### Correlation of CPM Core Connections Algebra 2 to Appendix A: Traditional Pathway of the CCSS

This document identifies the lesson(s) in CPM Core Connections Algebra 2 in which primary instruction of each standard Appendix A: Traditional Pathway of the Common Core State Standards for Mathematics occurs.

The standards continue to be implemented, applied, and practiced throughout subsequent lessons. #.#.# refers to a lesson in CPM Core Connections Algebra 2. MN #.#.# refers to the Math Notes box in Lesson #.#.#, Checkpoint # refers to the Checkpoint problems in the back of the student textbook, and #-# refers to an instance of a homework problem in which the standard is implemented. The list of homework problems is by no means comprehensive, but rather intended as a sample.

<table>
<thead>
<tr>
<th>Standard from CCSS Appendix A Traditional Pathway</th>
<th>Primary instruction for this standard and a few instances of homework in which the standard is implemented.</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>NUMBER AND QUANTITY</strong></td>
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<tr>
<td><strong>The Complex Number System N-CN</strong></td>
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<tr>
<td>Perform arithmetic operations with complex numbers.</td>
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</table>
| N-CN.1. Know there is a complex number $i$ such that $i^2 = -1$, and every complex number has the form $a + bi$ with $a$ and $b$ real. | 8.2.1–8.2.3  
 8-70, 8-72, 8-76, 8-90, 8-140, 8-156, 10-53, 10-131 |
| N-CN.2. Use the relation $i^2 = -1$ and the commutative, associative, and distributive properties to add, subtract, and multiply complex numbers. | 8.2.2, 8.2.3  
 8-71, 8-72, 8-90, 8-111, 8-184, 9-57, 10-104, 11-69 |
| Use complex numbers in polynomial identities and equations. |                                                                                                                  |
| Limit to polynomials with real coefficients.      |                                                                                                                  |
| N-CN.7. Solve quadratic equations with real coefficients that have complex solutions. | 8.2.1–8.2.3  
 8-88, 8-110, 8-143, 8-154, 8-171, 8-181, 8-186, 8-190, 9-55, 10-101(b), 10-124 |
| N-CN.8. (+) Extend polynomial identities to the complex numbers. For example, rewrite $x^2 + 4$ as $(x + 2i)(x - 2i)$. | 8.2.2, 8.2.3  
 MN: 8.3.2  
 8-87, 8-187, 9-14 |
| N-CN.9. (+) Know the Fundamental Theorem of Algebra; show that it is true for quadratic polynomials. | 8.1.1, 8.1.2, 8.2.1–8.2.3, 8.3.1–8.3.3  
 MN: 8.3.2  
 8-104, 8-105, 8-106, 8-125, 8-143, 8-170, 8-180, 8-182, 8-186 |
<table>
<thead>
<tr>
<th>ALGEBRA</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Seeing Structure in Expressions A-SSE</strong></td>
</tr>
<tr>
<td><strong>Interpret the structure of expressions.</strong></td>
</tr>
<tr>
<td><strong>Extend to polynomial and rational expressions.</strong></td>
</tr>
<tr>
<td>A-SSE.1. Interpret expressions that represent a quantity in terms of its context. ★</td>
</tr>
<tr>
<td>A-SSE.1a. Interpret parts of an expression, such as terms, factors, and coefficients.</td>
</tr>
<tr>
<td>A-SSE.1b. Interpret complicated expressions by viewing one or more of their parts as a single entity. For example, interpret ( P(1 + r)^n ) as the product of ( P ) and a factor not depending on ( P ).</td>
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<tr>
<td>A-SSE.2. Use the structure of an expression to identify ways to rewrite it. For example, see ( x^4 - y^4 ) as ( (x^2)^2 - (y^2)^2 ), thus recognizing it as a difference of squares that can be factored as ( (x^2 - y^2)(x^2 + y^2) ).</td>
</tr>
<tr>
<td>Write expressions in equivalent forms to solve problems.</td>
</tr>
<tr>
<td>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. Consider extending A.SSE.4 to infinite geometric series in curricular implementations of this course description.</td>
</tr>
<tr>
<td>Arithmetic with Polynomials and Rational Expressions A-APR</td>
</tr>
<tr>
<td><strong>Perform arithmetic operations on polynomials.</strong></td>
</tr>
<tr>
<td>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. Extend beyond the quadratic polynomials found in Algebra 1.</td>
</tr>
</tbody>
</table>

<p>| 2.2.2, 3.1.3 |
| 2-109, 2-126, 2-148, 3-133, 6-27, 7-137, 7-141, 8-183, 10-57, 10-84 |
| 2.1.2–2.1.5, 2.2.1, 2.2.2, 3.1.3, 4.1.1, 10.2.2 |
| MN: 3.2.4, 10.3.2 |
| Checkpoint 3A |
| 2-23, 2-24, 2-40, 2-93, 3-32, 3-53, 3-67, 3-98, 3-105, 3-130, 5-39, 5-112, 5-128, 6-26, 6-87, 6-114, 7-27, 9-69, 12-104 |
| 3.1.1–3.1.3, 4.1.1, 8.3.2, 10.3.2 |
| MN: 8.3.3 |
| 3-6, 3-23, 3-67, 3-98, 3-130, 5-134, 6-25, 8-143 |
| 10.2.1 |
| MN: 10.2.2 |
| 10-126, 10-147, 10-156, 10-180 |
| 3.1.1–3.1.3, 3.2.1 |
| Checkpoint 5A |
| 3-23, 3-29, 5-37, 5-49, 6-87, 8-87, 9-14, 10-175 |
| Operations with polynomials are also practiced extensively in implementing standards A-APR.6 and A-APR.7. |</p>
<table>
<thead>
<tr>
<th><strong>Understand the relationship between zeros and factors of polynomials.</strong></th>
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</thead>
</table>
| **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 \( p(x) \). | 8.3.1–8.3.3  
MN: 8.3.2  
8-148, 8-154, 8-175, 9-9 |
| **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. | 8.1.1–8.1.3, 8.3.2, 8.3.3  
MN: 8.3.2  
8-37, 8-106, 8-107, 8-143, 8-171, 8-179, 8-183, 8-186, 9-93, 10-38, 10-57 |

<table>
<thead>
<tr>
<th><strong>Use polynomial identities to solve problems.</strong></th>
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<tr>
<td><strong>This cluster has many possibilities for optional enrichment, such as relating the example in A.APR.4 to the solution of the system ( u^2 + v^2 = 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.</strong></td>
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</table>
| **A-APR.4.** Prove polynomial identities and use them to describe numerical relationships. For example, the polynomial identity \( (x^2 + y^2)^2 = (x^2 - y^2)^2 + (2xy)^2 \) can be used to generate Pythagorean triples. | 3.1.1–3.1.3, 10.3.1  
2-24, 2-147 |
| **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. | 10.3.1  
MN: 10.3.1  
10-145, 10-146, 10-155, 10-171, 10-175, 10-187 |

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<thead>
<tr>
<th><strong>Rewrite rational expressions.</strong></th>
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</table>
| **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. The limitations on rational functions apply to the rational expressions in A.APR.6. | 8.3.1, 8.3.2  
8-120, 8-124, 8-185, 9-54, 12-93, 12-110 |
| **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. A.APR.7 requires the general division algorithm for polynomials. | 3.2.2–3.2.5  
MN: 3.2.3, 3.2.5  
Checkpoints 6A and 6B  
3-90, 3-103, 3-130, 4-13, 5-31, 5-92, 6-13, 6-39, 6-73, 6-83, 6-114, 6-121, 6-145 |
<table>
<thead>
<tr>
<th>Creating Equations ★ A-CED</th>
<th>Reasoning with Equations and Inequalities A-REI</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Create equations that describe numbers or relationships.</strong></td>
<td><strong>Understand solving equations as a process of reasoning and explain the reasoning.</strong></td>
</tr>
</tbody>
</table>
| A-CED.1. Create equations and inequalities in one variable [including ones with absolute value – CA Standard] and use them to solve problems. *Include equations arising from linear and quadratic functions, and simple rational and exponential functions.*  
*For A.CED.1, use all available types of functions to create such equations, including root functions, but constrain to simple cases.* | A-REI.2. Solve simple rational and radical equations in one variable, and give examples showing how extraneous solutions may arise.  
*Extend to simple rational and radical equations.* |
| **MN:** 4.2.2, 4.2.4  
**Checkpoint:** 9A  
1-87, 1-107, 2-10, 2-120, 2-61, 2-87, 3-65, 3-123, 3-131, 4-43, 4-93, 5-32, 7-60, 7-124, 8-15, 10-163, 11-58 | **MN:** 4.2.1–4.2.4  
**Checkpoint:** 2B, Checkpoint 8A  
4-30, 4-40, 4-51, 4-65, 4-72, 4-74, 4-96, 4-99, 4-104, 4-107(b), 4-109, 7-151 |
| A-CED.2. Create equations in two or more variables to represent relationships between quantities; graph equations on coordinate axes with labels and scales.  
*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 Algebra 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.* | 5.1.3  
**Checkpoint:** 4B  
1-37, 1-91, 2-113, 3-41, 4-32, 4-67, 4-87, 6-25, 11-80 |
| A-CED.3. Represent constraints by equations or inequalities, and by systems of equations and/or inequalities, and interpret solutions as viable or nonviable options in a modeling context.  
*For example, represent inequalities describing nutritional and cost constraints on combinations of different foods.* | 4.2.1–4.2.4  
**MN:** 4.2.3, 4.2.4 |
| A-CED.4. Rearrange formulas to highlight a quantity of interest, using the same reasoning as in solving equations. *For example, rearrange Ohm’s law* \( V = IR \) *to highlight resistance* \( R \).  
*Note that the example given for A.CED.4 applies to earlier instances of this standard, not to the current course.* | 4.1.1, 4.1.2  
**Checkpoint:** 8B, Checkpoint 11  
3-96, 3-121, 4-27, 4-95, 6-40, 6-53, 7-68, 7-122, 9-58, 9-80, 9-108, 10-100, 11-46, 11-81 |
Represent and solve equations and inequalities graphically.

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. ★

*Include combinations of linear, polynomial, rational, radical, absolute value, and exponential functions.*

<table>
<thead>
<tr>
<th>FUNCTIONS</th>
<th></th>
</tr>
</thead>
<tbody>
<tr>
<td>Interpreting Functions F-IF</td>
<td></td>
</tr>
<tr>
<td>Interpret functions that arise in applications in terms of the context.</td>
<td></td>
</tr>
</tbody>
</table>

*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.* ★

F-IF.5. Relate the domain of a function to its graph and, where applicable, to the quantitative relationship it describes. *For example, if the function $h(n)$ gives the number of person-hours it takes to assemble $n$ engines in a factory, then the positive integers would be an appropriate domain for the function.* ★

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. ★

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. ★
<table>
<thead>
<tr>
<th>Standard</th>
<th>Topic</th>
<th>Pages</th>
</tr>
</thead>
<tbody>
<tr>
<td>F-IF.7b</td>
<td>Graph square root, cube root, and piecewise-defined functions, including step functions and absolute value functions.</td>
<td>1.1.3, 2.2.1, 2.2.2, 2.2.5, 1-86, 2-126, 2-131, 2-141, 2-171, 3-34, 3-56, 3-133, 3-134, 5-127, 6-78, 7-29, 7-85, 7-137</td>
</tr>
<tr>
<td>F-IF.7c</td>
<td>Graph polynomial functions, identifying zeros when suitable factorizations are available, and showing end behavior. Relate F-IF.7c to the relationship between zeros of quadratic functions and their factored forms.</td>
<td>8.1.1–8.1.3, 8.3.2, 8.3.3, 8-106, 8-107, 8-125, 8-138, 8-171, 8-183, 8-186, 9-9, 9-68, 9-93, 9-116, 10-38, 10-57, 10-151, 10-174</td>
</tr>
<tr>
<td>F-IF.7e</td>
<td>Graph exponential and logarithmic functions, showing intercepts and end behavior, and trigonometric functions, showing period, midline, and amplitude.</td>
<td>2.2.2, 5.2.3, 5.2.4, 6.2.4, 7.1.2–7.1.4, 7.1.7, 7.2.1–7.2.4, 12.1.4, MN: 2.1.1, 2-52, 5-89, 5-118, 6-27, 6-86, 6-116, 6-155, 7-141, 8-43, 8-146, 9-69, 10-92, 11-9</td>
</tr>
<tr>
<td>F-IF.8</td>
<td>Write a function defined by an expression in different but equivalent forms to reveal and explain different properties of the function.</td>
<td>10.3.2, MN: 2.1.1, Checkpoint 9A, 2-29, 2-63, 2-85, 3-49, 3-131, 6-15, 6-138, 7-20, 7-95, 8-23, 8-74, 9-41, 10-96, 10-169, 11-101, 12-71</td>
</tr>
<tr>
<td>F-IF.8a</td>
<td>Use the process of factoring and completing the square in a quadratic function to show zeros, extreme values, and symmetry of the graph, and interpret these in terms of a context.</td>
<td>2.1.2–2.1.5, MN: 2.1.3, 2.1.4, Checkpoints 5B, 7A, and 7B, 2-22, 2-36, 2-37, 2-50, 2-128, 2-166, 2-177, 3-31, 5-66, 5-76, 5-100, 5-134, 6-85, 7-9, 8-95, 9-25</td>
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<tr>
<td>F-IF.8b</td>
<td>Use the properties of exponents to interpret expressions for exponential functions. For example, identify percent rate of change in functions such as $y = (1.02)^t$, $y = (0.97)^t$, $y = (1.01)^{12t}$, $y = (1.2)^{10}$, and classify them as representing exponential growth or decay.</td>
<td>10.3.2, MN: 2.1.1, Checkpoint 9A, 2-29, 2-63, 2-85, 3-49, 3-131, 6-15, 6-138, 7-20, 7-95, 8-23, 8-74, 9-41, 10-96, 10-169, 11-101, 12-71, For implementation of properties of exponents in general, see standard A-SSE.1b</td>
</tr>
<tr>
<td>F-IF.9</td>
<td>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 function and an algebraic expression for another, say which has the larger maximum.</td>
<td>1.1.4, 1.2.3, 2.1.2–2.1.4, 2.2.1–2.2.5, 5.2.4, 7.2.1–7.2.4, MN: 2.1.3</td>
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</tbody>
</table>
**Building Functions F-BF**

**Build a function that models a relationship between two quantities.**

F-BF.1. Write a function that describes a relationship between two quantities. ★

F-BF.1b. Combine standard function types using arithmetic operations. *For example, build a function that models the temperature of a cooling body by adding a constant function to a decaying exponential, and relate these functions to the model.*

*Develop models for more complex or sophisticated situations than in previous courses.*

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.*

F-BF.4. Find inverse functions.

F-BF.4a. 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 example, \( f(x) = 2x^3 \) for \( x > 0 \) or \( f(x) = \frac{x+1}{x-1} \) for \( x \neq 1 \).*

*Extend F.BF.4a to simple rational, simple radical, and simple exponential functions; connect F.BF.4a to F.LE.4.*

**Linear and Exponential Models ★ F-LE**

**Construct and compare linear and exponential models and solve problems.**

F-LE.4. For exponential models, express as a logarithm the solution to \( a b^t = d \) where \( a, c, \) and \( d \) are numbers and the base \( b \) is 2, 10, or \( e \); evaluate the logarithm using technology.

*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 \( \log(xy) = \log x + \log y \).*

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| F-LE.4.1 Prove simple laws of logarithms. [CA Standard] | 6.2.2  
MN: 6.2.2  
6-129, 7-80, 7-83, 7-98, 7-149, 7-174, 8-60, 8-78, 8-158, 9-27, 9-106, 10-23, 10-56, 10-95, 10-103, 10-162, 10-176, 10-188, 12-58, 12-147 |
| F-LE.4.2 Use the definition of logarithms to translate between logarithms in any base. [CA Standard] | 5.2.3, 6.2.1, 6.2.2  
MN: 5.2.2  
5-73, 5-74, 5-85, 5-102, 6-75, 6-82, 6-96, 6-115, 6-139, 7-43, 11-59 |
| F-LE.4.3 Understand and use the properties of logarithms to simplify logarithmic numeric expressions and to identify their approximate values. [CA Standard] | 5.2.1, 5.2.2  
MN: 6.2.2  
5-97, 5-98, 5-128, 6-36, 6-37, 6-54, 6-55, 6-97, 6-151, 7-18, 7-39, 7-94, 7-111, 7-149, 7-174, 8-60, 8-158, 10-176, 11-25 |
| **Interpret expressions for functions in terms of the situation they model.** |  |
| F-LE.5. Interpret the parameters in a linear or exponential function in terms of a context. | 1.2.3, 6.2.3, 6.2.4  
MN: 1.1.2, 2.1.1  
1-9, 1-127, 2-63, 3-65, 4-44, 5-89, 7-20, 8-24 |
| **Trigonometric Functions F-TF** |  |
| **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. | 7.1.5  
MN: 7.1.5  
7-92, 7-104, 7-161, 9-44 |
| 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. | 7.1.6  
MN: 7.1.6, 7.1.7  
7-37, 7-54, 7-63, 7-64, 7-92, 7-104, 7-162, 7-169, 9-44, 10-69 |
| F-TF. 2.1 Graph all 6 basic trigonometric functions. [CA Standard] | 7.1.2–7.1.4, 7.1.7, 7.2.1, 7.2.2, 12.1.4  
MN: 7.2.4, 12.1.4  
7-24, 7-36, 7-65, 7-116, 7-117, 7-119, 7-120, 7-129, 7-144, 7-147, 7-158, 7-160, 8-14, 8-25, 8-62, 8-94, 8-146, 8-153, 8-162, 8-177, 8-188, 8-189, 9-69, 9-82, 10-24, 10-92, 10-94, 11-92, 11-104, 12-10, 12-17, 12-31, 12-54, 12-133, 12-143  
| Model periodic phenomena with trigonometric functions. |  
F-TF.5. Choose trigonometric functions to model periodic phenomena with specified amplitude, frequency, and midline.★ | 7.1.1, 7.1.2, 7.2.1–7.2.4  
MN: 7.2.4  
7-65, 7-117, 7-119, 7-130, 7-158, 8-25, 8-189, 12-98  
| Prove and apply trigonometric identities. |  
F-TF.8. Prove the Pythagorean identity \( \sin^2(\theta) + \cos^2(\theta) = 1 \) and use it to calculate trigonometric ratios. | 7.1.4, 12.2.1  
MN: 7.1.7  
7-53, 7-64, 7-96, 7-110, 9-79, 12-100, 12-114  
Standards F-TF.9+ (and F-TF.6+) are introduced in Lessons 12.1.1–12.1.3 and 12.2.2–12.2.3.  
| GEOMETRY |  
| Expressing Geometric Properties with Equations G-GPE |  
Translate between the geometric description and the equation for a conic section. |  
G-GPE.3.1 Given a quadratic equation of the form \( ax^2 + by^2 + cx + dy + e = 0 \), use the method for completing the square to put the equation into standard form; identify whether the graph of the equation is a circle, ellipse, [or] parabola, or hyperbola and graph the equation. [In Algebra II, this standard addresses only circles and parabolas.] [CA Standard] | 2.1.4, 2.2.4  
MN: 2.1.4  
2-119, 2-128, 2-139, 2-148, 2-165, 2-166, 2-167, 2-177, 3-35, 3-54, 4-54, 4-70, 5-52, 6-85, 7-9, 7-11, 7-26, 7-41, 7-81, 7-82, 7-109, 7-131, 7-134, 8-59, 10-40, 10-158, 11-56, 12-57, 12-115, 12-145 |
<table>
<thead>
<tr>
<th><strong>STATISTICS AND PROBABILITY</strong></th>
<th></th>
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</thead>
<tbody>
<tr>
<td><strong>Interpreting Categorical and Quantitative Data S-ID</strong></td>
<td></td>
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<td><strong>Summarize, represent, and interpret data on a single count or measurement variable.</strong></td>
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| 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. **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.** | 9.3.1–9.3.3  
MN: 9.3.1, 9.3.3  
9-88, 9-104, 9-105, 10-12, 10-41, 10-67, 11-6, 11-20 |
| **Making Inferences and Justifying Conclusions S-IC** |  |
| **Understand and evaluate random processes underlying statistical experiments.** |  |
| S-IC.1. Understand statistics as a process for making inferences about population parameters based on a random sample from that population. | 9.1.2, 9.1.3, 11.2.1  
MN: 9.1.1  
| S-IC.2. Decide if a specified model is consistent with results from a given data-generating process, e.g., using simulation. **For example, a model says a spinning coin falls heads up with probability 0.5. Would a result of 5 tails in a row cause you to question the model?** For S. IC.2, include comparing theoretical and empirical results to evaluate the effectiveness of a treatment. | 9.3.2, 11.1.1, 11.1.2  
11-18, 11-19, 11-29 |
| **Make inferences and justify conclusions from sample surveys, experiments, and observational studies.** |  |
| S-IC.3. Recognize the purposes of and differences among sample surveys, experiments, and observational studies; explain how randomization relates to each. | 9.1.2, 9.2.1, 9.2.2  
MN: 9.2.1  
| 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. | 9.3.2, 11.1.3, 11.2.1  
MN: 11.2.2, 11.2.3  
11-42, 11-64, 11-66, 11-75, 11-77, 11-98, 11-100 |
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<td><em>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.</em></td>
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| S-IC.5. Use data from a randomized experiment to compare two treatments; use simulations to decide if differences between parameters are significant. | 11.2.1–11.2.3  
MN: 11.2.3  
9-24, 9-89, 11-65, 11-76 |
| S-IC.6. Evaluate reports based on data. | 9.1.1, 9.2.1, 9.2.2, 11.3.1  
| **Using Probability to Make Decisions S-MD**  
**Calculate expected values and use them to solve problems.** |  |
| S-MD.6. (+) Use probabilities to make fair decisions (e.g., drawing by lots, using a random number generator). | 11.2.4, 11.3.1  
11-18, 11-20, 11-55, 11-87, 11-96, portfolio entry in Chapter 11 |
| 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).  
*Extend to more complex probability models. Include situations such as those involving quality control, or diagnostic tests that yield both false positive and false negative results.* | 11.2.4, 11.3.1  