

# Chapter 111. Texas Essential Knowledge and Skills for Mathematics

## Subchapter B. Middle School

### §111.26. Grade 6

(a) Introduction.

(1) The ***desire to achieve educational excellence*** is the driving force behind the Texas essential knowledge and skills for mathematics, guided by the college and career readiness standards. By embedding statistics, probability, and finance, while focusing on computational thinking, mathematical fluency and solid understanding, Texas will lead the way in mathematics education and prepare all Texas students for the challenges they will face in the 21<sup>st</sup> century.

(2) The ***process standards*** describe ways in which students are expected to engage in the content. The placement of the process standards at the beginning of the knowledge and skills listed for each grade and course is intentional. The process standards weave the other knowledge and skills together so that students may be successful problem solvers and use mathematics efficiently and effectively in daily life. The process standards are integrated at every grade level and course. When possible,

- Students will apply mathematics to problems arising in everyday life, society, and the workplace.
- Students will use a problem-solving model that incorporates analyzing given information, formulating a plan or strategy, determining a solution, justifying the solution, and evaluating the problem-solving process and the reasonableness of the solution.
- Students will select appropriate tools such as real objects, manipulatives, algorithms, paper and pencil, and technology and techniques such as mental math, estimation, and number sense, and generalization and abstraction to solve problems.
- Students will effectively communicate mathematical ideas, reasoning, and their implications using multiple representations such as symbols, diagrams, graphs, computer programs, and language.
- Students will use mathematical relationships to generate solutions and make connections and predictions.
- Students will analyze mathematical relationships to connect and communicate mathematical ideas.
- Students will display, explain, or justify mathematical ideas and arguments using precise mathematical language in written or oral communication.

(3) The ***primary focal areas*** in 6<sup>th</sup> grade are

- number and operations,
- proportionality,
- expressions, equations, and relationships
- measurement and data

Students use concepts, algorithms, and properties of rational numbers to explore mathematical relationships and to describe increasingly complex situations. Students use concepts of proportionality to explore, develop, and communicate mathematical relationships. Students use algebraic thinking to describe how a change in one quantity in a relationship results in a change in the other. Students connect verbal, numeric, graphic, and symbolic representations of relationships, including equations and inequalities. Students use geometric properties and relationships, as well as spatial reasoning, to model and analyze situations and solve problems. Students communicate information about geometric figures or situations by quantifying attributes, generalize procedures from measurement experiences, and use the procedures to solve problems. Students use appropriate statistics, representations of data, and reasoning to draw conclusions, evaluate arguments, and make recommendations. While the use of all types of technology is important, ***the emphasis on algebra readiness skills necessitates the implementation of graphing technology.***

(4) Statements that contain the word "including" reference content that must be mastered, while those containing the phrase "such as" are intended as possible illustrative examples.

(b) Knowledge and skills.

Mathematical Process Standards	Reporting Category 1: Numerical Representations and Relationships	Reporting Category 2: Computations and Algebraic Relationships	Reporting Category 3: Geometry and Measurement	Reporting Category 4: Data Analysis and Personal Financial Literacy
<p>These student expectations will NOT be listed under a separate reporting category. Instead, they will be incorporated into test questions across reporting categories since the application of mathematical process standards is part of each knowledge statement.</p> <p><b>6.1</b> The student uses mathematical processes to acquire and demonstrate mathematical understanding. The student is expected to:</p> <p>(A) <u>apply</u> mathematics to problems arising in everyday life, society, and the workplace;</p> <p>(B) <u>use</u> a problem-solving model that incorporates <u>analyzing</u> given information, <u>formulating</u> a plan or strategy, <u>determining</u> a solution, <u>justifying</u> the solution, and <u>evaluating</u> the problem-solving process and the reasonableness of the solution;</p> <p>(C) <u>select</u> tools, including real objects, manipulatives, paper and pencil, and technology as appropriate, and techniques, including mental math, estimation, and number sense as</p>	<p>The student will demonstrate an understanding of how to represent and manipulate numbers and expressions.</p> <p><b>6.2</b> The student applies mathematical process standards to represent and use rational numbers in a variety of forms. The student is expected to:</p> <p>(A) <u>classify</u> whole numbers, integers, and rational numbers using a visual representation such as a Venn diagram <u>to describe relationships</u> between sets of numbers;</p> <p>(B) <u>identify</u> a number, its opposite, and its absolute value;</p> <p>(C) <u>locate, compare, and order</u> integers and rational numbers using a number line;</p> <p>(D) <u>order</u> a set of rational numbers arising from mathematical and real-world contexts; and</p> <p>(E) <u>extend</u> representations for division to include fraction notation such as <math>a/b</math> represents the same number as <math>a \div b</math> where <math>b \neq 0</math>.</p> <p><b>6.4</b> The student applies mathematical process standards to develop an understanding of proportional relationships in problem situations. The student is expected to:</p> <p>(C) <u>give</u> examples of ratios as multiplicative comparisons of two quantities describing the same attribute;</p>	<p>The student will demonstrate an understanding of how to perform operations and represent algebraic relationships.</p> <p><b>6.3</b> The student applies mathematical process standards to represent addition, subtraction, multiplication, and division while solving problems and justifying solutions. The student is expected to:</p> <p>(A) <u>recognize</u> that dividing by a rational number and multiplying by its reciprocal result in equivalent values;</p> <p>(B) <u>determine</u>, with and without computation, whether a quantity is increased or decreased when multiplied by a fraction, including values greater than or less than one;</p> <p>(C) <u>represent</u> integer operations with concrete models and connect the actions with the models to standardized algorithms;</p> <p>(D) <u>add, subtract, multiply, and divide</u> integers fluently; and</p> <p>(E) <u>multiply and divide</u> positive rational numbers fluently.</p> <p><b>6.4</b> The student applies mathematical process standards to develop an understanding of proportional relationships in problem situations. The student is expected to:</p> <p>(A) <u>compare</u> two rules verbally, numerically, graphically, and symbolically in the form of <math>y = ax</math> or <math>y = x + a</math> in order <u>to differentiate</u> between additive and multiplicative relationships;</p> <p>(B) <u>apply</u> qualitative and quantitative reasoning <u>to solve</u> prediction and comparison of real-world problems involving ratios and rates;</p>	<p>The student will demonstrate an understanding of how to represent and apply geometry and measurement concepts.</p> <p><b>6.4</b> The student applies mathematical process standards to develop an understanding of proportional relationships in problem situations. The student is expected to:</p> <p>(H) <u>convert</u> units within a measurement system, including the use of proportions and unit rates.</p> <p><b>6.8</b> The student applies mathematical process standards to use geometry to represent relationships and solve problems. The student is expected to:</p> <p>(A) <u>extend</u> previous knowledge of triangles and their properties to include the sum of angles of a triangle, the relationship between the lengths of sides and measures of angles in a triangle, and determining when three lengths form a triangle;</p> <p>(B) <u>model</u> area formulas for parallelograms, trapezoids, and triangles by decomposing and</p>	<p>The student will demonstrate an understanding of how to represent and analyze data and how to describe and apply personal financial concepts.</p> <p><b>6.12</b> The student applies mathematical process standards to use numerical or graphical representations to analyze problems. The student is expected to:</p> <p>(A) <u>represent</u> numeric data graphically, including dot plots, stem-and-leaf plots, histograms, and box plots;</p> <p>(B) <u>use</u> the graphical representation of numeric data to describe the center, spread, and shape of the data distribution;</p> <p>(C) <u>summarize</u> numeric data with numerical summaries, including the mean and median (measures of center) and the range and interquartile range (IQR) (measures of spread), <u>and use</u> these summaries to describe the center, spread, and shape of the data distribution; and</p> <p>(D) <u>summarize</u> categorical data with numerical and graphical summaries, including the mode, the percent of values in each category (relative frequency table), and the percent bar graph, <u>and use</u> these summaries to describe the data distribution.</p> <p><b>6.13</b> The student applies mathematical process standards to</p>

<p>appropriate, to <b>solve</b> problems;</p> <p>(D) <b>communicate</b> mathematical ideas, reasoning, and their implications <b>using</b> multiple representations, including symbols, diagrams, graphs, and language as appropriate;</p> <p>(E) <b>create and use</b> representations to organize, record, and communicate mathematical ideas;</p> <p>(F) <b>analyze</b> mathematical relationships to connect and communicate mathematical ideas; and</p> <p>(G) <b>display, explain, and justify</b> mathematical ideas and arguments <b>using</b> precise mathematical language in written or oral communication.</p>	<p>(D) <b>give</b> examples of rates as the comparison by division of two quantities having different attributes, including rates as quotients;</p> <p>(E) <b>represent</b> ratios and percents with concrete models, fractions, and decimals;</p> <p>(F) <b>represent</b> benchmark fractions and percents such as 1%, 10%, 25%, 33 1/3%, and multiples of these values using 10 by 10 grids, strip diagrams, number lines, and numbers;</p> <p>(G) <b>generate</b> equivalent forms of fractions, decimals, and percents using real-world problems, including problems that involve money;</p> <p><b>6.5</b> The student applies mathematical process standards to solve problems involving proportional relationships. The student is expected to:</p> <p>(C) <b>use</b> equivalent fractions, decimals, and percents to show equal parts of the same whole.</p> <p><b>6.7</b> The student applies mathematical process standards to develop concepts of expressions and equations. The student is expected to:</p> <p>(A) <b>generate</b> equivalent numerical expressions using order of operations, including whole number exponents and prime factorization;</p> <p>(B) <b>distinguish</b> between expressions and equations verbally, numerically, and algebraically;</p> <p>(C) <b>determine</b> if two expressions are equivalent using concrete models, pictorial models, and algebraic representations; and</p>	<p><b>6.5</b> The student applies mathematical process standards to solve problems involving proportional relationships. The student is expected to:</p> <p>(A) <b>represent</b> mathematical and real-world problems involving ratios and rates using scale factors, tables, graphs, and proportions;</p> <p>(B) <b>solve</b> real-world problems to find the whole given a part and the percent, to find the part given the whole and the percent, and to find the percent given the part and the whole including the use of concrete and pictorial models;</p> <p><b>6.6</b> The student applies mathematical process standards to use multiple representations to describe algebraic relationships. The student is expected to:</p> <p>(A) <b>identify</b> independent and dependent quantities from tables and graphs;</p> <p>(B) <b>write</b> an equation that represents the relationship between independent and dependent quantities from a table;</p> <p>(C) <b>represent</b> a given situation using verbal descriptions, tables, graphs, and equations in the form <math>y = kx</math> or <math>y = x + b</math>.</p> <p><b>6.9</b> The student applies mathematical process standards to use equations and inequalities to represent situations. The student is expected to:</p> <p>(A) <b>write</b> one-variable, one-step equations and inequalities to represent constraints or conditions within problems;</p> <p>(B) <b>represent</b> solutions for one-variable, one-step equations and inequalities on number lines; and</p> <p>(C) <b>write</b> corresponding real-world problems given one-variable, one-step equations or inequalities.</p> <p><b>6.10</b> The student applies mathematical process standards to use equations and</p>	<p>rearranging parts of these shapes;</p> <p>(C) <b>write</b> equations that represent problems related to the area of rectangles, parallelograms, trapezoids, and triangles and volume of right rectangular prisms where dimensions are positive rational numbers; and</p> <p>(D) <b>determine</b> solutions for problems involving the area of rectangles, parallelograms, trapezoids, and triangles and volume of right rectangular prisms where dimensions are positive rational numbers.</p> <p><b>6.11</b> The student applies mathematical process standards to use coordinate geometry to identify locations on a plane. The student is expected to:</p> <p>(A) <b>graph</b> points in all four quadrants using ordered pairs of rational numbers.</p>	<p>use numerical or graphical representations to solve problems. The student is expected to:</p> <p>(A) <b>interpret</b> numeric data summarized in dot plots, stem-and-leaf plots, histograms, and box plots;</p> <p>(B) <b>distinguish</b> between situations that yield data with and without variability</p> <p><b>6.14</b> The student applies mathematical process standards to develop an economic way of thinking and problem solving useful in one's life as a knowledgeable consumer and investor. The student is expected to:</p> <p>(A) <b>compare</b> the features and costs of a checking account and a debit card offered by different local financial institutions;</p> <p>(B) <b>distinguish</b> between debit cards and credit cards;</p> <p>(C) <b>balance</b> a check register that includes deposits, withdrawals, and transfers;</p> <p>(D) <b>explain</b> why it is important to establish a positive credit history;</p> <p>(E) <b>describe</b> the information in a credit report and how long it is retained;</p> <p>(F) <b>describe</b> the value of credit reports to borrowers and to lenders.</p> <p>(G) <b>explain</b> various methods to pay for college, including through</p>
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	(D) <b>generate</b> equivalent expressions using operations; the inverse, identity, commutative, associative, and distributive properties.	inequalities to solve problems. The student is expected to:  (A) <b>model and solve</b> one-variable, one-step equations and inequalities that represent problems, including geometric concepts; and  (B) <b>determine</b> if the given value(s) make(s) one-variable, one-step equations or inequalities true		savings, grants, scholarships, student loans, and work study; and  (H) <b>compare</b> the annual salary of several occupations requiring various levels of post-secondary education or vocational training and calculate the effects of the different annual salaries on lifetime income.
<b>Mathematical Process Standards</b>	<b>Reporting Category 1: Numerical Representations and Relationships</b>	<b>Reporting Category 2: Computations and Algebraic Relationships</b>	<b>Reporting Category 3: Geometry and Measurement</b>	<b>Reporting Category 4: Data Analysis and Personal Financial Literacy</b>
These student expectations will NOT be listed under a separate reporting category. Instead, they will be incorporated into test questions across reporting categories since the application of mathematical process standards is part of each knowledge statement.	<b>Readiness Standards 4</b>	<b>Readiness Standards 6</b>	<b>Readiness Standards 3</b>	<b>Readiness Standards 3</b>
	<b>Supporting Standards 11</b>	<b>Supporting Standards 11</b>	<b>Supporting Standards 3</b>	<b>Supporting Standards 10</b>
	<b>Total Assessment Questions 10</b>	<b>Total Assessment Questions 15</b>	<b>Total Assessment Questions 6</b>	<b>Total Assessment Questions 7</b>

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