A Correlation of

Pearson
Integrated CME Project
Mathematics III
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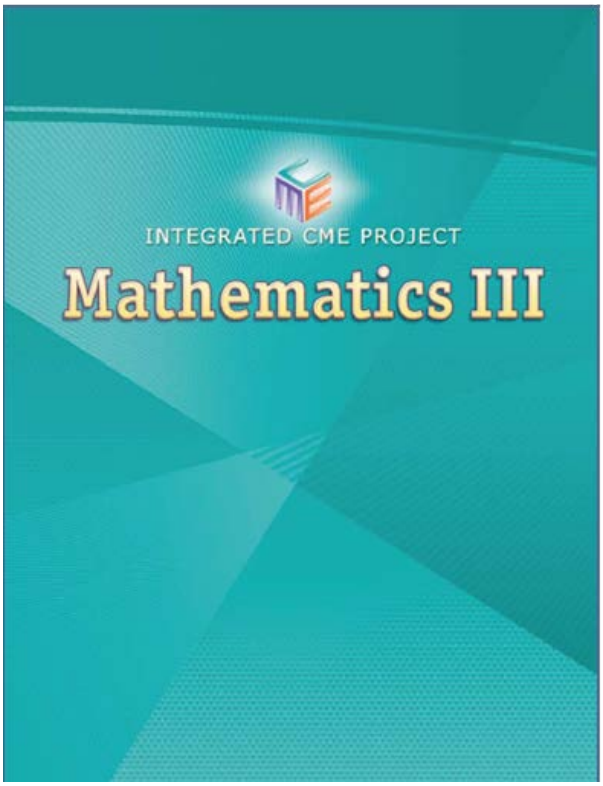

to the

Common Core State Standards for Mathematics

Appendix A, Integrated Pathway Mathematics III

High School

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Introduction

This document demonstrates how ***Pearson Integrated CME Project,* Mathematics III, ©2013** meets the standards of the *Common Core State Standards for Mathematics, Appendix A, Integrated Pathway Mathematics III.* Correlation references are to the pages of the Student and Teacher's Editions.

The ***Integrated CME Project*** is an NSF-funded core mathematics program that was built for the Integrated Pathway of the Common Core State Standards. It includes content from algebra, geometry, as well as precalculus concepts. The program's proven-effective pedagogy provides the focus, coherence, and rigor necessary to ensure today's students master the challenging new Common Core State Standards. The program also incorporates technology and hands-on projects and activities to engage today's digital students in deep mathematical learning.

Integrated CME Content includes Mathematics I, Mathematics II, and Mathematics III. Each course is focused on big ideas. ***Integrated CME Project*** is organized by coherent chapters. Chapters are comprised of investigation. Each Investigation is then composed of 3-6 lessons. The basic mathematics of each Investigation is accessible to all, and each Investigation can ultimately challenge the best students. The students work from a more informal to formal understanding of the mathematical topic explored in that particular chapter. The Investigation wrap-up, called Mathematical Reflections, provides an opportunity to review and summarize at the end of the chapter—good preparation for the Next-Generation assessments that will require students to justify their conclusions and mathematical understandings in writing. A Chapter Project extends student understanding by presenting challenges and highlighting connections to additional topics—projects are great preparation for performance tasks that will be on the upcoming Next-Generation assessments.

This document demonstrates the high degree of success students will achieve by using ***Pearson Integrated CME Project* Mathematics I-III.**

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Clusters with Instructional Notes	**Common Core State Standards for Mathematics, Integrated Pathway: Mathematics III**	**Integrated CME Project ©2013 Mathematics III**
Unit 1: Inferences and Conclusions from Data		
Summarize, represent, and interpret data on a single count or measurement variable. *While students may have heard of the normal distribution, it is unlikely that they will have prior experience using it to make specific estimates. Build on students' understanding of data distributions to help them see how the normal distribution uses area to make estimates of frequencies (which can be expressed as probabilities). Emphasize that only some data are well described by a normal distribution.*	S.ID.4 Use the mean and standard deviation of a data set to fit it to a normal distribution and to estimate population percentages. Recognize that there are data sets for which such a procedure is not appropriate. Use calculators, spreadsheets, and tables to estimate areas under the normal curve.	**SE/TE:** 273-275, 277-283, 284 (#5), 286 (#13), 287-290, 291-292
Understand and evaluate random processes underlying statistical experiments. *For S.IC.2, include comparing theoretical and empirical results to evaluate the effectiveness of a treatment.*	S.IC.1 Understand statistics as a process for making inferences about population parameters based on a random sample from that population.	**SE/TE:** 209-210, 235-236, 237-239, 243, 245 (#7, 9), 291 (#1-2)
	S.IC.2 Decide if a specified model is consistent with results from a given data-generating process, e.g., using simulation.	For related content, please see: **SE/TE:** 175-176, 227-232, 235-236, 291 (#5)

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Make inferences and justify conclusions from sample surveys, experiments, and observational studies. *In earlier grades, students are introduced to different ways of collecting data and use graphical displays and summary statistics to make comparisons., These ideas are revisited with a focus on how the way in which data is collected determines the scope and nature of the conclusions that can be drawn from that data. The concept of statistical significance is developed informally through simulation as meaning a result that is unlikely to have occurred solely as a result of random selection in sampling or random assignment in an experiment.* *For S.IC.4 and 5, focus on the variability of results from experiments—that is, focus on statistics as a way of dealing with, not eliminating, inherent randomness.*	S.IC.3 Recognize the purposes of and differences among sample surveys, experiments, and observational studies; explain how randomization relates to each.	**SE/TE:** 237-246, 252, 253, 254, 255, 258 (#9), 259 (#12)
	S.IC.4 Use data from a sample survey to estimate a population mean or proportion; develop a margin of error through the use of simulation models for random sampling.	For related content, please see: **SE/TE:** 209-210, 235-236, 252-255, 256 (#5), 257 (#6), 258 (#8), 261-265, 266-270
	S.IC.5 Use data from a randomized experiment to compare two treatments; use simulations to decide if differences between parameters are significant.	**SE/TE:** 237-239, 240-246, 255 (#1), 256 (#3-4), 258 (#10, 12)
	S.IC.6 Evaluate reports based on data.	**SE/TE:** 237-239, 240-246, 255 (#2), 257 (#6), 258 (#10-11), 287-292
Use probability to evaluate outcomes of decisions. *Extend to more complex probability models. Include situations such as those involving quality control or diagnostic tests that yields both false positive and false negative results.*	S.MD.6 Use probabilities to make fair decisions (e.g., drawing by lots, using a random number generator).	**SE/TE:** 175-176, 177-183
	S.MD.7 Analyze decisions and strategies using probability concepts (e.g., product testing, medical testing, pulling a hockey goalie at the end of a game).	**SE/TE:** 198-205

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Unit 2: Polynomials, Rational, and Radical Relationships		
Use complex numbers in polynomial identities and equations. *Build on work with quadratics equations in Mathematics II. Limit to polynomials with real coefficients.*	N.CN.8 Extend polynomial identities to the complex numbers.	For related content, please see: **Integrated CME Project Mathematics II** **SE/TE:** 221 (#14)
	N.CN.9 Know the Fundamental Theorem of Algebra; show that it is true for quadratic polynomials.	For related content, please see: **Integrated CME Project Mathematics II** **SE/TE:** 221 (#14-15), Honors Appendix: Historical Perspective: 877
Interpret the structure of expressions. *Extend to polynomial and rational expressions.*	A.SSE.1 Interpret expressions that represent a quantity in terms of its context. ★	**SE/TE:** 11 (#10), 22 (#7), 23 (#13-14), 24, 33-34, 39 (#5-6), 40 (#10), 45-46, 49-50, 53-54, 55-59, 60-61, 62-66, 67-68, 87-90, 95-97, 98-99, 107-109, 110-111, 127-128, 129, 408-411, 412 (#7-13), 413 (#18-19), 424-428, 429-431, 432-436, 437440, 456-460, 572-576, 577-580, Honors Appendix: 804-809, 810-815
	a. Interpret parts of an expression, such as terms, factors, and coefficients.	For related content, please see: **SE/TE:** 56
	b. Interpret complicated expressions by viewing one or more of their parts as a single entity.	**SE/TE:** 11 (#11-13), 17-21, 23-24, 45, 46 (#13-15, 18), 50 (#5, 7, 12), 67, 53 (#3), 60 (#2), 71 (#1, 6), 72 (#10), 110-111, 412 (#7), Honors Appendix: 814-815
	A.SSE.2 Use the structure of an expression to identify ways to rewrite it.	**SE/TE:** 49, 50 (#5, 12), 51-53, 55-61, 62-68, 73 (#1-3), Honors Appendix: 814-815

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Write expressions in equivalent forms to solve problems. *Consider extending A.SSE.4 to infinite geometric series in curricular implementations of this course description.*	A.SSE.4 Derive the formula for the sum of a finite geometric series (when the common ratio is not 1), and use the formula to solve problems. *For example, calculate mortgage payments* ★	For related content, please see: **SE/TE:** 91-94, 139, 143 (#12), 144 (#13-15), 572-576
Perform arithmetic operations on polynomials. *Extend beyond the quadratic polynomials found in Mathematics II.*	A.APR.1 Understand that polynomials form a system analogous to the integers, namely, they are closed under the operations of addition, subtraction, and multiplication; add, subtract, and multiply polynomials.	**SE/TE:** 6-8, 9 (#9), 11 (#10)
Understand the relationship between zeros and factors of polynomials.	A.APR.2 Know and apply the Remainder Theorem: For a polynomial $p(x)$ and a number a, the remainder on division by $x - a$ is $p(a)$, so $p(a) = 0$ if and only if $(x - a)$ is a factor of $p(x)$.	**SE/TE:** 35-40, 523-525, 529-536, 537-542
	A.APR.3 Identify zeros of polynomials when suitable factorizations are available, and use the zeros to construct a rough graph of the function defined by the polynomial.	**SE/TE:** 41-46, 51-54, 55-61, 507-509, 514-515

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Use polynomial identities to solve problems. *This cluster has many possibilities for optional enrichment, such as relating the example in A.APR.4 to the solution of the system u2+v2=1, v = t(u+1), relating the Pascal triangle property of binomial coefficients to (x+y)n+1 = (x+y)(x+y)n, deriving explicit formulas for the coefficients, or proving the binomial theorem by induction.*	A.APR.4 Prove polynomial identities and use them to describe numerical relationships.	**SE/TE:** 46 (#13-14), 449 (#7), 455 (#15)
	A.APR.5 Know and apply the Binomial Theorem for the expansion of $(x + y)n$ in powers of x and y for a positive integer n, where x and y are any numbers, with coefficients determined for example by Pascal's Triangle.	**SE/TE:** 159-163, 164-167, 168, 247-251, 277-286
Rewrite rational expressions *The limitations on rational functions apply to the rational expressions in A.APR.6. A.APR.7 requires the genera division algorithm for polynomials.*	A.APR.6 Rewrite simple rational expressions in different forms; write $a(x)/b(x)$ in the form $q(x) + r(x)/b(x)$, where $a(x)$, $b(x)$, $q(x)$, and $r(x)$ are polynomials with the degree of $r(x)$ less than the degree of $b(x)$, using inspection, long division, or, for the more complicated examples, a computer algebra system.	**SE/TE:** 40 (#16-17), 69-70, 71-72, 525 (#3-4), 545-548, 549-557, 560, 563-565
	A.APR.7 Understand that rational expressions form a system analogous to the rational numbers, closed under addition, subtraction, multiplication, and division by a nonzero rational expression; add, subtract, multiply, and divide rational expressions.	**SE/TE:** 69-70, 71-72, 549-557
Understand solving equations as a process of reasoning and explain the reasoning. *Extend to simple rational and radical equations.*	A.REI.2 Solve simple rational and radical equations in one variable, and give examples showing how extraneous solutions may arise.	**SE/TE:** 53 (#4), 67 (#6), 545-546, 547 (#9-10), 548 (#12-13), 736 (#6), 737 (#10), 743 (#2), 744 (#10)

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Represent and solve equations and inequalities graphically. *Include combinations of linear, polynomial, rational, radical, absolute value, and exponential functions.*	A.REI.11 Explain why the *x*-coordinates of the points where the graphs of the equations $y = f(x)$ and $y = g(x)$ intersect are the solutions of the equation $f(x) = g(x)$; find the solutions approximately, e.g., using technology to graph the functions, make tables of values, or find successive approximations. Include cases where $f(x)$ and/or $g(x)$ are linear, polynomial, rational, absolute value, exponential, and logarithmic functions. ★	**SE/TE:** 17-21, 25-27, 28 (#6-9), 54 (#8), 520-528, 537-538, 541 (#1-2), 542 (#12), 592-599, 642-647
Analyze functions using different representations. *Relate F.IF.7c to the relationship between zeros of quadratic functions and their factored forms.*	F.IF.7 Graph functions expressed symbolically and show key features of the graph, by hand in simple cases and using technology for more complicated cases. ★	**SE/TE:** 13, 15 (#12), 16, 27 (#1-2), 28 (#6-9), 333 (#8), 335-336, 337 (#1), 338 (#3-5), 342 (#5), 403-405, 406 (#3, 7), 407 (#9-11), 416 (#1-5), 417 (#8-10, 14), 421, 424-428, 429-430, 431 (#9), 432-436, 437, 438 (#5-6, 9), 439 (#12, 14), 440 (#18), 507-509, 510-512, 514, 520-522, 525, 527, 528 (#15, 17-18), 537-540, 545-547, 548 (#14-16), 549-553, 555 (#8-9), 556 (#13, 15-17), 557 (#19, 22), 592-597, 599 (#22), 642-643, 644 (#3), 646 (#10-11, 13), 647 (#16), 670, 672 (#6), Honors Appendix: 782-784, 785 (#3, 5), 787-790, 794-795, 798 (#9)
	c. Graph polynomial functions, identifying zeros when suitable factorizations are available, and showing end behavior.	**SE/TE:** 13, 14 (#12), 16 (#14-18), 25, 27 (#1-2), 28 (#6-9), 507-508, 509 (#10-11, 13), 510-514, 517 (#14), 521-522, 525 (#2-4), 527 (#10-12, 14), 528 (#15, 17-18)536 (#17), 537-538

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Unit 3: Trigonometry of General Triangles and Trigonometric Functions		
Apply trigonometry to general triangles. *With respect to the general case of the Laws of Sines and Cosines, the definitions of sine and cosine must be extended to obtuse angles.*	G.SRT.9 Derive the formula $A = 1/2\ ab \sin(C)$ for the area of a triangle by drawing an auxiliary line from a vertex perpendicular to the opposite side.	**SE/TE:** 353-355, 356-362
	G.SRT.10 Prove the Laws of Sines and Cosines and use them to solve problems.	**SE/TE:** 363-366, 366 (#1-3), 367-369, 370-376, 377-378, 379 (#18, 20)
	G.SRT.11 Understand and apply the Law of Sines and the Law of Cosines to find unknown measurements in right and non-right triangles (e.g., surveying problems, resultant forces).	**SE/TE:** 368 (#8-9, 13), 369 (#14-18, 19), 378 (#9, 15-17), 379 (#20)
Extend the domain of trigonometric functions using the unit circle.	F.TF.1 Understand radian measure of an angle as the length of the arc on the unit circle subtended by the angle.	**SE/TE:** 395-396, 397-399, 400, 407 (#15-16)
	F.TF.2 Explain how the unit circle in the coordinate plane enables the extension of trigonometric functions to all real numbers, interpreted as radian measures of angles traversed counterclockwise around the unit circle.	**SE/TE:** 316-321, 395-396, 397-402, 403-407
Model periodic phenomena with trigonometric functions.	F.TF.5 Choose trigonometric functions to model periodic phenomena with specified amplitude, frequency, and midline. ★	For related content, please see: **SE/TE:** 333 (#6, 8), 335-336, 422, 533-536, 437 (#2), 438 (#6, 9), 439 (#12), 440 (#18), 441 (#1, 3)

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Unit 4: Mathematical Modeling		
Create equations that describe numbers or relationships. For A.CED.1, use all available types of functions to create such equations, including root functions, but constrain to simple cases. While functions used in A.CED.2, 3, and 4 will often be linear, exponential, or quadratic the types of problems should draw from more complex situations than those addressed in Mathematics I. For example, finding the equation of a line through a given point perpendicular to another line allows one to find the distance from a point to a line. Note that the example given for A.CED.4 applies to earlier instances of this standard, not to the current course.	A.CED.1 Create equations and inequalities in one variable and use them to solve problems. *Include equations arising from linear and quadratic functions, and simple rational and exponential functions.*	**SE/TE:** 11 (#10)
	A.CED.2 Create equations in two or more variables to represent relationships between quantities; graph equations on coordinate axes with labels and scales.	**SE/TE:** 16 (#14-15), 523-526, 527 (#13-14), 528 (#20), 537-542, 662-667
	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.	Please see: **Integrated CME Project Mathematics I** **SE/TE:** 148-152, 172-177, 200-202, 203, 204 (#5-6), 265 (#11), 289-291, 292 (#1-2), 293 (#4-10), 304 (#1, 3), 305 (#4, 5), 306 (#9-10), 307 (#13), 311 (#10-12), 321, 322 (#8), 323 (#10-12), 329-332, 333 (#4-6), 334 (#10-11), 335 **Integrated CME Project Mathematics II** **SE/TE:** 73 (#9-12), 74 (#13), 79 (#7), 84 (#7-8), 175, 176 (#4), 182 (#8, 10), 160 (#1-8, 12-17), 161 (#19)
	A.CED.4 Rearrange formulas to highlight a quantity of interest, using the same reasoning as in solving equations.	**SE/TE:** Honors Appendix: 810-815

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Interpret functions that arise in applications in terms of a context. *Emphasize the selection of a model function based on behavior of data and context*.	F.IF.4 For a function that models a relationship between two quantities, interpret key features of graphs and tables in terms of the quantities, and sketch graphs showing key features given a verbal description of the relationship. *Key features include: intercepts; intervals where the function is increasing, decreasing, positive, or negative; relative maximums and minimums; symmetries; end behavior; and periodicity.* ★	**SE/TE:** 317, 335-336, 338 (#3), 414-417, 421-422, 424-428, 429-431, 432-439, 440 (#16-18), 441 (#1, 3), 510-511, 512 (#6-7), 514, 520-522, 525, 527, 528 (#15, 17-18), 537-538, 549-551, 554 (#3-4), 555 (#8-10), 557 (#19-20), 592-597, 599 (#22), 642-647, 676, 678 (#7)
	F.IF.5 Relate the domain of a function to its graph and, where applicable, to the quantitative relationship it describes. ★	**SE/TE:** 310-315, 316—321, 335-339, 344 (#8), 406 (#4), 414-417, 546, 547 (#10), 594-596, 598 (#13)
	F.IF.6 Calculate and interpret the average rate of change of a function (presented symbolically or as a table) over a specified interval. Estimate the rate of change from a graph. ★	**SE/TE:** 520-522, 524 (#1), 526, 537-540, 649-652, 655 (#12)

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Analyze functions using different representations. *Focus on applications and how key features relate to characteristics of a situation, making selection of a particular type of function model appropriate.*	F.IF.7 Graph functions expressed symbolically and show key features of the graph, by hand in simple cases and using technology for more complicated cases. ★	**SE/TE:** 13, 15 (#12), 16, 27 (#1-2), 28 (#6-9), 333 (#8), 335-336, 337 (#1), 338 (#3-5), 342 (#5), 403-405, 406 (#3, 7), 407 (#9-11), 416 (#1-5), 417 (#8-10, 14), 421, 424-428, 429-430, 431 (#9), 432-436, 437, 438 (#5-6, 9), 439 (#12, 14), 440 (#18), 507-509, 510-512, 514, 520-522, 525, 527, 528 (#15, 17-18), 537-540, 545-547, 548 (#14-16), 549-553, 555 (#8-9), 556 (#13, 15-17), 557 (#19, 22), 592-597, 599 (#22), 642-643, 644 (#3), 646 (#10-11, 13), 647 (#16), 670, 672 (#6), Honors Appendix: 782-784, 785 (#3, 5), 787-790, 794-795, 798 (#9)
	b. Graph square root, cube root, and piecewise-defined functions, including step functions and absolute value functions.	Please see: **Mathematics I** **SE/TE:** 392 (#8), 393 (#11-12), 395 (#17-18) **Mathematics II** **SE/TE:** 300-304, 306, 307 (#9-10), 308 (#1), 335 (#6-8), 337 (#18)
	e. Graph exponential and logarithmic functions, showing intercepts and end behavior, and trigonometric functions, showing period, midline, and amplitude.	**SE/TE:** 333 (#8), 335-336, 338-339, 340-342, 403-405, 406 (#7), 407 (#10-11), 414-415, 416-417, 424-428, 429-430, 431 (#9), 432-439, 440 (#16, 18), 441 (#1, 3), 592-596, 597 (#8), 599 (#22), 627, 632 (#5), 642-643, 644 (#3), 646 (#11, 13), 647 (#16), 649-652, 653-654, 655 (#9, 12-13), 656 (15-16), 659 (3-4), 660 (#7), 661 (#8), 670, 672 (#6), 674 (#6), 676 (#10)

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(Continued) Analyze functions using different representations. *Focus on applications and how key features relate to characteristics of a situation, making selection of a particular type of function model appropriate.*	F.IF.8 Write a function defined by an expression in different but equivalent forms to reveal and explain different properties of the function.	**SE/TE:** 79-81, 82, 84 (#11), 507-508, 509, 510-511, 514, 516 (#6), 529-533, 534 (#2-4, 6), 535, 536 (#13), 608 (#1-2)
	F.IF.9 Compare properties of two functions each represented in a different way (algebraically, graphically, numerically in tables, or by verbal descriptions).	For related content, please see: **SE/TE:** 79-81, 82, 84 (#11), 416 (#6), 417 (#14)
Build a function that models a relationship between two quantities. *Develop models for more complex or sophisticated situations than in previous courses.*	F.BF.1 Write a function that describes a relationship between two quantities.	**SE/TE:** 127, 129 (#5, 7), 569-571, 572-575576 (#7-8), 577-578, 579 (#1-4), 580 (#7, 9), 581, 598 (#13), 605 (#7), 607 (#13-15), 612 (#7-8), 613 (#12, 16)
	b. Combine standard function types using arithmetic operations.	For related content, please see: **SE/TE:** 27-29
Build new functions from existing functions. *Use transformations of functions to find more optimum models as students consider increasingly more complex situations.* *For F.BF.3, note the effect of multiple transformations on a single function and the common effect of each transformation across function types. Include functions defined only by a graph.* *Extend F.BF.4a to simple rational, simple radical, and simple exponential functions; connect F.BF.4a to F.LE.4.*	F.BF.3 Identify the effect on the graph of replacing *f(x)* by *f(x) + k, k f(x), f(kx),* and *f(x + k)* for specific values of *k* (both positive and negative); find the value of *k* given the graphs. Experiment with cases and illustrate an explanation of the effects on the graph using technology. *Include recognizing even and odd functions from their graphs and algebraic expressions for them.*	For related content, please see: **SE/TE:** 338 (#11-12), 406 (#4, 7), 407 (#10, 12), 421, 422 (#11), 423 (#12), 428, 429 (#7), 430-431, 435-436, 437, 438 (#5-8), 439, 440 (#18), 509 (#10-11, 13), 525-526, 599 (#22), 608 (#1), 613 (#13)
	F.BF.4 Find inverse functions.	**SE/TE:** 616-617, 618 (#4), 623 (#5, 7), 680-681, 685 (#15), Honors Appendix: 775 (#1, 3-4), 787-790
	a. Solve an equation of the form *f(x) = c* for a simple function *f* that has an inverse and write an expression for the inverse.	For related content, please see: **SE/TE:** 617, 618 (#4), 623 (#5, 7), 675-679, 787-793

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Construct and compare linear, quadratic, and exponential models and solve problems. *Consider extending this unit to include the relationship between properties of logarithms and properties of exponents, such as the connection between the properties of exponents and the basic logarithm property that log xy = log x + log y.*	F.LE.4 For exponential models, express as a logarithm the solution to *a bct = d* where *a, c*, and *d* are numbers and the base *b* is 2, 10, or *e*; evaluate the logarithm using technology.	**SE/TE:** 627-630, 632 (#16-17, 21-22), 633-640, 668-673
Visualize relationships between two-dimensional and three-dimensional objects.	G.GMD.4 Identify the shapes of two-dimensional cross-sections of three-dimensional objects, and identify three-dimensional objects generated by rotations of two-dimensional objects.	**SE/TE:** 627-630, 632 (#16-17, 21-22), 633-640, 668-673
Apply geometric concepts in modeling situations.	G.MG.1 Use geometric shapes, their measures, and their properties to describe objects (e.g., modeling a tree trunk or a human torso as a cylinder). ★	For related content, please see: **Integrated CME Project Mathematics II** For related content, please see: **SE/TE:** 443 (#13), 707-709, 767 (#5-8), 768 (#9-12)
	G.MG.2 Apply concepts of density based on area and volume in modeling situations (e.g., persons per square mile, BTUs per cubic foot). ★	**SE/TE:** 731 (#2), 733 (#8)
	G.MG.3 Apply geometric methods to solve design problems (e.g., designing an object or structure to satisfy physical constraints or minimize cost; working with typographic grid systems based on ratios). ★	**SE/TE:** 719-723, 725-727

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