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ABSTRACT

This document is designed to show the connection between the required state-written curriculum (courses of study) and the state-tested curriculum (the Alabama High School Graduation Examination and the Stanford Achievement Test, Ninth Edition [Stanford 9]) in Mathematics. The document illustrates that courses of study content standards embody both Alabama High School Graduation Examination and Stanford 9 objectives, demonstrating that local education agencies may feel confident developing local curriculum based on one document: the state course of study. Each page of this document contains four columns. The first is the course of study content standards, and the second places the Alabama High School Graduation Exam objectives, with eligible content, beside the related content standard. The third column contains an "X" for the Stanford 9 correlation to the course of study, indicating that one or more components of the content standard is tested on the Stanford 9. The fourth column is designed for local use; a system may choose to list instructional strategies or resources here. The standards are given for kindergarten through grade 11, although the mathematics subject-area test does not contain content above the level of Algebra I. (SLD)

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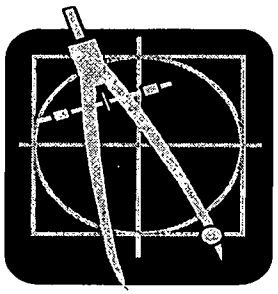
ED 458 251

ALABAMA

Mathematics Course of Study - Assessment Correlation



Classroom Improvement
Division of Instructional Services
State Department of Education
Ed Richardson, State Superintendent of Education

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MATHEMATICS COURSE OF STUDY — ASSESSMENT CORRELATION

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INTRODUCTION

Mathematics Course of Study — Assessment Correlation

An important factor in improving students' achievement is the alignment of written, taught, and tested curricula. The basis of both the taught and tested curricula is the written curriculum—the course of study. This document is designed to show the connection between the required state-written curriculum (courses of study) and the state-tested curriculum (the *Alabama High School Graduation Exam* and the *Stanford Achievement Test,* Ninth Edition, Stanford 9). Courses of study contain content standards that are the blueprints to be used by systems as they align their curricula locally. The content standards in the courses of study prescribe, from the state level, exactly what students should know and be able to do at the conclusion of any grade level or course. In the past, aligning these three types of curriculum may have been a cumbersome task because the standards/objectives were contained in different documents and had to be meshed/combined to create a composite of all state requirements.

This document illustrates that courses of study content standards embody both *Alabama High School Graduation Exam* and Stanford 9 objectives. Local Education Agencies may feel confident in developing local curriculum based on one document—the state course of study. In the elementary grades, course of study content standards are rarely worded in such a fashion as to be easily recognized as *Alabama High School Graduation Exam* standards or objectives. Yet, skills and concepts are identified at each grade level, K-6, that are foundational and prerequisite to the development of graduation exam standards and objectives. The teaching of all content standards in the course of study should adequately prepare students for any state or national assessment.

Directions for Interpreting the Mathematics Course of Study — Assessment Correlation Document

Each page of the document contains four columns. The first column is the course of study content standards; the second column places the *Alabama High School Graduation Exam* objectives, with eligible content, beside the related content standard that must be mastered at this grade level or in this subject. The third column contains an "X," instead of objectives, for the Stanford 9 correlation to the course of study because the Stanford 9 material is copyrighted. The fourth column is designed for local usage; for example, if using the document prior to aligning the curriculum locally, a system may choose to list instructional strategies or resources here.

The mathematics subject-area test does not contain content above the level of Algebra I. Standards and objectives identified in the *Alabama High School Graduation Exam* column for courses above that level have been taught in an earlier course and are being reviewed or used as a foundation for teaching new concepts.

Alabama High School Graduation Exam Standards

The following mathematics standards are referenced only by number throughout the document.

STANDARD I:
The student will be able to perform basic operations on algebraic expressions.

STANDARD II:
The student will be able to solve equations and inequalities.

STANDARD III:
The student will be able to apply concepts related to functions.

STANDARD IV:
The student will be able to apply formulas.

STANDARD V:
The student will be able to apply graphing techniques.

STANDARD VI:
The student will be able to represent problem situations.

STANDARD VII:
The student will be able to solve problems involving a variety of algebraic and geometric concepts.

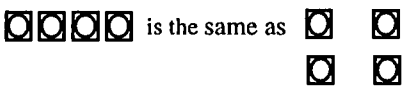
Alabama Course of Study: Mathematics	*Alabama High School Graduation Exam*	Stanford 9	Local
NUMBER SENSE, NUMBER SYSTEMS, NUMBER THEORY **CONTENT STANDARDS** Students will			
1. Demonstrate one-to-one correspondence using a variety of objects that relate to real-life situations.			
2. Count in sequence.			
3. Compare numbers and sets of objects up to 10. • Set to set • Set to number • Number to set • Number to number		X	
4. Compare numbers and sets of objects. • Equal • One more • One less		X	
5. Order numbers and sets of objects from 0 through 10.		X	
6. Use number words and numerals in everyday classroom situations.		X	

Alabama Course of Study: Mathematics	*Alabama High School Graduation Exam*	Stanford 9	Local
7. Develop an awareness of addition and subtraction. Examples: telling number stories, acting out number stories, joining and separating sets of objects, responding orally to problems presented in number stories	I-2 Add and subtract polynomials. • Using the distributive property may be required. • Unlike denominators may be used.	X	
8. Recognize that a whole object can be divided into equal parts.			
9. Use appropriately the vocabulary associated with mathematics. • More than, less than • First, second, third • First, last, next • Most • All • None • Every		X	
GEOMETRY, SPATIAL SENSE, MEASUREMENT			
10. Describe likenesses and differences in geometric shapes through exploration.		X	

Alabama Course of Study: Mathematics	*Alabama High School Graduation Exam*	Stanford 9	Local
11. Identify rectangles, circles, and triangles found in the environment.	IV-1 Find the perimeter, circumference, area, or volume of geometric figures. • The value of pi (π) will be 3.14. • Options may be left in terms of π. • Unnecessary dimensions may be included. • Drawings may be used. • Finding volume or surface area of a rectangular prism may be required. • Extracting a square root may be required. • Determining the area of a circle when given the diameter in the drawing may be required. • The formulas will be given in the problems. VII-4 Apply properties of plane and solid geometric figures. • Diagrams may be included. • Word problems may be used. • The following content may be included: - area and perimeter of triangles, rectangles, and squares - area and circumference of a circle, given radius or diameter - perimeter of a regular polygon, given one side - volume of rectangular prism or cylinder	X	

Alabama Course of Study: Mathematics	*Alabama High School Graduation Exam*	Stanford 9	Local
11. (continued)	- sum of the measures of the angles in a triangle - sum of the measures of the angles in a rectangle • Determining any dimension of a figure may be required. • Determining any dimension of a figure when the dimension is expressed as an algebraic expression may be required.		
12. Describe relative location using positional terms correctly. Examples: beside, inside, outside, above, below, between, on		X	
13. Use vocabulary associated with measurement. • Longer than • Shorter than • Taller than • Wider than • More than • Less than • As long as • As short as • As tall as • As wide as • Same as • Heavier than • Lighter than • Colder than • Hotter than		X	

Alabama Course of Study: Mathematics	*Alabama High School Graduation Exam*	Stanford 9	Local
14. Investigate the capacity of different containers. Example: pour the same amount of water into different size containers		X	
15. Estimate and measure the length of objects using nonstandard units. Example: the number of pencils to measure length of desk		X	
16. Develop oral language to describe sequence of events. Examples: before, after, first, last		X	
17. Use appropriately the vocabulary associated with the measurement of time. Examples: minutes, hours, days, weeks, months			
18. Identify parts of a clock and features of a calendar. Examples: hands, face, months, days, dates		X	
19. Identify a penny, nickel, and dime.		X	
PATTERNS, FUNCTIONS, ALGEBRA			
20. Sort a collection of objects by various characteristics.			

Alabama Course of Study: Mathematics	*Alabama High School Graduation Exam*	Stanford 9	Local
21. Explore and create patterns using objects and pictures.			
22. Reproduce and extend patterns with objects.		X	
23. Develop an understanding that the quantity remains the same when the spatial arrangement changes by exploring different arrangements of geometric figures. Example:  is the same as			
PROBABILITY, STATISTICS, DISCRETE MATHEMATICS			
24. Organize and interpret information collected from the immediate environment. Examples: modes of transportation to school, pets owned by students, articles of clothing worn by students			
25. Read and interpret graphs. • Graphs using real objects • Pictographs		X	

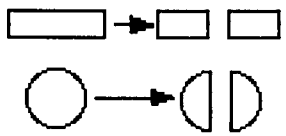
Alabama Course of Study: Mathematics	*Alabama High School Graduation Exam*	Stanford 9	Local
NUMBER SENSE, NUMBER SYSTEMS, NUMBER THEORY **CONTENT STANDARDS** Students will			
1. Demonstrate proficiency in applying one-to-one correspondence using a variety of objects.			
2. Develop vocabulary used to compare quantities. Examples: more, most, greater, greatest, equals, fewer, fewest, same, less, least			
3. Identify and compare the number of objects in sets up to 100 elements. • Set with fewer or fewest elements • Set with more or most elements		X	
4. Interpret and use representations and relationships for a given number including numeral and number word. Examples: five, 5, 𝍸, 2 + 3			
5. Read, write, order, and compare whole numbers from 0 through 100.		X	
6. Indicate position using ordinal numbers (first through tenth).		X	

Alabama Course of Study: Mathematics	*Alabama High School Graduation Exam*	Stanford 9	Local
7. Count in a variety of ways. • Forward and backward by ones, fives, and tens • From an initial number Example: count from 12 to 20		X	
8. Use number words and numerals in everyday classroom situations.			
9. Identify place value of the ones digit and tens digit in a number. • Using manipulatives Example: linking cubes • Using pictorial representation Example:  • Determining the value of a number given tens and ones Example: one ten and four ones		X	
10. Identifying a number that is 10 more or 10 less than a given number.		X	
11. Estimate quantity of objects in a set.			

Alabama Course of Study: Mathematics	*Alabama High School Graduation Exam*	Stanford 9	Local
12. Demonstrate an understanding of addition and subtraction. • Telling number stories • Joining and separating sets of objects • Applying signs to the actions of joining and separating sets (+ and -) • Using vertical and horizontal format	I-2 Add and subtract polynomials. • Using the distributive property may be required. • Unlike denominators may be used.	X	
13. Develop vocabulary associated with addition and subtraction. Examples: sum, difference, equal			
14. Demonstrate oral and written proficiency in basic addition facts of sums to 10 and in the corresponding basic subtraction facts.	I-2 Add and subtract polynomials. • Using the distributive property may be required. • Unlike denominators may be used.	X	
15. Explore addition using more than two addends. • Manipulative representations • Numerical representations	I-2 Add and subtract polynomials. • Using the distributive property may be required. • Unlike denominators may be used.		
16. Explore the addition and subtraction of two-digit numbers.	I-2 Add and subtract polynomials. • Using the distributive property may be required. • Unlike denominators may be used.		

Alabama Course of Study: Mathematics	*Alabama High School Graduation Exam*	Stanford 9	Local
17. Create and solve story problems involving real-life situations.	VII-8 Solve problems involving algebraic concepts. • Word problems will be used. • Interpretation of figures may be required. • The following content may be included: - distance-rate-time problems - money problems, which may require a system of equations - numbers (sum, difference, product, quotient) - simple age problems referring only to the present - consecutive integers - area, volume, dimension problems - quantity problems - cost problems - wage problems		
18. Solve problems using a variety of tools, models, and techniques. Examples: tools: manipulatives, calculators; models: number lines, tally marks, lists, drawings, tables, graphs; techniques: estimation, mental math, dramatization, patterns	VII-8 Solve problems involving algebraic concepts. • Word problems will be used. • Interpretation of figures may be required. • The following content may be included: - distance-rate-time problems - money problems, which may require a system of equations - numbers (sum, difference, product, quotient)	X	

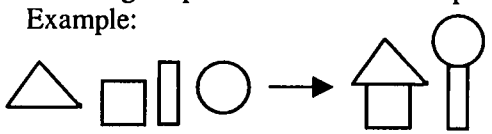
Alabama Course of Study: Mathematics	*Alabama High School Graduation Exam*	Stanford 9	Local
18. (continued)	- simple age problems referring only to the present - consecutive integers - area, volume, dimension problems - quantity problems - cost problems - wage problems		
19. Determine if estimations and calculations are reasonable. Examples: 3 + 4 cannot be less than 4, 7 - 3 cannot be more than 7			
20. Recognize relationships between operations. Example: addition and subtraction fact families 2 + 3 = 5 3 + 2 = 5 5 - 3 = 2 5 - 2 = 3			
21. Divide physical models into equal parts. • Two equal parts • Three equal parts • Four equal parts Example: paper plate, cookie, candy bar		X	

Alabama Course of Study: Mathematics	*Alabama High School Graduation Exam*	Stanford 9	Local
22. Identify parts of a whole using fraction models. Examples: 			
23. Solve simple word problems. • Distinguishing between relevant and irrelevant information • Using a variety of methods to determine solution(s) • Explaining and justifying thinking	VII-8 Solve problems involving algebraic concepts. • Word problems will be used. • Interpretation of figures may be required. • The following content may be included: - distance-rate-time problems - money problems, which may require a system of equations - numbers (sum, difference, product, quotient) - simple age problems referring only to the present - consecutive integers - area, volume, dimension problems - quantity problems - cost problems - wage problems		
24. Explain the identity properties of addition and subtraction. Examples: $1 + 0 = 1, 3 - 0 = 3$	I-2 Add and subtract polynomials. • Using the distributive property may be required. • Unlike denominators may be used.	X	

Alabama Course of Study: Mathematics	*Alabama High School Graduation Exam*	Stanford 9	Local
25. Demonstrate that the order of the addends does not affect the sum (commutative property of addition). Example: $2 + 3 = 3 + 2$	I-2 Add and subtract polynomials. • Using the distributive property may be required. • Unlike denominators may be used.	X	
26. Demonstrate an understanding of addition and subtraction as inverse operations. Examples: $2 + 3 = 5$ and $5 - 3 = 2$ or $5 - 2 = 3$	I-2 Add and subtract polynomials. • Using the distributive property may be required. • Unlike denominators may be used.	X	
GEOMETRY, SPATIAL SENSE, MEASUREMENT			
27. Describe characteristics of plane and solid figures using appropriate terms. Examples: round, flat, curved, straight			
28. Identify plane figures. Examples: circles, squares, rectangles, triangles	IV-1 Find the perimeter, circumference, area, or volume of geometric figures. • The value of pi (π) will be 3.14. • Options may be left in terms of π. • Unnecessary dimensions may be included. • Drawings may be used. • Finding volume or surface area of a rectangular prism may be required. • Extracting a square root may be required. • Determining the area of a circle when given the diameter in the drawing may be required.	X	

Alabama Course of Study: Mathematics	*Alabama High School Graduation Exam*	Stanford 9	Local
28. (continued)	• The formulas will be given in the problems. VII-4 Apply properties of plane and solid geometric figures. • Diagrams may be included. • Word problems may be used. • The following content may be included: - area and perimeter of triangles, rectangles, and squares - area and circumference of a circle, given radius or diameter - perimeter of a regular polygon, given one side - volume of rectangular prism or cylinder - sum of the measures of the angles in a triangle - sum of the measures of the angles in a rectangle • Determining any dimension of a figure may be required. • Determining any dimension of a figure when the dimension is expressed as an algebraic expression may be required.		
29. Develop an understanding of symmetry. Examples: paper folding, mirror reflection		X	
30. Investigate congruency (same size, same shape) of figures using manipulatives.		X	

Alabama Course of Study: Mathematics	*Alabama High School Graduation Exam*	Stanford 9	Local
31. Identify geometric shapes in objects from the environment. Examples: surface of a coin — circle, surface of a door — rectangle	IV-1 Find the perimeter, circumference, area, or volume of geometric figures. • The value of pi (π) will be 3.14. • Options may be left in terms of π. • Unnecessary dimensions may be included. • Drawings may be used. • Finding volume or surface area of a rectangular prism may be required. • Extracting a square root may be required. • Determining the area of a circle when given the diameter in the drawing may be required. • The formulas will be given in the problems. VII-4 Apply properties of plane and solid geometric figures. • Diagrams may be included. • Word problems may be used. • The following content may be included: - area and perimeter of triangles, rectangles, and squares - area and circumference of a circle, given radius or diameter - perimeter of a regular polygon, given one side - volume of rectangular prism or cylinder - sum of the measures of the angles in a triangle - sum of the measures of the angles in a rectangle	X	

Alabama Course of Study: Mathematics	*Alabama High School Graduation Exam*	Stanford 9	Local
31. (continued)	• Determining any dimension of a figure may be required. • Determining any dimension of a figure when the dimension is expressed as an algebraic expression may be required.		
32. Investigate spatial relationships. • Relating personal position to surrounding space • Determining orientation, perspective, and direction of objects in space Examples: above, below, behind, under, over, between, beside, near, far, left, right • Observing results of rotated shapes • Comparing relative size and proximity of objects • Combining shapes to create a new shape Example: 			
33. Demonstrate proficiency in ordering objects according to length.			
34. Estimate and measure length. • Using nonstandard units • Using customary units • Using metric units		X	

Alabama Course of Study: Mathematics	*Alabama High School Graduation Exam*	Stanford 9	Local
35. Compare weights of different objects. Example: Hold a penny and an apple. Which is heavier?			
36. Compare capacities of different containers. Example: Pour same amount of water into two unequal containers. Which holds more when full?		X	
37. Identify a sequence of events according to passage of time.			
38. Identify the hour using a clock. • Analog clock • Digital clock			
39. Locate days, dates, and months on a calendar.		X	
40. Develop vocabulary associated with time. Examples: yesterday, today, tomorrow, day before, day after			
41. Compare temperatures in real-life situations. Example: "Today is hotter than yesterday."			
42. Match coins to their monetary value (pennies, nickels, dimes, and quarters).		X	

Alabama Course of Study: Mathematics	*Alabama High School Graduation Exam*	Stanford 9	Local
43. Identify the monetary value (total) of a set of like coins.		X	
PATTERNS, FUNCTIONS, ALGEBRA			
44. Sort, compare, and order objects using different characteristics.			
45. Explore patterning of objects. • Reproducing and extending patterns • Describing patterns • Creating simple patterns • Identifying patterns in the environment		X	
46. Recognize that the quantity remains the same when the spatial arrangement changes. Example: • • / • / • • is the same as • • • • •			
47. Extend number patterns. Examples: (0, 1, 2, 3, 4, 5, 6, 7, 8, 9) repeats when writing numerals (10, 11, 12, 13, 14, 15, 16, 17, 18, 19,...) (0, 2, 4, 6, 8) repeats when counting by 2's (10, 12, 14, 16, 18, ...)		X	

Alabama Course of Study: Mathematics	*Alabama High School Graduation Exam*	Stanford 9	Local
PROBABILITY, STATISTICS, DISCRETE MATHEMATICS			
48. Interpret information collected from real-life situations. • Organizing data • Displaying data Examples: pictographs, bar graphs, tally charts, tables • Describing data		X	
49. Explore problem solving. • Identifying the question or problem and determining the operation • Identifying appropriate information • Collecting, organizing, and interpreting information • Drawing a conclusion based on information • Evaluating the conclusion	VII-8 Solve problems involving algebraic concepts. • Word problems will be used. • Interpretation of figures may be required. • The following content may be included: - distance-rate-time problems - money problems, which may require a system of equations - numbers (sum, difference, product, quotient) - simple age problems referring only to the present - consecutive integers - area, volume, dimension problems - quantity problems - cost problems - wage problems	X	

Alabama Course of Study: Mathematics	*Alabama High School Graduation Exam*	Stanford 9	Local
50. Predict outcomes of experiments. • Events most likely to occur • Events least likely to occur Example: spinner 	VII-6 Determine probabilities. • Both AND and OR situations may be included.	X	
51. Explore probability through experimentation. Example:  Spin the spinner 10 times. Record results on tally chart or floor-mat tally chart. How many times did the spinner land on red? How many times did the spinner land on blue? On which color is the spinner most likely to stop? Why?	VII-6 Determine probabilities. • Both AND and OR situations may be included.		

Alabama Course of Study: Mathematics	*Alabama High School Graduation Exam*	Stanford 9	Local
NUMBER SENSE, NUMBER SYSTEMS, NUMBER THEORY **CONTENT STANDARDS** Students will 1. Demonstrate proficiency in the use of basic number concepts and skills. • Counting forward by ones, twos, threes, fives, and tens • Reading, writing, ordering, and comparing whole numbers from 0 through 100 • Recognizing written words for numbers from 0 through 20 • Using ordinal numbers, first through twentieth • Using + and - symbols	I-2 Add and subtract polynomials. • Using the distributive property may be required. • Unlike denominators may be used. I-3 Multiply polynomials. • Multiplying two quantities in parentheses may be required. • Squaring a quantity in parentheses may be required. • Adding or subtracting may be required. • Raising a quantity to a power may be required. • Fractions may be used. • Adding exponents may be required.	X	

Alabama Course of Study: Mathematics	*Alabama High School Graduation Exam*	Stanford 9	Local
2. Develop an understanding of basic number concepts and skills. • Counting backward by ones, twos, fives, and tens • Recognizing odd and even numbers • Reading, writing, ordering, and comparing whole numbers from 0 through 1000 • Comprehending and using number words and numerals in everyday situations. • Developing representations for given numbers, numerals, and number words • Using >, <, and = symbols	I-2 Add and subtract polynomials. • Using the distributive property may be required. • Unlike denominators may be used. I-3 Multiply polynomials. • Multiplying two quantities in parentheses may be required. • Squaring a quantity in parentheses may be required. • Adding or subtracting may be required. • Raising a quantity to a power may be required. • Fractions may be used. • Adding exponents may be required.	X	
3. Demonstrate oral and written proficiency in using basic addition facts to sums of 20 and in the corresponding basic subtraction facts.	I-2 Add and subtract polynomials. • Using the distributive property may be required. • Unlike denominators may be used.		
4. Find the sum using more than two addends. Examples: horizontal forms, vertical forms	I-2 Add and subtract polynomials. • Using the distributive property may be required. • Unlike denominators may be used.		

Alabama Course of Study: Mathematics	*Alabama High School Graduation Exam*	Stanford 9	Local
5. Recognize and use multiple representations for a given number. Examples: 10 + 5 + 5 = 20 30 - 10 = 20 10 + 10 = 20			
6. Develop an understanding of addition and subtraction of two-digit numbers with and without regrouping. Examples: using manipulatives, mental math, paper and pencil, calculators	I-2 Add and subtract polynomials. • Using the distributive property may be required. • Unlike denominators may be used.	X	
7. Estimate answers to addition and subtraction problems. • Determining whether results are reasonable • Using calculators to check estimates	I-2 Add and subtract polynomials. • Using the distributive property may be required. • Unlike denominators may be used.		
8. Create and solve word problems originating from real-life situations.	VII-8 Solve problems involving algebraic concepts. • Word problems will be used. • Interpretation of figures may be required. • The following content may be included: - distance-rate-time problems - money problems, which may require a system of equations - numbers (sum, difference, product, quotient) - simple age problems referring only to the present	X	

Alabama Course of Study: Mathematics	*Alabama High School Graduation Exam*	Stanford 9	Local
8. (continued)	- consecutive integers - area, volume, dimension problems - quantity problems - cost problems - wage problems		
9. Determine which operations are needed to solve problems.	VII-8 Solve problems involving algebraic concepts. • Word problems will be used. • Interpretation of figures may be required. • The following content may be included: - distance-rate-time problems - money problems, which may require a system of equations - numbers (sum, difference, product, quotient) - simple age problems referring only to the present - consecutive integers - area, volume, dimension problems - quantity problems - cost problems - wage problems	X	

Alabama Course of Study: Mathematics	*Alabama High School Graduation Exam*	Stanford 9	Local
10. Express multiplication as repeated addition. • Using physical materials Example:  Make four groups of three counters each to show $3 + 3 + 3 + 3 = 4 \times 3$. • Using symbolic representation Example: $6 + 6 + 6 = 3 \times 6$	I-3 Multiply polynomials. • Multiplying two quantities in parentheses may be required. • Squaring a quantity in parentheses may be required. • Adding or subtracting may be required. • Raising a quantity to a power may be required. • Fractions may be used. • Adding exponents may be required.	X	
11. Develop vocabulary associated with operations. Examples: addend, product			
12. Investigate the concept of division. Example: dividing a group of 20 pennies into groups of four			
13. Solve problems using a variety of tools, models, and techniques. Examples: tools: manipulatives, calculator; models: number line, tally marks, lists, drawings, tables, graphs; techniques: estimation, mental math, dramatization, patterns	VII-8 Solve problems involving algebraic concepts. • Word problems will be used. • Interpretation of figures may be required. • The following content may be included: - distance-rate-time problems - money problems, which may require a system of equations - numbers (sum, difference, product, quotient)	X	

Alabama Course of Study: Mathematics	*Alabama High School Graduation Exam*	Stanford 9	Local
13. (continued)	- simple age problems referring only to the present - consecutive integers - area, volume, dimension problems - quantity problems - cost problems - wage problems		
14. Explain the results of mathematical actions. Examples: Asking, "Why does my answer make sense?" Asking, "What did I learn from this?"			
15. Demonstrate relationships between operations. Examples: "I can find the difference in a subtraction problem by adding." 18 - 9 = 9 because 9 +9 = 18.		X	
16. Identify the value of a digit in the ones, tens, and hundreds place. • Using manipulatives Examples: base 10 materials, place value charts • Using pictorial representations • Determining the value of a number expressed in expanded notation		X	

Alabama Course of Study: Mathematics	*Alabama High School Graduation Exam*	Stanford 9	Local
17. Demonstrate proficiency in determining the value of a digit in the ones and tens place.			
18. Identify a number that is 100 more or 100 less than a given number.		X	
19. Identify a fraction model that is part of a whole or part of a set. • One-half • One-third • One-fourth		X	
20. Use the numerical representations $\frac{1}{2}$, $\frac{1}{3}$, and $\frac{1}{4}$ for fractional parts.			
21. Recognize the decimal numbers .10, .25, .50, and .75 in everyday situations. Examples: money, stopwatch			
22. Solve simple word problems. • Distinguishing between relevant and irrelevant information • Translating story information into number sentences • Using a variety of strategies to determine solution(s) • Explaining and justifying thinking orally and in writing	VII-8 Solve problems involving algebraic concepts. • Word problems will be used. • Interpretation of figures may be required. • The following content may be included: - distance-rate-time problems - money problems, which may require a system of equations - numbers (sum, difference, product, quotient) - simple age problems referring only to the present		

Alabama Course of Study: Mathematics	*Alabama High School Graduation Exam*	Stanford 9	Local
22. (continued)	- consecutive integers - area, volume, dimension problems - quantity problems - cost problems - wage problems		
23. Recognize that the order of the addends does not affect the sum (commutative property of addition). Example: 2 + 3 = 3 + 2	I-2 Add and subtract polynomials. • Using the distributive property may be required. • Unlike denominators may be used.	X	
24. Recognize that grouping addends differently does not affect the sum (associative property of addition). Example: (2 +3) + 4 = 2 + (3 + 4)	I-2 Add and subtract polynomials. • Using the distributive property may be required. • Unlike denominators may be used.		
25. Use the inverse relationship of addition and subtraction. Example: 7 + 8 = 15, 8 + 7 = 15, 15 - 8 = 7, 15 - 7 = 8	I-2 Add and subtract polynomials. • Using the distributive property may be required. • Unlike denominators may be used.	X	
26. Explore the identity property of multiplication. Example: 1 x 3 = 3	I-3 Multiply polynomials. • Multiplying two quantities in parentheses may be required. • Squaring a quantity in parentheses may be required.	X	

Alabama Course of Study: Mathematics	*Alabama High School Graduation Exam*	Stanford 9	Local
26. (continued)	• Adding or subtracting may be required. • Raising a quantity to a power may be required. • Fractions may be used. • Adding exponents may be required.		
27. Recognize that the order of factors does not affect the product (commutative property of multiplication). Example: $5 \times 3 = 3 \times 5$	I-3 Multiply polynomials. • Multiplying two quantities in parentheses may be required. • Squaring a quantity in parentheses may be required. • Adding or subtracting may be required. • Raising a quantity to a power may be required. • Fractions may be used. • Adding exponents may be required.		
28. Apply the knowledge that adding zero will not affect the sum (identity property of addition). Example: $1 + 0 = 1$			

Alabama Course of Study: Mathematics	*Alabama High School Graduation Exam*	Stanford 9	Local
GEOMETRY, SPATIAL SENSE, MEASUREMENT			
29. Describe and compare attributes of plane and solid figures using appropriate terms. • Side • Surface • Edge • Vertex	IV-1 Find the perimeter, circumference, area, or volume of geometric figures. • The value of pi (π) will be 3.14. • Options may be left in terms of π. • Unnecessary dimensions may be included. • Drawings may be used. • Finding volume or surface area of a rectangular prism may be required. • Extracting a square root may be required. • Determining the area of a circle when given the diameter in the drawing may be required. • The formulas will be given in the problems. VII-4 Apply properties of plane and solid geometric figures. • Diagrams may be included. • Word problems may be used. • The following content may be included: - area and perimeter of triangles, rectangles, and squares - area and circumference of a circle, given radius or diameter	X	

Alabama Course of Study: Mathematics	*Alabama High School Graduation Exam*	Stanford 9	Local
29. (continued)	- perimeter of a regular polygon, given one side - volume of rectangular prism or cylinder - sum of the measures of the angles in a triangle - sum of the measures of the angles in a rectangle • Determining any dimension of a figure may be required. • Determining any dimension of a figure when the dimension is expressed as an algebraic expression may be required.		
30. Identify solid figures. Examples: cube, cone, cylinder, sphere	IV-1 Find the perimeter, circumference, area, or volume of geometric figures. • The value of pi (π) will be 3.14. • Options may be left in terms of π. • Unnecessary dimensions may be included. • Drawings may be used. • Finding volume or surface area of a rectangular prism may be required. • Extracting a square root may be required. • Determining the area of a circle when given the diameter in the drawing may be required. • The formulas will be given in the problems.		

Alabama Course of Study: Mathematics	*Alabama High School Graduation Exam*	Stanford 9	Local
30. (continued)	VII-4 Apply properties of plane and solid geometric figures. • Diagrams may be included. • Word problems may be used. • The following content may be included: - area and perimeter of triangles, rectangles, and squares - area and circumference of a circle, given radius or diameter - perimeter of a regular polygon, given one side - volume of rectangular prism or cylinder - sum of the measures of the angles in a triangle - sum of the measures of the angles in a rectangle • Determining any dimension of a figure may be required. • Determining any dimension of a figure when the dimension is expressed as an algebraic expression may be required.		

Alabama Course of Study: Mathematics	*Alabama High School Graduation Exam*	Stanford 9	Local
31. Identify geometric shapes from the environment. • Plane figures • Solid figures	IV-1 Find the perimeter, circumference, area, or volume of geometric figures. • The value of pi (π) will be 3.14. • Options may be left in terms of π. • Unnecessary dimensions may be included. • Drawings may be used. • Finding volume or surface area of a rectangular prism may be required. • Extracting a square root may be required. • Determining the area of a circle when given the diameter in the drawing may be required. • The formulas will be given in the problems. VII-4 Apply properties of plane and solid geometric figures. • Diagrams may be included. • Word problems may be used. • The following content may be included: - area and perimeter of triangles, rectangles, and squares - area and circumference of a circle, given radius or diameter - perimeter of a regular polygon, given one side - volume of rectangular prism or cylinder	X	

Alabama Course of Study: Mathematics	*Alabama High School Graduation Exam*	Stanford 9	Local
31. (continued)	- sum of the measures of the angles in a triangle - sum of the measures of the angles in a rectangle • Determining any dimension of a figure may be required. • Determining any dimension of a figure when the dimension is expressed as an algebraic expression may be required.		
32. Identify symmetry in plane figures.		X	
33. Identify congruent figures.		X	
34. Demonstrate an understanding of spatial relationships. • Relating personal position to surrounding space • Determining orientation, direction, perspective of objects in space Examples: behind, below, between, left, right, near, far • Observing result of rotations (turns) and reflections (flips) • Comparing relative size and proximity of objects • Visualizing results of combined shapes Example: tangrams		X	

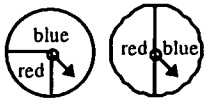
Alabama Course of Study: Mathematics	*Alabama High School Graduation Exam*	Stanford 9	Local
35. Develop an understanding of perimeter and area.	IV-1 Find the perimeter, circumference, area, or volume of geometric figures. • The value of pi (π) will be 3.14. • Options may be left in terms of π. • Unnecessary dimensions may be included. • Drawings may be used. • Finding volume or surface area of a rectangular prism may be required. • Extracting a square root may be required. • Determining the area of a circle when given the diameter in the drawing may be required. • The formulas will be given in the problems. VII-4 Apply properties of plane and solid geometric figures. • Diagrams may be included. • Word problems may be used. • The following content may be included: - area and perimeter of triangles, rectangles, and squares - area and circumference of a circle, given radius or diameter - perimeter of a regular polygon, given one side - volume of rectangular prism or cylinder - sum of the measures of the angles in a triangle		

Alabama Course of Study: Mathematics	*Alabama High School Graduation Exam*	Stanford 9	Local
35. (continued)	- sum of the measures of the angles in a rectangle • Determining any dimension of a figure may be required. • Determining any dimension of a figure when the dimension is expressed as an algebraic expression may be required.		
36. Select appropriate units for measuring. Example: using centimeters to measure length.		X	
37. Estimate and measure length using appropriate units. • Nonstandard units • Customary units • Metric units		X	
38. Estimate and compare weights.			
39. Estimate and compare capacities of containers.			
40. Read temperature on a thermometer. • Using the Fahrenheit scale • Using the Celsius scale			
41. Compare daily temperature changes.			
42. Demonstrate proficiency in finding a date on a calendar.		X	

Alabama Course of Study: Mathematics	*Alabama High School Graduation Exam*	Stanford 9	Local
43. Tell time using analog and digital clocks. • Half hour • Minute		X	
44. Demonstrate proficiency in matching coins to their monetary value. • Pennies • Nickels • Dimes • Quarters			
45. Use skills associated with money. • Determining the value of money • Comparing values of sets of coins and bills • Solving real-life problems involving money • Trading coins	VII-8 Solve problems involving algebraic concepts. • Word problems will be used. • Interpretation of figures may be required. • The following content may be included: - distance-rate-time problems - money problems, which may require a system of equations - numbers (sum, difference, product, quotient) - simple age problems referring only to the present - consecutive integers - area, volume, dimension problems - quantity problems - cost problems - wage problems	X	

Alabama Course of Study: Mathematics	*Alabama High School Graduation Exam*	Stanford 9	Local
46. Identify monetary symbols. • Dollars ($) • Cents (¢) • Decimal point (.)			
PATTERNS, FUNCTIONAL, ALGEBRA			
47. Extend and create patterns using objects, symbols, and numbers. Examples: △○□△○□; 1, 2, 4, 7, 11		X	
48. Determine missing elements in number patterns. Example: 2, 4, ___, 8, 10			
PROBABILITY, STATISTICS, DISCRETE MATHEMATICS		X	
49. Analyze information collected from real-life situations. • Organizing data • Displaying data Examples: pictographs, tally charts, lists, bar graphs, tables • Describing data			

Alabama Course of Study: Mathematics	*Alabama High School Graduation Exam*	Stanford 9	Local
50. Apply inquiry skills. • Identifying the question or problem and determining the operation • Identifying appropriate information • Collecting, organizing, and interpreting information • Drawing conclusions • Evaluating data	VI-1 Translate verbal or symbolic information into algebraic expressions; or identify equations or inequalities that represent graphs or problem situations. • Determining an equation or expression when given a verbal description may be required. • Graphing inequalities using a number line may be required. • Determining the equation of a line given two ordered pairs may be required. • Determining the equation of a line given the line graphed on the coordinate plane may be required. VII-8 Solve problems involving algebraic concepts. • Word problems will be used. • Interpretation of figures may be required. • The following content may be included: - distance-rate-time problems - money problems, which may require a system of equations - numbers (sum, difference, product, quotient) - simple age problems referring only to the present - consecutive integers - area, volume, dimension problems - quantity problems - cost problems - wage problems	X	

Alabama Course of Study: Mathematics	*Alabama High School Graduation Exam*	Stanford 9	Local
51. Make predictions from a sampling.	VII-6 Determine probabilities. • Both AND and OR situations may be included.	X	
52. Predict outcomes of experiments. • Most likely outcomes • Least likely outcomes • Equally likely outcomes Examples: tossing number cubes and coins, using counters	VII-6 Determine probabilities. • Both AND and OR situations may be included.	X	
53. Explore probability through experimentation. Example: using spinners with equal and unequal parts 	VII-6 Determine probabilities. • Both AND and OR situations may be included.		

Alabama Course of Study: Mathematics	*Alabama High School Graduation Exam*	Stanford 9	Local
NUMBER SENSE, NUMBER SYSTEMS, NUMBER THEORY **CONTENT STANDARDS** Students will 1. Demonstrate proficiency in the use of basic number concepts and skills. • Identifying odd and even numbers • Comparing numbers and sets from 0 to 1000 • Reading and writing number words from 0 to 1000 • Naming numbers from 0 to 9999 • Ordering numbers from 0 to 9999 • Using >, <, =, and ≠ symbols 2. Demonstrate an understanding of place value using physical materials and numerical and pictorial representations. • Identifying the place value of any digit in numbers 1 through 9999 • Determining the value of a number written in expanded notation • Writing numbers in expanded notation Example: 342 = 300 + 40 + 2		X X	

Alabama Course of Study: Mathematics	*Alabama High School Graduation Exam*	Stanford 9	Local
3. Round whole numbers to the nearest ten and hundred.		X	
4. Use skills associated with estimation to solve problems. • Using compatible numbers Example: 24 + 26 = 25 + 25 • Using front-end estimation Example: 72 is approximately 70 +36 +30 • Determining whether results are reasonable • Using calculators to check answers to estimation problems		X	
5. Demonstrate proficiency in adding and subtracting two-digit numbers with and without regrouping.	I-2 Add and subtract polynomials. • Using the distributive property may be required. • Unlike denominators may be used.	X	

Alabama Course of Study: Mathematics	*Alabama High School Graduation Exam*	Stanford 9	Local
6. Add and subtract three-digit numbers with and without regrouping.	I-2 Add and subtract polynomials. • Using the distributive property may be required. • Unlike denominators may be used.		
7. Develop vocabulary associated with operations. Examples: factors, quotient	I-4 Factor polynomials. • The following factoring may be required: - difference of two squares - greatest common monomial - trinomial - common binomial • Options will be factored completely.		
8. Demonstrate an understanding of multiplication. • Representing multiplication using physical materials Example: counters • Telling and writing number stories involving multiplication • Recognizing multiplication as repeated addition • Applying multiplication to problem situations	I-3 Multiply polynomials. • Multiplying two quantities in parentheses may be required. • Squaring a quantity in parentheses may be required. • Adding or subtracting may be required. • Raising a quantity to a power may be required. • Fractions may be used. • Adding exponents may be required.	X	

Alabama Course of Study: Mathematics	*Alabama High School Graduation Exam*	Stanford 9	Local
9. Demonstrate oral and written proficiency in using basic multiplication facts through 9×9.	I-3 Multiply polynomials. • Multiplying two quantities in parentheses may be required. • Squaring a quantity in parentheses may be required. • Adding or subtracting may be required. • Raising a quantity to a power may be required. • Fractions may be used. • Adding exponents may be required.	X	
10. Multiply whole numbers with and without regrouping using single-digit multipliers.	I-3 Multiply polynomials. • Multiplying two quantities in parentheses may be required. • Squaring a quantity in parentheses may be required. • Adding or subtracting may be required. • Raising a quantity to a power may be required. • Fractions may be used. • Adding exponents may be required.	X	

Alabama Course of Study: Mathematics	*Alabama High School Graduation Exam*	Stanford 9	Local
11. Develop an understanding of division. • Representing division with physical materials Example: counters • Illustrating division as repeated subtraction • Illustrating division as the inverse of multiplication • Using division symbols	I-3 Multiply polynomials. • Multiplying two quantities in parentheses may be required. • Squaring a quantity in parentheses may be required. • Adding or subtracting may be required. • Raising a quantity to a power may be required. • Fractions may be used. • Adding exponents may be required.		
12. Divide using one-digit divisors.			
13. Determine which operations are needed to solve problems.	VII-8 Solve problems involving algebraic concepts. • Word problems will be used. • Interpretation of figures may be required. • The following content may be included: - distance-rate-time problems - money problems, which may require a system of equations - numbers (sum, difference, product, quotient) - simple age problems referring only to the present - consecutive integers - area, volume, dimension problems - quantity problems - cost problems - wage problems	X	

Alabama Course of Study: Mathematics	*Alabama High School Graduation Exam*	Stanford 9	Local
14. Analyze problems for missing information.		X	
15. Solve non-routine problems using a variety of strategies. Examples: tables, charts, manipulatives, patterns and drawings, guess and check	VII-8 Solve problems involving algebraic concepts. • Word problems will be used. • Interpretation of figures may be required. • The following content may be included: - distance-rate-time problems - money problems, which may require a system of equations - numbers (sum, difference, product, quotient) - simple age problems referring only to the present - consecutive integers - area, volume, dimension problems - quantity problems - cost problems - wage problems	X	
16. Demonstrate proficiency in identifying a fraction model. • Parts of a whole figure • Parts of a group of objects Example: using physical materials: fraction circles, marbles		X	

Alabama Course of Study: Mathematics	*Alabama High School Graduation Exam*	Stanford 9	Local
17. Model equivalent fractions with concrete objects. Examples: fraction bars, pattern blocks 			
18. Compare and order fractions with common denominators.		X	
19. Identify decimals.			
20. Compare and order decimals. Examples: .25 < .75; .10, .25, .50		X	
21. Use the decimal point in money values.			
22. Add and subtract money values.	I-2 Add and subtract polynomials. • Using the distributive property may be required. • Unlike denominators may be used.	X	
23. Round money values to the nearest dollar.		X	

Alabama Course of Study: Mathematics	*Alabama High School Graduation Exam*	Stanford 9	Local
24. Identify number sentences that represent the commutative and associative properties of addition and multiplication.	I-2 Add and subtract polynomials. • Using the distributive property may be required. • Unlike denominators may be used. I-3 Multiply polynomials. • Multiplying two quantities in parentheses may be required. • Squaring a quantity in parentheses may be required. • Adding or subtracting may be required • Raising a quantity to a power may be required. • Fractions may be used. • Adding exponents may be required. VI-1 Translate verbal or symbolic information into algebraic expressions; or identify equations or inequalities that represent graphs or problem situations. • Determining an equation or expression when given a verbal description may be required. • Graphing inequalities using a number line may be required. • Determining the equation of a line given two ordered pairs may be required.	X	

Alabama Course of Study: Mathematics	*Alabama High School Graduation Exam*	Stanford 9	Local
24. (continued)	• Determining the equation of a line given the line graphed on the coordinate plane may be required.		
25. Identify number sentences that represent the identity property of multiplication.	I-3 Multiply polynomials. • Multiplying two quantities in parentheses may be required. • Squaring a quantity in parentheses may be required. • Adding or subtracting may be required. • Raising a quantity to a power may be required. • Fractions may be used. • Adding exponents may be required.	X	
	VI-1 Translate verbal or symbolic information into algebraic expressions; or identify equations or inequalities that represent graphs or problem situations. • Determining an equation or expression when given a verbal description may be required. • Graphing inequalities using a number line may be required. • Determining the equation of a line given two ordered pairs may be required. • Determining the equation of a line given the line graphed on the coordinate plane may be required.		

Alabama Course of Study: Mathematics	*Alabama High School Graduation Exam*	Stanford 9	Local
26. Identify number sentences that represent the zero property of multiplication.	I-3 Multiply polynomials. • Multiplying two quantities in parentheses may be required. • Squaring a quantity in parentheses may be required. • Adding or subtracting may be required. • Raising a quantity to a power may be required. • Fractions may be used. • Adding exponents may be required. VI-1 Translate verbal or symbolic information into algebraic expressions; or identify equations or inequalities that represent graphs or problem situations. • Determining an equation or expression when given a verbal description may be required. • Graphing inequalities using a number line may be required. • Determining the equation of a line given two ordered pairs may be required. • Determining the equation of a line given the line graphed on the coordinate plane may be required.	X	

Alabama Course of Study: Mathematics	*Alabama High School Graduation Exam*	Stanford 9	Local
27. Illustrate that addition and subtraction are inverse operations. Example: 8 + 9 = 17 and 9 + 8 = 17; therefore, 17 - 8 = 9 and 17 - 9 = 8	I-2 Add and subtract polynomials. • Using the distributive property may be required. • Unlike denominators may be used.	X	
28. Illustrate multiplication and division as inverse operations. Example: number families (3, 4, 12) 3 x 4 = 12; 4 x 3 = 12; 12 ÷ 3 = 4; 12 ÷ 4 = 3	I-3 Multiply polynomials. • Multiplying two quantities in parentheses may be required. • Squaring a quantity in parentheses may be required. • Adding or subtracting may be required. • Raising a quantity to a power may be required. • Fractions may be used. • Adding exponents may be required.	X	
GEOMETRY, SPATIAL SENSE, MEASUREMENT			
29. Identify geometric figures. Examples: cones, cubes, cylinders, spheres, rectangular prisms, quadrilaterals, pentagons, hexagons, octagons	IV-1 Find the perimeter, circumference, area, or volume of geometric figures. • The value of pi (π) will be 3.14. • Options may be left in terms of π. • Unnecessary dimensions may be included. • Drawings may be used. • Finding volume or surface area of a rectangular prism may be required.	X	

Alabama Course of Study: Mathematics	*Alabama High School Graduation Exam*	Stanford 9	Local
29. (continued)	• Extracting a square root may be required. • Determining the area of a circle when given the diameter in the drawing may be required. • The formulas will be given in the problems. VII-4 Apply properties of plane and solid geometric figures. • Diagrams may be included. • Word problems may be used. • The following content may be included: - area and perimeter of triangles, rectangles, and squares - area and circumference of a circle, given radius or diameter - perimeter of a regular polygon, given one side - volume of rectangular prism or cylinder - sum of the measures of the angles in a triangle - sum of the measures of the angles in a rectangle • Determining any dimension of a figure may be required. • Determining any dimension of a figure when the dimension is expressed as an algebraic expression may be required.		

Alabama Course of Study: Mathematics	*Alabama High School Graduation Exam*	Stanford 9	Local
30. Use terms associated with geometric figures. Examples: sides, vertices, angles, surfaces, edges	IV-1 Find the perimeter, circumference, area, or volume of geometric figures. • The value of pi (π) will be 3.14. • Options may be left in terms of π. • Unnecessary dimensions may be included. • Drawings may be used. • Finding volume or surface area of a rectangular prism may be required. • Extracting a square root may be required. • Determining the area of a circle when given the diameter in the drawing may be required. • The formulas will be given in the problems. VII-4 Apply properties of plane and solid geometric figures. • Diagrams may be included. • Word problems may be used. • The following content may be included: - area and perimeter of triangles, rectangles, and squares - area and circumference of a circle, given radius or diameter - perimeter of a regular polygon, given one side - volume of rectangular prism or cylinder	X	

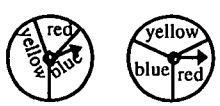
Alabama Course of Study: Mathematics	*Alabama High School Graduation Exam*	Stanford 9	Local
30. (continued)	- sum of the measures of the angles in a triangle - sum of the measures of the angles in a rectangle • Determining any dimension of a figure may be required. • Determining any dimension of a figure when the dimension is expressed as an algebraic expression may be required.		
31. Identify rotations (turns) and reflections (flips). Examples: reflection  rotation 		X	
32. Demonstrate proficiency in identifying lines of symmetry.		X	
33. Demonstrate proficiency in identifying congruent shapes and figures.		X	
34. Determine perimeter of polygons.	IV-1 Find the perimeter, circumference, area, or volume of geometric figures. • The value of pi (π) will be 3.14. • Options may be left in terms of π. • Unnecessary dimensions may be included. • Drawings may be used.		

Alabama Course of Study: Mathematics	*Alabama High School Graduation Exam*	Stanford 9	Local
34. (continued)	• Finding volume or surface area of a rectangular prism may be required. • Extracting a square root may be required. • Determining the area of a circle when given the diameter in the drawing may be required. • The formulas will be given in the problems. VII-4 Apply properties of plane and solid geometric figures. • Diagrams may be included. • Word problems may be used. • The following content may be included: - area and perimeter of triangles, rectangles, and squares - area and circumference of a circle, given radius or diameter - perimeter of a regular polygon, given one side - volume of rectangular prism or cylinder - sum of the measures of the angles in a triangle - sum of the measures of the angles in a rectangle • Determining any dimension of a figure may be required. • Determining any dimension of a figure when the dimension is expressed as an algebraic expression may be required.		

Alabama Course of Study: Mathematics	*Alabama High School Graduation Exam*	Stanford 9	Local
35. Determine and compare areas on a grid.		X	
36. Determine coordinate locations on a grid.	V-1 Graph or identify graphs of linear equations. • Equations may be expressed in terms of $f(x)$. • The options may be four graphs. • The option may be four equations. V-2 Graph lines given certain conditions. • The following conditions may be included: - two points - x- and y-intercepts - point and slope - slope and y-intercept	X	
37. Read scales of length, temperature, weight, and capacity.		X	
38. Use abbreviations and symbols for units of measurement in the customary and metric systems.			
39. Estimate, determine, record, and discuss length, distance, mass, weight, and capacity using appropriate metric and customary measuring tools and units.		X	

Alabama Course of Study: Mathematics	*Alabama High School Graduation Exam*	Stanford 9	Local
40. Estimate, determine, record, and discuss temperature using Celsius and Fahrenheit thermometers.		X	
41. Select appropriate units for measuring and solving problems in both the metric and customary systems.		X	
42. Identify equivalent measures within a measurement system. Examples: 12 inches = 1 foot, 4 cups = 1 quart, 100 centimeters = 1 meter			
43. Explain vocabulary associated with time. • a.m. and p.m. • Noon and midnight			
44. Demonstrate proficiency in using analog and digital clocks to identify time to the minute.			
45. Solve problems using analog and digital clocks.			
46. Identify and determine elapsed time. • Using calendars • Using clocks		X	
47. Use coins and bills. • Counting and trading • Making change up to $10.00		X	

Alabama Course of Study: Mathematics	*Alabama High School Graduation Exam*	Stanford 9	Local
PATTERNS, FUNCTIONS, ALGEBRA			
48. Describe, extend and create a variety of number patterns.		X	
49. Describe, extend, and create a variety of geometric patterns.		X	
50. Explore number patterns using a calculator.			
51. Use addition and subtraction number sentences to express equalities. Example: $17 + 3 = 25 - 5$	I-2 Add and subtract polynomials. • Using the distributive property may be required. • Unlike denominators may be used.		
52. Solve addition and subtraction number sentences with a missing addend or subtrahend.	I-2 Add and subtract polynomials. • Using the distributive property may be required. • Unlike denominators may be used.		
PROBABILITY, STATISTICS, DISCRETE MATHEMATICS			
53. Analyze information collected from real-life situations. • Organizing data • Displaying data Examples: lists, tables, tally charts, pictographs, bar graphs, circle graphs • Describing data		X	

Alabama Course of Study: Mathematics	*Alabama High School Graduation Exam*	Stanford 9	Local
54. Make predictions and decisions from a sampling.	VII-6 Determine probabilities. • Both AND and OR situations may be included.	X	
55. Predict, record, and discuss outcomes using real-life data and information. Examples: weather, daily classroom activities, events	VII-6 Determine probabilities. • Both AND and OR situations may be included.		
56. Identify most likely and least likely outcomes. Examples: tossing coins, using spinners 		X	

Alabama Course of Study: Mathematics	*Alabama High School Graduation Exam*	Stanford 9	Local
NUMBER SENSE, NUMBER SYSTEMS, NUMBER THEORY **CONTENT STANDARDS** Students will			
1. Identify the place value of a digit in a whole number to the millions place.		X	
2. Compare and order numbers and sets to 9999. • Using >, <, =, and ≠		X	
3. Demonstrate an understanding of place value. • Linking concrete materials to number symbols Example: base 10 blocks • Identifying a number when given a pictorial representation of groups of ones, tens, hundreds, and thousands • Writing a number in expanded notation Example: 342 = 3 hundreds + 4 tens + 2 ones 342 = (3 x 100) + (4 x 10) + (2 x 1) • Determining the value of a digit Example: 342—the value of 3 is 300 the value of 4 is 40 the value of 2 is 2		X	

Alabama Course of Study: Mathematics	*Alabama High School Graduation Exam*	Stanford 9	Local
4. Identify a number that is 1000 more or 1000 less than a given number.		X	
5. Round whole numbers to the nearest ten, hundred, and thousand.		X	
6. Round money values to the nearest dollar and dime.		X	
7. Round decimals to the nearest whole number.		X	
8. Develop vocabulary associated with operations. Examples: divisor, dividend			
9. Estimate sums, differences, products, and quotients of whole numbers. • Using compatible numbers Example: 24 + 26 = 25 + 25 • Using front-end estimation Example: 78 is approximately 70 +31 +30		X	
10. Demonstrate proficiency in addition and subtraction of three-digit numbers with and without regrouping.	I-2 Add and subtract polynomials. • Using the distributive property may be required. • Unlike denominators may be used.	X	

Alabama Course of Study: Mathematics	*Alabama High School Graduation Exam*	Stanford 9	Local
11. Determine whether results are reasonable.		X	
12. Identify and apply properties of addition and multiplication. • Associative: $(2+3)+5=2+(3+5)$, $(2\times4)\times6=2\times(4\times6)$ • Commutative: $2+3=3+2$, $2\times3=3\times2$ • Identity: $3+0=3$, $3\times1=3$	I-2 Add and subtract polynomials. • Using the distributive property may be required. • Unlike denominators may be used. I-3 Multiply polynomials. • Multiplying two quantities in parentheses may be required. • Squaring a quantity in parentheses may be required. • Adding or subtracting may be required. • Raising a quantity to a power may be required. • Fractions may be used. • Adding exponents may be required.	X	
13. Identify number sentences that represent inverse operations.	I-2 Add and subtract polynomials. • Using the distributive property may be required. • Unlike denominators may be used.	X	

Alabama Course of Study: Mathematics	*Alabama High School Graduation Exam*	Stanford 9	Local
13. (continued)	I-3 Multiply polynomials. • Multiplying two quantities in parentheses may be required. • Squaring a quantity in parentheses may be required. • Adding or subtracting may be required. • Raising a quantity to a power may be required. • Fractions may be used. • Adding exponents may be required.		
14. Apply rules to determine divisibility by 2, 3, 5, and 10. Example: If the sum of the digits is divisible by 3, the number is divisible by 3.			
15. Use problem-solving strategies. • Identifying what information is missing • Identifying operations needed to solve problems • Applying a variety of strategies to solve non-routine problems Examples: tables, charts, manipulatives, patterns and drawings, guess and check	VII-8 Solve problems involving algebraic concepts. • Word problems will be used. • Interpretation of figures may be required. • The following content may be included: - distance-rate-time problems - money problems, which may require a system of equations - numbers (sum, difference, product, quotient) - simple age problems referring only to the present	X	

Alabama Course of Study: Mathematics	*Alabama High School Graduation Exam*	Stanford 9	Local
15. (continued)	- consecutive integers - area, volume, dimension problems - quantity problems - cost problems - wage problems		
16. Determine and use the most appropriate method of calculation. • Paper and pencil • Mental math • Calculator			
17. Demonstrate oral and written proficiency in using multiplication facts through 12 x 12.	I-3 Multiply polynomials. • Multiplying two quantities in parentheses may be required. • Squaring a quantity in parentheses may be required. • Adding or subtracting may be required. • Raising a quantity to a power may be required. • Fractions may be used. • Adding exponents may be required.	X	

Alabama Course of Study: Mathematics	*Alabama High School Graduation Exam*	Stanford 9	Local
18. Demonstrate oral and written proficiency in using basic division facts.	I-3 Multiply polynomials. • Multiplying two quantities in parentheses may be required. • Squaring a quantity in parentheses may be required. • Adding or subtracting may be required. • Raising a quantity to a power may be required. • Fractions may be used. • Adding exponents may be required.	X	
19. Demonstrate proficiency with one-digit multipliers and one-digit divisors.	I-3 Multiply polynomials. • Multiplying two quantities in parentheses may be required. • Squaring a quantity in parentheses may be required. • Adding or subtracting may be required. • Raising a quantity to a power may be required. • Fractions may be used. • Adding exponents may be required.	X	

Alabama Course of Study: Mathematics	*Alabama High School Graduation Exam*	Stanford 9	Local
20. Multiply with two-digit multipliers.	I-3 Multiply polynomials. • Multiplying two quantities in parentheses may be required. • Squaring a quantity in parentheses may be required. • Adding or subtracting may be required. • Raising a quantity to a power may be required. • Fractions may be used. • Adding exponents may be required.	X	
21. Add, subtract, multiply, and divide whole numbers in context.	I-2 Add and subtract polynomials. • Using the distributive property may be required. • Unlike denominators may be used. I-3 Multiply polynomials. • Multiplying two quantities in parentheses may be required. • Squaring a quantity in parentheses may be required. • Adding or subtracting may be required. • Raising a quantity to a power may be required. • Fractions may be used. • Adding exponents may be required.	X	

Alabama Course of Study: Mathematics	*Alabama High School Graduation Exam*	Stanford 9	Local
22. Multiply and divide large numbers using a calculator and determine whether an answer is reasonable.			
23. Solve problems in context using multiple operations.	I-1 Apply order of operations. • One, two, or no variables may be used. • One set of parentheses may be used. • Determining the absolute value of a term may be required. • Squaring the quantity in parentheses may be required. • No more than four terms may be included. • Adding or subtracting negative integers may be required. • Decimals to the tenths' place may be used. VII-8 Solve problems involving algebraic concepts. • Word problems will be used. • Interpretation of figures may be required. • The following content may be included: - distance-rate-time problems - money problems, which may require a system of equations - numbers (sum, difference, product, quotient)	X	

Alabama Course of Study: Mathematics	*Alabama High School Graduation Exam*	Stanford 9	Local
23. (continued)	- simple age problems referring only to the present - consecutive integers - area, volume, dimension problems - quantity problems - cost problems - wage problems		
24. Model and interpret proper fractions, improper fractions, and mixed numbers.			
25. Restate fractions as a form of division. Example: $\frac{5}{4}$ as $5 \div 4$			
26. Model and interpret fractional equivalents as parts of a whole and parts of a group. Example: $\frac{1}{3}$ is the same as 2 out of 6		X	
27. Recognize a whole as 100%, $\frac{1}{2}$ as 50%, and $\frac{1}{4}$ as 25%.			

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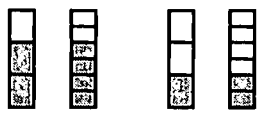
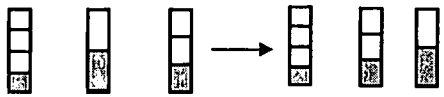
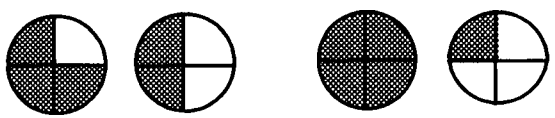
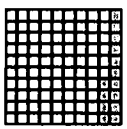
28. Use models to interpret equivalent fractions including the simplification (lowest terms) of fractions. Example: $\frac{2}{3}=\frac{4}{6}$ $\frac{1}{3}=\frac{2}{6}$ 			
29. Convert between improper fractions and whole or mixed numbers.			
30. Use models to compare and order fractions with and without common denominators. Example: Place the fraction bars in the correct order from the smallest fraction represented to the largest fraction represented. 		X	
31. Model addition and subtraction of fractions with common denominators. Examples: $\frac{1}{6}+\frac{1}{6}=\frac{2}{6}=\frac{1}{3}$  $\frac{3}{4}+\frac{2}{4}=$ $\frac{5}{4}=1\frac{1}{4}$ 			

Alabama Course of Study: Mathematics	*Alabama High School Graduation Exam*	Stanford 9	Local
32. Read, write, model, and interpret decimals through the hundredths place. Example:  $\frac{14}{100}$ = .14 = fourteen hundredths			
33. Identify place value of a digit in a decimal to the hundredths place.		X	
34. Write money amounts in words and dollar-and-cents notation.			
35. Identify and compare representations of decimals and money amounts. Examples: base ten blocks, money		X	
36. Compare and order decimals and money amounts. Examples: .34 > .26 .6 < .9		X	
37. Add and subtract decimals and money amounts in context.		X	
GEOMETRY, SPATIAL SENSE, MEASUREMENT			
38. Demonstrate proficiency in selecting appropriate units of measure.		X	

Alabama Course of Study: Mathematics	*Alabama High School Graduation Exam*	Stanford 9	Local
39. Compare measurements of length.		X	
40. Determine length, weight, capacity, and temperature using metric and customary tools.		X	
41. Estimate length, weight, capacity, and temperature and determine whether the estimate is reasonable.		X	
42. Recognize, describe, compare, and discuss a variety of geometric figures given models, pictures, and drawings. Examples: quadrilaterals, pentagons, triangles, octagons, cones, cubes, spheres, cylinders, prisms	IV-1 Find the perimeter, circumference, area, or volume of geometric figures. • The value of pi (π) will be 3.14. • Options may be left in terms of π. • Unnecessary dimensions may be included. • Drawings may be used. • Finding volume or surface area of a rectangular prism may be required. • Extracting a square root may be required. • Determining the area of a circle when given the diameter in the drawing may be required. • The formulas will be given in the problems.	X	

Alabama Course of Study: Mathematics	*Alabama High School Graduation Exam*	Stanford 9	Local
42. (continued)	VII-4 Apply properties of plane and solid geometric figures. • Diagrams may be included. • Word problems may be used. • The following content may be included: - area and perimeter of triangles, rectangles, and squares - area and circumference of a circle, given radius or diameter - perimeter of a regular polygon, given one side - volume of rectangular prism or cylinder - sum of the measures of the angles in a triangle - sum of the measures of the angles in a rectangle • Determining any dimension of a figure may be required. • Determining any dimension of a figure when the dimension is expressed as an algebraic expression may be required.		

Alabama Course of Study: Mathematics	*Alabama High School Graduation Exam*	Stanford 9	Local
43. Identify components of geometric figures. Examples: sides, vertices, angles, surfaces (faces), edges	IV-1 Find the perimeter, circumference, area, or volume of geometric figures. • The value of pi (π) will be 3.14. • Options may be left in terms of π. • Unnecessary dimensions may be included. • Drawings may be used. • Finding volume or surface area of a rectangular prism may be required. • Extracting a square root may be required. • Determining the area of a circle when given the diameter in the drawing may be required. • The formulas will be given in the problems. VII-4 Apply properties of plane and solid geometric figures. • Diagrams may be included. • Word problems may be used. • The following content may be included: - area and perimeter of triangles, rectangles, and squares - area and circumference of a circle, given radius or diameter - perimeter of a regular polygon, given one side	X	

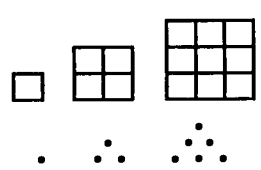
Alabama Course of Study: Mathematics	*Alabama High School Graduation Exam*	Stanford 9	Local
43. (continued)	- volume of rectangular prism or cylinder - sum of the measures of the angles in a triangle - sum of the measures of the angles in a rectangle • Determining any dimension of a figure may be required. • Determining any dimension of a figure when the dimension is expressed as an algebraic expression may be required.		
44. Identify geometric representations. • Points • Lines • Perpendicular lines • Parallel lines • Right angles • Rays	VII-1 Apply properties of angles and relationships between angles. • The following properties and relationships may be included: - vertical angles - adjacent angles - supplementary angles - complementary angles - linear pair (adjacent supplementary angles) - relationships among the measures of angles formed by two parallel lines and a transversal • Word problems may be used. • The knowledge of the sum of measures of angles may be used. • Determining measurements of angles when the measurements of angles are expressed as algebraic expressions may be required.		

Alabama Course of Study: Mathematics	*Alabama High School Graduation Exam*	Stanford 9	Local
45. Classify and compare angles. • Less than a right angle • Greater than a right angle	VII-1 Apply properties of angles and relationships between angles. • The following properties and relationships may be included: - vertical angles - adjacent angles - supplementary angles - complementary angles - linear pair (adjacent supplementary angles) - relationships among the measures of angles formed by two parallel lines and a transversal • Word problems may be used. • The knowledge of the sum of measures of angles may be used. • Determining measurements of angles when the measurements of angles are expressed as algebraic expressions may be required.	X	
46. Determine lines of symmetry.		X	

Alabama Course of Study: Mathematics	*Alabama High School Graduation Exam*	Stanford 9	Local
47. Use rotations (turns) and reflections (flips) in problem-solving situations. Examples: reflection  rotation 		X	
48. Identify coordinate locations and plot points on a grid. Example: map reading (grid map, latitude and longitude map)	V-1 Graph or identify graphs of linear equations. • Equations may be expressed in terms of $f(x)$. • The options may be four graphs. • The option may be four equations. V-2 Graph lines given certain conditions. • The following conditions may be included: - two points - x- and y-intercepts - point and slope - slope and y-intercept	X	
49. Determine and compare areas of polygons using models. Examples: grid paper, unit squares		X	

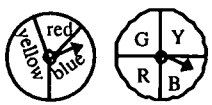
Alabama Course of Study: Mathematics	*Alabama High School Graduation Exam*	Stanford 9	Local
50. Distinguish between perimeter and area.	IV-1 Find the perimeter, circumference, area, or volume of geometric figures. • The value of pi (π) will be 3.14. • Options may be left in terms of π. • Unnecessary dimensions may be included. • Drawings may be used. • Finding volume or surface area of a rectangular prism may be required. • Extracting a square root may be required. • Determining the area of a circle when given the diameter in the drawing may be required. • The formulas will be given in the problems. VII-4 Apply properties of plane and solid geometric figures. • Diagrams may be included. • Word problems may be used. • The following content may be included: - area and perimeter of triangles, rectangles, and squares - area and circumference of a circle, given radius or diameter - perimeter of a regular polygon, given one side		

Alabama Course of Study: Mathematics	*Alabama High School Graduation Exam*	Stanford 9	Local
50. (continued)	- volume of rectangular prism or cylinder - sum of the measures of the angles in a triangle - sum of the measures of the angles in a rectangle • Determining any dimension of a figure may be required. • Determining any dimension of a figure when the dimension is expressed as an algebraic expression may be required.		
51. Demonstrate proficiency in relating equivalent units of time. Examples: 52 weeks = 1 year, 60 minutes = 1 hour 60 seconds = 1 minute			
52. Solve problems involving elapsed time.		X	
53. Demonstrate proficiency in counting and trading coins and bills.		X	
54. Solve problems that require making correct change.			
PATTERNS, FUNCTIONS, ALGEBRA			
55. Determine patterns in number sequences. Examples: multiples of 2, 3, 4, 5; odd and even numbers		X	

Alabama Course of Study: Mathematics	*Alabama High School Graduation Exam*	Stanford 9	Local
56. Generate patterns from a rule. Example: IN | RULE +2 | OUT 1 | 1 +2 | 3 2 | 2 +2 | ? 3 | ? | 4 | |	III-1 Identify functions. • The options may be graphs, ordered pairs, tables, or mappings. • The options may be equations when given a table of values or ordered pairs. • The options may be tables of values or ordered pairs when given an equation. • Functions may be expressed using either the terminology "$f(x) =$" or "$y =$".		
57. Construct patterns using numbers and/or geometric figures. • Repeating patterns (core repeats) Examples: 1 2 3 1 2 3 △○□△○□ • Growing patterns (core grows) Examples: 1 2 1 1 2 3 2 1 1 2 3 4 3 2 1 ab abc abcd 		X	

Alabama Course of Study: Mathematics	*Alabama High School Graduation Exam*	Stanford 9	Local
58. Solve open number sentences involving addition, subtraction, multiplication, and division.	I-1 Apply order of operations. • One, two, or no variables may be used. • One set of parentheses may be used. • Determining the absolute value of a term may be required. • Squaring the quantity in parentheses may be required. • No more than four terms may be included. • Adding or subtracting negative integers may be required. • Decimals to the tenths' place may be used. I-2 Add and subtract polynomials. • Using the distributive property may be required. • Unlike denominators may be used. I-3 Multiply polynomials. • Multiplying two quantities in parentheses may be required. • Squaring a quantity in parentheses may be required. • Adding or subtracting may be required. • Raising a quantity to a power may be required. • Fractions may be used. • Adding exponents may be required.	X	

Alabama Course of Study: Mathematics	*Alabama High School Graduation Exam*	Stanford 9	Local
59. Construct number sentences that represent problem situations.	VI-1 Translate verbal or symbolic information into algebraic expressions; or identify equations or inequalities that represent graphs or problem situations. • Determining an equation or expression when given a verbal description may be required. • Graphing inequalities using a number line may be required. • Determining the equation of a line given two ordered pairs may be required. • Determining the equation of a line given the line graphed on the coordinate plane may be required. VII-8 Solve problems involving algebraic concepts. • Word problems will be used. • Interpretation of figures may be required. • The following content may be included: - distance-rate-time problems - money problems, which may require a system of equations - numbers (sum, difference, product, quotient) - simple age problems referring only to the present - consecutive integers - area, volume, dimension problems - quantity problems - cost problems - wage problems		

Alabama Course of Study: Mathematics	*Alabama High School Graduation Exam*	Stanford 9	Local
PROBABILITY, STATISTICS, DISCRETE MATHEMATICS			
60. Display and interpret data using tally charts, diagrams, tables, and graphs (bar, line, circle, and pictograph).		X	
61. Use sampling techniques to collect information and make predictions.		X	
62. Make predictions based on exploration of probability. • Most likely outcomes • Least likely outcomes Example: spinners 	VII-6 Determine probabilities. • Both AND or OR situations may be included.	X	

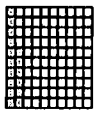
Alabama Course of Study: Mathematics	*Alabama High School Graduation Exam*	Stanford 9	Local
NUMBER SENSE, NUMBER SYSTEMS, NUMBER THEORY **CONTENT STANDARDS** Students will			
1. Extend understanding of whole numbers through billions and decimals through thousandths. • Rounding • Naming, ordering, comparing • Identifying place value • Using expanded notation (whole numbers)		X	
2. Demonstrate proficiency in the use of whole number concepts through millions. • Rounding • Naming, ordering, comparing • Identifying place value • Using expanded notation (whole numbers)		X	
3. Demonstrate proficiency in the use of basic operations on whole numbers through two-digit multipliers. Example: 247 x 23	I-1 Apply order of operations. • One, two, or no variables may be used. • One set of parentheses may be used. • Determining the absolute value of a term may be required. • Squaring the quantity in parentheses may be required. • No more than four terms may be included.	X	

Alabama Course of Study: Mathematics	*Alabama High School Graduation Exam*	Stanford 9	Local
3. (continued)	• Adding or subtracting negative integers may be required. • Decimals to the tenths' place may be used. I-2 Add and subtract polynomials. • Using the distributive property may be required. • Unlike denominators may be used. I-3 Multiply polynomials. • Multiplying two quantities in parentheses may be required. • Squaring a quantity in parentheses may be required. • Adding or subtracting may be required. • Raising a quantity to a power may be required. • Fractions may be used. • Adding exponents may be required.		

Alabama Course of Study: Mathematics	*Alabama High School Graduation Exam*	Stanford 9	Local
4. Divide whole numbers with two-digit divisors. Example: 274 ÷ 26	I-1 Apply order of operations. • One, two, or no variables may be used. • One set of parentheses may be used. • Determining the absolute value of a term may be required. • Squaring the quantity in parentheses may be required. • No more than four terms may be included. • Adding or subtracting negative integers may be required. • Decimals to the tenths' place may be used.		
5. Apply rules to determine divisibility by 2, 3, 5, and 10. Example: If the sum of the digits is divisible by 3, the number is divisible by 3.			
6. Develop an understanding of fractions and mixed numbers using physical materials and pictorial and numerical representations. • Naming, ordering, comparing • Identifying equivalent forms (common denominators) • Identifying lowest terms (simplification) • Identifying proper and improper fractions		X	

Alabama Course of Study: Mathematics	*Alabama High School Graduation Exam*	Stanford 9	Local
7. Demonstrate proficiency in adding and subtracting fractions with common denominators.	I-2 Add and subtract polynomials. • Using the distributive property may be required. • Unlike denominators may be used.	X	
8. Multiply and divide fractions.	I-3 Multiply polynomials. • Multiplying two quantities in parentheses may be required. • Squaring a quantity in parentheses may be required. • Adding or subtracting may be required. • Raising a quantity to a power may be required. • Fractions may be used. • Adding exponents may be required.	X	

Alabama Course of Study: Mathematics	*Alabama High School Graduation Exam*	Stanford 9	Local
9. Add, subtract, and multiply decimals.	I-1 Apply order of operations. • One, two, or no variables may be used. • One set of parentheses may be used. • Determining the absolute value of a term may be required. • Squaring the quantity in parentheses may be required. • No more than four terms may be included. • Adding or subtracting negative integers may be required. • Decimals to the tenths' place may be used. I-2 Add and subtract polynomials. • Using the distributive property may be required. • Unlike denominators may be used. I-3 Multiply polynomials. • Multiplying two quantities in parentheses may be required. • Squaring a quantity in parentheses may be required. • Adding or subtracting may be required. • Raising a quantity to a power may be required. • Fractions may be used. • Adding exponents may be required.	X	

Alabama Course of Study: Mathematics	*Alabama High School Graduation Exam*	Stanford 9	Local
10. Model and relate percents to parts of 100 using equivalent fractions and decimals. Example:  $= \frac{16}{100} = \frac{4}{25} = .16$ = sixteen hundredths = 16%			
11. Identify alternative representations of fractions, mixed numbers, decimals, and percents. Example:  $= \frac{1}{4} = .25 = 25\%$		X	
12. Understand concepts of positive and negative integers in real-life situations. Examples: temperature, altitude			

Alabama Course of Study: Mathematics	*Alabama High School Graduation Exam*	Stanford 9	Local
13. Apply basic operations in problem-solving situations involving whole numbers, decimals, fractions, mixed numbers, and money.	VII-8 Solve problems involving algebraic concepts. • Word problems will be used. • Interpretation of figures may be required. • The following content may be included: - distance-rate-time problems - money problems, which may require a system of equations - numbers (sum, difference, product, quotient) - simple age problems referring only to the present - consecutive integers - area, volume, dimension problems - quantity problems - cost problems - wage problems	X	
14. Solve contextual problems requiring rounding of numbers.		X	
15. Develop an understanding of number theory concepts. • Prime factors • Least common multiples • Greatest common factors	I-4 Factor polynomials. • The following factoring may be required: - difference of two squares - greatest common monomial - trinomial - common binomial • Options will be factored completely.	X	

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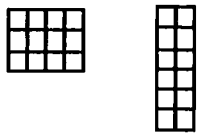
16. Use estimation to determine whether results are reasonable.		X	
17. Use methods of estimation appropriate to a given situation. • Front-end Example: $1\frac{7}{12} \rightarrow 1 \quad \frac{7}{12} \approx \frac{1}{2}$ $1\frac{5}{8} \rightarrow 1 \quad \frac{5}{8} \approx \frac{1}{2}$ $+1 \quad +1 \quad 1 \rightarrow 3 + 1 = (4)$ • Compatible numbers Example: $3.02 \times 7.3 \approx 3 \times 7$ or (21) $6\overline{)550} \approx 6\overline{)(90)540}$ • Clustering Example: $1.78 + $1.85 + $2.12 All of the addends are close to the same dollar amount—$2. Therefore, $2 × 3 = $6.		X	
18. Determine and use the most appropriate method of calculation. • Paper and pencil • Mental math • Calculator			

Alabama Course of Study: Mathematics	*Alabama High School Graduation Exam*	Stanford 9	Local
19. Apply a variety of strategies to solve problems with an emphasis on multi-step and non-routine problems. Examples: dramatize; work backwards; draw a diagram; guess, test, and revise; find a pattern; estimate; experiment; make an organized list, table, or chart; solve a simpler problem; write an equation (number sentence); use logical reasoning; use manipulatives	VII-8 Solve problems involving algebraic concepts. • Word problems will be used. • Interpretation of figures may be required. • The following content may be included: - distance-rate-time problems - money problems, which may require a system of equations - numbers (sum, difference, product, quotient) - simple age problems referring only to the present - consecutive integers - area, volume, dimension problems - quantity problems - cost problems - wage problems	X	

Alabama Course of Study: Mathematics	*Alabama High School Graduation Exam*	Stanford 9	Local
GEOMETRY, SPATIAL SENSE, MEASUREMENT			
20. Compare lengths, areas, volumes, and weights of objects using physical materials and pictorial and numerical representations. Example: A B  Compare the perimeters of A and B. Circle >, <, or = in the sentence below: Perimeter of A >, <, = Perimeter of B	IV-1 Find the perimeter, circumference, area, or volume of geometric figures. • The value of pi (π) will be 3.14. • Options may be left in terms of π. • Unnecessary dimensions may be included. • Drawings may be used. • Finding volume or surface area of a rectangular prism may be required. • Extracting a square root may be required. • Determining the area of a circle when given the diameter in the drawing may be required. • The formulas will be given in the problems. IV-2 Find the distance, midpoint, or slope of line segments when given two points. • Radicals may be used. • Radicals will be simplified. • Lines graphed on the coordinate plane may be included.	X	

Alabama Course of Study: Mathematics	*Alabama High School Graduation Exam*	Stanford 9	Local
20. (continued)	• Determining the slope of a line given a line on the coordinate plane with two points labeled with their ordered pairs may be required. • Determining the slope of a line or midpoint of a line segment given two points on a line on the coordinate plane without any coordinates labeled may be required. • The formulas will be given in the problems. VII-4 Apply properties of plane and solid geometric figures. • Diagrams may be included. • Word problems may be used. • The following content may be included: - area and perimeter of triangles, rectangles, and squares - area and circumference of a circle, given radius or diameter - perimeter of a regular polygon, given one side - volume of rectangular prism or cylinder - sum of the measures of the angles in a triangle - sum of the measures of the angles in a rectangle • Determining any dimension of a figure may be required.		

Alabama Course of Study: Mathematics	*Alabama High School Graduation Exam*	Stanford 9	Local
20. (continued)	• Determining any dimension of a figure when the dimension is expressed as an algebraic expression may be required.		
21. Select and use appropriate tools and units of measurement. • Customary • Metric		X	
22. Estimate and calculate perimeter and area.	IV-1 Find the perimeter, circumference, area, or volume of geometric figures. • The value of pi (π) will be 3.14. • Options may be left in terms of π. • Unnecessary dimensions may be included. • Drawings may be used. • Finding volume or surface area of a rectangular prism may be required. • Extracting a square root may be required. • Determining the area of a circle when given the diameter in the drawing may be required. • The formulas will be given in the problems.	X	

Alabama Course of Study: Mathematics	*Alabama High School Graduation Exam*	Stanford 9	Local
22. (continued)	VII-4 Apply properties of plane and solid geometric figures. • Diagrams may be included. • Word problems may be used. • The following content may be included: - area and perimeter of triangles, rectangles, and squares - area and circumference of a circle, given radius or diameter - perimeter of a regular polygon, given one side - volume of rectangular prism or cylinder - sum of the measures of the angles in a triangle - sum of the measures of the angles in a rectangle • Determining any dimension of a figure may be required. • Determining any dimension of a figure when the dimension is expressed as an algebraic expression may be required.		

Alabama Course of Study: Mathematics	*Alabama High School Graduation Exam*	Stanford 9	Local
23. Classify, compare, measure, and draw angles. • Right • Acute • Obtuse • Straight	VII-1 Apply properties of angles and relationships between angles. • The following properties and relationships may be included: - vertical angles - adjacent angles - supplementary angles - complementary angles - linear pair (adjacent supplementary angles) - relationships among the measures of angles formed by two parallel lines and a transversal • Word problems may be used. • The knowledge of the sum of measures of angles may be used. • Determining measurements of angles when the measurements of angles are expressed as algebraic expressions may be required.	X	
24. Convert from one measurement to another within the same system.		X	

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25. Determine measurements indirectly from scale drawings. Examples: blueprints, maps	VII-3 Apply properties of similar polygons. • Diagrams may be included. • Drawings will be to scale. • The word *similar* or the symbol "~" may be used. • Use of the scale factor will be required.	X	
26. Define and/or draw plane geometric representations. • Points • Perpendicular lines • Lines • Angles • Line segments • Parallel lines • Rays • Transversals	VII-1 Apply properties of angles and relationships between angles. • The following properties and relationships may be included: - vertical angles - adjacent angles - supplementary angles - complementary angles - linear pair (adjacent supplementary angles) - relationships among the measures of angles formed by two parallel lines and a transversal • Word problems may be used. • The knowledge of the sum of measures of angles may be used. • Determining measurements of angles when the measurements of angles are expressed as algebraic expressions may be required.		

Alabama Course of Study: Mathematics	*Alabama High School Graduation Exam*	Stanford 9	Local
27. Describe and classify polygons and solid geometric figures using component features.	IV-1 Find the perimeter, circumference, area, or volume of geometric figures. • The value of pi (π) will be 3.14. • Options may be left in terms of π. • Unnecessary dimensions may be included. • Drawings may be used. • Finding volume or surface area of a rectangular prism may be required. • Extracting a square root may be required. • Determining the area of a circle when given the diameter in the drawing may be required. • The formulas will be given in the problems. VII-4 Apply properties of plane and solid geometric figures. • Diagrams may be included. • Word problems may be used. • The following content may be included: - area and perimeter of triangles, rectangles, and squares - area and circumference of a circle, given radius or diameter - perimeter of a regular polygon, given one side	X	

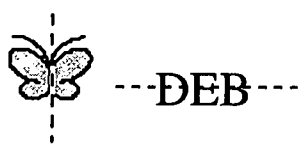
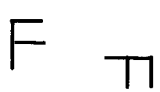
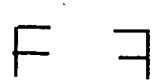
Alabama Course of Study: Mathematics	*Alabama High School Graduation Exam*	Stanford 9	Local
27. (continued)	- volume of rectangular prism or cylinder - sum of the measures of the angles in a triangle - sum of the measures of the angles in a rectangle • Determining any dimension of a figure may be required. • Determining any dimension of a figure when the dimension is expressed as an algebraic expression may be required.		
28. Exhibit proficiency in identifying parallel lines, perpendicular lines, squares, circles, rectangles, triangles, cubes, rectangular prisms, cones, cylinders, and pyramids.	VII-1 Apply properties of angles and relationships between angles. • The following properties and relationships may be included: - vertical angles - adjacent angles - supplementary angles - complementary angles - linear pair (adjacent supplementary angles) - relationships among the measures of angles formed by two parallel lines and a transversal		

Alabama Course of Study: Mathematics	*Alabama High School Graduation Exam*	Stanford 9	Local
28. (continued)	• Word problems may be used. • The knowledge of the sum of measures of angles may be used. • Determining measurements of angles when the measurements of angles are expressed as algebraic expressions may be required. VII-4 Apply properties of plane and solid geometric figures. • Diagrams may be included. • Word problems may be used. • The following content may be included: - area and perimeter of triangles, rectangles, and squares - area and circumference of a circle, given radius or diameter - perimeter of a regular polygon, given one side - volume of rectangular prism or cylinder - sum of the measures of the angles in a triangle - sum of the measures of the angles in a rectangle • Determining any dimension of a figure may be required. • Determining any dimension of a figure when the dimension is expressed as an algebraic expression may be required.		

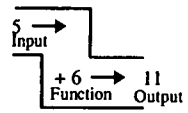
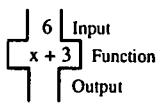
Alabama Course of Study: Mathematics	*Alabama High School Graduation Exam*	Stanford 9	Local
29. Identify and draw parts of a circle. • Center • Radius • Diameter	IV-1 Find the perimeter, circumference, area, or volume of geometric figures. • The value of pi (π) will be 3.14. • Options may be left in terms of π. • Unnecessary dimensions may be included. • Drawings may be used. • Finding volume or surface area of a rectangular prism may be required. • Extracting a square root may be required. • Determining the area of a circle when given the diameter in the drawing may be required. • The formulas will be given in the problems. VII-4 Apply properties of plane and solid geometric figures. • Diagrams may be included. • Word problems may be used. • The following content may be included: - area and perimeter of triangles, rectangles, and squares - area and circumference of a circle, given radius or diameter		

Alabama Course of Study: Mathematics	*Alabama High School Graduation Exam*	Stanford 9	Local
29. (continued)	- perimeter of a regular polygon, given one side - volume of rectangular prism or cylinder - sum of the measures of the angles in a triangle - sum of the measures of the angles in a rectangle • Determining any dimension of a figure may be required. • Determining any dimension of a figure when the dimension is expressed as an algebraic expression may be required.		
30. Identify triangles. • Right • Equilateral • Isosceles • Scalene • Obtuse • Acute	VII-2 Apply Pythagorean Theorem. • The Pythagorean Theorem will be given on the reference page. • Diagrams will be included. • Word problems will be used. • Radicals may be included in options. • All radicals will be simplified. • Drawings will be to scale.		

Alabama Course of Study: Mathematics	*Alabama High School Graduation Exam*	Stanford 9	Local
30. (continued)	VII-4 Apply properties of plane and solid geometric figures. • Diagrams may be included. • Word problems may be used. • The following content may be included: - area and perimeter of triangles, rectangles, and squares - area and circumference of a circle, given radius or diameter - perimeter of a regular polygon, given one side - volume of rectangular prism or cylinder - sum of the measures of the angles in a triangle - sum of the measures of the angles in a rectangle • Determining any dimension of a figure may be required. • Determining any dimension of a figure when the dimension is expressed as an algebraic expression may be required.		
31. Develop an understanding of corresponding parts of congruent figures.			

Alabama Course of Study: Mathematics	*Alabama High School Graduation Exam*	Stanford 9	Local
32. Develop an understanding of similarity. Examples: measuring figures, using scale drawings	VII-3 Apply properties of similar polygons. • Diagrams may be included. • Drawings will be to scale. • The word *similar* or the symbol "~" may be used. • Use of the scale factor will be required.		
33. Detect lines of symmetry in art, nature, architecture, and symbols. Examples:  			
34. Exhibit proficiency in identifying lines of symmetry in plane geometric figures.		X	
35. Identify geometric transformations. • Translation (slide) Example:  • Rotation (turn on a point) Example:  • Reflection (flip) Example: 		X	

Alabama Course of Study: Mathematics	*Alabama High School Graduation Exam*	Stanford 9	Local
36. Identify coordinates on grids, graphs, and maps.	V-1 Graph or identify graphs of linear equations. • Equations may be expressed in terms of $f(x)$. • The options may be four graphs. • The option may be four equations. V-2 Graph lines given certain conditions. • The following conditions may be included: - two points - x- and y-intercepts - point and slope - slope and y-intercept V-4 Identify graphs of common relations. • The common relations are: - x = constant - y = constant - y = x - $y = \sqrt{x}$ - $y = x^2$ - $y = \lvert x \rvert$ • The options may be four graphs. • The options may be four equations.	X	

Alabama Course of Study: Mathematics	*Alabama High School Graduation Exam*	Stanford 9	Local
PATTERNS, FUNCTIONS, ALGEBRA			
37. Describe, extend, and create a wide variety of numeric and geometric patterns.		X	
38. Find the output of functions (number machines). Examples:  If the input is 7, what is the output?  What is the output?	III-1 Identify functions • The options may be graphs, ordered pairs, tables, or mappings. • The options may be equations when given a table of values or ordered pairs. • The options may be tables of values or ordered pairs when given an equation. • Functions may be expressed using either the terminology "$f(x) =$" or "$y =$". III-2 Find the range of functions when given the domain. • The domain of a function may be a single value or a set of values. • A set of ordered pairs may be used. • Functions may be expressed using either the terminology "$f(x) =$" or "$y =$".	X	

Alabama Course of Study: Mathematics	*Alabama High School Graduation Exam*	Stanford 9	Local
39. Recognize number sentences that serve as examples of properties of numbers. • Identity properties of addition and multiplication • Commutative properties of addition and multiplication • Associative properties of addition and multiplication • Distributive property of multiplication over addition • Inverse properties of addition and multiplication	I-1 Apply order of operations. • One, two, or no variables may be used. • One set of parentheses may be used. • Determining the absolute value of a term may be required. • Squaring the quantity in parentheses may be required. • No more than four terms may be included. • Adding or subtracting negative integers may be required. • Decimals to the tenths' place may be used. I-2 Add and subtract polynomials. • Using the distributive property may be required. • Unlike denominators may be used. I-3 Multiply polynomials. • Multiplying two quantities in parentheses may be required. • Squaring a quantity in parentheses may be required. • Adding or subtracting may be required. • Raising a quantity to a power may be required. • Fractions may be used. • Adding exponents may be required.	X	

Alabama Course of Study: Mathematics	*Alabama High School Graduation Exam*	Stanford 9	Local
40. Recognize that two equivalent quantities remain equal when the same change takes place on each quantity. Example: If 7 = 5 + 2, then 7 + 3 = (5 + 2) + 3	II-1 Solve multi-step equations of first degree. • One set of parentheses may be used. • Finding the sum or difference of terms containing the same variable may be required. • Adding or subtracting a variable to or from both sides of the equation may be required. • The solution to the equation may be a fraction. • Coefficients may be simple fractions. II-3 Solve systems of two linear equations. • Solving for the values of both x and y may be required. • The options may be four graphs with lines plotted and the intersection point labeled with its ordered pair.		

Alabama Course of Study: Mathematics	*Alabama High School Graduation Exam*	Stanford 9	Local
41. Identify a solution sentence equivalent to a problem expressed in words.	VI-1 Translate verbal or symbolic information into algebraic expressions; or identify equations or inequalities that represent graphs or problem situations. • Determining an equation or expression when given a verbal description may be required. • Graphing inequalities using a number line may be required. • Determining the equation of a line given two ordered pairs may be required. • Determining the equation of a line given the line graphed on the coordinate plane may be required.	X	
42. Develop an understanding of the order of operations. • Simplify within parentheses, then multiply or divide in order from left to right, then add or subtract in order from left to right.	I-1 Apply order of operations. • One, two, or no variables may be used. • One set of parentheses may be used. • Determining the absolute value of a term may be required. • Squaring the quantity in parentheses may be required. • No more than four terms may be included. • Adding or subtracting negative integers may be required. • Decimals to the tenths' place may be used.		

Alabama Course of Study: Mathematics	*Alabama High School Graduation Exam*	Stanford 9	Local
PROBABILITY, STATISTICS, DISCRETE MATHEMATICS			
43. Collect, organize, and describe data.			
44. Construct, read, and interpret frequency tables, charts, line graphs, pictographs, bar graphs, circle graphs, frequency/tally charts, and histograms.		X	
45. Extrapolate data from frequency tables, charts, bar graphs, and line graphs.		X	
46. Determine probabilities from experiments and simulations. Examples: tossing coins or number cubes, using spinners, using surveys	VII-6 Determine probabilities. • Both AND and OR situations may be included.	X	
47. Make inferences and predict outcomes from collected data.	VII-6 Determine probabilities. • Both AND and OR situations may be included.	X	

Alabama Course of Study: Mathematics	*Alabama High School Graduation Exam*	Stanford 9	Local
48. Describe data using measures of central tendency and dispersion. • Mean • Median • Mode • Range	VII-5 Determine measures of central tendency. • The word "mean" will be used for the arithmetic average. • The set of numbers used to assess the range will not be in numerical order. • Decimals up to hundredths may be used. • Decimals with different numbers of decimal digits may be used in the same item. • Frequency diagrams may be used.	X	
49. Make decisions using probability and statistics in real-life situations. Examples: advertising, forecasting	VII-6 Determine probabilities. • Both AND and OR situations may be included.		
50. Use the appropriate current technology to facilitate the understanding of statistics and other mathematical concepts.			

Alabama Course of Study: Mathematics	*Alabama High School Graduation Exam*	Stanford 9	Local
51. Determine combinations and permutations.		X	

Examples:

Combinations

Mrs. Kyser must choose two students to attend a meeting. Her choices are Sam, Joe, and Karen. In how many ways can she choose two of the three? List them.

Answer: 3 ways - Sam, Joe Sam, Karen Joe, Karen

Permutations

John, Sue, amd Bob are racing. How many different possibilities are there for first, second, and third place winners? List them.

Answer: 6 possibilities

1st place	2nd place	3rd place
John	Sue	Bob
John	Bob	Sue
Sue	John	Bob
Sue	Bob	John
Bob	Sue	John
Bob	John	Sue

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NUMBER SENSE, NUMBER SYSTEMS, NUMBER THEORY **CONTENT STANDARDS** Students will			
1. Demonstrate proficiency in the use of whole number and decimal concepts. • Rounding • Determining place value • Naming, ordering, comparing		X	
2. Demonstrate an understanding of decimals using expanded notation.			
3. Exhibit proficiency in the use of fractions and mixed numbers. • Comparing, ordering • Changing to equivalent forms • Changing to lowest terms		X	
4. Demonstrate proficiency in multiplying and dividing fractions.	I-3 Multiply polynomials. • Multiplying two quantities in parentheses may be required. • Squaring a quantity in parentheses may be required. • Adding or subtracting may be required. • Raising a quantity to a power may be required. • Fractions may be used. • Adding exponents may be required.	X	

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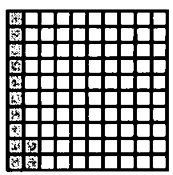
5. Add and subtract fractions that do not have common denominators.	I-2 Add and subtract polynomials. • Using the distributive property may be required. • Unlike denominators may be used.	X	
6. Demonstrate proficiency in adding, subtracting, and multiplying decimals.	I-1 Apply order of operations. • One, two, or no variables may be used. • One set of parentheses may be used. • Determining the absolute value of a term may be required. • Squaring the quantity in parentheses may be required. • No more than four terms may be included. • Adding or subtracting negative integers may be required. • Decimals to the tenths' place may be used. I-2 Add and subtract polynomials. • Using the distributive property may be required. • Unlike denominators may be used.	X	

Alabama Course of Study: Mathematics	*Alabama High School Graduation Exam*	Stanford 9	Local
6. (continued)	I-3 Multiply polynomials. • Multiplying two quantities in parentheses may be required. • Squaring a quantity in parentheses may be required. • Adding or subtracting may be required. • Raising a quantity to a power may be required. • Fractions may be used. • Adding exponents may be required.		
7. Divide decimals. • Whole number divisor • Decimal divisors (tenths)	I-1 Apply order of operations. • One, two, or no variables may be used. • One set of parentheses may be used. • Determining the absolute value of a term may be required. • Squaring the quantity in parentheses may be required. • No more than four terms may be included. • Adding or subtracting negative integers may be required. • Decimals to the tenths' place may be used.	X	

Alabama Course of Study: Mathematics	*Alabama High School Graduation Exam*	Stanford 9	Local
8. Demonstrate proficiency in using methods of estimation appropriate to a given situation.		X	
9. Demonstrate proficiency in using estimation to determine whether results are reasonable.		X	
10. Distinguish between prime and composite numbers.	I-4 Factor polynomials. • The following factoring may be required: - difference of two squares - greatest common monomial - trinomial - common binomial • Options will be factored completely.		
11. Use the least common multiple or the greatest common factor of two numbers in operations on fractions.	I-4 Factor polynomials. • The following factoring may be required: - difference of two squares - greatest common monomial - trinomial - common binomial • Options will be factored completely.	X	

Alabama Course of Study: Mathematics	*Alabama High School Graduation Exam*	Stanford 9	Local
12. Use basic operations in context. Examples: determining change, discounts, sales tax, unit price, cost of credit, multiple purchases	I-1 Apply order of operations. • One, two, or no variables may be used. • One set of parentheses may be used. • Determining the absolute value of a term may be required. • Squaring the quantity in parentheses may be required. • No more than four terms may be included. • Adding or subtracting negative integers may be required. • Decimals to the tenths' place may be used. I-2 Add and subtract polynomials. • Using the distributive property may be required. • Unlike denominators may be used. I-3 Multiply polynomials. • Multiplying two quantities in parentheses may be required. • Squaring a quantity in parentheses may be required. • Adding or subtracting may be required. • Raising a quantity to a power may be required. • Fractions may be used. • Adding exponents may be required.	X	

Alabama Course of Study: Mathematics	*Alabama High School Graduation Exam*	Stanford 9	Local
13. Determine and use the most appropriate method of calculation. • Paper and pencil • Mental math • Calculator • Computer			
14. Compare and order integers.			
15. Add and subtract integers.	I-2 Add and subtract ploynomials. • Using the distributive property may be required. • Unlike denominators may be used.		
16. Use ratios and proportions to describe real-life situations.	VII-3 Apply properties of similar polygons. • Diagrams may be included. • Drawings will be to scale. • The word *similar* or the symbol "~" may be used. • Use of the scale factor will be required. VII-7 Solve problems involving direct variation. • Diagrams may be used. • Verbal descriptions of proportions may be used.		

Alabama Course of Study: Mathematics	*Alabama High School Graduation Exam*	Stanford 9	Local
17. Develop understanding of alternative representations of decimals, fractions, mixed numbers, and percent. Example:  $= \frac{12}{100} = \frac{3}{25} = .12 = 12\%$		X	
18. Identify missing information in problem-solving situations.		X	
19. Develop and apply a variety of strategies to solve problems with emphasis on multi-step and non-routine problems. Examples: work backwards; draw a diagram; guess, test, and revise; find a pattern; estimate; experiment; make an organized list, table, or chart; make a model; write an equation (number sentence)	VII-8 Solve problems involving algebraic concepts. • Word problems will be used. • Interpretation of figures may be required. • The following content may be included: - distance-rate-time problems - money problems, which may require a system of equations - numbers (sum, difference, product, quotient) - simple age problems referring only to the present - consecutive integers - area, volume, dimension problems - quantity problems - cost problems - wage problems	X	

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GEOMETRY, SPATIAL SENSE, MEASUREMENT			
20. Demonstrate proficiency in the use of measurement skills in a variety of situations.		X	
21. Select and use appropriate customary and metric units of measurement.		X	
22. Determine equivalent measurements based on conversions within the same system.		X	
23. Compare similar customary and metric units of measure. Examples: 1 L ≈ 1 qt. 1 m ≈ 1 yd.			

Alabama Course of Study: Mathematics	*Alabama High School Graduation Exam*	Stanford 9	Local
24. Estimate perimeters and areas.	IV-1 Find the perimeter, circumference, area, or volume of geometric figures. • The value of pi (π)will be 3.14. • Options may be left in terms of π. • Unnecessary dimensions may be included. • Drawings may be used. • Finding volume or surface area of a rectangular prism may be required. • Extracting a square root may be required. • Determining the area of a circle when given the diameter in the drawing may be required. • The formulas will be given in the problems. VII-4 Apply properties of plane and solid geometric figures. • Diagrams may be included. • Word problems may be used. • The following content may be included: - area and perimeter of triangles, rectangles, and squares - area and circumference of a circle, given radius or diameter - perimeter of a regular polygon, given one side - volume of rectangular prism or cylinder		

Alabama Course of Study: Mathematics	*Alabama High School Graduation Exam*	Stanford 9	Local
24. (continued)	- sum of the measures of the angles in a triangle - sum of the measures of the angles in a rectangle • Determining any dimension of a figure may be required. • Determining any dimension of a figure when the dimension is expressed as an algebraic expression may be required.		
25. Calculate areas and perimeters in meaningful context.	IV-1 Find the perimeter, circumference, area, or volume of geometric figures. • The value of pi (π) will be 3.14. • Options may be left in terms of π. • Unnecessary dimensions may be included. • Drawings may be used. • Finding volume or surface area of a rectangular prism may be required. • Extracting a square root may be required. • Determining the area of a circle when given the diameter in the drawing may be required. • The formulas will be given in the problems.	X	

Alabama Course of Study: Mathematics	*Alabama High School Graduation Exam*	Stanford 9	Local
25. (continued)	VII-4 Apply properties of plane and solid geometric figures. • Diagrams may be included. • Word problems may be used. • The following content may be included: - area and perimeter of triangles, rectangles, and squares - area and circumference of a circle, given radius or diameter - perimeter of a regular polygon, given one side - volume of rectangular prism or cylinder - sum of the measures of the angles in a triangle - sum of the measures of the angles in a rectangle • Determining any dimension of a figure may be required. • Determining any dimension of a figure when the dimension is expressed as an algebraic expression may be required.		
26. Determine measurements indirectly from scale drawings.	VII-3 Apply properties of similar polygons. • Diagrams may be included. • Drawings will be to scale. • The word *similar* or the symbol "~" may be used. • Use of the scale factor will be required.	X	

Alabama Course of Study: Mathematics	*Alabama High School Graduation Exam*	Stanford 9	Local
27. Construct simple scale drawings.			
28. Identify symmetry in plane figures.		X	
29. Exhibit proficiency in drawing and labeling parts of a circle. • Center • Radius • Diameter • Chord	IV-1 Find the perimeter, circumference, area, or volume of geometric figures. • The value of pi (π) will be 3.14. • Options may be left in terms of π. • Unnecessary dimensions may be included. • Drawings may be used. • Finding volume or surface area of a rectangular prism may be required. • Extracting a square root may be required. • Determining the area of a circle when given the diameter in the drawing may be required. • The formulas will be given in the problems. VII-4 Apply properties of plane and solid geometric figures. • Diagrams may be included. • Word problems may be used.	X	

Alabama Course of Study: Mathematics	*Alabama High School Graduation Exam*	Stanford 9	Local
29. (continued)	• The following content may be included: - area and perimeter of triangles, rectangles, and squares - area and circumference of a circle, given radius or diameter - perimeter of a regular polygon, given one side - volume of rectangular prism or cylinder - sum of the measures of the angles in a triangle - sum of the measures of the angles in a rectangle • Determining any dimension of a figure may be required. • Determining any dimension of a figure when the dimension is expressed as an algebraic expression may be required.		
30. Establish formulas for determining perimeter, area, volume, and circumference through a variety of explorations.	IV-1 Find the perimeter, circumference, area, or volume of geometric figures. • The value of pi (π) will be 3.14. • Options may be left in terms of π. • Unnecessary dimensions may be included. • Drawings may be used.		

Alabama Course of Study: Mathematics	*Alabama High School Graduation Exam*	Stanford 9	Local
30. (continued)	• Finding volume or surface area of a rectangular prism may be required. • Extracting a square root may be required. • Determining the area of a circle when given the diameter in the drawing may be required. • The formulas will be given in the problems. VII-4 Apply properties of plane and solid geometric figures. • Diagrams may be included. • Word problems may be used. • The following content may be included: - area and perimeter of triangles, rectangles, and squares - area and circumference of a circle, given radius or diameter - perimeter of a regular polygon, given one side - volume of rectangular prism or cylinder - sum of the measures of the angles in a triangle - sum of the measures of the angles in a rectangle • Determining any dimension of a figure may be required. • Determining any dimension of a figure when the dimension is expressed as an algebraic expression may be required.		

Alabama Course of Study: Mathematics	*Alabama High School Graduation Exam*	Stanford 9	Local
31. Illustrate geometric transformations. • Translation (slide) • Rotation (turn on a point) • Reflection (flip)		X	
32. Classify and measure angles.	VII-1 Apply properties of angles and relationships between angles. • The following properties and relationships may be included: - vertical angles - adjacent angles - supplementary angles - complementary angles - linear pair (adjacent supplementary angles) - relationships among the measures of angles formed by two parallel lines and a transversal • Word problems may be used. • The knowledge of the sum of measures of angles may be used. • Determining measurements of angles when the measurements of angles are expressed as algebraic expressions may be required.	X	

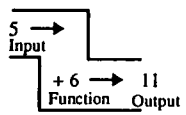
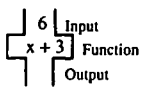
Alabama Course of Study: Mathematics	*Alabama High School Graduation Exam*	Stanford 9	Local
33. Develop understanding of geometric figures by drawing with a straightedge and/or a protractor. • Angles • Right triangles • Equilateral triangles • Scalene triangles • Obtuse triangles • Acute triangles • Polygons	VII-1 Apply properties of angles and relationships between angles. • The following properties and relationships may be included: - vertical angles - adjacent angles - supplementary angles - complementary angles - linear pair (adjacent supplementary angles) - relationships among the measures of angles formed by two parallel lines and a transversal • Word problems may be used. • The knowledge of the sum of measures of angles may be used. • Determining measurements of angles when the measurements of angles are expressed as algebraic expressions may be required. VII-2 Apply Pythagorean Theorem. • The Pythagorean Theorem will be given on the reference page. • Diagrams will be included. • Word problems will be used. • Radicals may be included in options. • All radicals will be simplified. • Drawings will be to scale		

Alabama Course of Study: Mathematics	*Alabama High School Graduation Exam*	Stanford 9	Local
33. (continued)	VII-4 Apply properties of plane and solid geometric figures. • Diagrams may be included. • Word problems may be used. • The following content may be included: - area and perimeter of triangles, rectangles, and squares - area and circumference of a circle, given radius or diameter - perimeter of a regular polygon, given one side - volume of rectangular prism or cylinder - sum of the measures of the angles in a triangle - sum of the measures of the angles in a rectangle • Determining any dimension of a figure may be required. • Determining any dimension of a figure when the dimension is expressed as an algebraic expression may be required.		

Alabama Course of Study: Mathematics	*Alabama High School Graduation Exam*	Stanford 9	Local
34. Use constructions with a straightedge and a compass to develop understanding of geometric relationships. • Perpendicular lines • Perpendicular bisector of a segment • Congruent line segments	VII-1 Apply properties of angles and relationships between angles. • The following properties and relationships may be included: - vertical angles - adjacent angles - supplementary angles - complementary angles - linear pair (adjacent supplementary angles) - relationships among the measures of angles formed by two parallel lines and a transversal • Word problems may be used. • The knowledge of the sum of measures of angles may be used. • Determining measurements of angles when the measurements of angles are expressed as algebraic expressions may be required.		

Alabama Course of Study: Mathematics	*Alabama High School Graduation Exam*	Stanford 9	Local
35. Describe relationships between pairs of angles. • Vertical angles • Adjacent angles	VII-1 Apply properties of angles and relationships between angles. • The following properties and relationships may be included: - vertical angles - adjacent angles - supplementary angles - complementary angles - linear pair (adjacent supplementary angles) - relationships among the measures of angles formed by two parallel lines and a transversal • Word problems may be used. • The knowledge of the sum of measures of angles may be used. • Determining measurements of angles when the measurements of angles are expressed as algebraic expressions may be required.		

Alabama Course of Study: Mathematics	*Alabama High School Graduation Exam*	Stanford 9	Local
36. Identify and plot coordinates on grids, graphs, and maps.	V-1 Graph or identify graphs of linear equations. • Equations may be expressed in terms of $f(x)$. • The options may be four graphs. • The option may be four equations. V-2 Graph lines given certain conditions. • The following conditions may be included: - two points - x- and y-intercepts - point and slope - slope and y-intercept	X	
37. Identify plane and solid geometric figures based on attributes, properties, and component parts.			
PATTERNS, FUNCTIONS, ALGEBRA			
38. Describe, extend, and create a wide variety of numeric and geometric patterns. Examples: 1, 2, 2, 3, 3, 3, ...		X	

Alabama Course of Study: Mathematics	*Alabama High School Graduation Exam*	Stanford 9	Local
39. Find the output of functions (number machines). Examples:  If the input is 7, what is the output?  What is the output?	III-1 Identify functions. • The options may be graphs, ordered pairs, tables, or mappings. • The options may be equations when given a table of values or ordered pairs. • The options may be tables of values or ordered pairs when given an equation. • Functions may be expressed using either the terminology "$f(x) =$" or "$y =$". III-2 Find the range of functions when given the domain. • The domain of a function may be a single value or a set of values. • A set of ordered pairs may be used. • Functions may be expressed using either the terminology "$f(x) =$" or "$y =$".	X	

Alabama Course of Study: Mathematics	*Alabama High School Graduation Exam*	Stanford 9	Local
40. Apply properties of operations to number sentences. • Identity properties of addition and multiplication • Commutative properties of addition and multiplication • Associative properties of addition and multiplication • Distributive property of multiplication over addition • Inverse properties of addition and multiplication	I-1 Apply order of operations. • One, two, or no variables may be used. • One set of parentheses may be used. • Determining the absolute value of a term may be required. • Squaring the quantity in parentheses may be required. • No more than four terms may be included. • Adding or subtracting negative integers may be required. • Decimals to the tenths' place may be used. I-2 Add and subtract polynomials • Using the distributive property may be required. • Unlike denominators may be used. I-3 Multiply polynomials. • Multiplying two quantities in parentheses may be required. • Squaring a quantity in parentheses may be required. • Adding or subtracting may be required. • Raising a quantity to a power may be required. • Fractions may be used. • Adding exponents may be required.	X	

Alabama Course of Study: Mathematics	*Alabama High School Graduation Exam*	Stanford 9	Local
41. Demonstrate an understanding of the addition and subtraction properties of equality. Examples: If 7 = 3 + 4, then 7 - 4 = (3 +4) - 4	I-2 Add and subtract polynomials • Using the distributive property may be required. • Unlike denominators may be used. II-1 Solve multi-step equations of first degree. • One set of parentheses may be used. • Finding the sum or difference of terms containing the same variable may be required. • Adding or subtracting a variable to or from both sides of the equation may be required. • The solution to the equation may be a fraction. • Coefficients may be simple fractions.		

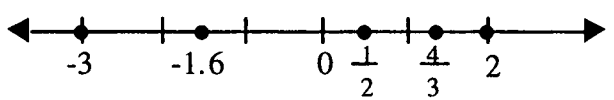
Alabama Course of Study: Mathematics	*Alabama High School Graduation Exam*	Stanford 9	Local
42. Demonstrate an understanding of exponential notation. Examples: $5 \times 5 = 5^2 = 25$ $8 = 2^3 = 2 \times 2 \times 2$	I-1 Apply order of operations. • One, two, or no variables may be used. • One set of parentheses may be used. • Determining the absolute value of a term may be required. • Squaring the quantity in parentheses may be required. • No more than four terms may be included. • Adding or subtracting negative integers may be required. • Decimals to the tenths' place may be used. I-3 Multiply polynomials. • Multiplying two quantities in parentheses may be required. • Squaring a quantity in parentheses may be required. • Adding or subtracting may be required. • Raising a quantity to a power may be required. • Fractions may be used. • Adding exponents may be required.		

Alabama Course of Study: Mathematics	*Alabama High School Graduation Exam*	Stanford 9	Local
43. Extend the understanding of the order of operations. • Simplify within parentheses, then evaluate with exponents, then multiply or divide in order from left to right, then add or subtract in order from left to right.	I-1 Apply order of operations. • One, two, or no variables may be used. • One set of parentheses may be used. • Determining the absolute value of a term may be required. • Squaring the quantity in parentheses may be required. • No more than four terms may be included. • Adding or subtracting negative integers may be required. • Decimals to the tenths' place may be used.		
PROBABILITY, STATISTICS, DISCRETE MATHEMATICS			
44. Formulate and test hypotheses.			
45. Collect, organize, and interpret data using graphs, tables, and charts.		X	

Alabama Course of Study: Mathematics	*Alabama High School Graduation Exam*	Stanford 9	Local
46. Determine measures of central tendency and dispersion. • Mean • Median • Mode • Range	VII-5 Determine measures of central tendency. • The word "mean" will be used for the arithmetic average. • The set of numbers used to assess the range will not be in numerical order. • Decimals up to hundredths may be used. • Decimals with different numbers of decimal digits may be used in the same item. • Frequency diagrams may be used.	X	
47. Make predictions and verify outcomes of independent events.	VII-6 Determine probabilities. • Both AND and OR situations may be included.	X	
48. Express the probability of the occurrence of an event as a fraction and as a decimal.	VII-6 Determine probabilities. • Both AND and OR situations may be included.	X	

Alabama Course of Study: Mathematics	*Alabama High School Graduation Exam*	Stanford 9	Local
49. Use combinations and permutations in context. Examples: **Combinations** Mrs. Kyser must choose two students to attend a meeting. Her choices are Sam, Joe, and Karen. In how many ways can she choose two of the three? List them. Answer: 3 ways - Sam, Joe Sam, Karen Joe, Karen **Permutations** John, Sue, amd Bob are racing. How many different possibilities are there for first, second, and third place winners? List them. Answer: 6 possibilities 1st place: John, John, Sue, Sue, Bob, Bob 2nd place: Sue, Bob, John, Bob, Sue, John 3rd place: Bob, Sue, Bob, John, John, Sue		X	
50. Use the appropriate current technology to facilitate the understanding of statistics and other mathematical concepts.			
51. Recognize vocabulary associated with sets. • Set • Subset • Member, element • Empty set • Venn diagrams			

Alabama Course of Study: Mathematics	*Alabama High School Graduation Exam*	Stanford 9	Local
52. Apply theory associated with sets. • Determining subsets • Drawing Venn diagrams			

Alabama Course of Study: Mathematics	*Alabama High School Graduation Exam*	Stanford 9	Local
NUMBER SENSE, NUMBER SYSTEMS, NUMBER THEORY **CONTENT STANDARDS** Students will			
1. Demonstrate proficiency in adding and subtracting fractions without common denominators.			
2. Add, subtract, multiply, and divide integers.		X	
3. Represent rational numbers on the number line. Example:  		X	
4. Compare and order rational numbers.		X	
5. Perform basic operations on rational numbers.		X	
6. Represent rational numbers and operations in a variety of equivalent forms using models, diagrams, and symbols.		X	
7. Use prime and composite numbers.		X	

Alabama Course of Study: Mathematics	*Alabama High School Graduation Exam*	Stanford 9	Local
8. Find least common multiples and greatest common factors using prime factorization.	I-4 Factor polynomials. • The following factoring may be required: - difference of two squares - greatest common monomial - trinomial - common binomial • Options will be factored completely.		
9. Evaluate powers of whole numbers and roots of perfect squares.		X	
10. Convert numbers between standard notation and scientific notation.		X	
11. Select and use the most appropriate mode of calculation in any given situation. • Estimation • Mental math • Paper and pencil • Calculator • Computer			

Alabama Course of Study: Mathematics	*Alabama High School Graduation Exam*	Stanford 9	Local
12. Use estimation techniques in real-life problem solving. • Front-end Example: $1\frac{7}{12}$ 1 $\frac{7}{12} \approx \frac{1}{2}$ $1\frac{5}{8}$ 1 $\frac{5}{8} \approx \frac{1}{2}$ +1 +1 → 3 → 1 → 3 + 1 = (4) • Compatible numbers Examples: $3.02 \times 7.3 \approx 3 \times 7$ or (21) $6\overline{)550} \approx 6\overline{)540}$ (90) • Clustering Example: $1.78 + $1.85 + $2.12 All of the addends are close to the same dollar amount—$2. Therefore, $2 × 3 = $6		X	
13. Demonstrate proficiency in solving consumer-related problems. • Salaries, wages, commissions • Unit cost • Credit purchases • Interest • Discounts • Comparison shopping		X	

Alabama Course of Study: Mathematics	*Alabama High School Graduation Exam*	Stanford 9	Local
14. Identify information missing in problem-solving situations.		X	
15. Use problem-solving strategies effectively. Examples: use objects, draw a picture, guess and check, make an organized list, write and solve an equation, solve a simpler problem, make a table or chart, look for a pattern, use logical reasoning, work backward		X	
16. Solve problems using ratios and/or proportions.	VII-7 Solve problems involving direct variation. • Diagrams may be used. • Verbal descriptions of proportions may be used.	X	
17. Demonstrate proficiency in converting among percents, fractions, and decimals.		X	
18. Identify equivalent fractions, including lowest-term fractions and improper fractions.		X	
19. Use exponents to express decimals in expanded notation.			

Alabama Course of Study: Mathematics	*Alabama High School Graduation Exam*	Stanford 9	Local
GEOMETRY, SPATIAL SENSE, MEASUREMENT			
20. Develop spatial sense by constructing and drawing two- and three-dimensional scale models.			
21. Convert from one measurement to another within the same system, customary or metric.		X	
22. Solve real-life measurement problems. • Elapsed time • Distance and length • Rate • Money • Weight and mass • Perimeter and circumference • Temperature • Area and surface area • Volume	IV-I Find the perimeter, circumference, area, or volume of geometric figures. • The value of pi (π) will be 3.14. • Options may be left in terms of π. • Unnecessary dimensions may be included. • Drawings may be used. • Finding volume or surface area of a rectangular prism may be required. • Extracting a square root may be required. • Determining the area of a circle when given the diameter in the drawing may be required. • The formulas will be given in the problems. VII-4 Apply properties of plane and solid geometric figures. • Diagrams may be included. • Word problems may be used.	X	

Alabama Course of Study: Mathematics	*Alabama High School Graduation Exam*	Stanford 9	Local
22. (continued)	• The following content may be included. - area and perimeter of triangles, rectangles, and squares - area and circumference of a circle, given radius or diameter - perimeter of a regular polygon, given one side - volume of rectangular prism or cylinder - sum of the measures of the angles in a triangle - sum of the measures of the angles in a rectangle • Determining any dimension of a figure may be required. • Determining any dimension of a figure when the dimension is expressed as an algebraic expression may be required.		

Alabama Course of Study: Mathematics	*Alabama High School Graduation Exam*	Stanford 9	Local
23. Exhibit proficiency in determining perimeter and area of regular plane geometric figures.	IV-I Find the perimeter, circumference, area, or volume of geometric figures. • The value of pi (π) will be 3.14. • Options may be left in terms of π. • Unnecessary dimensions may be included. • Drawings may be used. • Finding volume or surface area of a rectangular prism may be required. • Extracting a square root may be required. • Determining the area of a circle when given the diameter in the drawing may be required. • The formulas will be given in the problems. VII-4 Apply properties of plane and solid geometric figures. • Diagrams may be included. • Word problems may be used. • The following content may be included. - area and perimeter of triangles, rectangles, and squares - area and circumference of a circle, given radius or diameter - perimeter of a regular polygon, given one side - volume of rectangular prism or cylinder - sum of the measures of the angles in a triangle	X	

Alabama Course of Study: Mathematics	*Alabama High School Graduation Exam*	Stanford 9	Local
23. (continued)	- sum of the measures of the angles in a rectangle • Determining any dimension of a figure may be required. • Determining any dimension of a figure when the dimension is expressed as an algebraic expression may be required.		
24. Determine perimeter, area, and volume by actually measuring using customary and metric units.		X	
25. Apply appropriate formulas to find perimeter, circumference, surface area, area, and volume.	IV-1 Find the perimeter, circumference, area, or volume of geometric figures. • The value of pi (π) will be 3.14. • Options may be left in terms of π. • Unnecessary dimensions may be included. • Drawings may be used. • Finding volume or surface area of a rectangular prism may be required. • Extracting a square root may be required. • Determining the area of a circle when given the diameter in the drawing may be required. • The formulas will be given in the problems.	X	

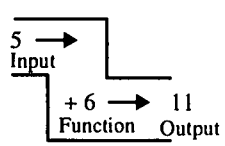
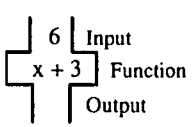
Alabama Course of Study: Mathematics	*Alabama High School Graduation Exam*	Stanford 9	Local
25. (continued)	VII-4 Apply properties of plane and solid geometric figures. • Diagrams may be included. • Word problems may be used. • The following content may be included. - area and perimeter of triangles, rectangles, and squares - area and circumference of a circle, given radius or diameter - perimeter of a regular polygon, given one side - volume of rectangular prism or cylinder - sum of the measures of the angles in a triangle - sum of the measures of the angles in a rectangle • Determining any dimension of a figure may be required. • Determining any dimension of a figure when the dimension is expressed as an algebraic expression may be required.		
26. Determine measurement indirectly from similar figures and scale drawings.	VII-3 Apply properties of similar polygons. • Diagrams may be included. • Drawings will be to scale. • The world *similar* or the symbol "~" may be used. • Use of the scale factor will be required.	X	

Alabama Course of Study: Mathematics	*Alabama High School Graduation Exam*	Stanford 9	Local
27. Identify plane and solid geometric figures. Examples: angles, polygons, polyhedrons, irregular figures		X	
28. Exhibit proficiency in identifying relationships between pairs of lines. • Parallel • Perpendicular • Skew • Intersecting (non-perpendicular)		X	
29. Relate parallel and perpendicular lines to the identification of plane and solid geometric figures. Example: A right rectangular prism has some perpendicular edges and some parallel edges.		X	

Alabama Course of Study: Mathematics	*Alabama High School Graduation Exam*	Stanford 9	Local
30. Describe relationships between pairs of angles. • Adjacent • Vertical • Complementary • Supplementary	VII-1 Apply properties of angles and relationships between angles. • The following properties and relationships may be included. - vertical angles - adjacent angles - supplementary angles - complementary angles - linear pair (adjacent supplementary angles) - relationships among the measures of angles formed by two parallel lines and a transversal • Word problems may be used. • The knowledge of the sum of measures of angles may be used. • Determining measurements of angles when the measurements of angles are expressed as algebraic expressions may be required.		
31. Draw geometric figures on the Cartesian plane and identify coordinates of vertices.		X	

Alabama Course of Study: Mathematics	*Alabama High School Graduation Exam*	Stanford 9	Local
32. Explore vertical and horizontal distances and slope on the Cartesian plane.	IV-2 Find the distance, midpoint, or slope of line segments when given two points. • Radicals may be used. • Radicals will be simplified. • Lines graphed on the coordinate plane may be included. • Determining the slope of a line given a line on the coordinate plane with two points labeled with their ordered pairs may be required. • Determining the slope of a line or midpoint of a line segment given two points on a line on the coordinate plane without any coordinates labeled may be required. • The formulas will be given in the problems.		
33. Explore geometric transformations on the Cartesian plane. • Translations • Rotations • Reflections		X	

Alabama Course of Study: Mathematics	*Alabama High School Graduation Exam*	Stanford 9	Local
34. Use computers and graphing calculators to facilitate understanding of coordinate geometry and other mathematical concepts.	IV-2 Find the distance, midpoint, or slope of line segments when given two points. • Radicals may be used. • Radicals will be simplified. • Lines graphed on the coordinate plane may be included. • Determining the slope of a line given a line on the coordinate plane with two points labeled with their ordered pairs may be required. • Determining the slope of a line or midpoint of a line segment given two points on a line on the coordinate plane without any coordinates labeled may be required. • The formulas will be given in the problems.		
35. Exhibit proficiency in drawing and labeling parts of a circle. • Arc • Central angle • Inscribed angle		X	
36. Use constructions with straightedge and compass to develop understanding of geometric concepts. • Congruent angles • Bisected angles • Right angles • Isosceles triangles • Equilateral triangles			

Alabama Course of Study: Mathematics	*Alabama High School Graduation Exam*	Stanford 9	Local
PATTERNS, FUNCTIONS, ALGEBRA			
37. Demonstrate proficiency in the use of the order of operations.	I-1 Apply order of operations. • One, two, or no variables may be used. • One set of parentheses may be used. • Determining the absolute value of a term may be required. • Squaring the quantity in parentheses may be required. • No more than four terms may be included. • Adding or subtracting negative integers may be required. • Decimals to the tenths' place may be used.		
38. Develop proficiency in describing, extending, analyzing, and creating a wide variety of patterns.		X	
39. Find the output of functions (function machines). Examples:  If the input is 7, what is the output?  What is the output?	III-2 Find the range of functions when given the domain. • The domain of a function may be a single value or a set of values. • A set of ordered pairs may be used. • Functions may be expressed using either the terminology "$f(x) =$" or "$y =$".	X	

Alabama Course of Study: Mathematics	*Alabama High School Graduation Exam*	Stanford 9	Local
40. Determine a rule that represents a function relationship. Example: What is the rule? INPUT / OUTPUT 6 / 12 12 / 24 18 / 36 Answer: INPUT × 2 = OUTPUT	III-1 Identify functions. • The options may be graphs, ordered pairs, tables, or mappings. • The options may be equations when given a table of values or ordered pairs. • The options may be tables of values or ordered pairs when given an equation. • Functions may be expressed using either the terminology "$f(x) =$" or "y =".		
41. Identify the domain and range of a function.	III-2 Find the range of functions when given the domain. • The domain of a function may be a single value or a set of values. • A set of ordered pairs may be used. • Functions may be expressed using either the terminology "$f(x) =$" or "y =".		
42. Use vocabulary associated with algebra. • Variable • Term • Coefficient • Constant • Exponent • Sentence, equation, inequality • Phrase, expression			

Alabama Course of Study: Mathematics	*Alabama High School Graduation Exam*	Stanford 9	Local
43. Simplify and evaluate linear algebraic expressions.	I-2 Add and subtract polynomials. • Using the distributive property may be required. • Unlike denominators may be used. I-3 Multiply polynomials. • Multiplying two quantities in parentheses may be required. • Squaring a quantity in parentheses may be required. • Adding or subtracting may be required. • Raising a quantity to a power may be required. • Fractions may be used. • Adding exponents may be required.	X	

Alabama Course of Study: Mathematics	*Alabama High School Graduation Exam*	Stanford 9	Local
44. Translate verbal phrases and sentences into symbolic notation.	VI-1 Translate verbal or symbolic information into algebraic expressions; or identify equations or inequalities that represent graphs or problem situations. • Determining an equation or expression when given a verbal description may be required. • Graphing inequalities using a number line may be required. • Determining the equation of a line given two ordered pairs may be required. • Determining the equation of a line given the line graphed on the coordinate plane may be required.	X	
45. Solve equations and inequalities by substituting values from a given set (domain).	II-1 Solve multi-step equations of first degree. • One set of parentheses may be used. • Finding the sum or difference of terms containing the same variable may be required. • Adding or subtracting a variable to or from both sides of the equation may be required. • The solution to the equation may be a fraction. • Coefficients may be simple fractions. II-4 Solve multi-step inequalities of first degree. • A negative coefficient may be used.	X	

Alabama Course of Study: Mathematics	*Alabama High School Graduation Exam*	Stanford 9	Local
45. (continued)	V-3 Determine solution sets of inequalities. • Compound inequality may be included. • Solving inequality may be required. • Options will be graphs.		
46. Solve linear equations of the type $ax + b = c$.	II-1 Solve multi-step equations of first degree. • One set of parentheses may be used. • Finding the sum or difference of terms containing the same variable may be required. • Adding or subtracting a variable to or from both sides of the equation may be required. • The solution to the equation may be a fraction. • Coefficients may be simple fractions.	X	

Alabama Course of Study: Mathematics	*Alabama High School Graduation Exam*	Stanford 9	Local
47. Solve linear inequalities of the type $ax + b > c$, and graph the solution set on a number line.	II-4 Solve multi-step inequalities of first degree. • A negative coefficient may be used. V-3 Determine solution sets of inequalities. • Compound inequality may be included. • Solving inequality may be required. • Options will be graphs. VI-1 Translate verbal or symbolic information into algebraic expressions; or identify equations or inequalities that represent graphs or problem situations. • Determining an equation or expression when given a verbal description may be required. • Graphing inequalities using a number line may be required. • Determining the equation of a line given two ordered pairs may be required. • Determining the equation of a line given the line graphed on the coordinate plane may be required.		

Alabama Course of Study: Mathematics	*Alabama High School Graduation Exam*	Stanford 9	Local
48. Exhibit understanding of the properties of rational numbers. • Distributive Property • Closure Property • Associative Property • Commutative Property • Inverse Property • Identity Property		X	
49. Solve algebraic problems using calculators and computers when appropriate.	VII-8 Solve problems involving algebraic concepts. • Word problems will be used. • Interpretation of figures may be required. • The following content may be included. - distance-rate-time problems - money problems, which may require a system of equations - numbers (sum, difference, product, quotient) - Simple age problems referring only to the present - consecutive integers - area, volume, dimension problems - quantity problems - cost problems - wage problems		

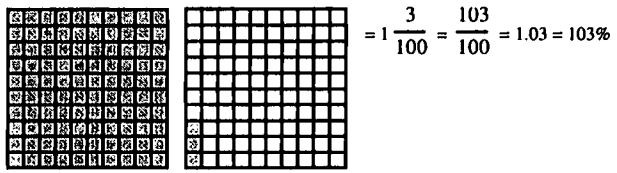
Alabama Course of Study: Mathematics	*Alabama High School Graduation Exam*	Stanford 9	Local
PROBABILITY, STATISTICS, DISCRETE MATHEMATICS			
50. Analyze and/or extrapolate data from lists, circle graphs, tables, single- and multiple-line graphs, single- and multiple-bar graphs, and tally charts.		X	
51. Exhibit proficiency in determining mean, mode, median, and range for a set of data.	VII-5 Determine measures of central tendency. • The word "mean" will be used for the arithmetic average. • The set of numbers used to assess the range will not be in numerical order. • Decimals up to hundredths may be used. • Decimals with different numbers of decimal digits may be used in the same item. • Frequency diagrams may be used.	X	

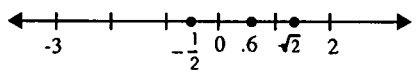
Alabama Course of Study: Mathematics	*Alabama High School Graduation Exam*	Stanford 9	Local
52. Apply measures of central tendency and dispersion to real-life situations.	VII-5 Determine measures of central tendency. • The word "mean" will be used for the arithmetic average. • The set of numbers used to assess the range will not be in numerical order. • Decimals up to hundredths may be used. • Decimals with different numbers of decimal digits may be used in the same item. • Frequency diagrams may be used.	X	
53. Identify uses and misuses of statistics in everyday life.			
54. Determine possible outcome(s) of an event and compare with experimental outcomes.		X	

Alabama Course of Study: Mathematics	*Alabama High School Graduation Exam*	Stanford 9	Local
55. Determine permutations and combinations. Examples: Combinations Mrs. Kyser must choose two students to attend a meeting. Her choices are Sam, Joe, and Karen. In how many ways can she choose two of the three? List them. Answer: 3 ways - Sam, Joe Sam, Karen Joe, Karen Permutations John, Sue, amd Bob are racing. How many different possibilities are there for first, second, and third place winners? List them. Answer: 6 possibilities 1st place / 2nd place / 3rd place John / Sue / Bob John / Bob / Sue Sue / John / Bob Sue / Bob / John Bob / Sue / John Bob / John / Sue 56. Develop an awareness of inductive and deductive reasoning. 57. Represent a given set in various ways. • Roster Example: {1, 2, 3, ...} • Definition or rule Example: $\{x \mid x \text{ is a natural number}\}$	VII-6 Determine probabilities. • Both AND or OR situations may be included.	X	

Alabama Course of Study: Mathematics	*Alabama High School Graduation Exam*	Stanford 9	Local
58. Recognize and use the vocabulary of set theory. • Element • Subset • Null (or empty) set • Intersection • Union • Venn diagrams			

Alabama Course of Study: Mathematics	*Alabama High School Graduation Exam*	Stanford 9	Local
NUMBER SENSE, NUMBER SYSTEMS, NUMBER THEORY **CONTENT STANDARDS** Students will			
1. Demonstrate proficiency in performing basic operations on rational numbers.		X	
2. Demonstrate proficiency in converting rational numbers between standard notation and scientific notation.		X	
3. Demonstrate proficiency in evaluating rational number expressions using the order of operations.	I-1 Apply order of operations. • One, two, or no variables may be used. • One set of parentheses may be used. • Determining the absolute value of a term may be required. • Squaring the quantity in parentheses may be required. • No more than four terms may be included. • Adding or subtracting negative integers may be required. • Decimals to the tenths' place may be used.	X	

Alabama Course of Study: Mathematics	*Alabama High School Graduation Exam*	Stanford 9	Local
4. Identify alternative representations of rational numbers. Examples:  $= 1\frac{3}{100} = \frac{103}{100} = 1.03 = 103\%$		X	
5. Demonstrate proficiency in determining least common multiples and greatest common factors.	I-4 Factor polynomials. • The following factoring may be required: - difference of two squares - greatest common monomial - trinomial - common binomial • Options will be factored completely.		
6. Apply the laws of exponents to simplify expressions containing integral exponents.		X	
7. Find square roots of rational numbers.		X	
8. Compare and order real numbers.		X	

Alabama Course of Study: Mathematics	*Alabama High School Graduation Exam*	Stanford 9	Local
9. Graph real numbers on a number line. Examples:  		X	
10. Demonstrate proficiency using estimation techniques in problem solving related to real-life situations. • Rounding • Front-end Example: $1\frac{7}{12} \approx 1$, $\frac{7}{12} \approx \frac{1}{2}$ $1\frac{5}{8} \approx 1$, $\frac{5}{8} \approx \frac{1}{2}$ $+1 \rightarrow +1 \rightarrow 3$, $+\frac{1}{2} \rightarrow 1 \rightarrow 3 + 1 = (4)$ • Compatible numbers Examples: $3.02 \times 7.3 \approx 3 \times 7$ or (21) $6\overline{)550} \approx 6\overline{)540}$ (90) • Clustering Example: $1.78 + $1.85 + $2.12 All of the addends are close to the same dollar amount—$2. Therefore, $2 × 3 = $6		X	

Alabama Course of Study: Mathematics	*Alabama High School Graduation Exam*	Stanford 9	Local
11. Use problem-solving strategies effectively. • Using objects • Drawing a picture • Using guess and check • Making an organized list • Writing an equation • Solving a simpler problem • Making a table or chart • Looking for a pattern • Using logical reasoning • Working backward		X	
12. Identify missing information in problem-solving situations.		X	
13. Solve problems with ratios and proportions.	VII-7 Solve problems involving direct variation. • Diagrams may be used. • Verbal descriptions of proportions may be used.	X	
14. Recognize and use absolute value of real numbers.			

Alabama Course of Study: Mathematics	*Alabama High School Graduation Exam*	Stanford 9	Local
GEOMETRY, SPATIAL SENSE, MEASUREMENT			
15. Identify the relationships between two- and three-dimensional geometric figures. Examples: Rectangular prisms are composed of rectangles. Pyramids are composed of triangles and a rectangle.			
16. Demonstrate proficiency in converting from one measurement to another within the same system. • Customary • Metric		X	
17. Solve measurement problems by using mental math, paper and pencil, and estimation techniques as well as appropriate units of measure. • Time • Distance and length • Rate • Money • Weight and mass • Perimeter and circumference • Temperature • Area and surface area • Volume	IV-1 Find the perimeter, circumference, area, or volume of geometric figures. • The value of pi (π) will be 3.14. • Options may be left in terms of π. • Unnecessary dimensions may be included. • Drawings may be used. • Finding volume or surface area of a rectangular prism may be required. • Extracting a square root may be required.	X	

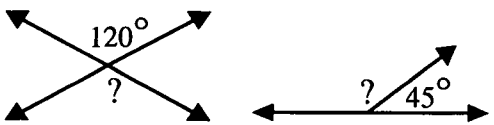
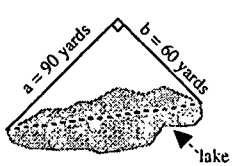
Alabama Course of Study: Mathematics	*Alabama High School Graduation Exam*	Stanford 9	Local
17. (continued)	• Determining the area of a circle when given the diameter in the drawing may be required. • The formulas will be given in the problems. VII-4 Apply properties of plane and solid geometric figures. • Diagrams may be included. • Word problems may be used. • The following content may be included. - area and perimeter of triangles, rectangles, and squares - area and circumference of a circle, given radius or diameter - perimeter of a regular polygon, given one side - volume of rectangular prism or cylinder - sum of the measures of the angles in a triangle - sum of the measures of the angles in a rectangle • Determining any dimension of a figure may be required. • Determining any dimension of a figure when the dimension is expressed as an algebraic expression may be required.		

Alabama Course of Study: Mathematics	*Alabama High School Graduation Exam*	Stanford 9	Local
18. Demonstrate proficiency in measuring to find perimeter, area, and volume using customary and metric units.	VII-4 Apply properties of plane and solid geometric figures. • Diagrams may be included. • Word problems may be used. • The following content may be included. - area and perimeter of triangles, rectangles, and squares - area and circumference of a circle, given radius or diameter - perimeter of a regular polygon, given one side - volume of rectangular prism or cylinder - sum of the measures of the angles in a triangle - sum of the measures of the angles in a rectangle • Determining any dimension of a figure may be required. • Determining any dimension of a figure when the dimension is expressed as an algebraic expression may be required. IV-1 Find the perimeter, circumference, area, or volume of geometric figures. • The value of pi (π) will be 3.14. • Options may be left in terms of π. • Unnecessary dimensions may be included. • Drawings may be used.	X	

Alabama Course of Study: Mathematics	*Alabama High School Graduation Exam*	Stanford 9	Local
18. (continued)	• Finding volume or surface area of a rectangular prism may be required. • Extracting a square root may be required. • Determining the area of a circle when given the diameter in the drawing may be required. • The formulas will be given in the problems.		
19. Produce measurements indirectly from similar geometric figures and drawings.	VII-3 Apply properties of similar polygons. • Diagrams may be included. • Drawings will be to scale. • The world *similar* or the symbol "~" may be used. • Use of the scale factor will be required.	X	

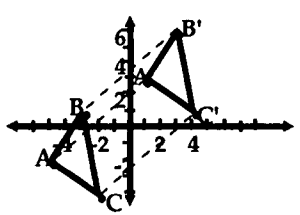
Alabama Course of Study: Mathematics	*Alabama High School Graduation Exam*	Stanford 9	Local
20. Demonstrate proficiency in classifying angles according to their characteristics. • Right, acute, obtuse, straight • Adjacent, vertical • Complementary, supplementary	VII-1 Apply properties of angles and relationships between angles. • The following properties and relationships may be included. - vertical angles - adjacent angles - supplementary angles - complementary angles - linear pair (adjacent supplementary angles) - relationships among the measures of angles formed by two parallel lines and a transversal • Word problems may be used. • The knowledge of the sum of measures of angles may be used. • Determining measurements of angles when the measurements of angles are expressed as algebraic expressions may be required.		
21. Estimate measures of angles and verify results.		X	

Alabama Course of Study: Mathematics	*Alabama High School Graduation Exam*	Stanford 9	Local
22. Recognize the relationship of angles formed by two parallel lines cut by a transversal. • Alternate interior • Corresponding • Alternate exterior	VII-1 Apply properties of angles and relationships between angles. • The following properties and relationships may be included. - vertical angles - adjacent angles - supplementary angles - complementary angles - linear pair (adjacent supplementary angles) - relationships among the measures of angles formed by two parallel lines and a transversal • Word problems may be used. • The knowledge of the sum of measures of angles may be used. • Determining measurements of angles when the measurements of angles are expressed as algebraic expressions may be required.		
23. Apply properties of plane and solid geometric figures to solve problems. • Triangles • Quadrilaterals • Regular polygons • Parallel and perpendicular lines • Circles • Rectangular prisms • Pyramids • Cones • Spheres		X	

Alabama Course of Study: Mathematics	*Alabama High School Graduation Exam*	Stanford 9	Local
24. Solve problems using relationships between angles. Example:  	VII-1 Apply properties of angles and relationships between angles. • The following properties and relationships may be included. - vertical angles - adjacent angles - supplementary angles - complementary angles - linear pair (adjacent supplementary angles) - relationships among the measures of angles formed by two parallel lines and a transversal • Word problems may be used. • The knowledge of the sum of measures of angles may be used. • Determining measurements of angles when the measurements of angles are expressed as algebraic expressions may be required.		
25. Recognize and use the Pythagorean Theorem. Example:  Find the distance across the widest part of the lake as depicted by the dotted segment.	VII-2 Apply Pythagorean Theorem. • The Pythagorean Theorem will be given on the reference page. • Diagrams will be included. • Word problems will be used. • Radicals may be included in options. • All radicals will be simplified. • Drawings will be to scale.		

Alabama Course of Study: Mathematics	*Alabama High School Graduation Exam*	Stanford 9	Local
26. Construct geometric figures using a compass and straightedge. • Perpendicular bisector of a given line segment • Angle congruent to a given angle • Line segment congruent to a given line segment • Congruent triangles • A line parallel to a given line through a given point not on the line			
27. Determine measures associated with plane and solid geometric figures using given formulas. • Perimeter of polygons and irregular figures • Circumference of circles • Area of circles, polygons, and irregular figures • Volume of spheres, prisms, pyramids, cylinders, and cones • Surface area of spheres, prisms, pyramids, cylinders, and cones	IV-1 Find the perimeter, circumference, area, or volume of geometric figures. • The value of pi (π) will be 3.14. • Options may be left in terms of π. • Unnecessary dimensions may be included. • Drawings may be used. • Finding volume or surface area of a rectangular prism may be required. • Extracting a square root may be required. • Determining the area of a circle when given the diameter in the drawing may be required. • The formulas will be given in the problems.	X	

Alabama Course of Study: Mathematics	*Alabama High School Graduation Exam*	Stanford 9	Local
27. (continued)	VII-4 Apply properties of plane and solid geometric figures. • Diagrams may be included. • Word problems may be used. • The following content may be included. - area and perimeter of triangles, rectangles, and squares - area and circumference of a circle, given radius or diameter - perimeter of a regular polygon, given one side - volume of rectangular prism or cylinder - sum of the measures of the angles in a triangle - sum of the measures of the angles in a rectangle • Determining any dimension of a figure may be required. • Determining any dimension of a figure when the dimension is expressed as an algebraic expression may be required.		

Alabama Course of Study: Mathematics	*Alabama High School Graduation Exam*	Stanford 9	Local
28. Identify components of the Cartesian plane. • x- and y-axes • Origin • Coordinates of points (abscissa and ordinate) • Quadrants		X	
29. Explore geometric transformations on the Cartesian plane. • Translations • Rotations • Reflections Example:  Translation of ΔABC into ΔA′B′C′ A(-5, -2) B(-3, 1) C(-2, -4) Find coordinates of the vertices of ΔA′B′C′.		X	

Alabama Course of Study: Mathematics	*Alabama High School Graduation Exam*	Stanford 9	Local
30. Use computers and graphing calculators to facilitate understanding of coordinate geometry.	IV-2 Find the distance, midpoint, or slope of line segments when given two points. • Radicals may be used. • Radicals will be simplified. • Lines graphed on the coordinate plane may be included. • Determining the slope of a line given a line on the coordinate plane with two points labeled with their ordered pairs may be required. • Determining the slope of a line or midpoint of a line segment given two points on a line on the coordinate plane without any coordinates labeled may be required. • The formulas will be given in the problems.		
31. Identify and graph functions on the Cartesian plane. Examples: $y = 2x + 1$; $f(x) = x^2$	III-1 Identify functions. • The options may be graphs, ordered pairs, tables, or mappings. • The options may be equations when given a table of values or ordered pairs. • The options may be tables of values or ordered pairs when given an equation. • Functions may be expressed using either the terminology "$f(x) =$" or "$y =$".		

Alabama Course of Study: Mathematics	*Alabama High School Graduation Exam*	Stanford 9	Local
31. (continued)	V-1 Graph or identify graphs of linear equations. • Equations may be expressed in terms of $f(x)$. • The options may be four graphs. • The options may be four equations. V-2 Graph lines given certain conditions. • The following conditions may be included. - two points - x- and y-intercepts - point and slope - slope and y-intercept		
PATTERNS, FUNCTIONS, ALGEBRA			
32. Develop an understanding of rules that represent patterns or relationships that are functions. Example: RULE y = 3x x | y 1 | 3 2 | 6 3 | 9	III-1 Identify functions. • The options may be graphs, ordered pairs, tables, or mappings. • The options may be equations when given a table of values or ordered pairs. • The options may be tables of values or ordered pairs when given an equation. • Functions may be expressed using either the terminology "$f(x) =$" or "y =".	X	

Alabama Course of Study: Mathematics	*Alabama High School Graduation Exam*	Stanford 9	Local
33. Develop an understanding of algebraic terms. • Variable • Term • Coefficient • Constant • Exponent • Sentence, equation, inequality • Phrase, expression			
34. Simplify and evaluate linear algebraic expressions. • Combining like terms • Using laws of exponents restricted to positive integral exponents • Using the distributive property • Using order of operations	I-1 Apply order of operations. • One, two, or no variables may be used. • One set of parentheses may be used. • Determining the absolute value of a term may be required. • Squaring the quantity in parentheses may be required. • No more than four terms may be included. • Adding or subtracting negative integers may be required. • Decimals to the tenths' place may be used. I-2 Add and subtract polynomials. • Using the distributive property may be required. • Unlike denominators may be used.	X	

Alabama Course of Study: Mathematics	*Alabama High School Graduation Exam*	Stanford 9	Local
34. (continued)	I-3 Multiply polynomials. • Multiplying two quantities in parentheses may be required. • Squaring a quantity in parentheses may be required. • Adding or subtracting may be required. • Raising a quantity to a power may be required. • Fractions may be used. • Adding exponents may be used.		
35. Translate verbal phrases and sentences into symbolic notation.	VI-1 Translate verbal or symbolic information into algebraic expressions; or identify equations or inequalities that represent graphs or problem situations. • Determining an equation or expression when given a verbal description may be required. • Graphing inequalities using a number line may be required. • Determining the equation of a line given two ordered pairs may be required. • Determining the equation of a line given the line graphed on the coordinate plane may be required.	X	

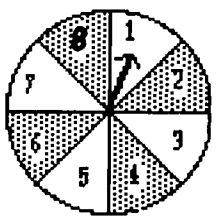
Alabama Course of Study: Mathematics	*Alabama High School Graduation Exam*	Stanford 9	Local
36. Solve linear equations and inequalities.	II-1 Solve multi-step equations of first degree. • One set of parentheses may be used. • Finding the sum or difference of terms containing the same variable may be required. • Adding or subtracting a variable to or from both sides of the equation may be required. • The solution to the equation may be a fraction. • Coefficients may be simple fractions. II-4 Solve multi-step inequalities of first degree. • A negative coefficient may be used. V-3 Determine solution sets of inequalities. • Compound inequality may be included. • Solving inequality may be required. • Options will be graphs.	X	

Alabama Course of Study: Mathematics	*Alabama High School Graduation Exam*	Stanford 9	Local
37. Use linear equations and inequalities to solve problems. Examples: proportion problems, percent problems, absolute value problems	VII-8 Solve problems involving algebraic concepts. • Word problems will be used. • Interpretation of figures may be required. • The following content may be included. - distance-rate-time problems - money problems, which may require a system of equations - numbers (sum, difference, product, quotient) - Simple age problems referring only to the present - consecutive integers - area, volume, dimension problems - quantity problems - cost problems - wage problems V-3 Determine solution sets of inequalities. • Compound inequality may be included. • Solving inequality may be required. • Options will be graphs.	X	
38. Demonstrate proficiency in recognizing the commutative, associative, and identity properties.			

Alabama Course of Study: Mathematics	*Alabama High School Graduation Exam*	Stanford 9	Local
39. Use the properties of rational numbers. • Distributive Property • Closure Property • Associative Property • Commutative Property • Identity Property • Inverse Property		X	
40. Solve algebraic problems using calculators and computers when appropriate.	VII-8 Solve problems involving algebraic concepts. • Word problems will be used. • Interpretation of figures may be required. • The following content may be included. - distance-rate-time problems - money problems, which may require a system of equations - numbers (sum, difference, product, quotient) - Simple age problems referring only to the present - consecutive integers - area, volume, dimension problems - quantity problems - cost problems - wage problems		

Alabama Course of Study: Mathematics	*Alabama High School Graduation Exam*	Stanford 9	Local
PROBABILITY, STATISTICS, DISCRETE MATHEMATICS			
41. Analyze and/or extrapolate data from frequency tables, stem-and-leaf plots, histograms, scattergrams, tally charts, single- and multiple-bar graphs, single- and multiple-line graphs, circle graphs, and published studies.		X	
42. Use mean, median, mode, and range to analyze statistical data.	VII-5 Determine measures of central tendency. • The word "mean" will be used for the arithmetic average. • The set of numbers used to assess the range will not be in numerical order. • Decimals up to hundredths may be used. • Decimals with different numbers of decimal digits may be used in the same item. • Frequency diagrams may be used.	X	
43. Identify uses and misuses of statistics in everyday life.			
44. Conduct a statistical study and use a statistical sampling to make a prediction.		X	
45. Determine possible outcome(s) of an event and compare with experimental outcomes.		X	

Alabama Course of Study: Mathematics	*Alabama High School Graduation Exam*	Stanford 9	Local
46. Exhibit an understanding of permutations and combinations. Examples: Combinations Mrs. Kyser must choose two students to attend a meeting. Her choices are Sam, Joe, and Karen. In how many ways can she choose two of the three? List them. Answer: 3 ways - Sam, Joe Sam, Karen Joe, Karen Permutations John, Sue, amd Bob are racing. How many different possibilities are there for first, second, and third place winners? List them. Answer: 6 possibilities 1st place / 2nd place / 3rd place John / Sue / Bob John / Bob / Sue Sue / John / Bob Sue / Bob / John Bob / Sue / John Bob / John / Sue	VII-6 Determine probabilities. • Both AND or OR situations may be included.	X	

Alabama Course of Study: Mathematics	*Alabama High School Graduation Exam*	Stanford 9	Local
47. Determine the probability of simple events, complementary events, and mutually exclusive events. Examples:  Simple event - Pointer stops on 7. The probability is $\frac{1}{8}$. Mutually exclusive events - Pointer stops on 5 or a shaded wedge. The probability is $\frac{1}{8}+\frac{4}{8}=\frac{5}{8}$. Complementary events - Pointer stops on 2 on the first spin. Pointer does not stop on 2 on the next spin. The probability that the pointer does not stop on 2 is $\frac{7}{8}$. 48. Recognize and use inductive and deductive reasoning. 49. Represent a given set in various ways. • Roster • Rule	VII-6 Determine probabilities. • Both AND or OR situations may be included.	X	

Alabama Course of Study: Mathematics	*Alabama High School Graduation Exam*	Stanford 9	Local
50. Use the vocabulary and symbols of set theory. • Element • Subset • Finite set • Infinite set • Null (or empty) set • Equal set • Intersection • Union • Venn diagrams			

Alabama Course of Study: Mathematics	*Alabama High School Graduation Exam*	Stanford 9	Local
NUMBER SENSE, NUMBER SYSTEMS, NUMBER THEORY **CONTENT STANDARDS** Students will 1. Define sets of numbers. • Whole • Natural • Integers • Rational • Irrational • Real 2. Demonstrate proficiency with operations on integers and rational numbers. 3. Apply properties of real numbers. • Identity • Inverse • Commutative • Distributive • Closure • Associative 4. Recognize, simplify, and use irrational numbers. 5. Write and use ratios to compare one quantity with another.			

Alabama Course of Study: Mathematics	*Alabama High School Graduation Exam*	Stanford 9	Local
6. Use ratios and proportions in problem solving.	VII-7 Solve problems involving direct variation. • Diagrams may be used. • Verbal descriptions of proportions may be used.		
7. Recognize percents as ratios.			
8. Solve percent problems. Examples: base, rate, percentage, percent of increase or decrease			
9. Demonstrate proficiency in simplifying rational number expressions using the order of operations.	I-1 Apply order of operations. • One, two, or no variables may be used. • One set of parentheses may be used. • Determining the absolute value of a term may be required. • Squaring the quantity in parentheses may be required. • No more than four terms may be included. • Adding or subtracting negative integers may be required. • Decimals to the tenths' place may be used.		

Alabama Course of Study: Mathematics	*Alabama High School Graduation Exam*	Stanford 9	Local
10. Demonstrate proficiency in the application of number theory concepts. • Primes • Factors • Multiples • Divisibility • Least common multiple • Greatest common factor 11. Demonstrate proficiency in converting between decimal notation and scientific notation. 12. Apply the laws of exponents to simplify expressions containing natural number exponents. 13. Recognize absolute value as distance from zero on the number line.	I-4 Factor polynomials. • The following factoring may be required: - difference of two squares - greatest common monomial - trinomial - common binomial • Options will be factored completely.		

Alabama Course of Study: Mathematics	*Alabama High School Graduation Exam*	Stanford 9	Local
14. Use problem-solving strategies effectively. • Using objects • Drawing a picture • Using guess and check • Making an organized list • Writing an equation • Solving a simpler problem • Making a table or chart • Looking for a pattern • Using logical reasoning • Working backward • Using formulas	VII-8 Solve problems involving algebraic concepts. • Word problems will be used. • Interpretation of figures may be required. • The following content may be included. - distance-rate-time problems - money problems, which may require a system of equations - numbers (sum, difference, product, quotient) - simple age problems referring only to the present - consecutive integers - area, volume, dimension problems - quantity problems - cost problems - wage problems	X	

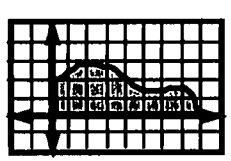
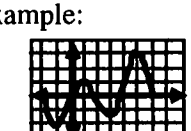
Alabama Course of Study: Mathematics	*Alabama High School Graduation Exam*	Stanford 9	Local
GEOMETRY, SPATIAL SENSE, MEASUREMENT			
15. Apply properties of plane and solid geometric figures to solve problems. • Triangles • Quadrilaterals • Regular polygons • Parallel and perpendicular lines • Circles • Rectangular prisms • Pyramids • Cones • Spheres	VII-4 Apply properties of plane and solid geometric figures. • Diagrams may be included. • Word problems may be used. • The following content may be included. - area and perimeter of triangles, rectangles, and squares - area and circumference of a circle, given radius or diameter - perimeter of a regular polygon, given one side - volume of rectangular prism or cylinder - sum of the measures of the angles in a triangle - sum of the measures of the angles in a rectangle • Determining any dimension of a figure may be required. • Determining any dimension of a figure when the dimension is expressed as an algebraic expression may be required.	X	

Alabama Course of Study: Mathematics	*Alabama High School Graduation Exam*	Stanford 9	Local
16. Apply the Pythagorean Theorem.	VII-2 Apply Pythagorean Theorem. • The Pythagorean Theorem will be given on the reference page. • Diagrams will be included. • Word problems will be used. • Radicals may be included in options. • All radicals will be simplified. • Drawings will be to scale.		
17. Deduce measures of angles in polygons from given assumptions. Examples: interior, exterior		X	

Alabama Course of Study: Mathematics	*Alabama High School Graduation Exam*	Stanford 9	Local
18. Deduce lengths of the sides of polygons from given assumptions.	VII-4 Apply properties of plane and solid geometric figures. • Diagrams may be included. • Word problems may be used. • The following content may be included. - area and perimeter of triangles, rectangles, and squares - area and circumference of a circle, given radius or diameter - perimeter of a regular polygon, given one side - volume of rectangular prism or cylinder - sum of the measures of the angles in a triangle - sum of the measures of the angles in a rectangle • Determining any dimension of a figure may be required. • Determining any dimension of a figure when the dimension is expressed as an algebraic expression may be required.	X	

Alabama Course of Study: Mathematics	*Alabama High School Graduation Exam*	Stanford 9	Local
19. Given the formulas, use perimeter, area, surface area, circumference, or volume of geometric figures to solve problems.	IV-1 Find the perimeter, circumference, area, or volume of geometric figures. • The value of pi (π) will be 3.14. • Options may be left in terms of π. • Unnecessary dimensions may be included. • Drawings may be used. • Finding volume or surface area of a rectangular prism may be required. • Extracting a square root may be required. • Determining the area of a circle when given the diameter in the drawing may be required. • The formulas will be given in the problems. VII-4 Apply properties of plane and solid geometric figures. • Diagrams may be included. • Word problems may be used. • The following content may be included. - area and perimeter of triangles, rectangles, and squares - area and circumference of a circle, given radius or diameter - perimeter of a regular polygon, given one side - volume of rectangular prism or cylinder - sum of the measures of the angles in a triangle	X	

Alabama Course of Study: Mathematics	*Alabama High School Graduation Exam*	Stanford 9	Local
19. (continued)	- sum of the measures of the angles in a rectangle • Determining any dimension of a figure may be required. • Determining any dimension of a figure when the dimension is expressed as an algebraic expression may be required.		
20. Demonstrate proficiency in using vocabulary and basic concepts related to the coordinate plane. • x- and y-axes • Origin • Point location			
21. Determine midpoints and lengths of line segments given coordinates in the Cartesian plane.	IV-2 Find the distance, midpoint, or slope of line segments when given two points. • Radicals may be used. • Radicals will be simplified. • Lines graphed on the coordinate plane may be included. • Determining the slope of a line given a line on the coordinate plane with two points labeled with their ordered pairs may be required. • Determining the slope of a line or midpoint of a line segment given two points on a line on the coordinate plane without any coordinates labeled may be required. • The formulas will be given in the problems.	X	

Alabama Course of Study: Mathematics	*Alabama High School Graduation Exam*	Stanford 9	Local
22. Identify coordinates of translations, rotations, and reflections.		X	
23. Graph linear functions in the form y = mx + b on the Cartesian plane.	V-1 Graph or identify graphs of linear equations. • Equations may be expressed in terms of *f*(x). • The options may be four graphs. • The options may be four equations. V-2 Graph lines given certain conditions. • The following conditions may be included. - two points - x- and y-intercepts - point and slope - slope and y-intercept	X	
24. Estimate the area under a curve graphed on the Cartesian coordinate plane. Example: 		X	
25. Determine the maximum or minimum points of a graph. Example:  maximum point (5, 3) minimum point (-1, -2)		X	

Alabama Course of Study: Mathematics	*Alabama High School Graduation Exam*	Stanford 9	Local
26. Determine slopes and y-intercepts of lines. • Given equations of the form $y = mx + b$ • Given graphs	IV-2 Find the distance, midpoint, or slope of line segments when given two points. • Radicals may be used. • Radicals will be simplified. • Lines graphed on the coordinate plane may be included. • Determining the slope of a line given a line on the coordinate plane with two points labeled with their ordered pairs may be required. • Determining the slope of a line or midpoint of a line segment given two points on a line on the coordinate plane without any coordinates labeled may be required. • The formulas will be given in the problems.		
27. Identify graphs that represent data given in a table.	V-2 Graph lines given certain conditions. • The following conditions may be included. - two points - x- and y-intercepts - point and slope - slope and y-intercept	X	

Alabama Course of Study: Mathematics	*Alabama High School Graduation Exam*	Stanford 9	Local
28. Identify equations of functions that represent data given in a table.	III-1 Identify functions. • The options may be graphs, ordered pairs, tables, or mappings. • The options may be equations when given a table of values or ordered pairs. • The options may be tables of values or ordered pairs when given an equation. • Functions may be expressed using either the terminology "$f(x) =$" or "$y =$".	X	
29. Use scale drawings and geometric models to solve problems.	VII-3 Apply properties of similar polygons. • Diagrams may be included. • Drawings will be to scale. • The world *similar* or the symbol "~" may be used. • Use of the scale factor will be required.	X	

Alabama Course of Study: Mathematics	*Alabama High School Graduation Exam*	Stanford 9	Local
PATTERNS, FUNCTIONS, ALGEBRA			
30. Describe and represent relationships with tables, graphs, and rules.			
31. Make predictions from data in a table.		X	
32. Determine rules that represent patterns or functions.	III-1 Identify functions. • The options may be graphs, ordered pairs, tables, or mappings. • The options may be equations when given a table of values or ordered pairs. • The options may be tables of values or ordered pairs when given an equation. • Functions may be expressed using either the terminology "$f(x) =$" or "$y =$".		
33. Evaluate algebraic expressions.		X	

Alabama Course of Study: Mathematics	*Alabama High School Graduation Exam*	Stanford 9	Local
34. Determine equations or inequalities that represent problem situations.	VI-1 Translate verbal or symbolic information into algebraic expressions; or identify equations or inequalities that represent graphs or problem situations. • Determining an equation or expression when given a verbal description may be required. • Graphing inequalities using a number line may be required. • Determining the equation of a line given two ordered pairs may be required. • Determining the equation of a line given the line graphed on the coordinate plane may be required.	X	
35. Solve simple linear equations.	II-1 Solve multi-step equations of first degree. • One set of parentheses may be used. • Finding the sum or difference of terms containing the same variable may be required. • Adding or subtracting a variable to or from both sides of the equation may be required. • The solution to the equation may be a fraction. • Coefficients may be simple fractions.	X	

Alabama Course of Study: Mathematics	*Alabama High School Graduation Exam*	Stanford 9	Local
36. Simplify and combine polynomials.	I-2 Add and subtract polynomials. • Using the distributive property may be required. • Unlike denominators may be used. I-3 Multiply polynomials. • Multiplying two quantities in parentheses may be required. • Squaring a quantity in parentheses may be required. • Adding or subtracting may be required. • Raising a quantity to a power may be required. • Fractions may be used. • Adding exponents may be required.		
37. Use the distributive axiom to factor polynomials.	I-4 Factor polynomials. • The following factoring may be required: - difference of two squares - greatest common monomial - trinomial - common binomial • Options will be factored completely.		

Alabama Course of Study: Mathematics	*Alabama High School Graduation Exam*	Stanford 9	Local
PROBABILITY, STATISTICS, DISCRETE MATHEMATICS			
38. Collect, organize, and describe data.			
39. Present data in graphical form. • Scattergram • Bar graph • Circle graph • Line graph • Picture graph			
40. Interpret data and draw inferences from tables, charts, and graphs.	VII-5 Determine measures of central tendency. • The word "mean" will be used for the arithmetic average. • The set of numbers used to assess the range will not be in numerical order. • Decimals up to hundredths may be used. • Decimals with different numbers of decimal digits may be used in the same item. • Frequency diagrams may be used.	X	

Alabama Course of Study: Mathematics	*Alabama High School Graduation Exam*	Stanford 9	Local
41. Compute and use measures of central tendency to analyze statistical data. • Mean • Median • Range • Mode	VII-5 Determine measures of central tendency. • The word "mean" will be used for the arithmetic average. • The set of numbers used to assess the range will not be in numerical order. • Decimals up to hundredths may be used. • Decimals with different numbers of decimal digits may be used in the same item. • Frequency diagrams may be used.	X	
42. Demonstrate an understanding of probability. • Simple events • Compound events	VII-6 Determine probabilities. • Both AND or OR situations may be included.	X	

Alabama Course of Study: Mathematics	*Alabama High School Graduation Exam*	Stanford 9	Local
NUMBER SENSE, NUMBER SYSTEMS, NUMBER THEORY **CONTENT STANDARDS** Students will 1. Define sets of numbers. • Whole numbers • Natural numbers • Integers • Rational numbers • Irrational numbers • Real numbers 2. Graph real numbers on the number line. 3. Graph the solution set of a linear inequality in one variable on the number line.	V-3 Determine solution sets of inequalities. • Compound inequality may be included. • Solving inequality may be required. • Options will be graphs.	X	

Alabama Course of Study: Mathematics	*Alabama High School Graduation Exam*	Stanford 9	Local
4. Use the order of operations, including exponentiation, to simplify numeric and variable expressions.	I-1 Apply order of operations. • One, two, or no variables may be used. • One set of parentheses may be used. • Determining the absolute value of a term may be required. • Squaring the quantity in parentheses may be required. • No more than four terms may be included. • Adding or subtracting negative integers may be required. • Decimals to the tenths' place may be used. I-2 Add and subtract polynomials. • Using the distributive property may be required. • Unlike denominators may be used. I-3 Multiply polynomials. • Multiplying two quantities in parentheses may be required. • Squaring a quantity in parentheses may be required. • Adding and subtracting may be required. • Raising a quantity to a power may be required. • Fractions may be used. • Adding exponents may be required.		

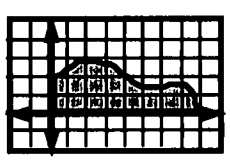
Alabama Course of Study: Mathematics	*Alabama High School Graduation Exam*	Stanford 9	Local
5. Perform operations involving square roots with and without calculators. 6. Apply the number properties. • Commutative • Associative • Distributive • Inverse • Identity • Substitution • Closure **GEOMETRY, SPATIAL SENSE, MEASUREMENT** 7. Recognize absolute value of a number as its distance from zero on a number line.			

Alabama Course of Study: Mathematics	*Alabama High School Graduation Exam*	Stanford 9	Local
8. Apply the perimeter and area of a polygon to solve problems, given the formulas.	IV-1 Find the perimeter, circumference, area, or volume of geometric figures. • The value of pi (π) will be 3.14. • Options may be left in terms of π. • Unnecessary dimensions may be included. • Drawings may be used. • Finding volume or surface area of a rectangular prism may be required. • Extracting a square root may be required. • Determining the area of a circle when given the diameter in the drawing may be required. • The formulas will be given in the problems. VII-4 Apply properties of plane and solid geometric figures. • Diagrams may be included. • Word problems may be used. • The following content may be included. - area and perimeter of triangles, rectangles, and squares - area and circumference of a circle, given radius or diameter - perimeter of a regular polygon, given one side - volume of rectangular prism or cylinder - sum of the measures of the angles in a triangle	X	

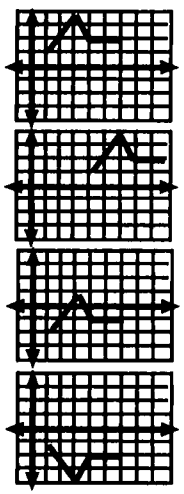
Alabama Course of Study: Mathematics	*Alabama High School Graduation Exam*	Stanford 9	Local
8. (continued)	- sum of the measures of the angles in a rectangle • Determining any dimension of a figure may be required. • Determining any dimension of a figure when the dimension is expressed as an algebraic expression may be required.		
9. Determine the volume and surface area of geometric solids, given the formulas.	IV-1 Find the perimeter, circumference, area, or volume of geometric figures. • The value of pi (π) will be 3.14. • Options may be left in terms of π. • Unnecessary dimensions may be included. • Drawings may be used. • Finding volume or surface area of a rectangular prism may be required. • Extracting a square root may be required. • Determining the area of a circle when given the diameter in the drawing may be required. • The formulas will be given in the problems.	X	

Alabama Course of Study: Mathematics	*Alabama High School Graduation Exam*	Stanford 9	Local
9. (continued)	VII-4 Apply properties of plane and solid geometric figures. • Diagrams may be included. • Word problems may be used. • The following content may be included. - area and perimeter of triangles, rectangles, and squares - area and circumference of a circle, given radius or diameter - perimeter of a regular polygon, given one side - volume of rectangular prism or cylinder - sum of the measures of the angles in a triangle - sum of the measures of the angles in a rectangle • Determining any dimension of a figure may be required. • Determining any dimension of a figure when the dimension is expressed as an algebraic expression may be required.		
10. Solve problems involving the area and circumference of a circle, given the formulas.	IV-1 Find the perimeter, circumference, area, or volume of geometric figures. • The value of pi (π) will be 3.14. • Options may be left in terms of π. • Unnecessary dimensions may be included. • Drawings may be used.	X	

Alabama Course of Study: Mathematics	*Alabama High School Graduation Exam*	Stanford 9	Local
10. (continued)	• Finding volume or surface area of a rectangular prism may be required. • Extracting a square root may be required. • Determining the area of a circle when given the diameter in the drawing may be required. • The formulas will be given in the problems. VII-4 Apply properties of plane and solid geometric figures. • Diagrams may be included. • Word problems may be used. • The following content may be included. - area and perimeter of triangles, rectangles, and squares - area and circumference of a circle, given radius or diameter - perimeter of a regular polygon, given one side - volume of rectangular prism or cylinder - sum of the measures of the angles in a triangle - sum of the measures of the angles in a rectangle • Determining any dimension of a figure may be required. • Determining any dimension of a figure when the dimension is expressed as an algebraic expression may be required.		

Alabama Course of Study: Mathematics	*Alabama High School Graduation Exam*	Stanford 9	Local
11. Apply length, midpoint, and slope of a line segment when given coordinates on a Cartesian plane. • Determining radius or diameter • Determining dimensions of a polygon	IV-2 Find the distance, midpoint, or slope of line segments when given two points. • Radicals may be used. • Radicals will be simplified. • Lines graphed on the coordinate plane may be included. • Determining the slope of a line given a line on the coordinate plane with two points labeled with their ordered pairs may be required. • Determining the slope of a line or midpoint of a line segment given two points on a line on the coordinate plane without any coordinates labeled may be required. • The formulas will be given in the problems.	X	
12. Estimate areas under curves graphed on the Cartesian plane. Example: 		X	

Alabama Course of Study: Mathematics	*Alabama High School Graduation Exam*	Stanford 9	Local
13. Apply the terminology associated with the Cartesian plane to the graphing of equations. • Origin • Abscissa • Ordinate • Quadrant • Axes			
14. Graph linear inequalities on the Cartesian plane.			
15. Graph and identify graphs of common relations. • $y = c$, where c is a constant • $x = c$, where c is a constant • $y = x$ • $y = \|x\|$ • $y = \sqrt{x}$ • $y = x^2$	V-4 Identify graphs of common relations. • The common relations are: - x = constant - y = constant - $y = x$ - $y = \sqrt{x}$ - $y = x^2$ - $y = \|x\|$ • The options may be four graphs. • The options may be four equations.	X	

Alabama Course of Study: Mathematics	*Alabama High School Graduation Exam*	Stanford 9	Local
16. Identify the effects of parameter changes on functions. Example: Given function f(x) Horizontal shift f(x-3) Vertical shift f(x) -3 Reflection across x-axis -f(x) 		X	
17. Graph lines given two points or a slope and a point.	V-2 Graph lines given certain conditions. • The following conditions may be included: - two points - x- and y-intercepts - point and slope - slope and y-intercept		

Alabama Course of Study: Mathematics	*Alabama High School Graduation Exam*	Stanford 9	Local
18. Graph linear equations written in standard form or slope-intercept form.	V-2 Graph lines given certain conditions. • The following conditions may be included: - two points - x- and y-intercepts - point and slope - slope and y-intercept V-1 Graph or identify graphs of linear equations. • Equations may be expressed in terms of $f(x)$. • The options may be four graphs. • The options may be four equations.		
19. Graph systems of linear equations.	II-3 Solve systems of two linear equations. • Solving for the values of both x and y may be required. • The options may be four graphs with lines plotted and the intersection point labeled with its ordered pair.		

Alabama Course of Study: Mathematics	*Alabama High School Graduation Exam*	Stanford 9	Local
PATTERNS, FUNCTIONS, ALGEBRA			
20. Perform basic operations on algebraic expressions.	I-1 Apply order of operations. • One, two, or no variables may be used. • One set of parentheses may be used. • Determining the absolute value of a term may be required. • Squaring the quantity in parentheses may be required. • No more than four terms may be included. • Adding or subtracting negative integers may be required. • Decimals to the tenths' place may be used. I-3 Multiply polynomials. • Multiplying two quantities in parentheses may be required. • Squaring a quantity in parentheses may be required. • Adding or subtracting may be required. • Raising a quantity to a power may be required. • Fractions may be used. • Adding exponents may be required. I-2 Add and subtract polynomials. • Using the distributive property may be required. • Unlike denominators may be used.		

Alabama Course of Study: Mathematics	*Alabama High School Graduation Exam*	Stanford 9	Local
PATTERNS, FUNCTIONS, ALGEBRA			
21. Evaluate algebraic expressions.		X	
22. Know and use laws of exponents including zero and negative integral exponents.	I-1 Apply order of operations. • One, two, or no variables may be used. • One set of parentheses may be used. • Determining the absolute value of a term may be required. • Squaring the quantity in parentheses may be required. • No more than four terms may be included. • Adding or subtracting negative integers may be required. • Decimals to the tenths' place may be used. I-3 Multiply polynomials. • Multiplying two quantities in parentheses may be required. • Squaring a quantity in parentheses may be required. • Adding or subtracting may be required. • Raising a quantity to a power may be required. • Fractions may be used. • Adding exponents may be required.		

Alabama Course of Study: Mathematics	*Alabama High School Graduation Exam*	Stanford 9	Local
23. Translate verbal or symbolic information into algebraic expressions.	VI-1 Translate verbal or symbolic information into algebraic expressions; or identify equations or inequalities that represent graphs or problem situations. • Determining an equation or expression when given a verbal description may be required. • Graphing inequalities using a number line may be required. • Determining the equation of a line given two ordered pairs may be required. • Determining the equation of a line given the line graphed on the coordinate plane may be required.		

Alabama Course of Study: Mathematics	*Alabama High School Graduation Exam*	Stanford 9	Local
24. Identify equations or inequalities that represent graphs or problem situations.	V-3 Determine solution sets of inequalities. • Compound inequality may be included. • Solving inequality may be required. • Options will be graphs. VI-1 Translate verbal or symbolic information into algebraic expressions; or identify equations or inequalities that represent graphs or problem situations. • Determining an equation or expression when given a verbal description may be required. • Graphing inequalities using a number line may be required. • Determining the equation of a line given two ordered pairs may be required. • Determining the equation of a line given the line graphed on the coordinate plane may be required.	X	
25. Factor algebraic expressions. • Polynomials in which each term contains a common monomial • Binomials • Trinomials	I-4 Factor polynomials. • The following factoring may be required: - difference of two squares - greatest common monomial - trinomial - common binomial • Options will be factored completely.		

Alabama Course of Study: Mathematics	*Alabama High School Graduation Exam*	Stanford 9	Local
26. Solve linear equations.	II-1 Solve multi-step equations of first degree. • One set of parentheses may be used. • Finding the sum or difference of terms containing the same variable may be required. • Adding or subtracting a variable to or from both sides of the equation may be required. • The solution to the equation may be a fraction. • Coefficients may be simple fractions. II-3 Solve systems of two linear equations. • Solving for the values of both x and y may be required. • The options may be four graphs with lines plotted and the intersection point labeled with its ordered pair.	X	
27. Solve simple radical equations. Examples: $\sqrt{x} - 4 = 0$ $\sqrt{x-4} = 2$		X	
28. Solve literal equations for any variable.			

Alabama Course of Study: Mathematics	*Alabama High School Graduation Exam*	Stanford 9	Local
29. Determine equations of lines satisfying given conditions. • Two points • Point and slope • Graph of a line	V-2 Graph lines given certain conditions. • The following conditions may be included: - two points - x- and y-intercepts - point and slope - slope and y-intercept VI-1 Translate verbal or symbolic information into algebraic expressions; or identify equations or inequalities that represent graphs or problem situations. • Determining an equation or expression when given a verbal description may be required. • Graphing inequalities using a number line may be required. • Determining the equation of a line given two ordered pairs may be required. • Determining the equation of a line given the line graphed on the coordinate plane may be required.		

Alabama Course of Study: Mathematics	*Alabama High School Graduation Exam*	Stanford 9	Local
30. Solve linear inequalities.	II-4 Solve multi-step inequalities of first degree. • A negative coefficient may be used. V-3 Determine solution sets of inequalities. • Compound inequality may be included. • Solving inequality may be required. • Options will be graphs.	X	
31. Solve systems of linear equations. • Graphically • Algebraically	II-3 Solve systems of two linear equations. • Solving for the values of both x and y may be required • The options may be four graphs with lines plotted and the intersection point labeled with its ordered pair.		

Alabama Course of Study: Mathematics	*Alabama High School Graduation Exam*	Stanford 9	Local
32. Solve word problems using a variety of methods. • Trial and error • Algebraic methods • Drawings and graphs • Charts and tables • Patterns	VII-8 Solve problems involving algebraic concepts. • Word problems will be used. • Interpretation of figures may be required. • The following content may be included. - distance-rate-time problems - money problems, which may require a system of equations - numbers (sum, difference, product, quotient) - simple age problems referring only to the present - consecutive integers - area, volume, dimension problems - quantity problems - cost problems - wage problems	X	

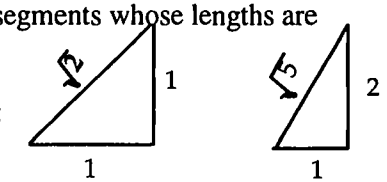
Alabama Course of Study: Mathematics	*Alabama High School Graduation Exam*	Stanford 9	Local
33. Solve quadratic equations using the zero product property.	II-2 Solve quadratic equations that are factorable. • Factoring of the type $ax^2 + bx = 0$ may be required. • The following factoring may be required: - difference of two squares - greatest common monomial - trinomial - common binomial		
34. Solve simple absolute value equations. Examples: $\|x\| = 5$ $\|x+2\| = 3$			
35. Solve problems involving direct variation and inverse (indirect) variation.	VII-7 Solve problems involving direct variation. • Diagrams may be used. • Verbal descriptions of proportions may be used.		

Alabama Course of Study: Mathematics	*Alabama High School Graduation Exam*	Stanford 9	Local
36. Determine whether or not relations are functions, given graphs, tables of values, or sets of ordered pairs.	III-1 Identify functions. • The options may be graphs, ordered pairs, tables, or mappings. • The options may be equations when given a table of values or ordered pairs. • The options may be tables of values or ordered pairs when given an equation. • Functions may be expressed using either the terminology "$f(x) =$" or "$y =$".	X	
37. Recognize domain and range of relations, given graphs, tables of values, or sets of ordered pairs.	III-2 Find the range of functions when given the domain. • The domain of a function may be a single value or a set of values. • A set of ordered pairs may be used. • Functions may be expressed using either the terminology "$f(x) =$" or "$y =$".		
38. Evaluate functions for given values in their domains.	III-2 Find the range of functions when given the domain. • The domain of a function may be a single value or a set of values. • A set of ordered pairs may be used. • Functions may be expressed using either the terminology "$f(x) =$" or "$y =$".		
39. Determine equations of functions, given tables of values or graphs.		X	

Alabama Course of Study: Mathematics	*Alabama High School Graduation Exam*	Stanford 9	Local
40. Identify graphs of functions, given data in tables or equations.	III-1 Identify functions. • The options may be graphs, ordered pairs, tables, or mappings. • The options may be equations when given a table of values or ordered pairs. • The options may be tables of values or ordered pairs when given an equation. • Functions may be expressed using either the terminology "$f(x) =$" or "$y =$".	X	
41. Determine the maximum or minimum points of graphs. Example:  maximum point (5, 3) minimum point (-1, -2)		X	
PROBABILITY, STATISTICS, DISCRETE MATHEMATICS			
42. Draw inferences or make predictions from tables.		X	

Alabama Course of Study: Mathematics	*Alabama High School Graduation Exam*	Stanford 9	Local
43. Draw inferences or make predictions from graphs. • Scattergram • Stem-and-leaf graph • Line graph • Histogram • Box-and-whisker graph		X	
44. Determine correlation given a set of data. • Identifying a line equation that best fits data points in scattergram • Identifying a line equation that best fits a set of data		X	
45. Identify the effect on mean, median, mode, and range when a set of data is changed.	VII-5 Determine measures of central tendency. • The word "mean" will be used for the arithmetic average. • The set of numbers used to assess the range will not be in numerical order. • Decimals up to hundredths may be used. • Decimals with different numbers of decimal digits may be used in the same item. • Frequency diagrams may be used.	X	

Alabama Course of Study: Mathematics	*Alabama High School Graduation Exam*	Stanford 9	Local
46. Predict outcomes for simple events, given the probabilities.	VII-6 Determine probabilities. • Both AND or OR situations may be included.	X	
47. Predict outcomes of compound events, given the probabilities.	VII-6 Determine probabilities. • Both AND or OR situations may be included.	X	
48. Estimate probabilities, given experimental data or graphs.		X	
49. Find probabilities, given graphs of probability distributions or tables of outcomes.	VII-6 Determine probabilities. • Both AND or OR situations may be included.	X	

Alabama Course of Study: Mathematics	*Alabama High School Graduation Exam*	Stanford 9	Local
NUMBER SENSE, NUMBER SYSTEMS, NUMBER THEORY **CONTENT STANDARDS** Students will 1. Construct line segments whose lengths are irrational. Examples:  **GEOMETRY, SPATIAL SENSE, MEASUREMENT** 2. Demonstrate an understanding of the term, "Euclidean geometry," and the fundamental proposition of Euclidean geometry. 3. Distinguish among lines, rays, and segments.			

Alabama Course of Study: Mathematics	*Alabama High School Graduation Exam*	Stanford 9	Local
4. Measure and classify angles.	VII-1 Apply properties of angles and relationships between angles. • The following properties and relationships may be included. - vertical angles - adjacent angles - supplementary angles - complementary angles - linear pair (adjacent supplementary angles) - relationships among the measures of angles formed by two parallel lines and a transversal • Word problems may be used. • The knowledge of the sum of measures of angles may be used. • Determining measurements of angles when the measurements of angles are expressed as algebraic expressions may be required.		

Alabama Course of Study: Mathematics	*Alabama High School Graduation Exam*	Stanford 9	Local
5. Determine area and circumference of a circle.	VII-4 Apply properties of plane and solid geometric figures. • Diagrams may be included. • Word problems may be used. • The following content may be included. - area and perimeter of triangles, rectangles, and squares - area and circumference of a circle, given radius or diameter - perimeter of a regular polygon, given one side - volume of rectangular prism or cylinder - sum of the measures of the angles in a triangle - sum of the measures of the angles in a rectangle • Determining any dimension of a figure may be required. • Determining any dimension of a figure when the dimension is expressed as an algebraic expression may be required. IV-1 Find the perimeter, circumference, area, or volume of geometric figures. • The value of pi (π) will be 3.14. • Options may be left in terms of π. • Unnecessary dimensions may be included.	X	

Alabama Course of Study: Mathematics	*Alabama High School Graduation Exam*	Stanford 9	Local
5. (continued)	• Drawings may be used. • Finding volume or surface area of a rectangular prism may be required. • Extracting a square root may be required. • Determining the area of a circle when given the diameter in the drawing may be required. • The formulas will be given in the problems.		
6. Determine arc length.			
7. Use a compass and a straightedge for geometric constructions. • Parallel lines • Perpendicular lines • Congruent line segments • Median • Altitude • Perpendicular bisector • Congruent angles • Angle bisector			
8. Demonstrate reflections, translations, and rotations.		X	

Alabama Course of Study: Mathematics	*Alabama High School Graduation Exam*	Stanford 9	Local
9. Determine perimeter and area of polygons.	VII-4 Apply properties of plane and solid geometric figures. • Diagrams may be included. • Word problems may be used. • The following content may be included. - area and perimeter of triangles, rectangles, and squares - area and circumference of a circle, given radius or diameter - perimeter of a regular polygon, given one side - volume of rectangular prism or cylinder - sum of the measures of the angles in a triangle - sum of the measures of the angles in a rectangle • Determining any dimension of a figure may be required. • Determining any dimension of a figure when the dimension is expressed as an algebraic expression may be required.	X	

Alabama Course of Study: Mathematics	*Alabama High School Graduation Exam*	Stanford 9	Local
9. (continued)	IV-1 Find the perimeter, circumference, area, or volume of geometric figures. • The value of pi (π) will be 3.14. • Options may be left in terms of π. • Unnecessary dimensions may be included. • Drawings may be used. • Finding volume or surface area of a rectangular prism may be required. • Extracting a square root may be required. • Determining the area of a circle when given the diameter in the drawing may be required. • The formulas will be given in the problems.		

Alabama Course of Study: Mathematics	*Alabama High School Graduation Exam*	Stanford 9	Local
10. Find the area of an inscribed or a circumscribed polygon or circle.	VII-4 Apply properties of plane and solid geometric figures. • Diagrams may be included. • Word problems may be used. • The following content may be included. - area and perimeter of triangles, rectangles, and squares - area and circumference of a circle, given radius or diameter - perimeter of a regular polygon, given one side - volume of rectangular prism or cylinder - sum of the measures of the angles in a triangle - sum of the measures of the angles in a rectangle • Determining any dimension of a figure may be required. • Determining any dimension of a figure when the dimension is expressed as an algebraic expression may be required. IV-1 Find the perimeter, circumference, area, or volume of geometric figures. • The value of pi (π) will be 3.14. • Options may be left in terms of π. • Unnecessary dimensions may be included. • Drawings may be used.	X	

Alabama Course of Study: Mathematics	*Alabama High School Graduation Exam*	Stanford 9	Local
10. (continued)	• Finding volume or surface area of a rectangular prism may be required. • Extracting a square root may be required. • Determining the area of a circle when given the diameter in the drawing may be required. • The formulas will be given in the problems.		
11. Find the surface area and volume of cylinders, spheres, and prisms, given formulas.	VII-4 Apply properties of plane and solid geometric figures. • Diagrams may be included. • Word problems may be used. • The following content may be included. - area and perimeter of triangles, rectangles, and squares - area and circumference of a circle, given radius or diameter - perimeter of a regular polygon, given one side - volume of rectangular prism or cylinder - sum of the measures of the angles in a triangle - sum of the measures of the angles in a rectangle • Determining any dimension of a figure may be required. • Determining any dimension of a figure when the dimension is expressed as an algebraic expression may be required.	X	

Alabama Course of Study: Mathematics	*Alabama High School Graduation Exam*	Stanford 9	Local
11. (continued)	IV-1 Find the perimeter, circumference, area, or volume of geometric figures. • The value of pi (π) will be 3.14. • Options may be left in terms of π. • Unnecessary dimensions may be included. • Drawings may be used. • Finding volume or surface area of a rectangular prism may be required. • Extracting a square root may be required. • Determining the area of a circle when given the diameter in the drawing may be required. • The formulas will be given in the problems.		
12. Apply postulates and theorems related to parallel lines.	VII-1 Apply properties of angles and relationships between angles. • The following properties and relationships may be included. - vertical angles - adjacent angles - supplementary angles - complementary angles - linear pair (adjacent supplementary angles) - relationships among the measures of angles formed by two parallel lines and a transversal	X	

Alabama Course of Study: Mathematics	*Alabama High School Graduation Exam*	Stanford 9	Local
12. (continued)	• Word problems may be used. • The knowledge of the sum of measures of angles may be used. • Determining measurements of angles when the measurements of angles are expressed as algebraic expressions may be required.		
13. Apply the definition and theorems related to perpendicular lines.			
14. Describe and use relationships between pairs of angles. • Adjacent angles • Vertical angles • Complementary angles • Supplementary angles	VII-1 Apply properties of angles and relationships between angles. • The following properties and relationships may be included. - vertical angles - adjacent angles - supplementary angles - complementary angles - linear pair (adjacent supplementary angles) - relationships among the measures of angles formed by two parallel lines and a transversal • Word problems may be used. • The knowledge of the sum of measures of angles may be used. • Determining measurements of angles when the measurements of angles are expressed as algebraic expressions may be required.		

Alabama Course of Study: Mathematics	*Alabama High School Graduation Exam*	Stanford 9	Local
15. Classify a triangle according to its components.			
16. Apply properties and measures associated with triangles and quadrilaterals to solve problems.	VII-4 Apply properties of plane and solid geometric figures. • Diagrams may be included. • Word problems may be used. • The following content may be included. - area and perimeter of triangles, rectangles, and squares - area and circumference of a circle, given radius or diameter - perimeter of a regular polygon, given one side - volume of rectangular prism or cylinder - sum of the measures of the angles in a triangle - sum of the measures of the angles in a rectangle • Determining any dimension of a figure may be required. • Determining any dimension of a figure when the dimension is expressed as an algebraic expression may be required.	X	
17. Identify polyhedrons.			

Alabama Course of Study: Mathematics	*Alabama High School Graduation Exam*	Stanford 9	Local
18. Deduce the measure of angles associated with polygons from given information. Examples: interior, exterior	VII-1 Apply properties of angles and relationships between angles. • The following properties and relationships may be included. - vertical angles - adjacent angles - supplementary angles - complementary angles - linear pair (adjacent supplementary angles) - relationships among the measures of angles formed by two parallel lines and a transversal • Word problems may be used. • The knowledge of the sum of measures of angles may be used. • Determining measurements of angles when the measurements of angles are expressed as algebraic expressions may be required. VII-4 Apply properties of plane and solid geometric figures. • Diagrams may be included. • Word problems may be used. • The following content may be included. - area and perimeter of triangles, rectangles, and squares - area and circumference of a circle, given radius or diameter	X	

Alabama Course of Study: Mathematics	*Alabama High School Graduation Exam*	Stanford 9	Local
18. (continued)	- perimeter of a regular polygon, given one side - volume of rectangular prism or cylinder - sum of the measures of the angles in a triangle - sum of the measures of the angles in a rectangle • Determining any dimension of a figure may be required. • Determining any dimension of a figure when the dimension is expressed as an algebraic expression may be required.		
19. Determine whether triangles are congruent.			
20. Describe and identify parts of circles. • Radius • Diameter • Tangent • Secant • Chord • Arcs • Central angle • Inscribed angle			

Alabama Course of Study: Mathematics	*Alabama High School Graduation Exam*	Stanford 9	Local
21. Apply properties and theorems related to circles. Examples: A diameter perpendicular to a chord bisects the chord and its arcs. The measure of an inscribed angle is equal to one-half the measure of its intercepted arc.	IV-1 Find the perimeter, circumference, area, or volume of geometric figures. • The value of pi (π) will be 3.14. • Options may be left in terms of π. • Unnecessary dimensions may be included. • Drawings may be used. • Finding volume or surface area of a rectangular prism may be required. • Extracting a square root may be required. • Determining the area of a circle when given the diameter in the drawing may be required. • The formulas will be given in the problems.		
22. Distinguish among circumcenter, incenter, orthocenter, and centroid of a triangle.			
PATTERNS, FUNCTIONS, ALGEBRA			
23. Find the area of a rectangle or triangle, given the coordinates of the vertices.	IV-1 Find the perimeter, circumference, area, or volume of geometric figures. • The value of pi (π) will be 3.14. • Options may be left in terms of π. • Unnecessary dimensions may be included.	X	

Alabama Course of Study: Mathematics	*Alabama High School Graduation Exam*	Stanford 9	Local
23. (continued)	• Drawings may be used. • Finding volume or surface area of a rectangular prism may be required. • Extracting a square root may be required. • Determining the area of a circle when given the diameter in the drawing may be required. • The formulas will be given in the problems. VII-4 Apply properties of plane and solid geometric figures. • Diagrams may be included. • Word problems may be used. • The following content may be included. - area and perimeter of triangles, rectangles, and squares - area and circumference of a circle, given radius or diameter - perimeter of a regular polygon, given one side - volume of rectangular prism or cylinder - sum of the measures of the angles in a triangle - sum of the measures of the angles in a rectangle • Determining any dimension of a figure may be required. • Determining any dimension of a figure when the dimension is expressed as an algebraic expression may be required.		

Alabama Course of Study: Mathematics	*Alabama High School Graduation Exam*	Stanford 9	Local
24. Determine the slope of a line from its graph or from its equation.	IV-2 Find the distance, midpoint, or slope of line segments when given two points. • Radicals may be used. • Radicals will be simplified. • Lines graphed on the coordinate plane may be included. • Determining the slope of a line given a line on the coordinate plane with two points labeled with their ordered pairs may be required. • Determining the slope of a line or midpoint of a line segment given two points on a line on the coordinate plane without any coordinates labeled may be required. • The formulas will be given in the problems.		
25. Apply formulas of coordinate geometry. • Distance • Slope • Midpoint	IV-2 Find the distance, midpoint, or slope of line segments when given two points. • Radicals may be used. • Radicals will be simplified. • Lines graphed on the coordinate plane may be included. • Determining the slope of a line given a line on the coordinate plane with two points labeled with their ordered pairs may be required. • Determining the slope of a line or midpoint of a line segment given two points on a line on the coordinate plane without any coordinates labeled may be required. • The formulas will be given in the problems.	X	

Alabama Course of Study: Mathematics	*Alabama High School Graduation Exam*	Stanford 9	Local
26. Determine an equation of a line from given information. • Two points • Point and slope • Slope and y-intercept	VI-1 Translate verbal or symbolic information into algebraic expressions; or identify equations or inequalities that represent graphs or problem situations. • Determining an equation or expression when given a verbal description may be required. • Graphing inequalities using a number line may be required. • Determining the equation of a line given two ordered pairs may be required. • Determining the equation of a line given the line graphed on the coordinate plane may be required.		
27. Recognize and use the relationship of the slopes of parallel lines and the slopes of perpendicular lines.			
28. Apply the Triangle Inequality Theorem in problem solving.			
29. Recognize and use Pythagorean Triples.	VII-2 Apply Pythagorean Theorem. • The Pythagorean Theorem will be given on the reference page. • Diagrams will be included. • Word problems will be used. • Radicals may be included in options. • All radicals will be simplified. • Drawings will be to scale.		

Alabama Course of Study: Mathematics	*Alabama High School Graduation Exam*	Stanford 9	Local
30. Apply the Pythagorean Theorem in problem solving using calculators when appropriate.	VII-2 Apply Pythagorean Theorem. • The Pythagorean Theorem will be given on the reference page. • Diagrams will be included. • Word problems will be used. • Radicals may be included in options. • All radicals will be simplified. • Drawings will be to scale.	X	
31. Solve an equation involving radicals.	II-1 Solve multi-step equations of first degree. • One set of parentheses may be used. • Finding the sum or difference of terms containing the same variable may be required. • Adding or subtracting a variable to or from both sides of the equation may be required. • The solution to the equation may be a fraction. • Coefficients may be simple fractions.	X	
32. Apply the properties of 30-60-90 degree triangles and 45-45-90 degree triangles.			

Alabama Course of Study: Mathematics	*Alabama High School Graduation Exam*	Stanford 9	Local
33. Solve a problem using ratio or proportion.	II-1 Solve multi-step equations of first degree. • One set of parentheses may be used. • Finding the sum or difference of terms containing the same variable may be required. • Adding or subtracting a variable to or from both sides of the equation may be required. • The solution to the equation may be a fraction. • Coefficients may be simple fractions. VII-7 Solve problems involving direct variation. • Diagrams may be used. • Verbal descriptions of proportions may be used.	X	
34. Determine the geometric mean between two numbers.			
35. Apply properties of similar polygons in problem solving.	VII-3 Apply properties of similar polygons. • Diagrams may be included. • Drawings will be to scale. • The world *similar* or the symbol "~" may be used. • Use of the scale factor will be required.	X	
36. Know the right triangle definitions of the sine, cosine, and tangent functions and use them to solve a triangle.		X	

Alabama Course of Study: Mathematics	*Alabama High School Graduation Exam*	Stanford 9	Local
PROBABILITY, STATISTICS, DISCRETE MATHEMATICS 37. Distinguish between inductive and deductive reasoning. 38. Recognize the hypothesis and conclusion of an if-then statement. 39. Describe the locus that satisfies a given condition. • Circle • Cylinder • Sphere			

Alabama Course of Study: Mathematics	*Alabama High School Graduation Exam*	Stanford 9	Local
NUMBER SENSE, NUMBER SYSTEMS, NUMBER THEORY **CONTENT STANDARDS** Students will 1. Define sets of numbers. • Whole numbers • Natural numbers • Integers • Rational numbers • Irrational numbers • Real numbers • Complex numbers 2. Perform operations on rational variable expressions.	I-1 Apply order of operations. • One, two, or no variables may be used. • One set of parentheses may be used. • Determining the absolute value of a term may be required. • Squaring the quantity in parentheses may be required. • No more than four terms may be included. • Adding or subtracting negative integers may be required. • Decimals to the tenths' place may be used. I-2 Add and subtract polynomials. • Using the distributive property may be required. • Unlike denominators may be used.		

Alabama Course of Study: Mathematics	*Alabama High School Graduation Exam*	Stanford 9	Local
2. (continued)	I-3 Multiply polynomials. • Multiplying two quantities in parentheses may be required. • Squaring a quantity in parentheses may be required. • Adding or subtracting may be required. • Raising a quantity to a power may be required. • Fractions may be used. • Adding exponents may be required.		
3. Identify the domain of a rational variable expression.			
4. Perform operations involving polynomials, including polynomials with complex coefficients.	I-1 Apply order of operations. • One, two, or no variables may be used. • One set of parentheses may be used. • Determining the absolute value of a term may be required. • Squaring the quantity in parentheses may be required. • No more than four terms may be included. • Adding or subtracting negative integers may be required. • Decimals to the tenths' place may be used.		

Alabama Course of Study: Mathematics	*Alabama High School Graduation Exam*	Stanford 9	Local
4. (continued)	I-2 Add and subtract polynomials. • Using the distributive property may be required. • Unlike denominators may be used. I-3 Multiply polynomials. • Multiplying two quantities in parentheses may be required. • Squaring a quantity in parentheses may be required. • Adding or subtracting may be required. • Raising a quantity to a power may be required. • Fractions may be used. • Adding exponents may be required. I-4 Factor polynomials. • The following factoring may be required: - difference of two squares - greatest common monomial - trinomial - common binomial • Options will be factored completely.		
5. Simplify a number within any subset of the set of complex numbers.			

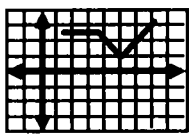
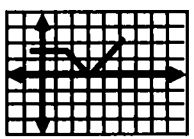
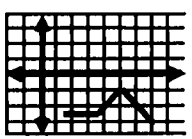
Alabama Course of Study: Mathematics	*Alabama High School Graduation Exam*	Stanford 9	Local
6. Write the conjugate of a complex number. 7. Determine the absolute value of a complex number. 8. Perform operations with complex numbers in the form a + bi. 9. Determine the nature of the solutions of a quadratic equation. 10. Identify a matrix as a rectangular array of numbers. 11. Identify the zero matrix and the identity matrix. 12. Evaluate a second order determinant and a third order determinant.			

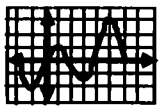
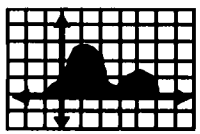
Alabama Course of Study: Mathematics	*Alabama High School Graduation Exam*	Stanford 9	Local
GEOMETRY, SPATIAL SENSE, MEASUREMENT			
13. Apply the distance and midpoint formulas to coordinate geometry. Examples: finding the area of a rectangle or triangle, given the coordinates of its vertices; finding the circumference of a circle, given the endpoints of diameter or radius; finding the dimensions of a polygon, given the coordinates of its vertices	IV-2 Find the distance, midpoint, or slope of line segments when given two points. • Radicals may be used. • Radicals will be simplified. • Lines graphed on the coordinate plane may be included. • Determining the slope of a line given a line on the coordinate plane with two points labeled with their ordered pairs may be required. • Determining the slope of a line or midpoint of a line segment given two points on a line on the coordinate plane without any coordinates labeled may be required. • The formulas will be given in the problems.	X	
14. Determine an equation of a line given certain conditions. • Intercepts • Two points • Slope, point • Parallel line, point • Perpendicular line, point • Graph	VI-1 Translate verbal or symbolic information into algebraic expressions; or identify equations or inequalities that represent graphs or problem situations. • Determining an equation or expression when given a verbal description may be required. • Graphing inequalities using a number line may be required.		

Alabama Course of Study: Mathematics	*Alabama High School Graduation Exam*	Stanford 9	Local
14. (continued)	• Determining the equation of a line given two ordered pairs may be required. • Determining the equation of a line given the line graphed on the coordinate plane may be required.		
15. Identify the coordinates of transformations. • Reflections across the x-axis • Reflections across the y-axis • Horizontal translations • Vertical translations • Rotations		X	
16. Use perimeter, area, and volume formulas to solve word problems.	IV-1 Find the perimeter, circumference, area, or volume of geometric figures. • The value of pi (π) will be 3.14. • Options may be left in terms of π. • Unnecessary dimensions may be included. • Drawings may be used. • Finding volume or surface area of a rectangular prism may be required. • Extracting a square root may be required. • Determining the area of a circle when given the diameter in the drawing may be required. • The formulas will be given in the problems.	X	

Alabama Course of Study: Mathematics	*Alabama High School Graduation Exam*	Stanford 9	Local
16. (continued)	VII-4 Apply properties of plane and solid geometric figures. • Diagrams may be included. • Word problems may be used. • The following content may be included. - area and perimeter of triangles, rectangles, and squares - area and circumference of a circle, given radius or diameter - perimeter of a regular polygon, given one side - volume of rectangular prism or cylinder - sum of the measures of the angles in a triangle - sum of the measures of the angles in a rectangle • Determining any dimension of a figure may be required. • Determining any dimension of a figure when the dimension is expressed as an algebraic expression may be required.		

Alabama Course of Study: Mathematics	*Alabama High School Graduation Exam*	Stanford 9	Local
17. Graph basic equations and identify the graphs of basic equations in the coordinate plane. • $x = k$ • $y = k$ • $y = x$ • $y = \frac{1}{x}$ • $y = [x]$ • $y = \lvert x \rvert$ • $y = \sqrt{x}$ • $y = x^2$	V-1 Graph or identify graphs of linear equations. • Equations may be expressed in terms of $f(x)$. • The options may be four graphs. • The options may be four equations. V-4 Identify graphs of common relations. • The common relations are: - x = constant - y = constant - $y = x$ - $y = \sqrt{x}$ - y = x2 - $y = \lvert x \rvert$ • The options may be four graphs. • The options may be four equations. III-1 Identify functions. • The options may be graphs, ordered pairs, tables, or mappings. • The options may be equations when given a table of values or ordered pairs. • The options may be tables of values or ordered pairs when given an equation. • Functions may be expressed using either the terminology "$f(x) =$" or "y =".	X	

Alabama Course of Study: Mathematics	*Alabama High School Graduation Exam*	Stanford 9	Local
18. Analyze the effects of parameter changes on the graphs of functions. Examples: Given f(x)  f(x+2) -1  –f(x)  19. Graph equations of and identify the graphs of conic sections. • $y = a(x - h)^2 + k$ • $y = ax^2 + bx + c$ • $(x - h)^2+(y - k)^2 = r^2$ • $\frac{(x - h)^2}{a^2} + \frac{(y - k)^2}{b^2} = 1$ • $\frac{(x - h)^2}{a^2} - \frac{(y - k)^2}{b^2} = 1$		X	

Alabama Course of Study: Mathematics	*Alabama High School Graduation Exam*	Stanford 9	Local
20. Determine the maximum or minimum points of graphs. Example:  maximum point (5, 3) minimum point (-1, -2)		X	
21. Determine the maximum or minimum values of quadratic functions. • Algebraically • Graphically			
22. Estimate the areas under curves graphed on the Cartesian plane. Example: 		X	

Alabama Course of Study: Mathematics	*Alabama High School Graduation Exam*	Stanford 9	Local
PATTERNS, FUNCTIONS, ALGEBRA			
23. Solve equations or inequalities involving absolute value.	V-3 Determine solution sets of inequalities. • Compound inequality may be included. • Solving inequality may be required. • Options will be graphs.		
24. Solve equations involving radicals. Examples: $\sqrt{x+4}=\sqrt{3x+5}$ $3\sqrt{x+1}=\sqrt{x-2}$		X	
25. Solve equations involving complex numbers.			
26. Express the solutions of equations or inequalities in different ways. • Using graphs • Using set notations • Using interval notations	II-4 Solve multi-step inequalities of first degree. • A negative coefficient may be used. V-3 Determine solution sets of inequalities. • Compound inequality may be included. • Solving inequality may be required. • Options will be graphs.		

Alabama Course of Study: Mathematics	*Alabama High School Graduation Exam*	Stanford 9	Local
27. Solve quadratic equations by using a variety of methods. • Inspection • Graphing • Factoring • Completing the square • Using quadratic formula • Using calculator	II-2 Solve quadratic equations that are factorable. • Factoring of the type $ax^2 + bx = 0$ may be required. • The following factoring may be required: - difference of two squares - greatest common monomial - trinomial - common binomial		
28. Identify equations or inequalities that represent problem situations.	VI-1 Translate verbal or symbolic information into algebraic expressions; or identify equations or inequalities that represent graphs or problem situations. • Determining an equation or expression when given a verbal description may be required. • Graphing inequalities using a number line may be required. • Determining the equation of a line given two ordered pairs may be required. • Determining the equation of a line given the line graphed on the coordinate plane may be required.	X	

Alabama Course of Study: Mathematics	*Alabama High School Graduation Exam*	Stanford 9	Local
28. (continued)	V-3 Determine solution sets of inequalities. • Compound inequality may be included. • Solving inequality may be required. • Options will be graphs.		
29. Solve word problems that involve linear or quadratic equations.	II-1 Solve multi-step equations of first degree. • One set of parentheses may be used. • Finding the sum or difference of terms containing the same variable may be required. • Adding or subtracting a variable to or from both sides of the equation may be required. • The solution to the equation may be a fraction. • Coefficients may be simple fractions.	X	
	II-2 Solve quadratic equations that are factorable. • Factoring of the type $ax^2 + bx = 0$ may be required. • The following factoring may be required: - difference of two squares - greatest common monomial - trinomial - common binomial		

Alabama Course of Study: Mathematics	*Alabama High School Graduation Exam*	Stanford 9	Local
29. (continued)	VII-8 Solve problems involving algebraic concepts. • Word problems will be used. • Interpretation of figures may be required. • The following content may be included: - distance-rate-time problems - money problems, which may require a system of equations - numbers (sum, difference, product, quotient) - simple age problems referring only to the present - consecutive integers - area, volume, dimension problems - quantity problems - cost problems - wage problems		
30. Determine zeros of functions algebraically and graphically.			
31. Write polynomial functions given the zeros.			
32. Solve systems of equations or inequalities. • Linear • Quadratic • Linear - quadratic	II-3 Solve systems of two linear equations. • Solving for the values of both x and y may be required. • The options may be four graphs with lines plotted and the intersection point labeled with its ordered pair.	X	

Alabama Course of Study: Mathematics	*Alabama High School Graduation Exam*	Stanford 9	Local
32. (continued)	II-4 Solve multi-step inequalities of first degree. • A negative coefficient may be used. V-3 Determine solution sets of inequalities. • Compound inequality may be included. • Solving inequality may be required. • Options will be graphs.		
33. Use Cramer's Rule to solve systems of equations in two or three variables.	II-3 Solve systems of two linear equations. • Solving for the values of both x and y may be required. • The options may be four graphs with lines plotted and the intersection point labeled with its ordered pair.		

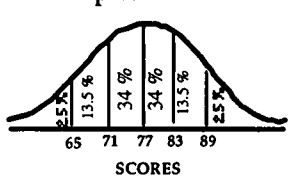
Alabama Course of Study: Mathematics	*Alabama High School Graduation Exam*	Stanford 9	Local
34. Identify equations or graphs of functions from given tables of values. • Constant • Identity • Direct variation • Inverse variation • Greatest integer • Absolute value • Quadratic • Rational	III-1 Identify functions. • The options may be graphs, ordered pairs, tables, or mappings. • The options may be equations when given a table of values or ordered pairs. • The options may be tables of values or ordered pairs when given an equation. • Functions may be expressed using either the terminology "$f(x) =$" or "y =".	X	
35. Identify the domain and range of functions.	III-2 Find the range of functions when given the domain. • The domain of a function may be a single value or a set of values. • A set of ordered pairs may be used. • Functions may be expressed using either the terminology "$f(x) =$" or "y =".		
36. Perform operations on functions. • Addition • Subtraction • Multiplication • Division • Factoring • Composition	I-4 Factor polynomials. • The following factoring may be required: - difference of two squares - greatest common monomial - trinomial - common binomial • Options will be factored completely.		

Alabama Course of Study: Mathematics	*Alabama High School Graduation Exam*	Stanford 9	Local
37. Simplify expressions involving rational and irrational exponents.	I-2 Add and subtract polynomials. • Using the distributive property may be required. • Unlike denominators may be used. I-3 Multiply polynomials. • Multiplying two quantities in parentheses may be required. • Squaring a quantity in parentheses may be required. • Adding or subtracting may be required. • Raising a quantity to a power may be required. • Fractions may be used. • Adding exponents may be required.		
38. Know and apply the laws of logarithms.			
39. Solve exponential equations. Example: $3^x = 17$			
40. Translate exponential equations into logarithmic equations and vice versa.			
41. Solve equations involving logarithms, including natural logarithms.			
42. Define the six trigonometric functions. • As ratios of the sides of a right triangle • As coordinates on the unit circle • As the reciprocal of another function			

Alabama Course of Study: Mathematics	*Alabama High School Graduation Exam*	Stanford 9	Local
43. Given a trigonometric function value of an angle, determine its other trigonometric values.			
44. Develop and know the values of the trigonometric functions of special angles. • 0^0 • 30^0 • 45^0 • 60^0 • 90^0 • 180^0 • 270^0			
45. Read and interpret the graphs of trigonometric functions.		X	
46. Graph the sine, cosine, and tangent functions.			
47. Recognize and determine period, amplitude, and phase shift of sine, cosine, and tangent functions.			
48. Verify simple trigonometric identities.			
49. Solve right triangles.	VII-2 Apply Pythagorean Theorem. • The Pythagorean Theorem will be given on the reference page. • Diagrams will be included. • Word problems will be used. • Radicals may be included in options. • All radicals will be simplified. • Drawings will be to scale.	X	

Alabama Course of Study: Mathematics	*Alabama High School Graduation Exam*	Stanford 9	Local
50. Solve oblique triangles using the Law of Sines and the Law of Cosines.		X	
51. Solve a simple trigonometric equation.			
52. Solve word problems using trigonometric functions.			
53. Recognize number patterns as sequences.			
54. Recognize number sequences as functions.			
55. Recognize and determine characteristics of arithmetic and geometric sequences and series. • First term • Common difference or ratio • n^{th} term • Means			
56. Determine the limit, if it exists, of an infinite sequence.		X	
57. Determine the sum, if it exists, of finite and infinite series.		X	
58. Use sequences and series to solve word problems.		X	

Alabama Course of Study: Mathematics	*Alabama High School Graduation Exam*	Stanford 9	Local
59. Solve problems using a variety of methods. • Trial and error • Algebraic methods • Drawings/Graphs • Charts/Tables • Patterns • Intuition	VII-8 Solve problems involving algebraic concepts. • Word problems will be used. • Interpretation of figures may be required. • The following content may be included: - distance-rate-time problems - money problems, which may require a system of equations - numbers (sum, difference, product, quotient) - simple age problems referring only to the present - consecutive integers - area, volume, dimension problems - quantity problems - cost problems - wage problems	X	
PROBABILITY, STATISTICS, DISCRETE MATHEMATICS			
60. Identify the results of algorithms.		X	
61. Identify equations of lines of regression for a scattergram.		X	
62. Make predictions from statistical samples.		X	

Alabama Course of Study: Mathematics	*Alabama High School Graduation Exam*	Stanford 9	Local
63. Solve problems using enumeration procedures. • Counting principle • Combinations • Permutations		X	
64. Find probability. • Using sample spaces • Using graphs of probability distributions • Using tables of outcomes	VII-6 Determine probabilities. • Both AND or OR situations may be included.	X	
65. Solve problems involving sequences with recurrence relations.		X	
66. Solve problems involving normal distributions. Example:  The mean of set of test scores is 77 with a standard deviation of 6. If 5285 people took the test, how many scored above 2 standard deviations above the mean?		X	

Alabama Course of Study: Mathematics	*Alabama High School Graduation Exam*	Stanford 9	Local
NUMBER SENSE, NUMBER SYSTEMS, NUMBER THEORY **CONTENT STANDARDS** Students will 1. Use and apply the axioms of equality and the axioms of order. • Verifying statements • Verifying steps in problems	I-1 Apply order of operations. • One, two, or no variables may be used. • One set of parentheses may be used. • Determining the absolute value of a term may be required. • Squaring the quantity in parentheses may be required. • No more than four terms may be included. • Adding or subtracting negative integers may be required. • Decimals to the tenths' place may be used.		
2. Demonstrate an understanding of the relationship between vectors and complex numbers. 3. Express complex numbers in trigonometric form. 4. Use DeMoivre's Theorem. 5. Define a vector as an ordered n-tuple. 6. Distinguish between a scalar and a vector.			

Alabama Course of Study: Mathematics	*Alabama High School Graduation Exam*	Stanford 9	Local
7. Perform vector operations. • Displacement • Addition • Difference • Scalar multiplication • Dot product • Cross product			
8. Recognize the properties for vector addition. • Commutativity • Associativity • Identity • Additive inverse			
9. Determine norms of vectors.			
10. Identify unit vectors.			
11. Determine coincidence, parallelism, collinearity, and perpendicularity of vectors.			
12. Express vectors as the sum of component vectors.			
13. Determine parametric equations of lines.			
14. Graph parametric equations.			
GEOMETRY, SPATIAL SENSE, MEASUREMENT			
15. Determine limits of functions.			
16. Develop an understanding of the derivative as a rate of change.			

Alabama Course of Study: Mathematics	*Alabama High School Graduation Exam*	Stanford 9	Local
17. Determine derivatives using the definition of derivative as a limit.			
18. Determine the slope of a polynomial function at a point.	IV-2 Find the distance, midpoint, or slope of line segments when given two points. • Radicals may be used. • Radicals will be simplified. • Lines graphed on the coordinate plane may be included. • Determining the slope of a line given a line on the coordinate plane with two points labeled with their ordered pairs may be required. • Determining the slope of a line or midpoint of a line segment given two points on a line on the coordinate plane without any coordinates labeled may be required. • The formulas will be given in the problems.		
19. Write equations of lines. • Tangent to polynomial functions at a point • Normal to polynomial functions at a point			
20. Solve problems using derivatives. • Relative maximum • Relative minimum			

Alabama Course of Study: Mathematics	*Alabama High School Graduation Exam*	Stanford 9	Local
21. Estimate areas under curves.		X	
22. Identify and graph conic sections from second degree equations in any given form.	V-4 Identify graphs of common relations. • The common relations are: - x = constant - y = constant - y = x - $y = \sqrt{x}$ - $y = x^2$ - y = |x| • The options may be four graphs. • The options may be four equations.		
23. Determine characteristics of conic sections. • Center • Vertices • Axes of symmetry • Directrix • End-points of axes • Latera recta • Eccentricity • Foci			
24. Determine equations of conic sections from given characteristics.			
25. Identify degenerate conics.			

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26. Graph rational functions using intercepts, symmetry, and asymptotes (vertical, horizontal, and oblique).			
27. Identify functions from tables of values or graphs. • Constant • Identity • Direct variation • Indirect variation • Greatest integer • Absolute value • Power • Root • Exponential • Logarithmic	III-1 Identify functions. • The options may be graphs, ordered pairs, tables, or mappings. • The options may be equations when given a table of values or ordered pairs. • The options may be tables of values or ordered pairs when given an equation. • Functions may be expressed using either the terminology "$f(x) =$" or "y =".	X	
28. Analyze the effects of parameter changes on the graphs of functions.		X	
29. State the properties of functions. • Domain and range • Increasing/decreasing • Continuity • Symmetry • Odd/even	III-2 Find the range of functions when given the domain. • The domain of a function may be a single value or a set of values. • A set of ordered pairs may be used. • Functions may be expressed using either the terminology "$f(x) =$" or "y =".		
30. Graph piecewise functions.			

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PATTERNS, FUNCTIONS, ALGEBRA			
31. Know and apply the laws of logarithms.			
32. Solve equations. • Logarithmic • Exponential • Trigonometric • Matrix			
33. Solve equations involving natural logarithms.			
34. Solve systems of equations. • Linear/quadratic • Quadratic	II-1 Solve multi-step equations of first degree. • One set of parentheses may be used. • Finding the sum or difference of terms containing the same variable may be required. • Adding or subtracting a variable to or from both sides of the equation may be required. • The solution to the equation may be a fraction. • Coefficients may be simple fractions.	X	

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34. (continued)	II-2 Solve quadratic equations that are factorable. • Factoring of the type $ax^2 + bx = 0$ may be required. • The following factoring may be required: - difference of two squares - greatest common monomial - trinomial - common binomial II-3 Solve systems of two linear equations. • Solving for the values of both x and y may be required. • The options may be four graphs with lines plotted and the intersection point labeled with its ordered pair.		
35. Apply the Fundamental Theorem of Algebra to solve polynomial equations.		X	
36. Know and apply the Remainder Theorem, the Factor Theorem, the Rational Root Theorem, Descartes' Rule of Signs, and the Location Principle.			
37. Use synthetic division to find the zeros of polynomial functions.			
38. Determine the upper and lower bounds for real roots.			

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39. Determine the inverse of functions. • Linear • Rational • Logarithmic • Exponential			
40. Determine the composition of functions and the domain of that composition.			
41. Define the six trigonometric functions. • As ratios of the sides of a right triangle • As coordinates on the unit circle			
42. State the amplitude, period, and phase shift of trigonometric functions.		X	
43. Determine the domain and range of inverse trigonometric functions.			
44. Graph inverse trigonometric functions.			
45. Derive basic trigonometric identities.			
46. Verify trigonometric identities.			
47. Derive the Law of Sines and the Law of Cosines.			

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48. Determine the area of oblique triangles.	IV-1 Find the perimeter, circumference, area, or volume of geometric figures. • The value of pi (π) will be 3.14. • Options may be left in terms of π. • Unnecessary dimensions may be included. • Drawings may be used. • Finding volume or surface area of a rectangular prism may be required. • Extracting a square root may be required. • Determining the area of a circle when given the diameter in the drawing may be required. • The formulas will be given in the problems. VII-4 Apply properties of plane and solid geometric figures. • Diagrams may be included. • Word problems may be used. • The following content may be included. - area and perimeter of triangles, rectangles, and squares - area and circumference of a circle, given radius or diameter - perimeter of a regular polygon, given one side - volume of rectangular prism or cylinder		

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48. (continued)	- sum of the measures of the angles in a triangle - sum of the measures of the angles in a rectangle • Determining any dimension of a figure may be required. • Determining any dimension of a figure when the dimension is expressed as an algebraic expression may be required.		
49. Use formulas to solve trigonometric equations. • Sum/difference • Half angle • Double angle			
50. Use trigonometric equations and inequalities to solve word problems.		X	
51. Define polar coordinates.			
52. Express Cartesian coordinates and equations in polar form and vice versa.			
53. Express complex numbers in polar form.			
54. Graph polar equations.			
55. Express sequences recursively.		X	

Alabama Course of Study: Mathematics	*Alabama High School Graduation Exam*	Stanford 9	Local
56. Recognize and determine characteristics of arithmetic and geometric sequences and series. • First term • Common difference or ratio • n^{th} term • Means • Sigma notation			
57. Apply the Binomial Theorem. • Expanding binomials • Finding the nth term			
58. Use Pascal's Triangle to determine coefficients of expanded binomials.			
59. Determine limits of sequences.		X	
60. Define e. • $\sum_{n=0}^{\infty} \frac{1}{n!}$ • $\lim_{n\to\infty}(1+\frac{1}{n})^n$ • $\lim_{n\to 0}(1+n)^{\frac{1}{n}}$			
61. Determine convergence or divergence of sequences.			
62. Find the sums of infinite geometric series.			

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63. Solve problems using non-routine strategies.		X	
PROBABILITY, STATISTICS, DISCRETE MATHEMATICS			
64. Use the vocabulary for symbolic logic.			
65. Determine the validity of statements using truth tables. • Negation • Conjunction • Disjunction • Conditionals • Converses • Inverses • Contrapositives • Compound statements			
66. Use conditional statements to reach a logical conclusion.			
67. Prove statements. • Using mathematical induction • Using contradiction			
68. Differentiate between a population and a sample, random or biased.			
69. Compute and use measures of variability. • Range • Variance • Standard deviation			

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70. Identify equations of lines of regression for scattergrams.		X	
71. Recognize r value as an indicator of correlation.			
72. Read and interpret normal distribution curves.		X	
Example:  The mean of set of test scores is 77 with a standard deviation of 6. If 5285 people took the test, how many scored above 2 standard deviations above the mean?			
73. Use matrices in problem solving.			
74. Solve problems involving maximum or minimum values using linear programming procedures.		X	

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NUMBER SENSE, NUMBER SYSTEMS, NUMBER THEORY **CONTENT STANDARDS** Students will			
1. Compute and compare returns on various types of investments, using recurrence relations. Examples: stocks, certificates of deposit, mutual funds, retirement income, savings accounts, 401K, Keogh Plans, other current investment trends		X	
2. Critique and compare banking services. • Checking accounts • Savings accounts			
3. Determine interest associated with credit cards.			
4. Read and use amortization tables for loans. Examples: auto, home, education		X	
5. Assess various types of insurance based on need and cost. Examples: home, rental, auto, health, disability, long-term care, life			
6. Develop personal budgets.			

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7. Determine the impact of major purchases on personal budgets. 8. Identify factors that influence the cost of licenses or permits. Examples: driving, hunting, business, construction 9. Recognize equivalent representations of the same number. • Decimal • Fraction • Percent • Per unit • Integer • Logarithm • Scientific notation 10. Critique and compare housing options. • Rentals • Lease to purchase • Loan purchase Examples: fixed-rate loan, variable-rate loan 11. Express mathematical ideas by speaking, writing, demonstrating, and depicting visually.			

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12. Critique and compare automotive acquisition. • Leasing • Purchasing by cash • Purchasing by loan			
GEOMETRY, SPATIAL SENSE, MEASUREMENT			
13. Apply perimeter, area, and volume formulas in problem solving. Examples: fence a yard, lay carpet in a room, frame a picture, sew clothing, paint a room, install a cabinet, tile a floor, fill a pool	IV-1 Find the perimeter, circumference, area, or volume of geometric figures. • The value of pi (π) will be 3.14. • Options may be left in terms of π. • Unnecessary dimensions may be included. • Drawings may be used. • Finding volume or surface area of a rectangular prism may be required. • Extracting a square root may be required. • Determining the area of a circle when given the diameter in the drawing may be required. • The formulas will be given in the problems.	X	

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13. (continued)	VII-4 Apply properties of plane and solid geometric figures. • Diagrams may be included. • Word problems may be used. • The following content may be included: - area and perimeter of triangles, rectangles, and squares - area and circumference of a circle, given radius or diameter - perimeter of a regular polygon, given one side - volume of rectangular prism or cylinder - sum of the measures of the angles in a triangle - sum of the measures of the angles in a rectangle • Determining any dimension of a figure may be required. • Determining any dimension of a figure when the dimension is expressed as an algebraic expression may be required.		
14. Use symmetry, perspective, spatial representation, or patterns to evaluate and/or create works of art.		X	

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15. Produce a scale drawing of two- and three-dimensional objects.	VII-3 Apply properties of similar polygons. • Diagrams may be included. • Drawings will be to scale. • The world *similar* or the symbol "~" may be used. • Use of the scale factor will be required.	X	
16. Demonstrate an understanding of the role of geometry in society. Examples: product development, architectural design, interior design, container design			
17. Develop charts and graphs to show investment growth, insurance information, and loan information.		X	
PATTERNS, FUNCTIONS, ALGEBRA			
18. Calculate appreciation or depreciation, and assess the impact on the value of items. Examples: appliance, home, vehicle, art work		X	

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19. Critique statements from producers and suppliers to make wise consumer decisions. Examples: advertising, warranties, guarantees			
20. Recognize methods used in deceptive and fraudulent pricing. Examples: bait and switch, games of chance, flim flams, land deals, swindles			
21. Use functions to draw conclusions about consumer costs. Examples: step function – postage rates, trip fares, shipping charges; constant function – membership dues, license fees; linear function – gas cost, sales tax		X	
22. Use tables of numbers from familiar societal contexts to determine if patterns exist. Examples: population change, inflation rate, employment rate, cholesterol count		X	
23. Interpret and analyze information about change in the real world. Examples: percent change, average change, rates such as distance per unit, rate of depreciation		X	

Alabama Course of Study: Mathematics	*Alabama High School Graduation Exam*	Stanford 9	Local
24. Recognize mathematical skills required for success in various vocations and avocations. Examples: nursing, fast-food management, electrical engineering, stamp collecting, commercial knitting, weight lifting			
PROBABILITY, STATISTICS, DISCRETE MATHEMATICS			
25. Represent problem situations using discrete structures such as finite graphs, matrices, sequences, and recurrence relations. Examples: half-life, population growth and decline, geometric figures, particle motion (bouncing ball, sound wave)		X	
26. Determine probability of real-life events.	VII-6 Determine probabilities. • Both AND or OR situations may be included.	X	
27. Collect data using various methods. Examples: surveys, newspaper information, experiments, interviews		X	

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28. Predict outcomes, given the probability in real-life situations. Examples: financial investment, lottery, medical test, weather forecast		X	
29. Apply statistical techniques, including correlation, to predict or analyze election results.		X	
30. Interpret statistical analyses in sports and subsequent changes. Example: changing performances of players or teams		X	
31. Make predictions from statistical samples.		X	
32. Solve problems using enumeration procedures. • Counting principle • Combinations • Permutations		X	
33. Find probability. • Using sample spaces • Using graphs of probability distributions • Using tables of outcomes	VII-6 Determine probabilities. • Both AND or OR situations may be included.	X	

Alabama Course of Study: Mathematics	*Alabama High School Graduation Exam*	Stanford 9	Local
34. Solve problems involving sequences with recurrence relations.		X	
35. Solve problems involving normal distribution. Example:  The mean of set of test scores is 77 with a standard deviation of 6. If 5285 people took the test, how many scored above 2 standard deviations above the mean?		X	

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