



SOUTH DAKOTA
Mathematics Standards Grades 9-12
Geometry © 2004

STANDARDS	PAGE REFERENCES
GRADES 9-12 ALGEBRA STANDARDS	
1. select, justify, and apply a technique to solve quadratic equations over the set of complex numbers and interpret the results graphically.	SE: Solving quadratic equations can be found on 305 #50, 348 #50, 445 #44, 521 #10-#13, 568 #57-#59, 570 ex 3, 571 ex 4, 676 #40, 719 #39, 750-751.
2. analyze the relationships among the coefficients, factors, and roots of polynomials.	This objective can be covered in <i>Algebra 2</i> © 2003 pages 371-377 and 378-382.
3. apply commutative, associative, distributive, identity, and inverse properties when combining functions.	SE: 746-747
4. use matrices to organize and manipulate data, including matrix addition, subtraction, and scalar multiplication.	SE: 461 #13-#16, 505 #73-#78, 506-511, 516 #42-#47, 716 ex 4, 752-753 TWE: OEA 511
5. analyze various expressions which emphasize the distributive property, e.g., $3(x + 2)$; $(x^3 - 4x^2 + 3x + 1)(x^2 - 2x + 3)$.	SE: 746-747
6. explain the logic of algebraic procedures.	SE: 94-100, 106 #31-#34, 119 #39-#46, 121 #16 TWE: OEA 100
7. extend the concepts of algebra to other types of functions, e.g., trigonometric, exponential, and logarithmic.	SE: 364-370
8. apply recursive formulas to express iterative patterns of change including those of exponential growth and decay, e.g., mortgages, investment returns.	SE: 327 ex 5, 328 #10, 329 #38, 330 #39-#41 TWE: CC 327 DI 327 H 325
9. determine roots of polynomial functions including complex roots.	SE: Solving quadratic equations can be found on 305 #50, 348 #50, 445 #44, 521 #10-#13, 568 #57-#59, 570 ex 3, 571 ex 4, 676 #40, 719 #39, 750-751.
10. determine equations for lines meeting certain conditions.	SE: 145-150, 157 #47-#50, 164 #39-#43, 169 #29-#34, 171 #31 TWE: DI 146 OEA 150
11. use inductive reasoning to test and prove that a formula is correct.	SE: 62-66, 115 #9-#11 TWE: OEA 66
12. explore and develop procedures to identify the real roots of polynomial functions.	SE: Solving quadratic equations can be found on 305 #50, 348 #50, 445 #44, 521 #10-#13, 568 #57-#59, 570 ex 3, 571 ex 4, 676 #40, 719 #39, 750-751.
13. determine the solution of systems of equations in multiple ways.	SE: 59 #11, 241 ex 3, 243 #7-#9, 244 #27, 616 #58, 742-743 <i>Graphing Calculator</i> 242

STANDARDS	PAGE REFERENCES
14. solve problems using the quadratic formula including graphic representation and analysis.	SE: Solving quadratic equations can be found on 305 #50, 348 #50, 445 #44, 521 #10-#13, 568 #57-#59, 570 ex 3, 571 ex 4, 676 #40, 719 #39, 750-751.
15. analyze the binomial theorem.	This objective can be found in <i>Algebra 2</i> © 2003 pages 612-617.
16. solve linear-quadratic and quadratic-quadratic systems of equations algebraically and graphically.	This objective can be found in <i>Algebra: Concepts and Applications</i> © 2004 pages 580-585.
17. derive procedures for determining critical features of circles, ellipses, hyperbolas, or parabolas given equations in standard form.	SE: 575-580, 586 #50-#57, 587 #21-#22, 600 #39-#42, 609 #68-#70
18. use matrices to investigate networks and graphs.	SE: 461 #13-#16, 505 #73-#78, 506-511, 516 #42-#47, 716 ex 4 TWE: OEA 511
19. create algebraic models to represent problem situations.	SE: 19 #57, 27 #58, 32 ex 3, 66 #44, 74 #55, 80 #5, 87 #35, 114 #45, 144 #50, 157 #46
20. compare quadratic growth with linear and exponential growth.	This objective can be found in <i>Algebra 2</i> © 2003 pages 560-565.
21. explain the graphical impact of the xy term in a quadratic equation.	This objective can be found in <i>Advanced Mathematical Concepts</i> © 2004 page 673.
22. graph and interpret complex numbers in vector and polar form.	This objective can be found in <i>Algebra 2</i> © 2003 in the <i>Algebra Activity</i> on page 272.
23. build formulas representing patterns that are algebraic, trigonometric, logarithmic and exponential.	SE: 327 ex 4, 329 #25
24. find sums, differences, scalar products, dot products, and norms of vectors noting properties which apply.	SE: 498-505, 511 #51-#52, 516 #42-#47 TWE: DI 499 OEA 505 TNT 501
25. determine, interpret, and use a unit directional vector, perpendicular components, and norms to express vectors in the coordinate plane.	SE: 498-505, 511 #51-#52, 516 #42-#47 TWE: DI 499 OEA 505 TNT 501
GRADES 9-12 GEOMETRY STANDARDS	
1. know, use, derive formulas for, and solve problems involving perimeter, circumference, area, volume, lateral area, and surface area of common geometric figures.	SE: 46-50, 522-528, 649-654, 655-659, 660-665, 666-670, 671-676, 688-694, 696-701
2. prove the properties of geometric figures using algebraic and deductive proofs.	SE: 101-106, 107-114 TWE: OEA 106, 114
3. justify conjectures pertaining to geometric figures.	SE: 101-106, 107-114 TWE: OEA 106, 114
4. use given information to deduce properties of and relationship between figures.	SE: 404-409, 411-416, 417-423, 424-430, 431-437, 439-445, 454 #21-#23, 455 #30-#32, 457 #1-#3 <i>Spreadsheet Investigation</i> 410

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5. explore and analyze the properties of triangles.	SE: 238-245, 247-254, 261-266, 267-273, 274 #8-#10, 275 #11-#17, 277 #13-#15 TWE: DI 240, 262 OEA 245
6. investigate and identify congruence and similarity relationships among triangles.	SE: 192-198, 298-306, 315 #49-#51, 323 #44-#45, 334 #22-#26, 337 #10-#12 TWE: DI 300 OEA 298
7. determine the values of the six trigonometric functions of angles in standard position.	SE: 364-370, 376 #30-#35, 383 #46-#49, 394 #21-#25, 397 #13-#15 TWE: OEA 370
8. investigate and use properties of angles, arcs, chords, tangents, and secants to solve problems.	SE: 529-535, 536-543, 544-551, 552-558, 561-568 TWE: DI 531 OEA 535, 543, 551 TT 532
9. identify, create, and solve practical problems involving triangles and vectors.	SE: 350-356, 357-363, 498-505 TWE: OEA 356, 505 TNT 501
10. build three-dimensional figures from two-dimensional shapes or drawings.	SE: 639 #4, 640 #9-#12, 645 #8, 646 #25-#27, 647 #39, 648 #41, 654 #47-#48, 659 #35-#36 TWE: DI 644
11. draw two-dimensional drawings of three-dimensional objects from various perspectives.	SE: 636-637 ex 1, 639 #4, 640 #13-#15, 643 ex 1, 644 ex 2, 645 #5-#7, 646 #15-#23, 647 #35, 654 #44-#46, 679 #14-#19
12. build three-dimensional objects to scale.	SE: 707-713 TWE: H 707
13. use matrices to translate, reflect, rotate, or scale polygonal figures represented on the coordinate plane.	SE: 506-511, 516 #42-#47, 716 ex 4 TWE: DI 509 OEA 511
14. use graphing tools to study transformations, e.g., congruence using rigid motion, similarity using magnification of images.	SE: 463-469, 470-475, 476-482, 488 #42-#45, 490-497, 513 #12-#14 TWE: DI 478 OEA 469, 482, 497
15. select transformations required to map images of objects.	SE: 463-469, 470-475, 476-482, 488 #42-#45, 490-497, 513 #12-#14 TWE: DI 478 OEA 469, 482, 497
16. use proportional reasoning to solve practical problems.	SE: 282-287, 292 ex 5, 294 #21-#23, 303 #32 TWE: DI 283, 285
17. identify, create, and solve practical problems using a system of vectors and their horizontal and vertical components.	SE: 498-505, 511 #51-#52, 516 #35-#41, 517 #22-#23 TWE: DI 499 OEA 505
18. represent situations using the properties of coordinate geometry to answer pertinent questions.	SE: 21-27, 36 #52-#54, 43 #50-#55, 47 ex 3, 55 #20-#27, 139-144, 154 #11, 169 #23-#26

STANDARDS	PAGE REFERENCES
GRADES 9-12 MEASUREMENT STANDARDS	
1. investigate and explain the relationships between linear, square, and cubic measures and describe how changes in one of the measures of an object affect the others.	SE: 599 #32-#34, 608 #51-#56, 615 #52-#54, 698 #1, 710 #10, 723 #18 <i>Spreadsheet Investigation</i> 695, 708-709
2. analyze unit combinations to check answers, e.g., feet per second.	SE: 13-19 TWE: DI 14 OEA 19
3. use quotient measures and relate them to slope, e.g., speed, density.	SE: 140 ex 2, 142 #12-#14, 143 #39-#41, 173 #15b <i>How</i> 139
4. derive and use formulas for solving problems involving measurements.	SE: 48 ex 4, 49 #29-#31, 179 ex 3, 180 #9-#10, 405 ex 2, 407 #8-#9, 524 ex 4, 604 ex 4, 605 #10-#11, 701 #34
5. develop units or combinations of units for a given situation or application.	SE: 13-19 TWE: DI 14 OEA 19
6. create tools or application processes to solve problems that defy direct measurement.	SE: 285 #9-#10, 291 ex 3, 293 #8, 371-376, 598 #9-#14, 606 #30-#35, 692 #7-#16, 713 #52-#53 TWE: DI 372 OEA 376
7. use the concept of significant digits in giving answers to an appropriate degree of accuracy.	SE: 13-19 TWE: DI 14 OEA 19
8. create tools or application processes to improve accuracy or minimize error in measurement situations.	SE: 13-19 TWE: DI 14 OEA 19
9. analyze specific measurement situations to determine necessary degree of accuracy and/or allowable error tolerance.	SE: 13-19 TWE: DI 14 OEA 19
10. identify the structural parts and characteristics of objects to answer questions about them, e.g., a penny can be seen as a cylinder with a small height so its volume is $V = \pi r^2 h$.	SE: 655 ex 1, 657 #8, 658 #26, 663 #17, 665 #32, 668 #6, 669 #23, 673 ex 3, 675 #30, 699 #7
11. solve measurement problems involving perimeter, area, volume, and mass of irregularly-shaped objects.	SE: 48 #7, 49 #20, 617-621, 627 #35-#36, 630 #17-#18, 631 #16-#18, 642 #53-#55, 664 #21-#23 TWE: DI 618 OEA 621
GRADES 9-12 NUMBER SENSE STANDARDS	
1. describe the structure of the real number system and related subsets.	This objective can be found in <i>Algebra 2</i> © 2003 on page 12.
2. apply properties and axioms of the real number system to various subsets, e.g., axioms of order, closure.	SE: 80 #66-#68, 94-99, 106 #31-#34, 119 #39-#46, 122 #8, 173 #10, 588 #3, 757 #1-#4 TWE: DI 96 OEA 100
3. understand that real numbers can be represented in a variety of forms, e.g., integers, fractions, decimals, percents, scientific notation, exponents, radicals, absolute value, logarithms.	SE: 5 #5-#12, 11 #60-#65, 43 #58-#62, 734-735, 736

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4. describe the relationship of the real number system to the complex number system.	This objective can be found in <i>Algebra 2</i> © 2003 on pages 270-275.
5. explain the meaning of the number e .	This objective can be found in <i>Algebra 2</i> © 2003 on pages 554-559.
6. add, subtract, multiply, and divide algebraic expressions.	SE: 746-747, 748-749, 750-751
7. evaluate algebraic expressions.	SE: 43 #58-#62, 61 #1-#6, 74 #70-#73, 593 #7-#12, 734-735, 736, 744-745, 746-747, 748-749
8. add, subtract, multiply, and divide real numbers including roots and exponents using appropriate computational strategies, e.g., mental mathematics, paper and pencil, calculator.	SE: 5 #9-#12, 138 #55-#59, 338 #1, 341 #9-#12, 734-735, 736 <i>Study Tip</i> 366, 667, 703
9. explain the effects of arithmetic operations on real numbers, e.g., roots, exponents, and inverse relationships.	SE: 744-745, 746-747, 748-749
10. analyze and describe fractional exponents, e.g., $10^{3/4}$.	This objective can be found in <i>Advanced Mathematical Concepts</i> © 2004 on pages 697-702.
11. analyze the decimal representation of numbers, e.g., $1/3 = .33333 \dots$, $.010010001\dots$	This objective can be found in <i>Algebra 2</i> © 2003 on pages 601 ex 3, 602 #10-#12, and 603 #40-#47.
12. add, subtract, multiply, divide, and simplify expressions containing fractional exponents.	This objective can be found in <i>Advanced Mathematical Concepts</i> © 2004 on pages 697-702.
13. use estimation strategies in complex situations to predict results and to check the reasonableness of results.	SE: 142 #2, 263 #2, 284 #3, 292 #1, 345 #3, 571 #2, 605 #2, 625 #3, 657 #3 <i>Geometry Software Investigation</i> 384
14. select and justify alternative strategies, e.g., use properties of numbers that allow operational shortcuts for computational procedures.	SE: 734-735, 736, 744-745, 752-753
15. apply properties of arithmetic and geometric sequences and series to solve problems, e.g., write the first n terms, find the n th term, evaluate summation formulas.	SE: 62 ex 1, 74 #56-#61, 143 #39-#41, 327, 404 <i>Geometry Activity</i> 406 <i>Spreadsheet Activity</i> 288 TWE: DI 407 GA 406 TNT 406
16. use logic strategies to develop and defend mathematical arguments.	SE: 67-74, 82-87, 89-93, 94-100, 101-106, 107-114 TWE: DI 71, 96 OEA 93, 106
17. understand and use basic concepts of infinity and limits.	This objective can be found in <i>Algebra 2</i> © 2003 on the <i>Graphing Calculator Investigation</i> on page 593.
18. compare, contrast, and extend arithmetic and geometric patterns of growth and use them to make predictions about events for which there is no data.	This objective can be found in <i>Algebra 2</i> © 2003 on pages 578-582, 583-587, 588-592, 594-598, 599-604.
19. understand the relative size of sets of rational numbers and irrational numbers.	This objective be found in <i>Algebra 2</i> © 2003 on pages 11-12.
20. describe impact of powers on products and quotients.	SE: 746 ex 3, 747 #15-#18, 748 ex 1b, 749 #7-#10

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21. apply operations to numbers expressed in scientific notation.	This objective can be found in <i>Algebra 2</i> © 2003 on pages 225-227.
GRADES 9-12 PATTERNS, RELATIONS, AND FUNCTIONS STANDARDS	
1. use various representations of functions, e.g., graphs, tables, symbolic forms.	SE: 74 #55, 147 ex 5, 149 #45-#51, 171 #24, 331 #47, 501 ex 5, 509 #13-#14, 567 #48, 658 #29, 670 #35
2. analyze direct and inverse relations to determine their characteristic patterns.	SE: 80 #51, 144 #50, 574 #35
3. apply transformations to the graph of a basic function and predict and analyze the results.	This objective can be found in <i>Algebra 2</i> © 2003 on pages 320-321.
4. determine the domain, range, zeros, y-intercepts, end behavior, relative maximum and minimum points, and symmetry of functions.	Finding a minimum can be found on page 123 #14b.
5. demonstrate and explain the effect that changing coefficients and/or constants has on the graph of a function.	SE: 145-150 TWE: OEA 150
6. use a graph of a function to find the graph of the inverse function.	This objective can be found in <i>Algebra 2</i> © 2003 on pages 390-394.
7. determine the restrictions that must be placed on the domain and range of a relation for it to be a function.	This objective can be found in <i>Algebra 2</i> © 2003 on pages 56-62.
8. create tables or graphs to interpret relations and/or functions.	SE: 74 #55, 147 ex 5, 149 #45-#51, 171 #24, 331 #47, 501 ex 5, 509 #13-#14, 567 #48, 658 #29, 670 #35
9. create geometric and numerical patterns that model relations and/or functions.	SE: 62 ex 1, 74 #56-#61, 143 #39-#41, 327, 404 <i>Geometry Activity 406</i> <i>Spreadsheet Activity 288</i> TWE: DI 407 GA 406 TNT 406
10. determine which type of function best models a situation, write an equation, and use this equation to answer questions about the situation.	SE: 567 #48
11. use laws of logarithms to simplify expressions and solve equations involving logarithms and exponents.	This objective can be found in <i>Algebra 2</i> © 2003 on pages 541-546.
12. analyze the relationship between exponential and logarithmic functions.	This objective can be found in <i>Algebra 2</i> © 2003 on pages 523-530 and 531-538.
13. graph various parametric polar equations.	This objective can be found in <i>Advanced Mathematical Concepts</i> © 2004 on pages 561-567.
14. identify natural phenomena that are cyclic.	This objective can be found in <i>Algebra 2</i> © 2003 on pages 739-745.
15. apply special number relationships, e.g., sequences and series to real-world problems.	This objective can be found in <i>Algebra 2</i> © 2003 on pages 578-582, 583-587, 588-592, 594-598, 599-604.
16. compare, contrast, and extend arithmetic and geometric patterns of growth and use them to make predictions.	This objective can be found in <i>Algebra 2</i> © 2003 on pages 578-582, 583-587, 588-592, 594-598, 599-604.
17. determine and use recursive formulas to express iterative patterns of change including those of exponential growth and decay.	This objective can be found in <i>Algebra 2</i> © 2003 on pages 602-610.

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18. use concepts of infinity and limits to solve problems.	This objective can be found in <i>Algebra 2</i> © 2003 on the <i>Graphing Calculator Investigation</i> on page 593.
19. use successive approximation techniques to solve problems.	This objective can be found in <i>Algebra 2</i> © 2003 on pages 602-610.
20. apply limits of geometric series to problem situations.	This objective can be found in <i>Algebra 2</i> © 2003 on the <i>Graphing Calculator Investigation</i> on page 593.
21. use iteration and recursion to evaluate problem situations.	This objective can be found in <i>Algebra 2</i> © 2003 on pages 602-610.
22. solve equations that include both infinite solutions and restricted domain solutions.	SE: 743 #4
23. estimate the limit of a given infinite sequence.	This objective can be found in <i>Algebra 2</i> © 2003 on the <i>Graphing Calculator Investigation</i> on page 593.
GRADES 9-12 STATISTICS & PROBABILITY STANDARDS	
1. analyze and evaluate surveys and experiments conducted by others, e.g., bias, randomness, analysis, interpretation.	This objective can be found in <i>Algebra 2</i> © 2003 on pages 682-685.
2. create, implement, and defend a plan for gathering data to answer relevant questions.	SE: <i>WebQuest 3</i> TWE: DI 96, 108, 134, 141, 153, 218, 257, 300, 318
3. compare multiple one-variable data sets, using statistical techniques including measures of central tendency and dispersion.	SE: 114 #45, 183 #45, 245 #35-#36, 254 #60
4. calculate measures of central tendency and dispersion for complex sets of data.	SE: 114 #45, 183 #45, 245 #35-#36, 254 #60
5. demonstrate how statistical analysis can quantify variability.	This objective can be found in <i>Algebra 2</i> © 2003 on pages 665 ex 2.
6. describe the normal curve and use it to predict percentiles and probabilities.	This objective can be found in <i>Algebra 2</i> © 2003 on pages 671-675.
7. use scatterplots, regression lines, and correlation coefficients to model data and support conclusions.	This objective can be found in <i>Algebra 2</i> © 2003 on the <i>Graphing Calculator Investigation</i> on page 87.
8. determine probabilities using counting procedures, tables, tree diagrams, and formulas for permutations and combinations.	SE: 265 #48, 278 #4 TWE: DI 624
9. determine probability of compound, complementary, independent, and dependent events.	SE: 164 #35, 549 #7, 550 #31-#34 TWE: DI 624 OEA 627
10. evaluate effectiveness and accuracy of the model in respect to the theoretical probability.	SE: 164 #35, 549 #7, 550 #31-#34 TWE: DI 624 OEA 627
11. design, implement, and interpret simulations to estimate probabilities of events.	SE: 164 #35 TWE: DI 624 OEA 627
12. determine probability using given graphs of distributions or table of outcomes.	This objective can be found in <i>Algebra 2</i> © 2003 on page 646.
13. predict outcomes of simple and compound events using given theoretical probabilities.	SE: 164 #35, 549 #7, 550 #31-#34 TWE: DI 624 OEA 627

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14. determine whether experimental or theoretical methods were used to calculate a particular probability.	SE: 164 #35 TWE: DI 624 OEA 627
15. use combinations, permutations, and probabilities to solve problems.	SE: 265 #48, 278 #4 TWE: DI 624

Codes Used for TWE Pages

CC	Concept Check
DI	Daily Intervention
GA	Geometry Activity
H	How
OEA	Open-Ended Assessment
TNT	Tips for New Teachers
TT	Teaching Tip