

FCAT MATHEMATICS CONTENT MATRIX  
GRADES 9-10

Grades 9 -10 General Content Limits

The content limits described below are applicable to all items developed for Grade 9. The content limits defined in the individual benchmark specifications, however, may be an expansion or further restriction of these limits.

**Whole numbers**

**Addition**

- Items should not exceed 6 addends.
- Addends should not exceed 6 digits.

**Subtraction**

- Numbers should not exceed 6 digits.

**Multiplication**

- Products should not exceed 8 digits.

**Division**

- Divisors should not exceed 3 digits, and dividends should not exceed 5 digits.

**Decimals**

**Addition**

- Items should not exceed 6 addends.
- Addends should not exceed 6 digits.

**Subtraction**

- Numbers should not exceed 6 digits.

**Multiplication**

- Products should not exceed 8 digits.

**Division**

- Divisors should not exceed 3 digits, and dividends should not exceed 5 digits.
- Quotients should not exceed 7 digits.

**Fractions**

- Items should not exceed three addends or factors.

**Percents**

- See benchmark

**Measurements**

- See benchmark.

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Grades 9 – 10 Benchmark	Grade 9 Clarification Statement	Grade 9 Content Limits	Grade 10 Clarification Statement	Grade 10 Content Limits
A.A.1.4.2 Understands the relative size of integers, rational numbers, irrational numbers and real numbers.	Students will compare, order, and determine the relative size of real numbers.  MC	<ul style="list-style-type: none"> <li>Items should include whole number bases and integer exponents.</li> </ul>	Students will compute, identify, and/or compare the relative size of real numbers.  MC	<ul style="list-style-type: none"> <li>Negative exponents may be used in simple computations only.</li> </ul>
A.A.1.4.4 Understands that numbers can be represented a variety of equivalent forms, including integers, fractions, decimals, percents, scientific notation, exponents, radicals, absolute value, and logarithms. (Also assesses A.1.4.1 and A.1.4.3)	Students will use numbers expressed in equivalent forms, including integers, fractions, decimals, percents, scientific notation and other exponential forms, radicals, and absolute value.  MC, GR	<ul style="list-style-type: none"> <li>Different forms of numbers may be mixed within the same item.</li> <li><i>Logarithms and complex numbers will not be assessed.</i></li> </ul>	Students will identify and/or represent numbers in equivalent forms.  MC, GR	<ul style="list-style-type: none"> <li><i>Logarithms and complex numbers will not be assessed at grade 10.</i></li> </ul>
A.A.3.4.1 Understands and explains the effects of addition, subtraction, multiplication, and division of real numbers, including square roots, exponents, and appropriate inverse relationships (Also assesses A.2.4.2)	Students will determine, analyze, and/or identify the effects or results of mathematical operations (including appropriate inverse operations) on real numbers.  MC, GR	<ul style="list-style-type: none"> <li>Items should require students to determine the effects of operations on real numbers, including adding, subtracting, multiplying, dividing, raising to powers, and extracting square roots.</li> <li>Items that require determining inverses should include adding and subtracting, multiplying and dividing, squaring, and extracting square roots.</li> <li>Numbers may exceed the limits specified in the General Content Limits when the numbers are represented in word form (e.g., fifty billion) or as denominate numbers (e.g., 4.3 trillion).</li> </ul>	Students will analyze and identify the effects or results of mathematical operations.  MC,GR	<ul style="list-style-type: none"> <li>Numbers may exceed the limits specified in the General Content Limits when the numbers are represented in word form (e.g., fifty billion) or as denominate numbers (e.g., 4.3 trillion).</li> </ul>
A.A.3.4.2 Selects and justifies alternative strategies, such as using properties of numbers, including inverse, identity, distributive, associative, and transitive, to allow operational shortcuts for computational procedures in real-world or mathematical problems. (Also assesses A.2.4.2 and A.3.3.2)	Students will use an alternative strategy that permits an operational shortcut and/or use the correct order of operations to solve a problem.  MC, GR	<ul style="list-style-type: none"> <li>Items may include numeric or one - variable expressions.</li> <li>Items will assess understanding of the properties and <b>not</b> the vocabulary.</li> </ul>	Students will identify an alternative strategy that permits an operational shortcut and/or use the correct order of operations to solve a problem.  MC	<ul style="list-style-type: none"> <li>Items may include numeric or variable expressions.</li> <li>Items will assess understanding of the properties and <b>not</b> the vocabulary.</li> </ul>

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A.A.3.4.3 Adds, subtracts, multiplies, and divides real numbers, including square roots and exponents, using appropriate methods of computing, such as mental mathematics, paper and pencil, and calculator. (Also assesses A.2.4.2)	Students will solve real-world problems using appropriate computation with real numbers.  <p style="text-align: right;">MC, GR</p>	<ul style="list-style-type: none"> <li>Items may include problems dealing with percents.</li> </ul>	Students will solve real-world problems using appropriate computation.  <p style="text-align: right;">MC, GR</p>	<ul style="list-style-type: none"> <li>See General Content Limits.</li> </ul>
A.A.4.4.1 Uses estimation strategies in complex situations to predict results and to check the reasonableness of results. (Also assesses A.4.2.1 and A.4.1)	Students will use an appropriate estimation strategy or determine the reasonableness of results.  <p style="text-align: right;">MC</p>	<ul style="list-style-type: none"> <li>The data that are presented to students may be either precise value or a range of values.</li> </ul>	Students will demonstrate or explain the strategies used to estimate a solution or determine and explain the reasonableness of results.  <p style="text-align: right;">SR</p>	<ul style="list-style-type: none"> <li>The data that are presented to students may be either precise values or a range of values.</li> </ul>
A.B.1.4.1 Uses concrete and graphic models to derive formulas for finding perimeter, area, surface area, circumference, and volume of two- and three-dimensional shapes, including rectangular solids, cylinders, cones, and pyramids. (Also assesses B.1.2.2)	Students will use and derive formulas to solve problems involving perimeter, area, surface area, circumference, or volume.  <p style="text-align: right;">MC, GR</p>	<ul style="list-style-type: none"> <li>Benchmark B.1.2.2 has been included to assess solving problems involving perimeter (including circumference) and area of two-dimensional shapes; and surface area and volume of three dimensional shapes, including rectangular solids, cylinders, cones, and pyramids.</li> <li>Surface area will <b>not</b> be assessed for cones and pyramids.</li> <li>Items should include either symmetric or regular figures or a combination of these figures.</li> <li>Items assessing cones or cylinders should include only right circular cones or right circular cylinders.</li> <li>Items assessing characteristics of pyramids should include only square pyramids.</li> </ul>	Students will solve a problem by using and/or deriving formulas for perimeter, circumference, area, surface area, or volume.  <p style="text-align: right;">GR, SR</p>	<ul style="list-style-type: none"> <li>Benchmark B.1.2.2 has been included to assess solving problems involving perimeter (including circumference) and area of two-dimensional shapes; and surface area and volume of three dimensional shapes, including rectangular solids, cylinders, cones, and pyramids.</li> <li>Items should include either symmetric or regular figures or a combination of these figures.</li> <li>Items assessing cones or cylinders should include only right circular cones or right circular cylinders.</li> <li>Items assessing characteristics of pyramids should include only square pyramids.</li> </ul>
A.B.1.4.2 Uses concrete and graphic models to derive formulas for finding rate, distance, time, angle measures, and arc lengths. (Also assesses B.1.2.2)	Students will solve problems by using formulas (derived or standard) for rate, distance, time or angle measures.  <p style="text-align: right;">MC, GR</p>	<ul style="list-style-type: none"> <li>Benchmark B.1.2.2 has been included to assess solving problems involving rate, distance, time, and angle measures.</li> </ul>	Students will solve problems by using and/or deriving formulas for rate, distance, time, angle measures, or arc lengths.  <p style="text-align: right;">MC, SR</p>	<ul style="list-style-type: none"> <li>Benchmark B.1.2.2 has been included to assess solving problems involving rate, distance, time, and angle measures.</li> </ul>

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A.B.1.4.3 Relates the concepts of measurement to similarity and proportionality in real-world situations.	Students will use an appropriate proportion to solve real-world measurement problems, which may include similar figures or scale drawings.  MC, GR	<ul style="list-style-type: none"> <li>See General Content Limits.</li> </ul>	Assessed through C.2.4.1	
A.B.2.4.1 Selects and uses direct (measured) or indirect (not measured) methods of measurement as appropriate.	Students will use indirect methods of measurement to solve problems within systems of measurement.  MC, GR	<ul style="list-style-type: none"> <li>Conversions should be within one system of measurement.</li> </ul>	Students will use indirect methods of measurement to solve a problem.  MC	<ul style="list-style-type: none"> <li>See General Content Limits.</li> </ul>
A.B.2.4.2 Solves real-world problems involving rated measures (miles per hour, feet per second). (Also assesses C.3.2)	Students will solve problems involving units of measure, conversions, and rated measures (e.g., miles per hour, feet per second).  MC, GR	<ul style="list-style-type: none"> <li>See General Content Limits.</li> </ul>	Students will solve problems involving conversions and rated measures.  MC, GR	<ul style="list-style-type: none"> <li>See General Content Limits.</li> </ul>
A.C.1.4.1 Uses properties and relationships of geometric shapes to construct formal and informal proofs. (Also assesses C.1.2.1 and C.1.3.1)	Students will use geometric properties and relationships to determine numeric and/or definitional characteristics of geometric shapes.  MC, GR	<ul style="list-style-type: none"> <li>Geometric proofs will be assessed at an introductory level; however, informal proofs will be accepted.</li> <li>Three-dimensional shapes should be limited to right circular cones or cylinders, square pyramids, spheres, or rectangular solids.</li> </ul>	Students will use geometric properties and relationships to determine and/or explain numeric and definitional characteristics of geometric shapes.  MC, GR, SR	<ul style="list-style-type: none"> <li>Geometric proofs will be assessed at an introductory level; however, informal proofs will be accepted.</li> <li>Three-dimensional shapes should be limited to right circular cones or cylinders, square pyramids, spheres, or rectangular solids.</li> </ul>
A.C.2.4.1 Understands geometric concepts such as perpendicularity, parallelism, tangency, congruency, similarity, reflections, symmetry, and transformations including translations, slides, turns, dilations, enlargements, rotations, and reflections. (Also assesses C.1.4.3, C.1.4.1, and C.3.4.1)	Students will apply geometric concepts, properties, formulas, and/or relationships to solve problems.  MC, GR	<ul style="list-style-type: none"> <li>Items should <b>not</b> assess tangency or fractals.</li> <li>Items should <b>not</b> focus on the conditions that cause figures to be similar or congruent.</li> <li>Items should <b>not</b> assess trigonometric functions, such as sine, cosine, or tangent.</li> </ul>	Students will recognize, represent, apply, and/or explain geometric concepts, properties, formulas, and relationships to solve problems.  MC, GR, ER	<ul style="list-style-type: none"> <li>Items should <b>not</b> assess tangency or fractals.</li> <li>Items will <b>not</b> assess trigonometric functions, such as sine, cosine, or tangent.</li> </ul>

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A.C.2.4.2 Analyzes and applies geometric relationships involving planar cross-sections (the intersection of a plane and a three-dimensional figure).	Not assessed at Grade 9.		Students will analyze and apply geometric properties to solve problems involving planar cross-sections.  MC	<ul style="list-style-type: none"> <li>Items should include only right circular cylinders, right circular cones, regular square pyramids, spheres, or rectangular solids.</li> </ul>
A.C.3.4.1 Represents and applies geometric properties and relationships to solve real-world and mathematical problems including ratio, proportion, and properties of right triangle trigonometry. (Also assesses C.2.4.1)	Students will apply geometric properties, formulas, and relationships in the coordinate plane to solve real-world and mathematical problems, including ratio, proportion, and right triangle geometry.  MC	<ul style="list-style-type: none"> <li>Items should <b>not</b> assess trigonometric functions, such as sine, cosine, or tangent.</li> </ul>	Students will represent, apply, and/or explain geometric properties, formulas, and relationships to solve a problem.  MC, SR	<ul style="list-style-type: none"> <li>Items should <b>not</b> assess trigonometric functions, such as sine, cosine, or tangent.</li> </ul>
A.C.3.4.2 Using a rectangular coordinate system (graph), applies and algebraically verifies properties of two- and three-dimensional figures, including distance, midpoint, slope, parallelism, and perpendicularity. (Also assesses C.3.3.2 and D.2.4.1)	Students will apply algebraic properties, including distance, midpoint, slope, parallelism, and perpendicularity, to interpret graphs or solve problems in a rectangular coordinate system.  MC, GR	<ul style="list-style-type: none"> <li>Parabolic relations will <b>not</b> be used.</li> <li>Three-dimensional figures will <b>not</b> be assessed.</li> </ul>	Students will interpret graphs and solve problems by applying, verifying, and/or explaining algebraic properties in a rectangular coordinate system.  MC, GR, SR	<ul style="list-style-type: none"> <li>Items that involve parabolas should include reading and interpreting graphics only.</li> <li>Three-dimensional figures in a coordinate system will <b>not</b> be assessed at grade 10.</li> </ul>
A.D.1.4.1 Describes, analyzes, and generalizes relationships, patterns, and actions using words, symbols, variables, tables, and graphs.	Students will analyze, identify, and/or generalize relationships or functions to solve problems or continue patterns.  MC, GR	<ul style="list-style-type: none"> <li>Items should include no more than two variables.</li> <li>Items should require no more than two operations.</li> </ul>	Students will analyze, identify, and/or generalize relationships or functions to solve problems or continue patterns.  MC, GR	<ul style="list-style-type: none"> <li>Items should include no more than two variables.</li> </ul>
A.D.1.4.2 Determines the impact when changing parameters of given functions.	Students will determine the result of changing a parameter in a given situation or function or determine the required change in a parameter to achieve the desired outcome.  MC, GR	<ul style="list-style-type: none"> <li>Items should <b>not</b> exceed more than two parameters.</li> <li>No more than one parameter should be changed at a time.</li> </ul>	Students will determine and/or explain the result of changing a parameter in a given situation or function or determine the required change in a parameter to achieve the desired outcome.  SR	<ul style="list-style-type: none"> <li>Items should <b>not</b> exceed more than two parameters.</li> <li>No more than one parameter should be changed at a time.</li> </ul>

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A.D.2.4.2 Uses systems of equations and inequalities to solve real-world problems graphically, algebraically, and with matrices. (Also assesses D.2.3.1, D.2.3.2, And D.2.4.1)	Students will interpret and/or solve real-world problems involving linear equations or linear inequalities or manipulate literal equations.  MC, GR	<ul style="list-style-type: none"> <li>• Items may require students to solve equations or formulas for one variable in terms of the others. (No variables will occur with a power different from 1.)</li> <li>• System of linear equations or inequalities will <b>not</b> be assessed.</li> <li>• Matrices, sequences, series, and recursive relations will <b>not</b> be assessed.</li> <li>• Items involving graphs using discrete data, such as bar graphs or scatter plots, should contain no more than 15 data points.</li> </ul>	Students will interpret and/or solve real-world problems involving equations, inequalities, and/or systems of equations and inequalities by formulating, solving, and/or graphing equations.  MC, GR, SR	<ul style="list-style-type: none"> <li>• In items containing equations or inequalities, the equation or inequality should be linear.</li> <li>• Matrices, sequences, series, and recursive relations will <b>not</b> be assessed.</li> <li>• Items involving graphs using discrete data, such as bar graphs or scatter plots, should contain no more than 15 data points.</li> </ul>
A.E.1.4.1 Interprets data that have been collected, organized, and displayed in charts, tables, and plots. (Also assesses E.1.3.1 and E.1.4.3)	Students will interpret and/or make predictions based on displayed data or identify accurate displays of given data.  MC, GR	<ul style="list-style-type: none"> <li>• See General Content Limits.</li> </ul>	Students will display, analyze, and/or interpret data.  MC, GR, ER	<ul style="list-style-type: none"> <li>• Students will be asked to interpret data in Venn diagrams, step-function graphs, stem-and-leaf plots, histograms, or box-and-whisker plots, but will <b>not</b> be asked to display data in these forms.</li> </ul>
A.E.1.4.2 Calculates measures of central tendency (mean, median, and mode) and dispersion (range, standard deviation, and variance) for complex sets of data and determines the most meaningful measure to describe the data. (Also assesses E.1.4.3)	Students will calculate and/or interpret measures of central tendency and/or range for sets of data or determine the most meaningful measure to describe the data for given situations.  MC, GR	<ul style="list-style-type: none"> <li>• The measures of standard deviation and variance will <b>not</b> be assessed.</li> <li>• Items should use the terms <i>mean</i>, <i>median</i>, <i>mode</i>, and <i>range</i>, but should <b>not</b> provide or require a definition of the terms.</li> <li>• Students should be provided with no more than 15 data points.</li> <li>• Complexity of data should be limited to a maximum of three unique statistical categories.</li> </ul>	Students will calculate and/or interpret measures of central tendency and/or range for sets of data or determine the most meaningful measure to describe the data for given situations.  MC, GR	<ul style="list-style-type: none"> <li>• The measures of standard deviation and variance will <b>not</b> be assessed.</li> <li>• Items should use the terms <i>mean</i>, <i>median</i>, <i>mode</i>, and <i>range</i>, but should <b>not</b> provide or require a definition of the terms.</li> <li>• If single-digit data points are given, students should be provided with a maximum of 30 raw, unorganized data points. If data points containing more than one digit are used, students should be provided with fewer than 15 data points.</li> <li>• If students are required to determine and compare all measures of central tendency and/or range, no more than fifteen two- or three-digit data points should be provided.</li> <li>• Complexity of data should be limited to a maximum of three unique statistical categories.</li> </ul>

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A.E.2.4.1 Determines probabilities using counting procedures, tables, tree diagrams, and formulas for permutations and combinations. (Also assesses E.3.4.2)	Students will use a variety of methods, including counting procedures, tables, and tree diagrams, to determine the probability of a given simple event or independent, compound events.  MC, GR	<ul style="list-style-type: none"> <li>• Items should <b>not</b> assess dependent compound events.</li> <li>• Items should <b>not</b> require the use of formulas for permutations and combinations.</li> </ul>	Students will determine the probability of a given event or events.  MC, GR	<ul style="list-style-type: none"> <li>• Items should <b>not</b> require the use of formulas for permutations and combinations.</li> </ul>
A.E.3.4.1 Designs and reforms real-world statistical experiments that involve more than one variable, then analyzes results and reports findings. (Also assesses E.3.1 and E.3.4.2)	Students will analyze and interpret data that result from statistical experiments.  MC, GR	<ul style="list-style-type: none"> <li>• Items should include exactly two unique statistical categories.</li> </ul>	Students will analyze and interpret data that result from statistical experiments or identify and/or explain design components or flaws in statistical experiments.  MC, GR, SR	<ul style="list-style-type: none"> <li>• Items should include exactly two unique statistical categories.</li> <li>• Explanation of design components or flaws in statistical experiments will be limited to SR items.</li> </ul>