize and apply mathematics in contexts outside of mathematics.

8.CN.6 Recognize and provide examples of the presence of mathematics in their daily lives

Representation Strand

Students will create and use representations to organize, record, and communicate mathematical ideas.

8.R.1 Use *physical objects, drawings*, charts, tables, graphs, symbols, equations, or objects created using technology as representations

8.R.2 Explain, describe, and defend mathematical ideas using representations

8.R.3 Recognize, compare, and use an array of representational forms

Students will select, apply, and translate among mathematical representations to solve problems.

8.R.6 Use representations to explore problem situations

Students will use representations to model and interpret physical, social, and mathematical phenomena.

8.R.9 Use mathematics to show and understand physical phenomena (e.g., make and interpret scale drawings of figures or scale models of objects)

8.R.10 Use mathematics to show and understand social phenomena (e.g., determine profit from sale of yearbooks)

8.R.11 Use mathematics to show and understand mathematical phenomena (e.g., use tables, graphs, and equations to show a pattern underlying a function)

Number Sense and Operations Strand

Students will understand meanings of operations and procedures, and how they relate to one another.

Operations

8.N.4 Apply percents to:

Tax
Percent increase/decrease
Simple interest
Sale price
Commission
Interest rates
Gratuities

Integrated Algebra

A.R.4 Select appropriate representations to solve problem situations

Students will use representations to model and interpret physical, social, and mathematical phenomena.

A.R.6 Use mathematics to show and understand physical phenomena (e.g., find the height of a building if a ladder of a given length forms a given angle of elevation with the ground)

A.R.7 Use mathematics to show and understand social phenomena (e.g., determine profit from student and adult ticket sales)

A.R.8 Use mathematics to show and understand mathematical phenomena (e.g., compare the graphs of the functions represented by the equations $y = x^2$ and $y = -x^2$)

Number Sense and Operations Strand

Students will understand numbers, multiple ways of representing numbers, relationships among numbers, and number systems.

Number Theory

A.N.1 Identify and apply the properties of real numbers (*closure*, commutative, associative, distributive, identity, inverse) *Note: Students do not need to identify groups and fields, but students should be engaged in the ideas.*

Students will understand meanings of operations and procedures, and how they relate to one another.

Operations	A.N.4	Understand and use scientific notation to compute products and *quotients* of numbers
	A.N.5	Solve algebraic problems arising from situations that involve fractions, decimals, *percents (decrease/increase and discount), and proportionality/direct variation*
	A.N.7	Determine the number of possible events, using counting techniques or the Fundamental Principle of Counting
	A.N.8	Determine the number of possible arrangements (permutations) of a list of items

Algebra Strand

Students will represent and analyze algebraically a wide variety of problem solving situations.

Variables and Expressions	A.A.5	Write algebraic equations or *inequalities* that represent a situation
Trigonometric Functions	A.A.45	Determine the measure of a third side of a right triangle using the Pythagorean Theorem, given the lengths of any two sides

Geometry Strand

Students will use visualization and spatial reasoning to analyze characteristics and properties of geometric shapes.

Shapes	A.G.1	Find the area and/or perimeter of figures composed of *polygons* and circles or *sectors* of a circle. *Figures may include triangles, rectangles, squares, parallelograms, rhombuses, trapezoids, circles, semi-circles, quarter-circles, and regular polygons (perimeter only).*

Measurement Strand

Students will determine what can be measured and how, using appropriate methods and formulas.

Units of Measurement	A.M.1	Calculate rates using appropriate units (e.g., rate of a space ship versus the rate of a snail)
	A.M.2	Solve problems involving conversions within measurement systems, given the relationship between the units

Statistics and Probability Strand

Students will collect, organize, display, and analyze data.

Organization and Display of Data

	A.S.5	Construct a histogram, *cumulative frequency histogram*, and a box-and-whisker plot, given a set of data
	A.S.7	Create a scatter plot of bivariate data

Analysis of Data

	A.S.11	*Find the percentile rank of an item in a data set* and identify the point values for first, second, and third quartiles
	A.S.12	Identify the relationship between the independent and dependent variables from a scatter plot (positive, negative, or none)

Students will understand and apply concepts of probability.

Probability

	A.S.20	Calculate the probability of an event and its complement
	A.S.21	Determine empirical probabilities based on specific sample data
	A.S.23	Calculate the probability of: o a series of independent events o a series of dependent events o *two mutually exclusive events* o *two events that are not mutually exclusive*

Geometry

G.G.48 *Investigate, justify*, and apply the Pythagorean theorem and its converse

Algebra 2 and Trigonometry

Students will understand and apply concepts of probability.

Probability	A2.S.9	Differentiate between situations requiring permutations and those requiring combinations
	A2.S.11	Calculate the number of possible combinations $({}_nC_r)$ of n items taken r at a time
	A2.S.12	Use permutations, combinations, and the Fundamental Principle of Counting to determine the number of elements in a sample space and a specific subset (event)
	A2.S.14	Calculate empirical probabilities