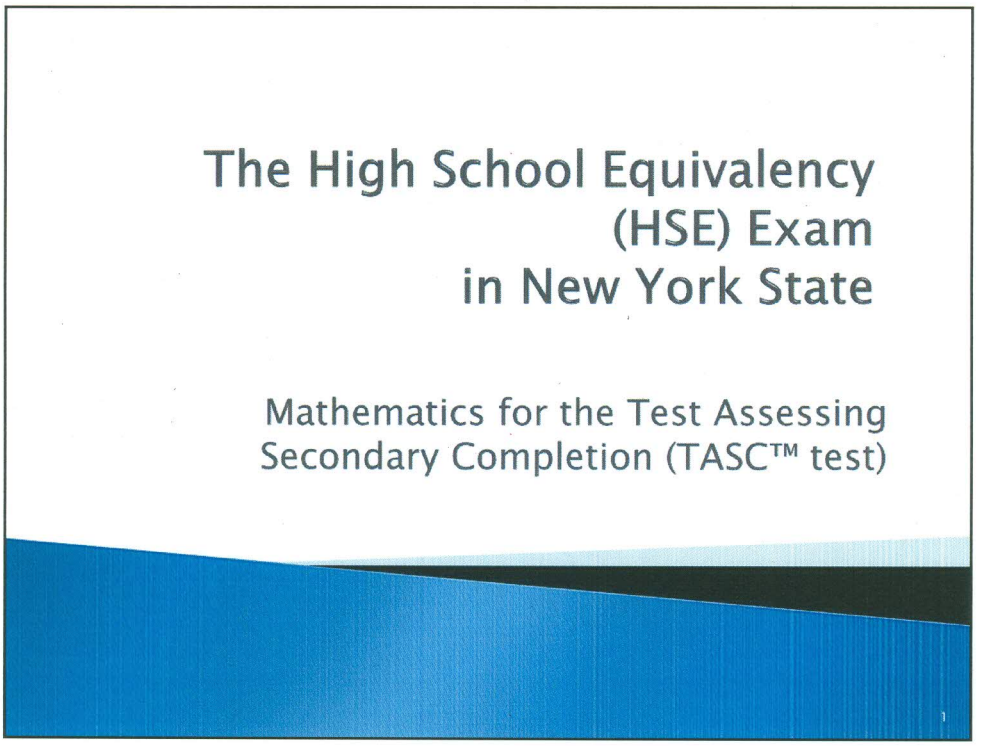
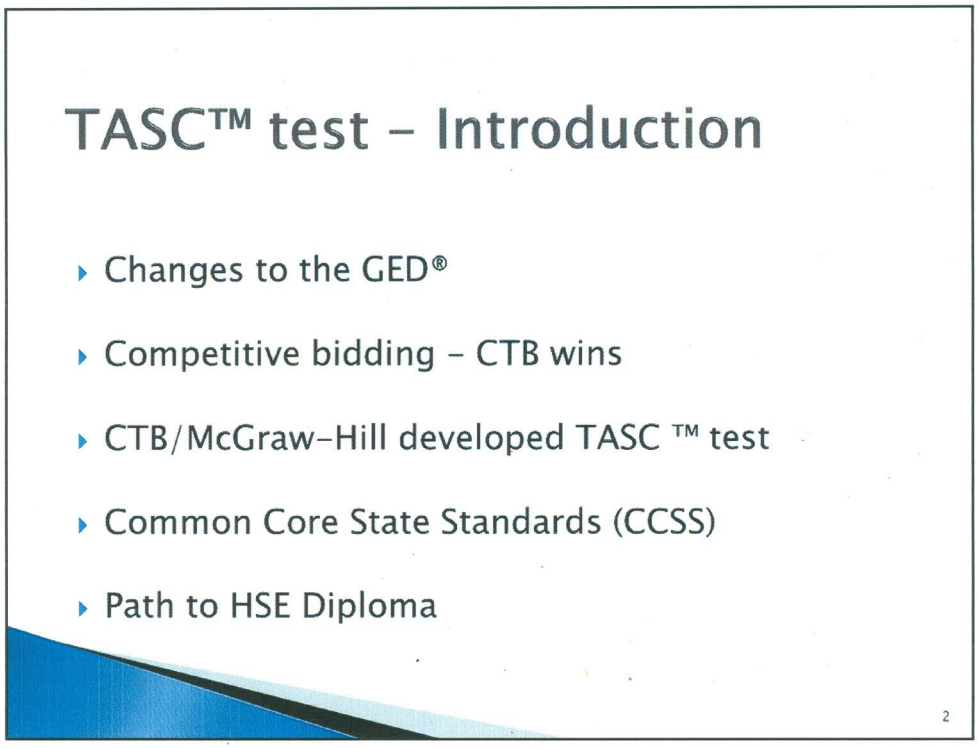
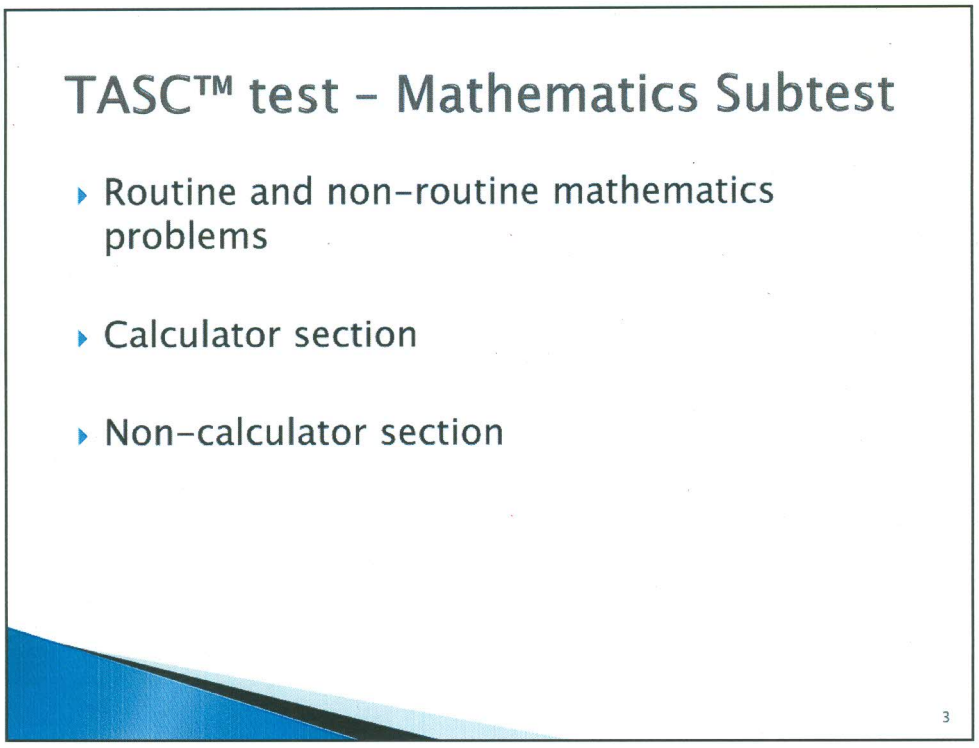


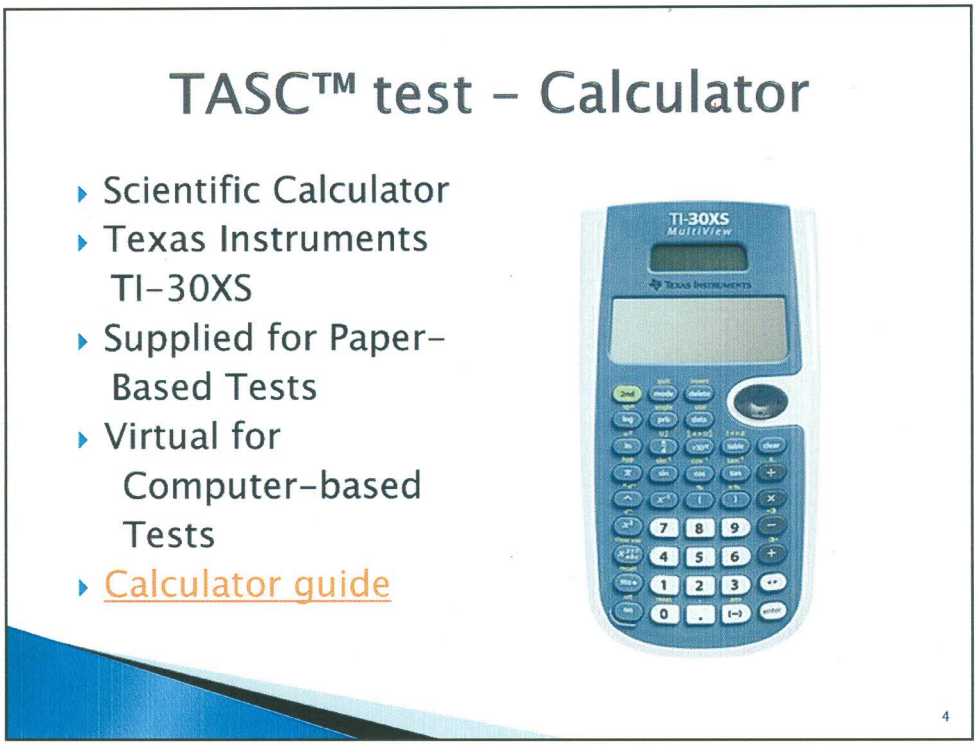
Beginning in 2014, New York opened a new era in high school equivalency (HSE) testing with the adoption of the Test Assessing Secondary Completion (TASC™ test). In this presentation, we will examine the Math content of this new national HSE exam.



The Test of General Educational Development or GED®, had been the only national HSE exam since 1942. In response to changes made to the GED®, the New York State Education Department (NYSED) issued a competitive Request For Proposal (RFP) for the provision of a newly developed HSE exam that would measure the Common Core State Standards (CCSS). CTB/McGraw-Hill won the contract and has developed the TASC™ test, for national use. Starting in 2014, the TASC™ test became the only exam for acquiring an HSE diploma in New York State (NYS). The TASC™ test has five subtests. This presentation is on the Math Subtest.



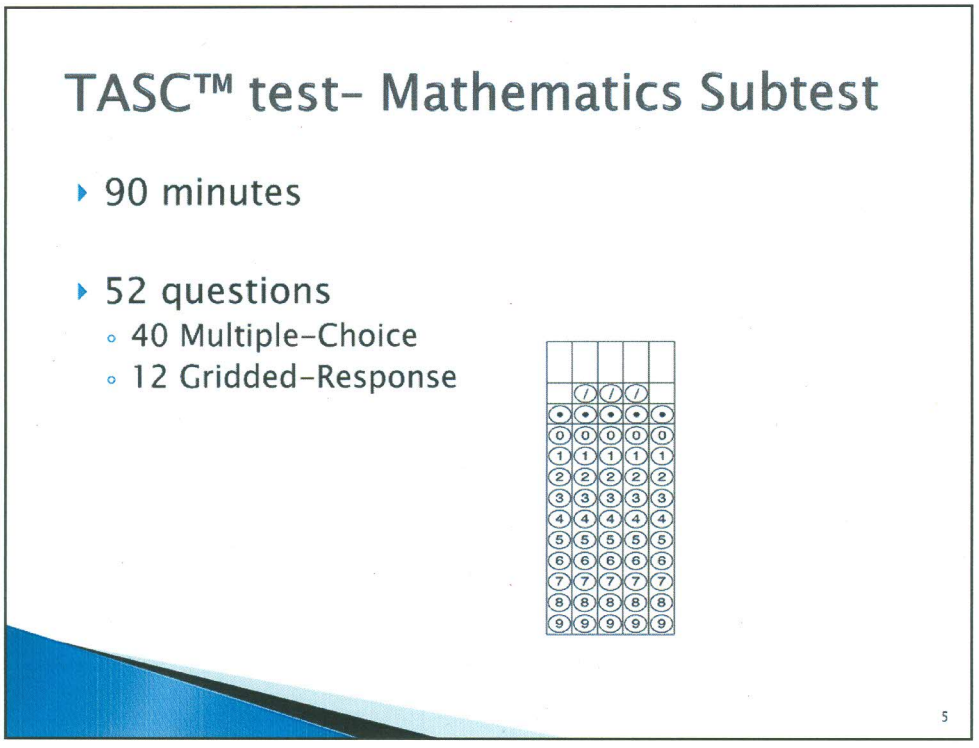
The TASC™ test Mathematics Subtest assesses an examinee's ability to solve routine and non-routine mathematics problems using conceptual and procedural knowledge. The Mathematics Subtest consists of a calculator section and a non-calculator section.



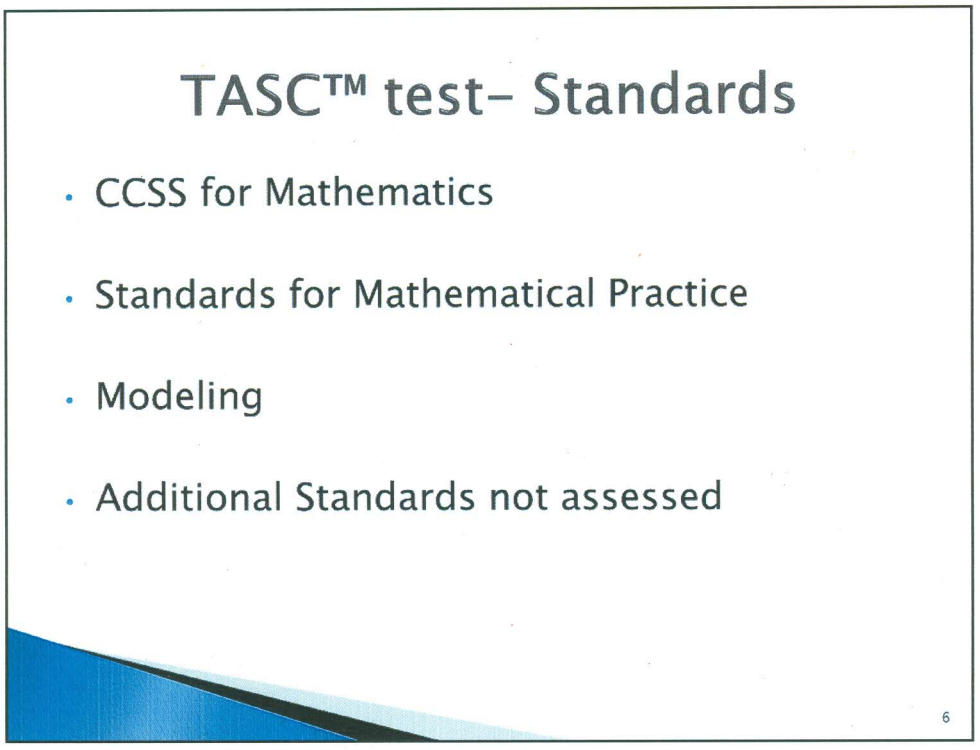
Examinees may not use their own calculators. The Texas Instruments TI-30XS calculator will be provided for all examinees taking the test. For the computer-based exam, a virtual version of this same calculator is available on the screen. The TI-30XS is a scientific calculator and has more functions than the simpler four-function calculators used for past HSE Exams.

This calculator does have a memory function, but does not have any graphing functionality and it is not programmable. Examinees who have attended New York State High School Algebra Classes in the last several years have been allowed the use of graphing calculators. Students who have become accustomed to using a graphing calculator for certain algebra skills, such as simultaneous solution of two equations and evaluating functions may require instruction in how to solve these types of problems without a graphing calculator.

This calculator is used for the Science Subtest as well as the calculator portion of the Math Subtest. A Teacher's Guidebook, with learning resources for the TI-30XS Multi-view Scientific Calculator, can be found on the Texas Instruments website which may be reached by clicking on the hyper-link on this slide, or by web searching "TI 30XS."



Examinees have 90 minutes to complete 52 questions on the combined calculator and non-calculator sections. These items include 40 multiple-choice questions and 12 gridded-response items. A gridded-response item is similar to a fill-in-the-blank type of question. A grid of bubbles like the one shown here is provided on the answer sheet for test-takers to grid, or bubble in, their numeric answers. Gridded-responses may include decimals or fractions. Fractions are coded by bubbling in the backslash indicated on row two of the grid on the slide, as the fraction bar. Mathematically equivalent answers are acceptable for gridded-response items.



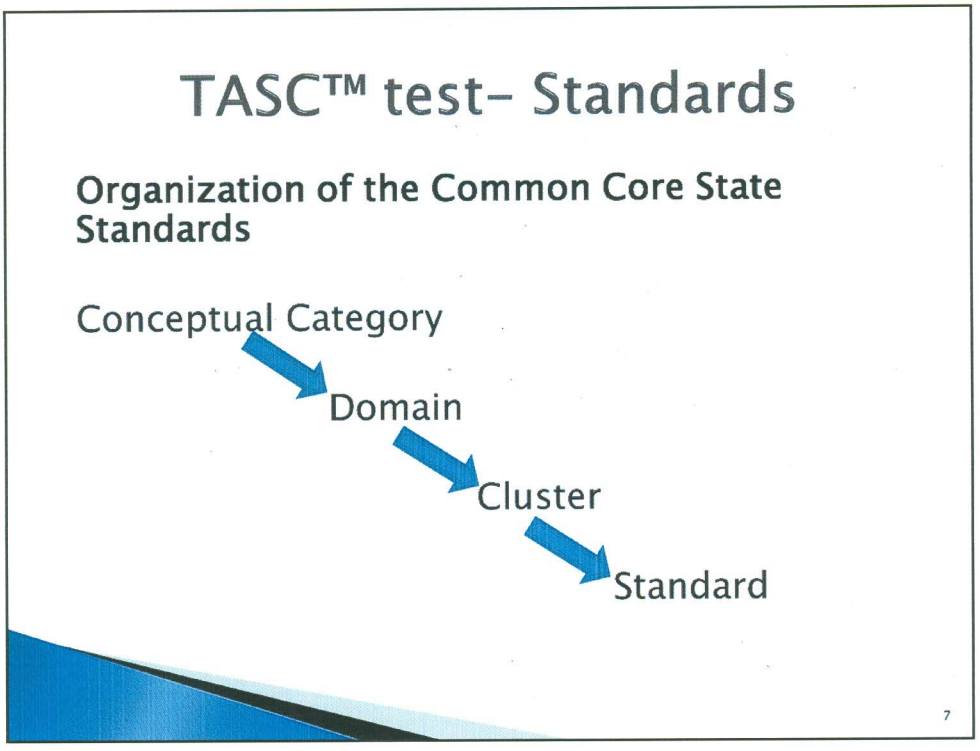
The TASC™ test emphasizes the CCSS for Mathematics that are the most relevant to College and Career Readiness.

The Standards for Mathematical Practice is a list of eight habits of procedural fluency that all students are encouraged to develop and use throughout their education. For example, the first Standard for Mathematical Practice is, "Make sense of problems and persevere in solving them."

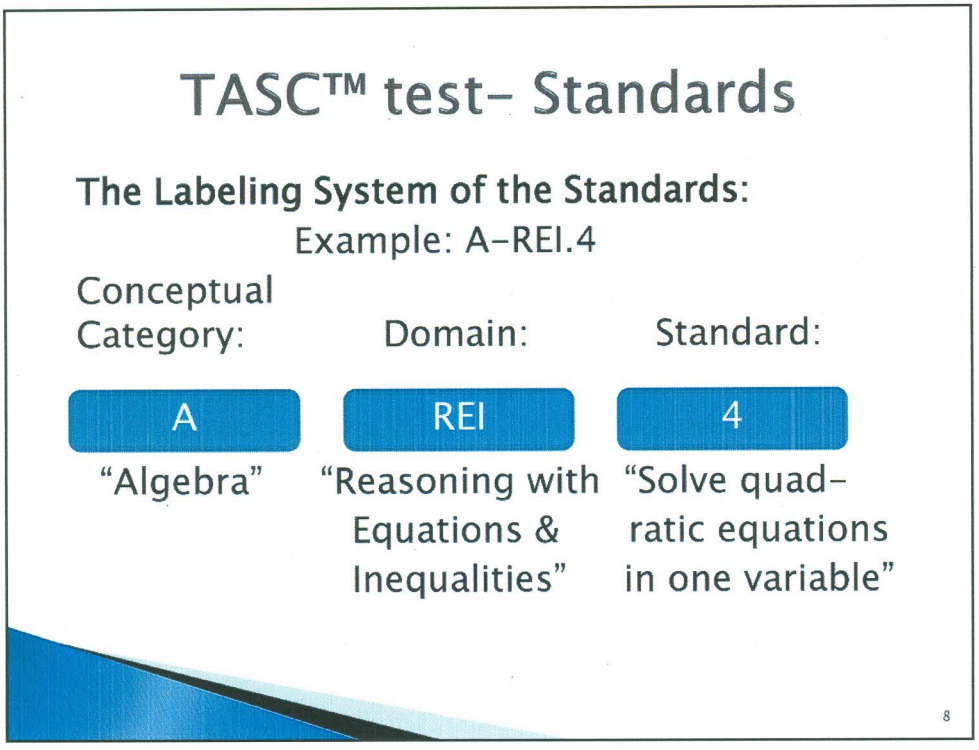
Part of the CCSS for High School Mathematics is the Modeling Domain. This is described within the Common Core as follows, "Modeling is best interpreted not as a collection of isolated topics but rather in relation to other Standards. Making mathematical models is a standard for Mathematical Practice, and specific Modeling Standards appear throughout the high school Standards."

The Standards for Mathematical Practice, as well as the High School Modeling Domain, are not separately assessed and reported on the TASC™ test, but are skills that are incorporated throughout the assessment of the content Standards.

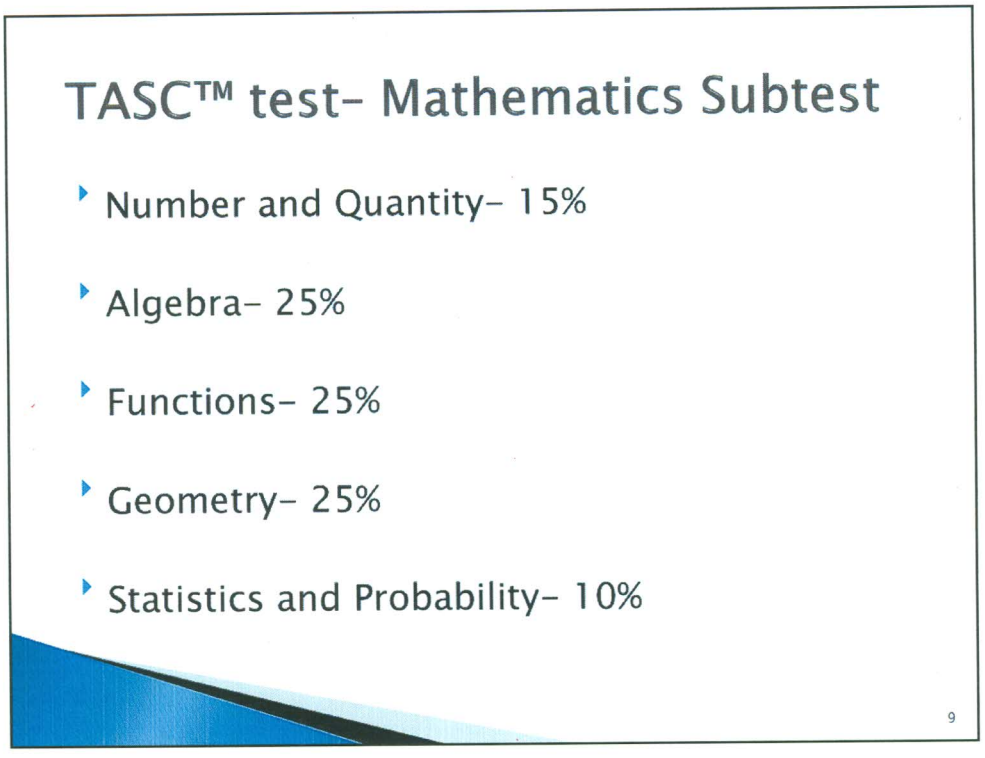
The CCSS designate certain Standards as "Additional Mathematics" recommended in order to take advanced courses; these Standards will not be assessed on the TASC™ test.



Let us briefly review the organization of the CCSS for Mathematics. Conceptual Categories are the highest organizing level in the High School CCSS for Mathematics. These Conceptual Categories are divided into Domains, Clusters, and Standards. Domains are larger groups of related Clusters and Standards. Standards from different Domains may be closely related. Clusters are groups of related Standards. Note that Standards from different Clusters may sometimes be closely related, because Mathematics is a connected subject. Standards define what students should understand and be able to do.



Here is an example of a coded Standard used to illustrate the labeling system of the CCSS for Mathematics. "A" dash "REI" point four designates a specific Standard. The "A" represents the Conceptual Category "Algebra." Following the dash is the code for the Domain, in this case the letters "REI" represent the Domain "Reasoning with Equations & Inequalities." The number following the decimal point designates the actual Standard. For this example, the fourth Standard in the Domain reads, "Solve quadratic equations in one variable."



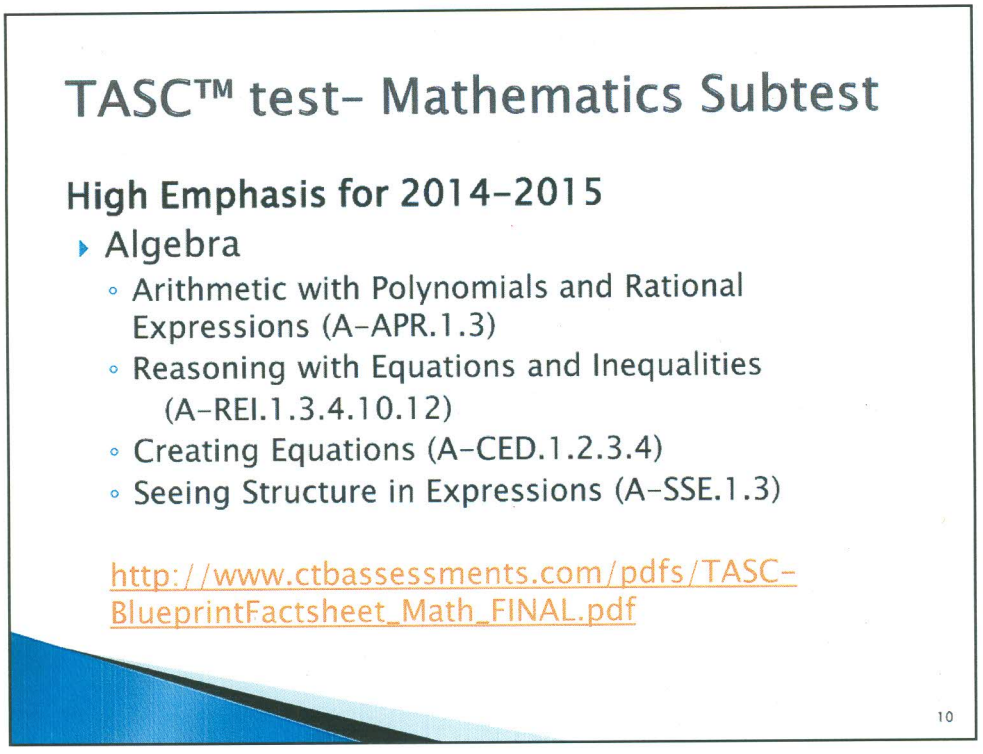
The CCSS for high school Mathematics are delineated into the these Conceptual Categories:

-Number and Quantity
-Algebra
-Functions
-Geometry
-Statistics and Probability

Approximately fifteen percent of the math content of the TASC™ test is in the area of number and quantity.

Algebra I is now a graduation requirement for high school in New York, and most other states. The majority of the questions on the TASC™ test are based on algebra. This represents perhaps the most noticeable change from previous HSE exams which were largely based on arithmetic.

Fifty percent of the TASC™ test math items are in the area of Algebra or Functions, which is a branch of algebra. About 25% of the items fall into the Category of Geometry, and the remaining 10% of the Math Subtest assesses knowledge of Statistics and Probability.

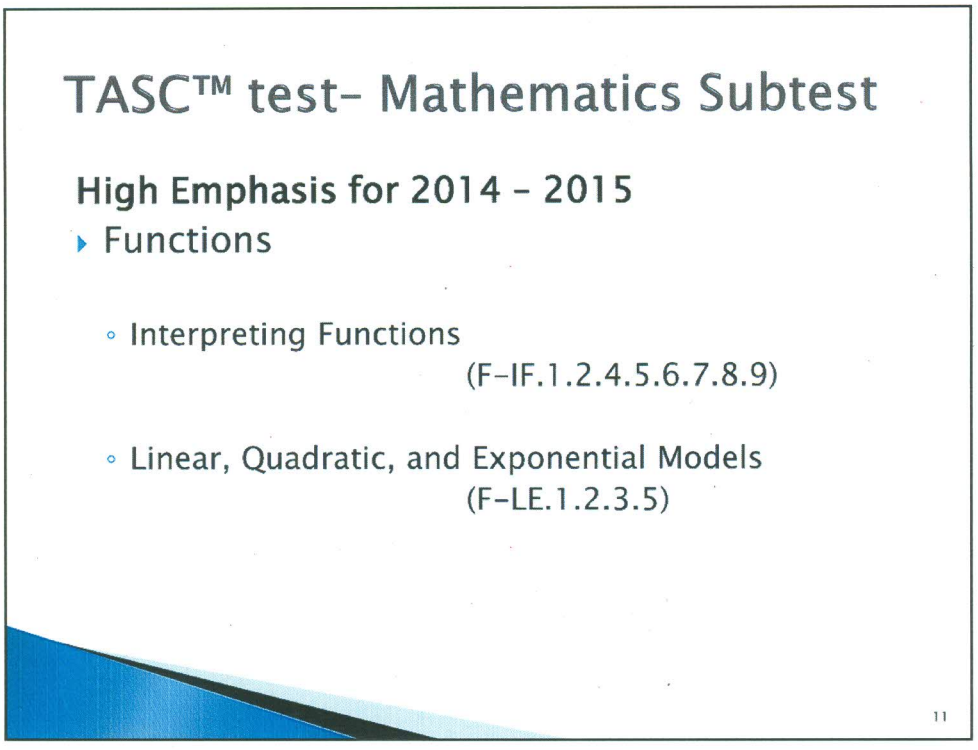


The TASC™ test developer, CTB, has identified High, Medium, and Low emphasis topics within the Standards. A comprehensive list, with these Standards written in their entirety, is available under "Resources" at the TASC™ test web site accessed by clicking on the hyperlink on this slide.

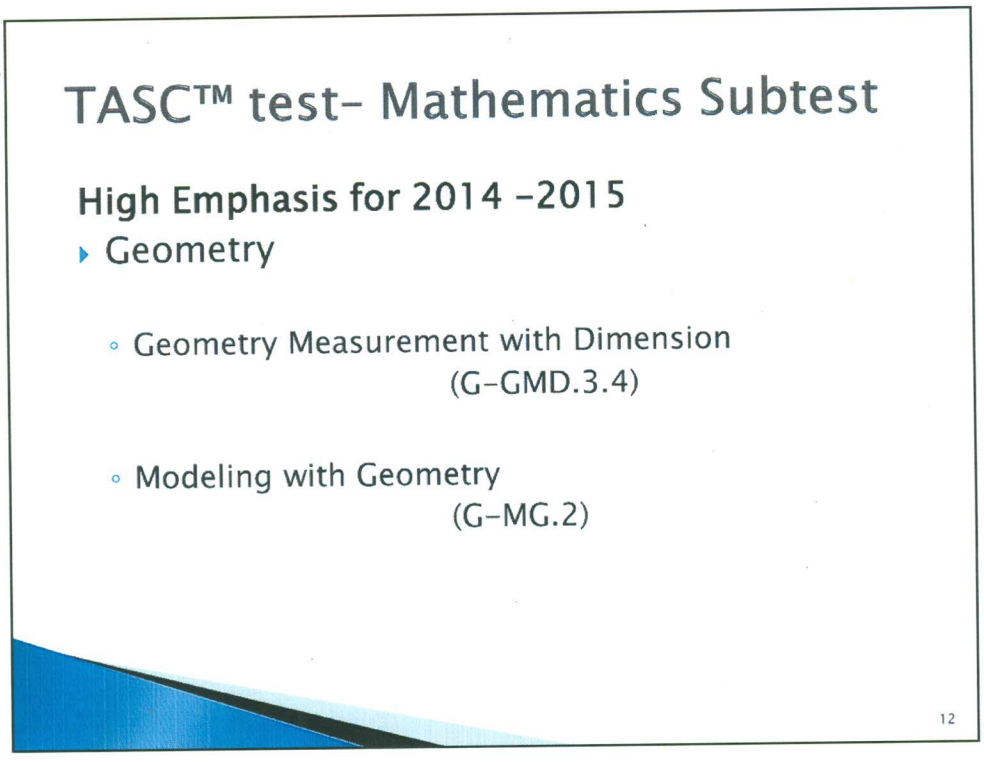
"High Emphasis" CCSS for Mathematics are those that CTB considers the most relevant to College and Career Readiness. Emphasis refers to the relative number of items that the TASC™ test will assess. One may expect to see more questions with high emphasis content and relatively fewer, but still some, "low emphasis" items.

The CCSS delineate the Conceptual Category of Algebra into four Domains:
-Arithmetic with Polynomials and Rational Expressions
-Reasoning with Equations and Inequalities
-Creating Equations
-Seeing Structure in Expressions.

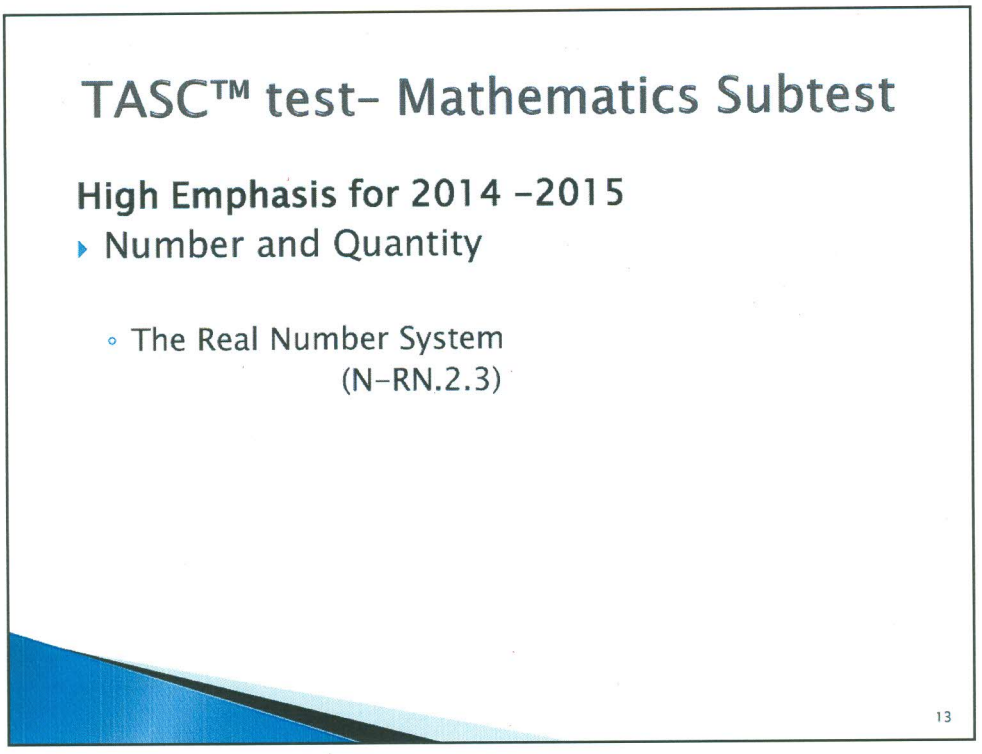
Specific Standards within each Algebra Domain are designated high emphasis. The individual Standards that receive high emphasis on the TASC™ test are listed by code in parentheses. Resources for understanding the CCSS for Mathematics can be found at the CCSS Initiative Home web site, which may be accessed via the hyperlink on the "Resources" slide at the end of this presentation.



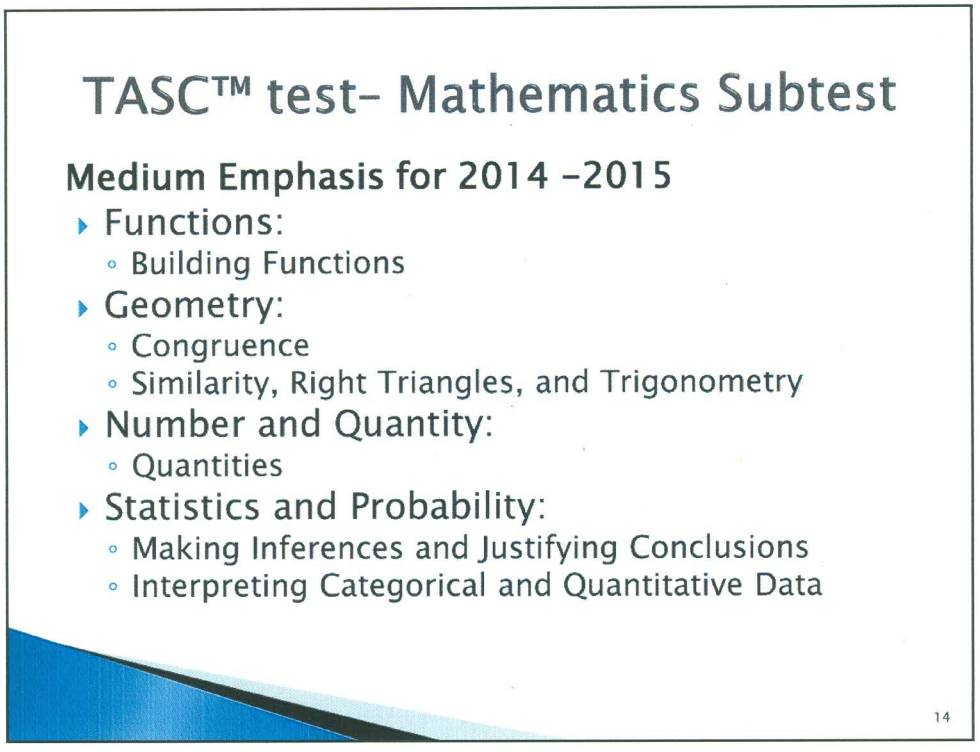
For the Conceptual Category of Functions, for 2014 and 2015, high emphasis Standards are found in two Domains: Interpreting Functions and Linear, Quadratic, and Exponential Models. For example, Standard F-IF.2 is in the Conceptual Category of "Functions" and is the second Standard in the Domain "Interpreting Functions." This Standard states, "Use function notation, evaluate functions for inputs in their domains, and interpret statements that use function notation in terms of a context."



In the Conceptual Category of Geometry, for 2014 and 2015, high emphasis is given to some Standards from the Domains of Geometric Measurement with Dimension and Modeling with Geometry.



For the Conceptual Category of Number and Quantity, in 2014 and 2015, two Standards from the Domain The Real Number System receive high emphasis. Since the majority of the questions on the TASC™ test Mathematics Subtest are based on the Standards designated by test developer, CTB, as high emphasis, preparation should be focused on these areas.

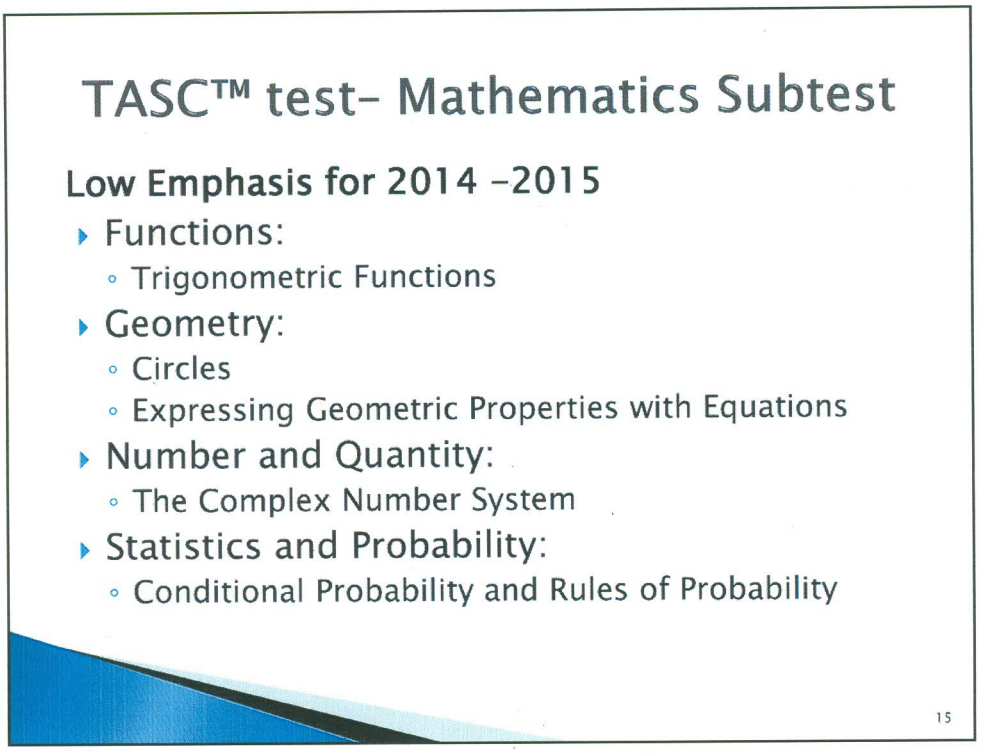


For 2014 and 2015, content from "Medium Emphasis" Domains can be expected to be included in fewer items than that from the High Emphasis Domains. TASC™ test producer CTB has only specified individual CCSS for High Emphasis topics. Whole Domains, but not individual Standards, have been designated Medium and Low Emphasis.

Of Medium Emphasis in the Conceptual Category of Functions is the Domain Building Functions.

For Geometry, the Domain of Congruence and the Domain titled Similarity, Right Triangles, and Trigonometry are Medium Emphasis.

For Statistics and Probability, two Domains, Making Inferences and Justifying Conclusions and the Domain of Interpreting Categorical and Quantitative Data are Medium Emphasis.



CCSS designated Low Emphasis for 2014 and 2015 will still be measured on the TASC™ test, but by a relatively smaller number of items than those Standards listed as higher emphasis. According to test-producer CTB, the Low Emphasis category will have no more than one or two items on any given test. Since the TASC™ test measures the Common Core, basic familiarity with the foundational content of these Low Emphasis Standards may be assessed as part of items designed to measure higher emphasis Standards.

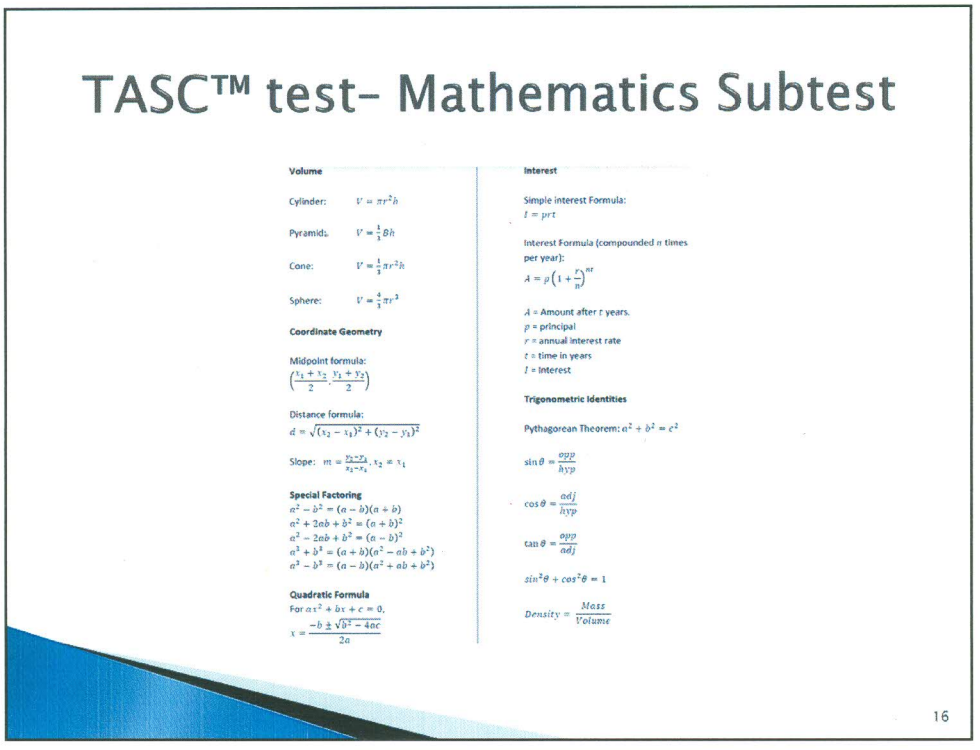
In the Conceptual Category of Functions, the Standards in the Domain of Trigonometric Functions may be assessed but are Low Emphasis.

For Geometry, two Domains receive Low Emphasis: Circles, and Expressing Geometric Properties with Equations.

Under the Conceptual Category of Number and Quantity, the Domain of The Complex Number System is Low Emphasis.

For the Category of Statistics and Probability, the Domain of Conditional Probability and Rules of Probability is Low Emphasis.

Next, we will take a look at the Mathematics Reference Sheet and use this as an opportunity to further illustrate the some of the Standards designated High, Medium, or Low Emphasis.



This is the first page of the two page reference sheet for the Mathematics Subtest. Don't worry if this is too small to see. We will be taking a closer look at these equations momentarily. A careful examination of these formulas is an excellent jumping-off point for becoming familiar with the TASC™ test math content. This reference sheet is available on-line by web searching the phrase "TASC™ test Reference Sheet."

TASC™ test- Mathematics Subtest

Central Angle

$m\angle AOB = m\overset{\frown}{AB}$

Inscribed Angle

$m\angle ABC = \frac{1}{2}m\overset{\frown}{AC}$

Intersecting Chords Theorem

$A \cdot B = C \cdot D$

Probability

Permutations: ${}_nP_r = \frac{n!}{(n-r)!}$

Combinations: ${}_nC_r = \frac{n!}{(n-r)!r!}$

Multiplication rule (independent events): $P(A \text{ and } B) = P(A) \cdot P(B)$

Multiplication rule (general): $P(A \text{ and } B) = P(A) \cdot P(B|A)$

Addition rule: $P(A \text{ or } B) = P(A) + P(B) - P(A \text{ and } B)$

Conditional Probability: $P(B|A) = \frac{P(A \text{ and } B)}{P(A)}$

Arithmetic Sequence: $a_n = a_1 + (n-1)d$ where a_n is the nth term, a_1 is the first term, and d is the common difference.

Geometric Sequence: $a_n = a_1 r^{(n-1)}$ where a_n is the nth term, a_1 is the first term, and r is the common ratio.

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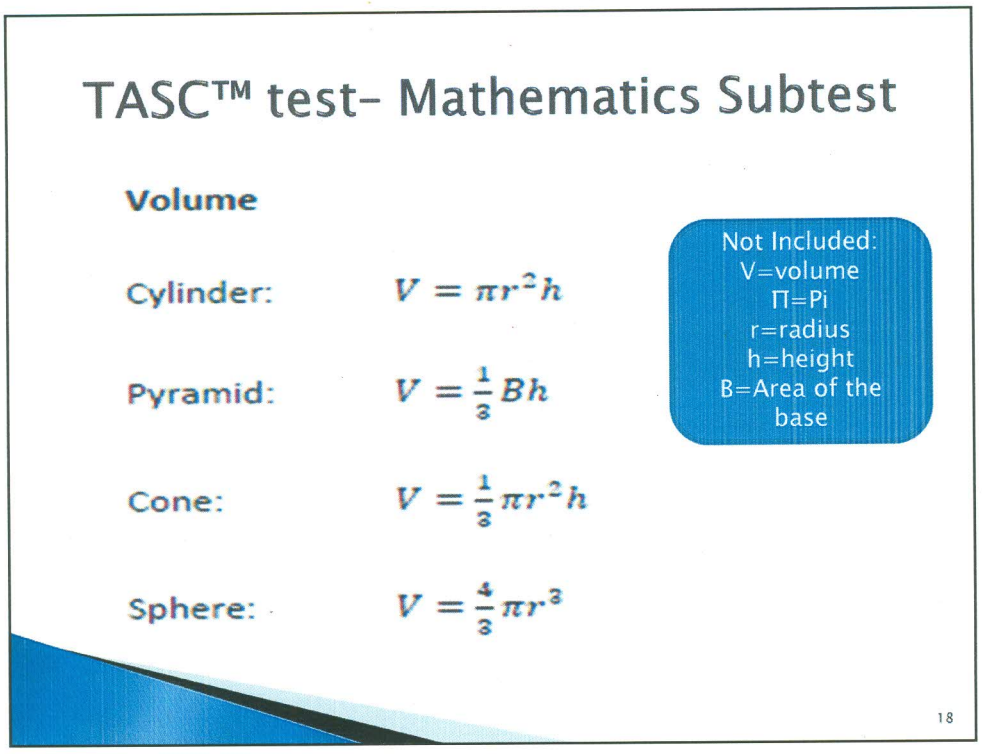
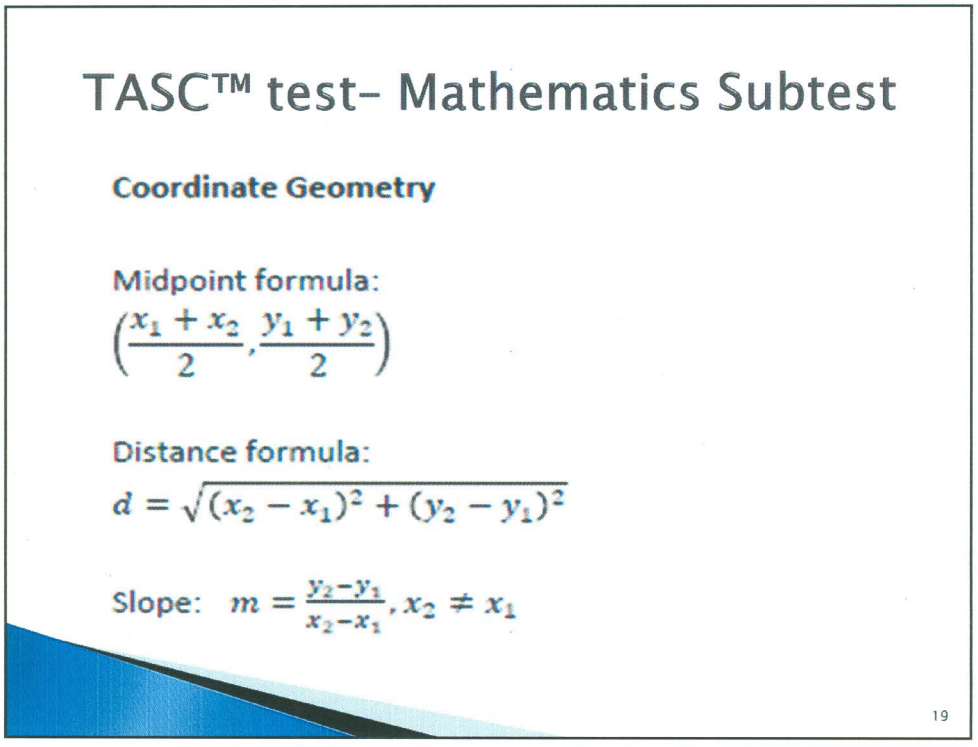
This is the second part of the TASC™ test Mathematics Reference Sheet. Again, we will examine it closely in upcoming slides. It is likely that many people preparing to get an HSE diploma have limited exposure to some of these mathematical formulas. Pretesting is recommended to gauge the level of remediation that may be necessary. Certain pre-algebra skills, such as decimals, fractions, percents, and negative numbers should be in place to prepare for success in a course of study in algebra.



Let us zoom in and take a closer look at these formulas. There is no key to the variables provided, so the examinee needs to know that "r" in the volume formula means radius, for example. Note that in the formula for the volume of a pyramid the capital "B" stands for the area of the base of the pyramid. Practice with these formulas is valuable preparation.

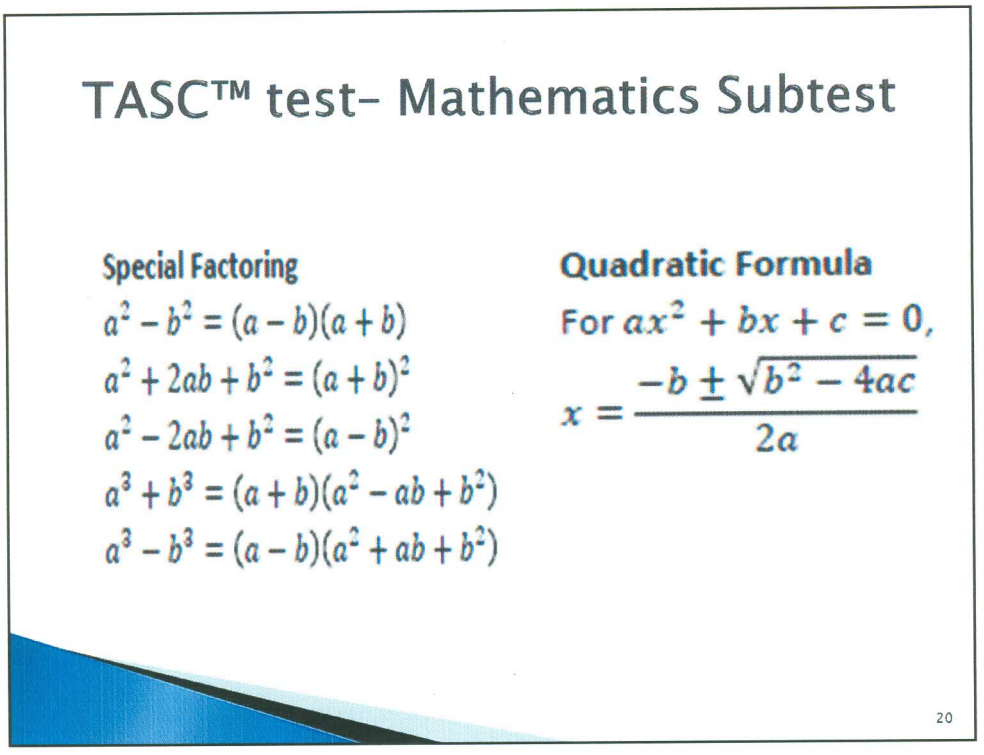
These formulas are contained in CCSS G-GMD.3. The "G" represents the Conceptual Category "Geometry" and "GMD" represents the Domain "Geometric Measurement and Dimension." Standard 3 reads, "Use volume formulas for cylinders, pyramids, cones, and spheres to solve problems." This Standard is considered High Emphasis for the TASC™ test in 2014 and 2015.

Traditionally, a course of study in Algebra begins with practice with the order of operations and evaluating algebraic expressions and formulas. These volume formulas also offer an opportunity to practice working with exponents and multiplying fractions, with or without a calculator.



Three Coordinate Geometry formulas are included on the TASC™ test Mathematics Reference Sheet. These formulas are used in conjunction with X-Y, Cartesian Coordinate graphs. Instruction would include plotting points correctly on a graph. Understanding graphing is basic to several Algebra, Geometry, and Functions concepts.

These three coordinate geometry formulas are included in the Common Core Domain of Expressing Geometric Properties with Equations, and are low emphasis topics in 2014 and 2015. However, the concept of slope is important as it is foundational to Standards in Algebra, Functions, and Geometry. Examinees should be able to determine slope several ways including from graphs using "rise over run," from slope-intercept form of linear equations, and from given points or tables of values using this slope formula.



For Standard A-APR.3, the "A" means the Conceptual Category of Algebra, and "APR" designates the Domain "Arithmetic with Polynomials and Rational Expressions." Standard 3 states, "Identify zeroes of polynomials when suitable factorizations are available, and use the zeroes to construct a rough graph of the function defined by the polynomial." This is a High Emphasis topic for the TASC™ test in 2014 and 2015.

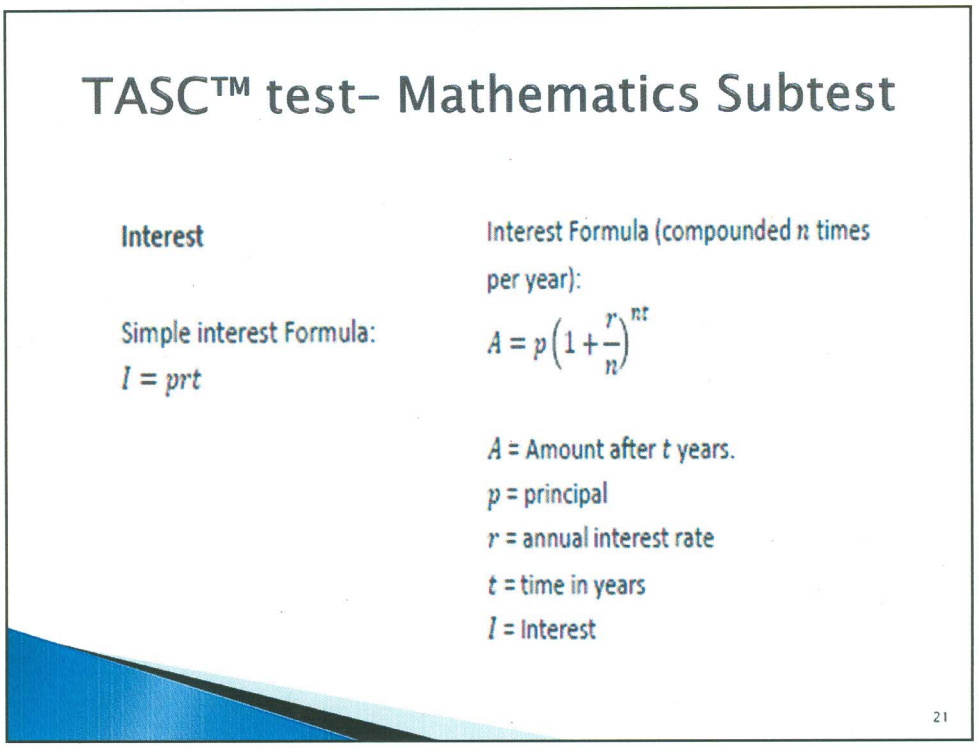
CCSS A-REI.4 reads, "Solve quadratic equations in one variable" and is a High Emphasis Standard that includes the use of the Quadratic Formula. Solutions may include either real number or complex imaginary roots.

Factoring quadratic equations or functions is based on a set of valuable algebraic skills that should be in place prior to instruction in quadratic factoring. These include:

-rules for exponents
-combining signed numbers
-addition of polynomials
-use of the Distributive Property with polynomials

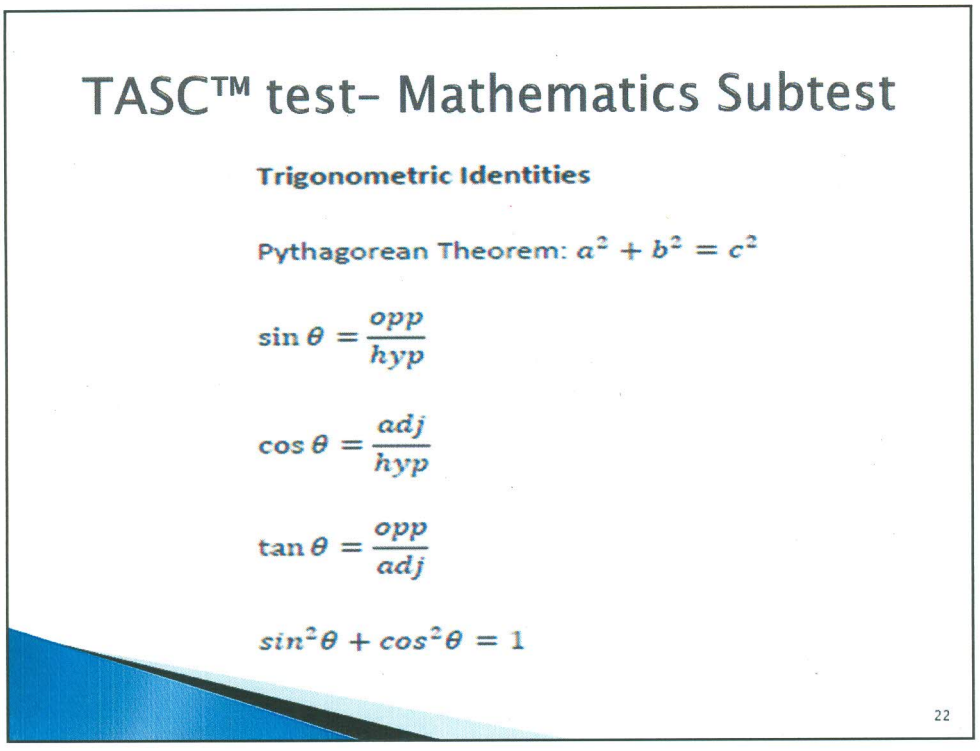
Examinees unfamiliar with this topic will need practice multiplying binomials prior to learning how to reverse the process to find the factors of quadratic equations.

Questions about the zeroes or roots of a quadratic function may be based on graphs.



Note that a key is included on the Reference Sheet for these two interest formulas. The formula for simple interest is included in middle school math Standards, but examinees may not be familiar with the formula or the vocabulary.

Standard F-IF.8, on Interpreting Functions, covers the formula for compounded interest. For 2014 and 2015, this Standard is High Emphasis.

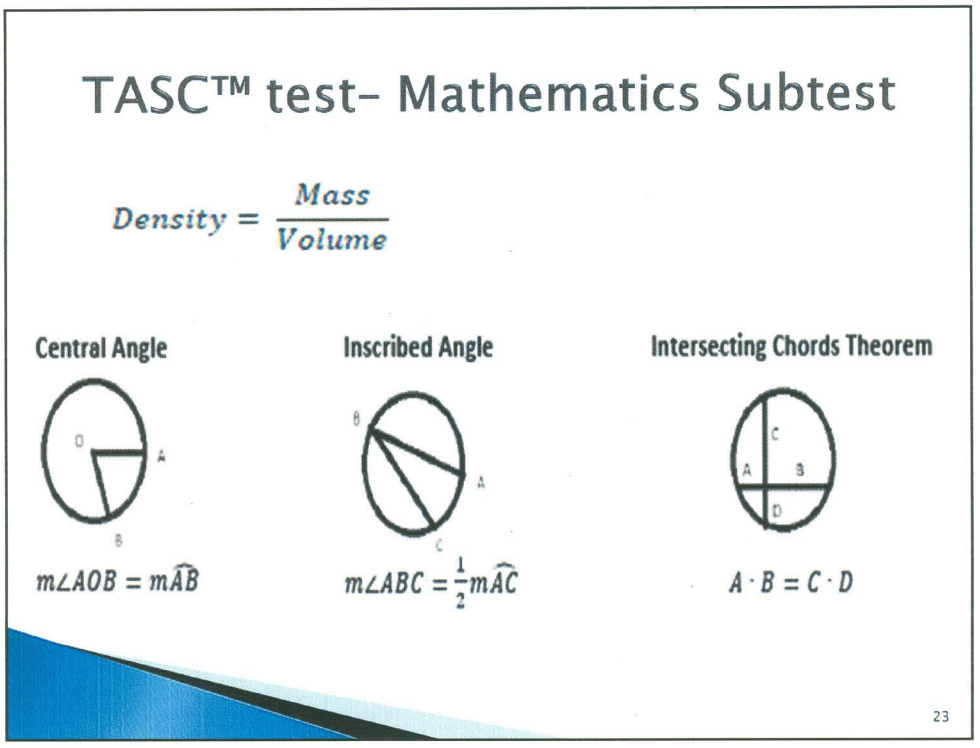


The Pythagorean Theorem and the three basic trigonometry ratios are included in the Standard G-SRT.8 which reads, "Use trigonometric ratios and the Pythagorean Theorem to solve right triangles in applied problems." For 2014 and 2015, this is a Medium Emphasis Standard.

HSE Examinees should become familiar with the symbols included in the TASC™ test Reference Sheet. For example, the Greek letter theta, Θ, the symbol for a given angle, may be new to many examinees.

Angles on the TASC™ test may be given in degrees or in radian measure. Radian angle measure is part of CCSS F-TF.1 and .2.

The last formula on this slide, the Pythagorean Identity is covered by Standard F-TF.8. The Standards within the Conceptual Category "Functions" in the Domain of "Trigonometric Functions" are coded as the F-TF Standards. For 2014 and 2015, all Trigonometric Function Standards are Low Emphasis.



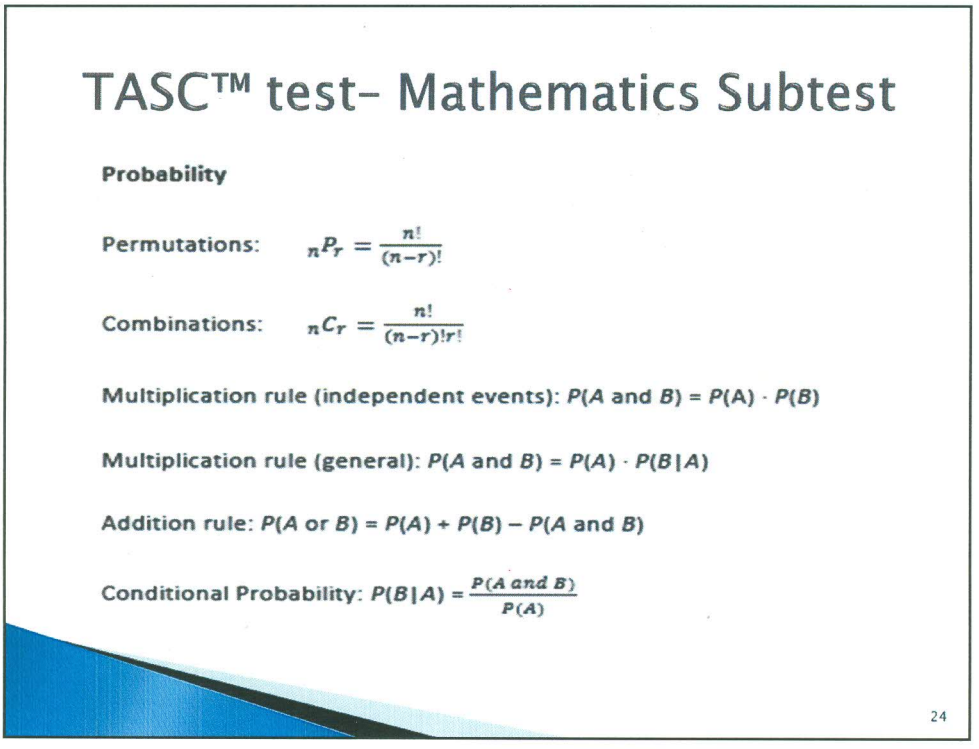
The density formula is included in Standard G-MG.2. This is a High Emphasis standard for 2014 and 2015. It reads, "Apply concepts of density based on area and volume in modeling situations (e.g., persons per square mile, BTU's per cubic foot)."

Note that the concept of density is extended beyond mass per spacial volume. Density will also be included in TASC™ test Science items.

Many returning examinees are likely to have limited exposure to circle geometry beyond the basics. These circle formulas fit into Common Core Standard G-C.2 which is Low Emphasis.

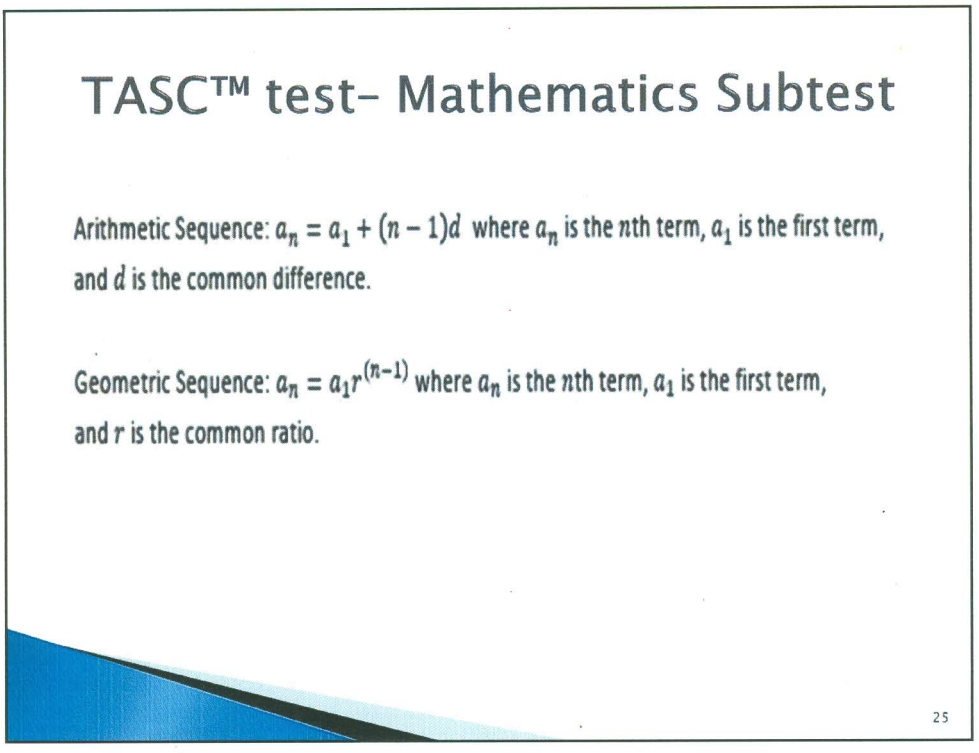
These formulas may be considered fairly easy to use once the foundational vocabulary terms are in place. Concepts that merit study include:

-central angle
-inscribed angle
-chords
-subtended arcs
-the formal definition of a circle as a locus of points equidistant from a center point



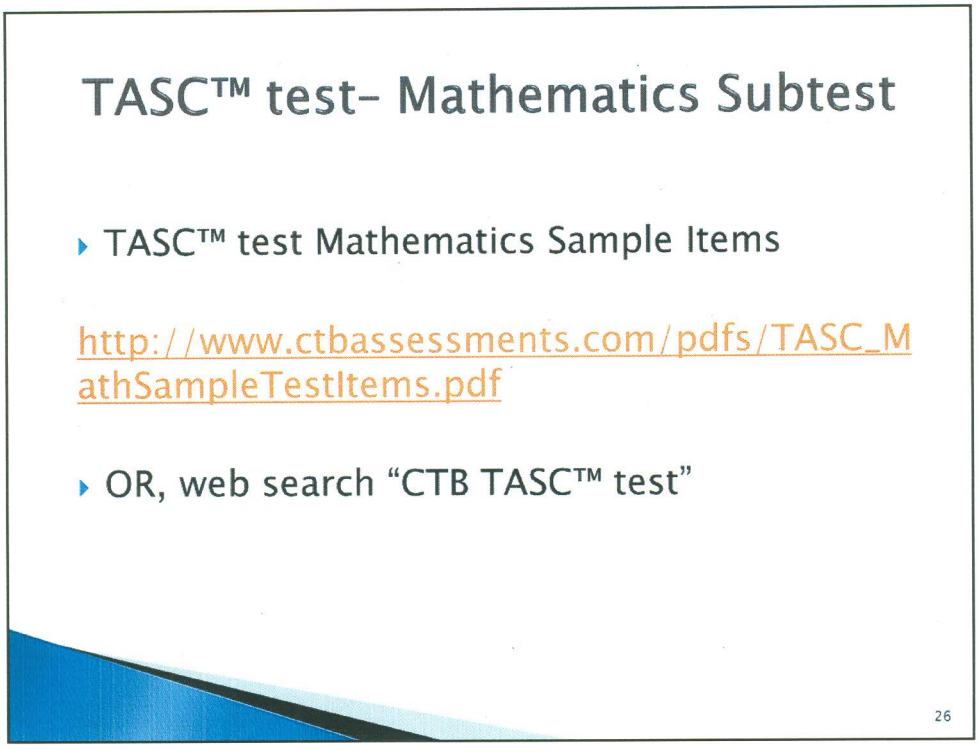
These probability formulas are included in Standards listed in the Domain Conditional Probability and the Rules of Probability, a subset of the Conceptual Category Statistics and Probability. These Standards are Low Emphasis for the TASC™ test in 2014 and 2015.

While a thorough understanding of the formulas for permutation and combination is useful to students of statistics, it should be noted that the supplied calculator does include combination and permutation functions. These are available in the probability menu found by pressing the key marked "prb." These calculator functions make these two formulas unnecessary. Again, we encourage all examinees to practice and become familiar with the calculator prior to testing.



The last two formulas included on the TASC™ test Mathematics Reference Sheet are for arithmetic and geometric sequences. Standard F-LE.2 states, "Construct linear and exponential functions, including arithmetic and geometric sequences, given a graph, a description of a relationship, or two input-output pairs (include reading these from a table)."

In 2014 and 2015, this is a High Emphasis Standard for the TASC™ test. Even though the variables are defined, remediation of the vocabulary and the application of these sequence formulas is recommended.



Next let's take a look at some of the Sample Items available at CTB's TASC™ test web site. The Math Sample Items can be accessed by clicking on the hyperlink seen here or by web searching "CTB TASC™ test." A review of the Sample Items is a good starting place to become familiar with the expectations of the TASC™ test.

We will examine five of the eleven Sample Items provided by CTB/McGraw-Hill. You may want to pause this presentation to try these Sample Items.

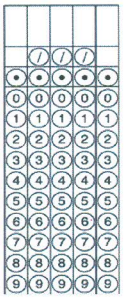
Item 3

Sharon made a scale drawing of a triangular park. The coordinates for the vertices of the park are:

(- 10,5)
(15,5)
(10,12)

Her scale is 1 unit = 1 meter.

What is the area of the triangular park in square meters?



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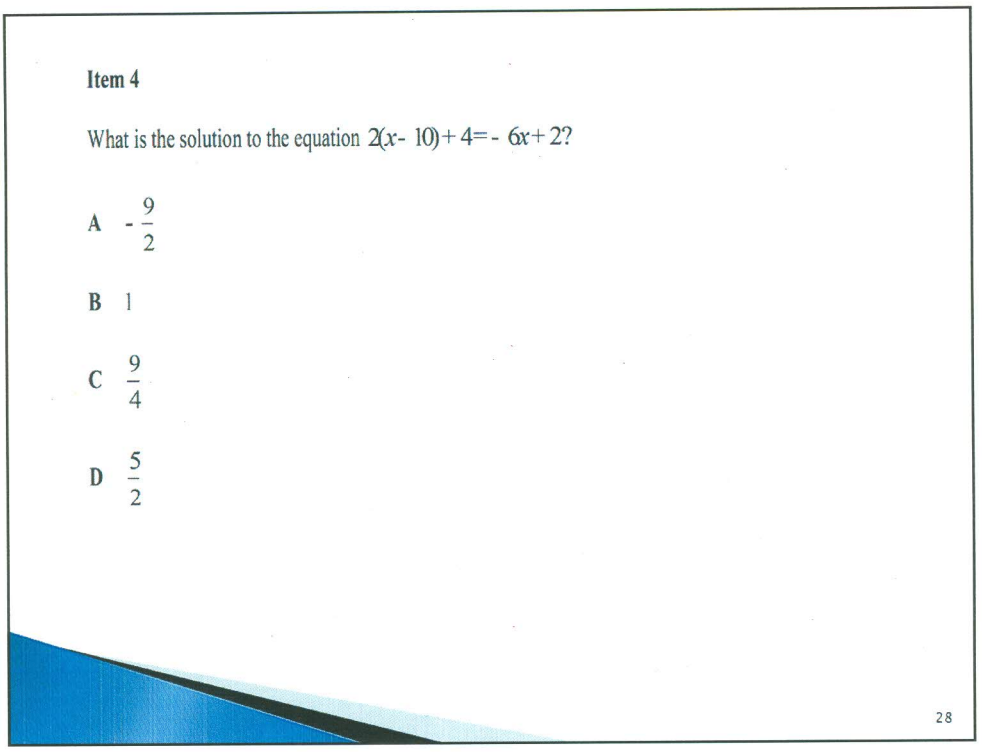
Let's start with the third item from the TASC™ test Math Sample Items. Please take a moment now to read Item 3.

Examinees are asked not to write in the TASC™ test booklets as they will be reused by other examinees. Scrap paper will be available during the test.

To answer this item it is advisable that a sketch of an X-Y Cartesian Coordinate graph be used to diagram the triangular park from the given ordered pairs. While the distance formula is given on the Reference Sheet, a reasonable rough sketch on scrap paper should yield the necessary dimensions by inspection. The base of the triangle is 25 meters and height is 7 meters.

The formula for the area of a triangle is not supplied, so it is expected that examinees know that the area of a triangle is one-half base times height. The answer to this gridded-response question is 87.5.

This item is written to CCSS G-GPE.7. Here the "G" represents the Conceptual Category of "Geometry", and "GPE" stands for the Domain "Expressing Geometric Properties with Equations." Standard 7 reads, "Use coordinates to compute perimeters of polygons and areas of triangles and rectangles, e.g., using the distance formula." For 2014 and 2015, this is Low Emphasis.

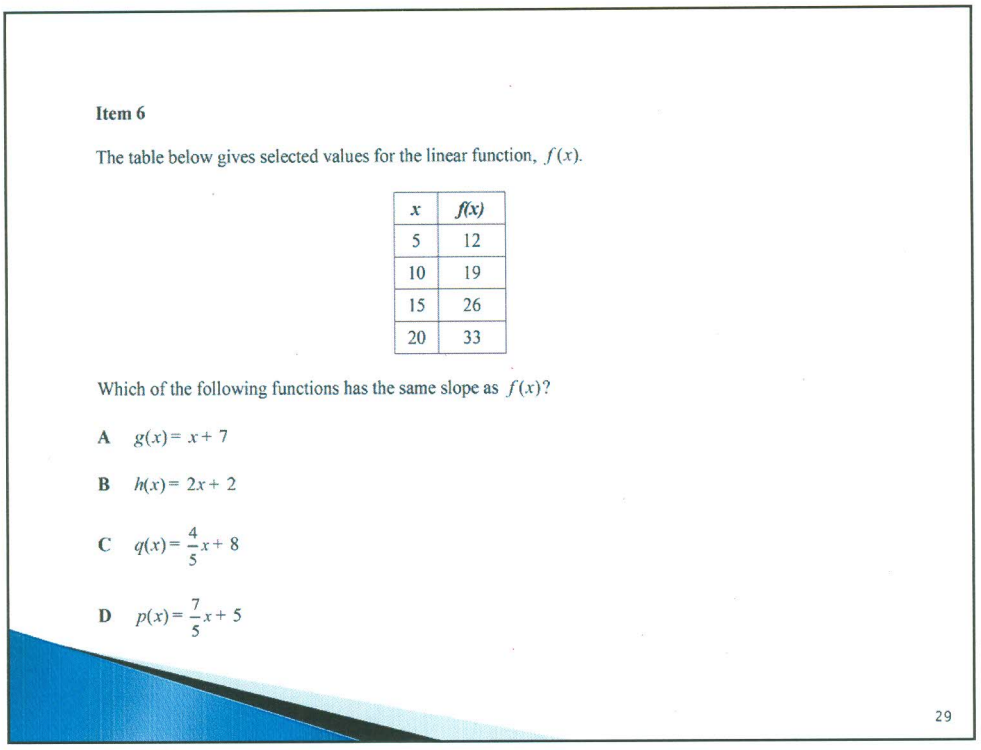


Please read through Sample Item 4.

Here is an example that calls for solving an algebraic linear equation. This is High Emphasis for 2014 and 2015.

While past HSE exams included solving some algebraic equations, the problems usually could be done in two or three steps. The TASC™ test is a more rigorous exam, particularly the Math Subtest. The order of operations, manipulating like terms, negative numbers, and fractions all come into play in this item. The answer to this question is choice "C," nine-fourths.

The fractional answer reduces the likelihood of an examinee successfully using the guess-and-check method with the alternatives to find the answer without solving the equation algebraically. Test producer CTB has stated that solving algebraic equations "is often assessed using gridded response items" requiring examinees to use an algebraic solution.



Item 6

The table below gives selected values for the linear function, $f(x)$.

x	$f(x)$
5	12
10	19
15	26
20	33

Which of the following functions has the same slope as $f(x)$?

A $g(x) = x + 7$

B $h(x) = 2x + 2$

C $q(x) = \frac{4}{5}x + 8$

D $p(x) = \frac{7}{5}x + 5$

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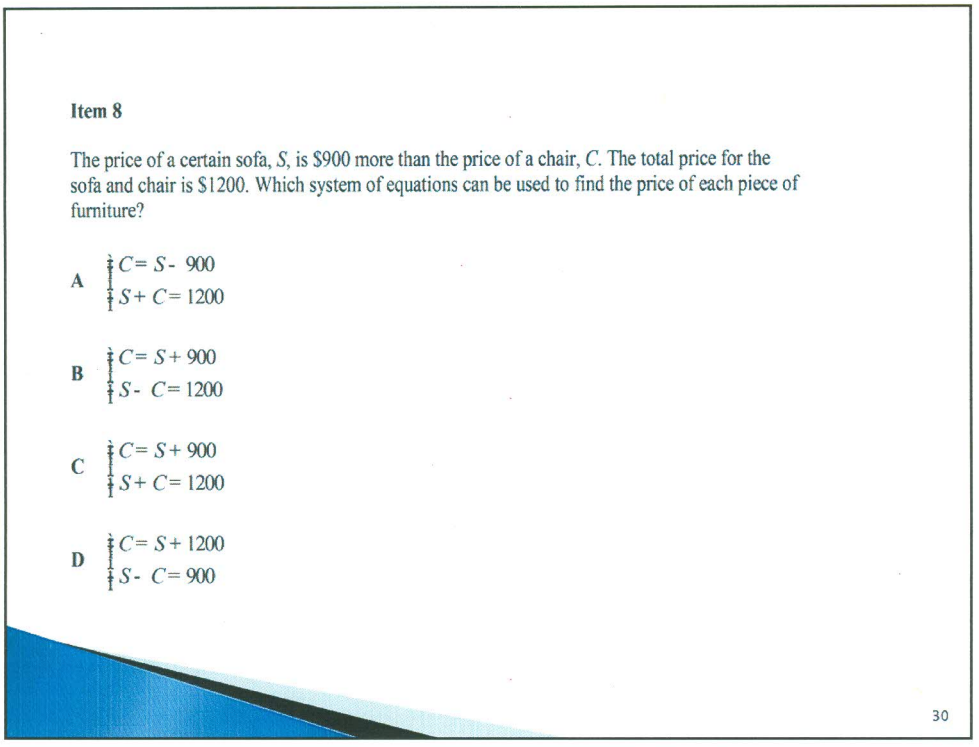
Please read through the Sample Item. Common Core Math Standard F-IF.9 is addressed by this item. This is the ninth Standard in the Domain Interpreting Functions within the Conceptual Category Functions. It is High Emphasis for 2014 and 2015. The Standard reads:

> "Compare properties of two functions each represented in a different way (algebraically, graphically, numerically in tables, or by verbal descriptions). For example, given a graph of one quadratic equation and an algebraic expression for another, say which has the larger maximum."

The CCSS for Mathematics continue the trend for more content in the area of Functions. For graphing or slope questions such as this, it is often taught to think of the function value for a given X, for example f(x), as synonymous with the "y" coordinate. Swapping "y" for f(x) puts the information in a form more likely to be familiar to returning students, and allows for usage of the slope formula as it appears on the Mathematics Reference Sheet.

This item calls for finding slope in two ways, by using the slope formula for the given points and by recognizing that the functions in the responses are presented in slope-intercept form. The slope calculated from the table is seven-fifths, making the answer choice "D".



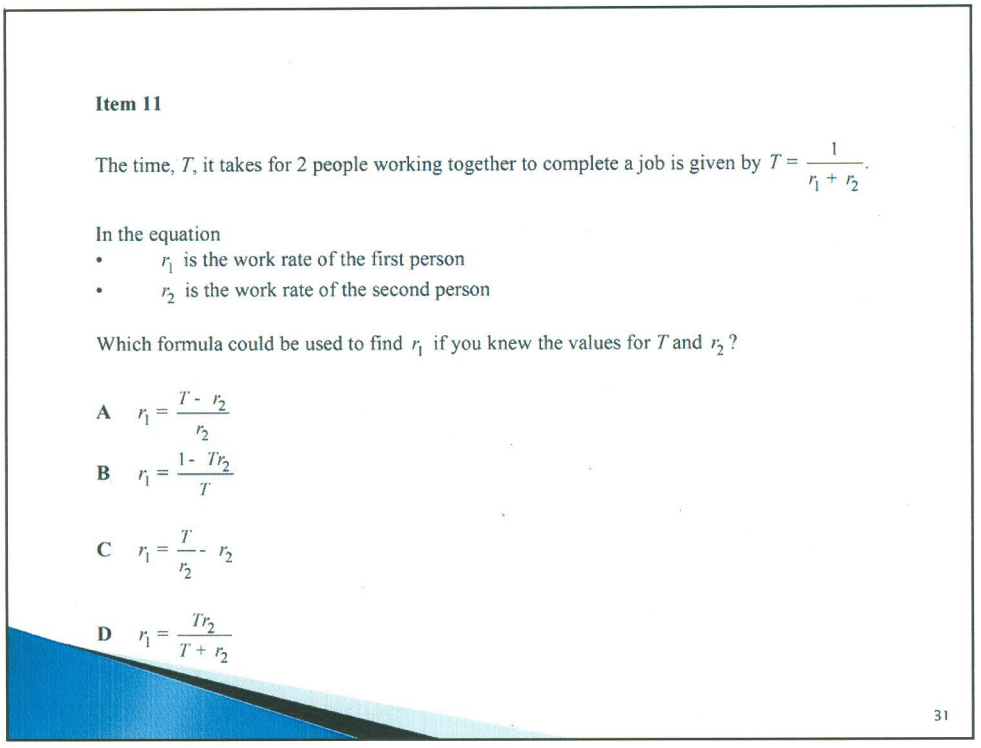
Please take a moment now to read this Sample Item.

This Sample Item addresses CCSS A-CED.3:

> "Represent constraints by equations or inequalities, and by systems of equations and/or inequalities, and interpret solutions as viable or non-viable options in a modeling context. For example, represent inequalities describing nutritional and cost constraints on combinations of different foods."

For 2014 and 2015, this is High Emphasis. Although this question does not call for simultaneous solution of these equations, simultaneous solution may be required for two linear equations, or for a linear with a quadratic or exponential equation. Some examinees may be accustomed to doing these types of questions with the aid of a graphing calculator, but the calculator used for the TASC™ test, the TI-30XS, does not have such graphing capability. Therefore, examinees should practice simultaneous solution of two equations without a graphing calculator.

The answer to this sample item is Choice "A."

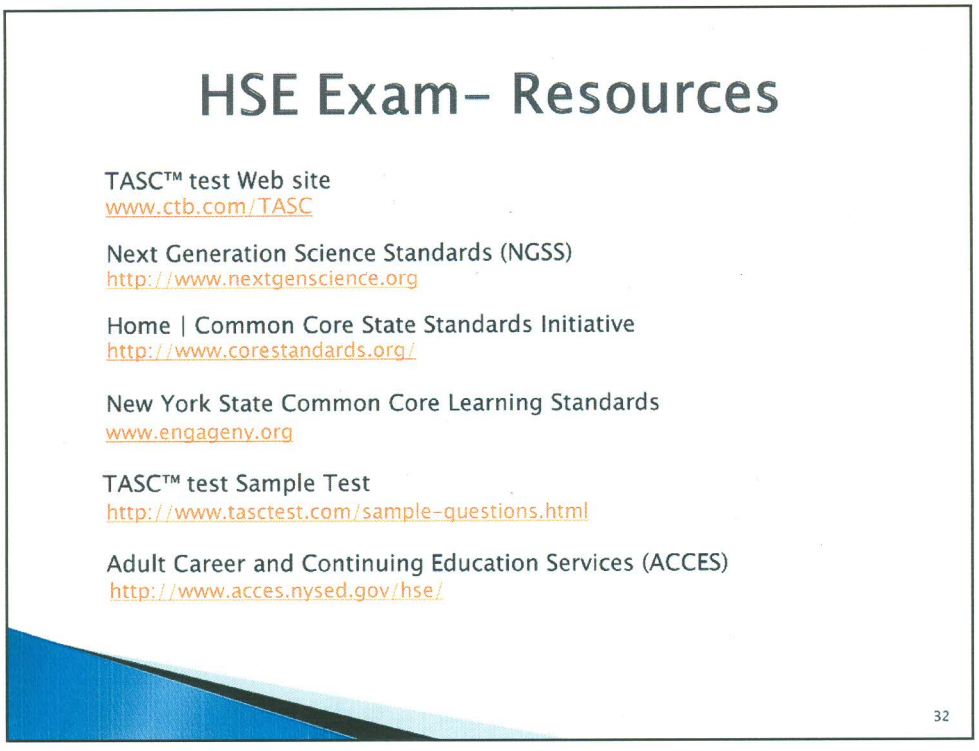


Please take a moment now to read Sample Item 11.

This item also measures CCSS A-REI.3. We saw this Standard previously applied to Item 4, involving solving an equation. The Common Core Mathematics Standards are general, and many types of questions can be aligned to the same Standard.

Rearranging equations to solve for a stated variable is a skill that has been assessed on past HSE exams, but this Sample Item illustrates the increased rigor of the TASC™ test content.

To solve for "r_1," or "r sub 1," first the examinee must recognize that both sides of the equation should be multiplied by $(r_1 + r_2)$. This involves correct application of the distributive property. Further algebraic manipulation yields the answer, Choice "B."



More information about the TASC™ test can be found on the TASC™ test web site. The Science Standards on which the TASC™ test is based may be explored at the NGSS web site. Also listed are web sites for ELA and Math national and state standards.

Probably the best starting point for either HSE instructors or candidates to begin preparation for the TASC™ test is to visit the web site containing the official TASC™ test Sample Test. Similar to the actual TASC™ test, the Sample Test is broken into five Subtests and features items indicative of the rigor and scope of the TASC™ test. Also available at the TASC™ test web site is information about the TASC™ test Readiness Test which may be useful both to gauge a person's preparedness to take the TASC™ test and to inform the HSE examinee about the TASC™ test.

For more information, visit NYSED's Adult Career and Continuing Education Services web site. A printable brochure on HSE in NYS can also be found there.

Thank you for listening.