

Index

A

Absolute value

- of a complex number, 275
- definition of, 50
- equations, 49–55, 60
- functions, 122–127, 132, 985–988
- graphing, 49–51
- inequalities, 49–55, 60

Addition

- combinations and, 709
- of complex numbers, 273, 315
- of functions, 415
- inequalities and, 41
- of matrices, 200, 240
- of polynomials, 338, 341–343
- properties of, 5, 19, 201, 928
- of radicals, 408–409
- of rational expressions, 562–563, 565–567, 578
- of roots, 408–409

Additive inverse, 5

- of a complex number, 279

Ahmes papyrus, 40, 665

Algebra tiles, modeling completing the square with, 281

Algorithm

- for approximating a best-fitting line, 101
- for converting between degrees and radians, 777
- for drawing an object in two-point perspective, 194
- for evaluating an algebraic expression, 12
- for evaluating trigonometric functions of any angle, 786
- for graphing equations in slope-intercept form, 82
- for graphing equations in standard form, 84
- for graphing equations in two variables, 69
- for graphing a linear inequality, 109
- for graphing a quadratic inequality in two variables, 299
- for graphing a radical function, 431
- for hypothesis testing, 741
- for order of operations, 11
- for solving linear systems using the linear combination method, 149

- for solving linear systems using the substitution method, 148
- for solving a problem algebraically, 33
- for transforming sine and cosine graphs, 840
- for transforming a tangent graph, 843
- for using the linear combination method with three variables, 178

Amplitude, of a function, 831

And rule, 924–925

Angles, See also Trigonometric functions

- central, 779
- coterminal, 777
- of depression, 771
- of elevation, 771
- finding the measure of, 793–798
- initial side of, 776
- quadrantal, 785
- radian measure of, 777–778, 822–823
- reference, 785–786
- of repose, 794
- in standard position, 776–778
- terminal side of, 776

Appendices

- Collecting Data, 993–996
- Displaying and Analyzing Data, 997–1000
- Modeling Data with Functions, 989–992
- Transformations of Functions, 985–988

Applications, See also Connections; Multicultural connections

- acoustics, 495, 496, 498
- advertising, 87, 744
- agriculture, 212, 285, 310, 311, 340, 605, 685, 781, 812
- amusement park rides, 133, 297, 829, 842, 846, 854, 863, 865, 874
- anatomy, 54, 55, 73, 106, 751
- animals, 30, 42, 174, 219, 254, 268, 288, 405, 410, 419, 428, 515, 516, 535, 683, 684, 706, 728, 732, 740, 743, 818

- archeology, 347, 591
- architecture, 9, 36, 80, 127, 303, 377, 613, 645, 662, 773, 779, 780, 782, 804, 809, 811, 847, 881, 891
- astronomy, 268, 325, 326, 344, 425, 452, 507, 512, 538, 587, 611, 627, 630, 640, 759, 801
- automobiles, 16, 23, 32, 44, 45, 56, 128, 254, 302, 307, 342, 357, 435, 476, 573, 702, 705, 713, 729, 781, 806, 871, 872
- aviation, 70, 297, 606, 620, 771, 772, 814, 817, 881
- baseball, 30, 204, 311, 583, 730, 808, 810, 816
- basketball, 54, 61, 73, 88, 295, 445–448, 571, 735, 891
- bicycling, 89, 342, 778, 817, 891
- billiards, 124, 135
- biology, 101, 254, 288, 332, 391, 399, 410, 417, 419, 433, 497, 519, 521, 522, 527, 535, 551, 559, 563, 695, 740, 846
- boats and boating, 87, 219, 382, 403, 414, 443, 572, 817, 825, 836, 866
- bowling, 52, 428
- business, 34, 39, 87, 97, 113, 119, 152, 153, 167, 189, 193, 259, 262, 317, 335, 348, 355, 356, 357, 369, 370, 417, 450, 542, 543, 552, 553, 559, 579, 664, 722, 725, 735, 754, 759, 763
- camping, 124, 125, 599
- chemistry, 161, 234, 477, 478, 485, 506, 507, 570, 685
- collectibles, 471
- communications, 110, 111, 510, 513, 606, 625, 628, 636, 669, 670, 672
- computers and internet, 23, 83, 144, 296, 312, 450, 467, 470, 479, 514, 671, 706, 717, 743
- construction, 23, 35, 38, 54, 78, 80, 81, 175, 234, 235, 261, 300, 364, 442, 472, 537, 538, 656, 679, 794, 795, 796

- consumer economics, 12, 13, 14, 16, 17, 40, 61, 81, 83, 97, 116, 117, 119, 128, 142, 144, 145, 153, 154, 155, 161, 174, 182, 189, 193, 220, 229, 234, 236, 243, 307, 309, 333, 335, 351, 358, 370, 378, 395, 419, 429, 444, 478, 546, 572, 574, 600, 685, 783, 802, 803, 806
- cooking, 167, 173, 502, 506
- crafts, 218, 243, 258, 288, 350, 361, 362
- criminology, 702
- cryptography, 225–229, 243, 395, 420
- design, 284, 286, 350, 363, 364, 365, 375, 550, 664, 706, 796
- earth science, 104, 106, 247, 297, 317, 487, 489, 491, 504, 505, 573, 605, 634, 635, 637, 638, 860, 866, 887
- economics, 325, 327, 405, 471, 521, 544, 551, 679
- education, 38, 46, 205, 337, 343, 370, 539, 566, 704, 713, 728, 734, 743, 751, 775
- electronics, 262, 279, 280, 538, 567, 726
- employment, 15, 16, 21, 22, 23, 39, 46, 116, 135, 169, 175, 263, 288, 305, 418, 606, 607, 652, 728, 735, 743
- endangered species, 482, 483, 732
- engineering, 252, 266, 284, 288, 319, 405, 599, 767, 774, 796, 871
- entertainment, 16, 46, 112, 155, 168, 234, 266, 268, 294, 298, 304, 358, 370, 459, 495, 570, 663, 706, 709, 713, 718, 721, 811, 815
- figure skating, 630, 781
- finance, 6, 9, 38, 119, 181, 190, 232, 233, 343, 395, 427, 469, 476, 478, 479, 482, 484, 506, 527, 560, 565, 688, 721, 736, 763
- fine arts, 97, 350, 617, 713, 715
- food, 478, 706, 709, 715, 735, 736, 737, 743, 847
- football, 112, 254, 572, 583, 614, 878, 879
- fractal geometry, 275, 277, 278, 436, 649, 672, 680, 685, 891
- fundraising, 16, 27, 30, 40, 85, 166
- games and puzzles, 124, 428, 656, 712, 713, 720, 730, 734, 735, 753, 754, 782
- gardening, 28, 38, 113, 135, 172, 221, 262, 284, 286, 310, 378, 520, 551, 611, 612, 805
- geography, 4, 104, 215, 812, 860, 881
- geometry, 21, 24, 28, 78, 413
- golf, 8, 127, 787, 820, 882
- government, 87, 119, 470, 728, 759
- health and fitness, 102, 112, 137, 144, 154, 158, 161, 191, 193, 202, 203, 212, 254, 304, 312, 363, 454, 733, 747, 750, 759, 851, 852, 871
- hiking, 592
- history, 35, 133, 225, 262, 263, 268, 403
- jewelry, 94, 606
- law, 636, 743
- manufacturing, 52, 53, 56, 165, 271, 349, 355, 363, 375, 376, 442, 549, 731, 735, 743, 750
- measurement, 34, 54, 55, 133, 144, 167, 182, 258, 260, 261, 284, 286, 288, 349, 363, 365, 377, 412, 413, 428, 496, 497, 620, 774, 781, 794, 797, 805, 812
- medicine, 54, 335, 368, 442, 478, 484, 566, 606, 685, 743, 749, 751, 845
- mountain climbing, 296, 463, 484, 774, 843, 844
- music, 13, 37, 126, 127, 184, 197, 204, 207, 413, 478, 699, 713, 717, 787, 788, 833, 836, 892
- natural resources, 34, 304, 357, 559, 685, 763
- navigation, 603, 637
- nutrition, 38, 167, 454
- oceanography, 80, 268, 435, 506, 535, 551
- photography, 330, 564, 873
- physics, 37, 39, 73, 97, 127, 269, 423, 677, 678, 679, 695, 825, 835, 836, 845, 873, 880, 881
- politics, 73, 93, 183, 450
- population, 16, 97, 205, 342, 370, 469, 515, 719
- publishing, 340, 343
- racquetball, 544
- retail display, 38, 652, 654, 655, 656
- skateboarding, 789
- skiing, 703, 818
- skydiving, 531, 557, 558
- soccer, 819
- social studies, 95, 328, 385, 386, 395, 470, 521, 673, 747, 752
- softball, 210, 211
- space exploration, 46, 321, 325, 327, 385, 403, 614, 621
- surveys, 739, 740, 741, 747, 748, 811, 861
- swimming and diving, 120, 154, 270, 296, 377, 817
- technology, 9, 44, 74, 507, 597, 607, 617, 618, 620, 629, 637, 833, 866
- telecommunications, 103, 110, 111, 297, 599, 645
- temperature, 8, 23, 46, 61, 78, 81, 104, 120, 252, 253, 427, 539, 544, 864, 866, 867, 868, 887
- tennis, 319, 335, 671
- track and field, 24, 72, 182, 288, 311, 404, 604, 713, 818
- transportation, 1, 33, 35, 174, 263, 290, 307, 308, 310, 593, 773
- travel, 9, 10, 37, 45, 47, 71, 79, 141, 144, 193, 228
- volleyball, 297, 789
- weather, 36, 46, 97, 119, 126, 255, 440, 441, 443, 491, 728, 771, 859, 860, 867
- weightlifting, 161
- youth services, 65, 105, 385
- Approximation** *See* **Estimation**;
Prediction
- Arc length**, 779
derivation of the formula for, 900
- Area**, *See also* **Formulas**
of a circle, 28, 914
of an ellipse, 29, 764–765
Heron’s formula for, 809
of a parallelogram, 914–915
of a rectangle, 28, 914
of a sector, 779
of a square, 914
of a trapezoid, 28, 914
of a triangle, 28, 802–806, 809, 914
- Area model, for completing the square**, 282
- Arithmetic sequence**, 659–665, 693
recursive rule for, 682
- Arithmetic series**, 661–665, 693

Assessment, *See also* Projects;

Reviews

Chapter Standardized Test, 62–63, 134–135, 190–191, 244–245, 318–319, 392–393, 460–461, 528–529, 580–581, 646–647, 696–697, 760–761, 826–827, 888–889

Chapter Test, 61, 133, 189, 243, 317, 391, 459, 527, 579, 645, 695, 759, 825, 887

Quiz, 17, 40, 56, 89, 106, 128, 155, 169, 184, 221, 236, 270, 298, 312, 344, 365, 386, 414, 429, 452, 485, 508, 522, 553, 574, 607, 621, 638, 673, 687, 715, 737, 752, 783, 798, 819, 847, 868, 882

Associative property, 5, 201

of matrix multiplication, 209
of scalar multiplication, 209

Asymptotes, 465

horizontal, 540
of logarithmic functions, 489
of logistic growth functions, 518
of rational functions, 540–541, 547–548
of tangent functions, 834
vertical, 540

Augmented matrix, 237–238

Average, rate of change and, 78

Axis (Axes)

coordinate plane, 67
imaginary, 273
real, 273
of symmetry, of a parabola, 249, 595–596
three-dimensional coordinate, 170

B.....

Bar graph, 934, 997

Base, of an exponential expression, 11, 465

al-Battani, Abu Abdullah, 853

Best-fitting line, 99–105, 131–132
linear regression and, 107

Best-fitting quadratic model, 308, 990

Binomial distribution, 738–744, 758

constructing, 745
mean of, 744
normal approximation of, 748

Binomial experiment, 739

Binomial probability, 739–744

Binomial theorem, 710–714, 756

Binomials, 256, *See also*

Polynomials

dividing by, 556
expansion, 710–714, 756
multiplying, 251, 339, 937

Bounded region, 163

Box-and-whisker plot, 447, 453, 458, 997

Branches, of graphs of rational functions, 540

C.....

Calculator, *See also* Graphing calculator; Student Help; Technology Activities

evaluating expressions, 18
evaluating factorials, 703, 704, 709
exercises, 404, 471, 789
exponent key, 402
root key, 402
trigonometric functions, 770

Careers

accident reconstructionist, 593
accountant, 355
air traffic controller, 606
amusement ride designer, 433
archeologist, 347, 591
astronomer, 801
auto mechanic, 871
automotive designer, 308
biotechnician, 172
botanist, 728
cartographer, 789
caterer, 151
chemical engineer, 450
chemist, 217
civil engineer, 252
coast guard, 435
computer programmer, 671
dentist, 234
economist, 679
electrician, 279
entomologist, 664
farmer, 559
financial planner, 468
fishery biologist, 683
forester, 68
gerontologist, 342
health services manager, 202
hospital administrator, 551
investment banker, 427
marine biologist, 482
market researcher, 748

meteorologist, 858
musician, 836
nurse, 335
nutritionist, 112
ornithologist, 327
paleontologist, 419
pediatrician, 102
personal trainer, 158
pharmacist, 566
photographer, 330
physical therapist, 16
physician, 685
police detective, 702
police officer, 636
real estate broker, 21
sculptor, 805
seismologist, 634
set designer, 304
sound technician, 495
sports statistician, 30
stockbroker, 23
surveyor, 811
teacher, 735
web developer, 296

Ceiling function, 118

Center, of an ellipse, 609

Central angle, 779

Central tendency, measures of, 445, 453, 458, 998–1000, *See also* Mean; Median; Mode

Chain rule, 924

Challenge exercises, 10, 16, 24, 32, 39, 47, 55, 74, 81, 88, 98, 105, 113, 120, 127, 145, 154, 162, 168, 175, 183, 206, 213, 220, 229, 235, 255, 263, 269, 280, 289, 297, 305, 312, 328, 336, 343, 350, 358, 364, 371, 378, 385, 406, 413, 420, 428, 436, 443, 451, 472, 479, 485, 492, 498, 507, 516, 522, 539, 545, 552, 560, 567, 573, 594, 600, 606, 614, 620, 630, 637, 657, 665, 672, 680, 686, 707, 714, 722, 729, 744, 751, 774, 782, 790, 797, 806, 812, 818, 837, 846, 854, 861, 867, 874, 881

Change-of-base formula, 494

Chapter Review, *See* Reviews

Chapter Summary, *See* Reviews

Chapter Test, *See* Assessment

Checking solutions

algebraically, 149, 292, 440
using a calculator, 793, 869

by graphing, 92, 149, 259, 265,
283, 291, 292, 382, 424, 440,
596, 632, 840, 851, 855, 870,
877

using inverse operations, 352

using logical reasoning, 123, 778,
864

using substitution, 19, 42, 48, 108,
139, 148, 216, 223, 224, 265,
283, 292, 367, 438, 439, 501,
502, 503, 632, 856

Choosing a method

for factoring a polynomial, 349

for solving linear systems,
149–150

for solving a quadratic function, 297

for solving a rational equation, 572

Circle graph, 934, 997

Circles

area of, 28, 914, 915

central angle of, 779

circumference of, 28, 915

degree measure and, 777–778

eccentricity of, 639

equation of, 601–608, 643

translated, 624–626, 628–630

graph of an equation of, 601–608,
643

radian measure and, 777–778

radius of, 601, 915

sector of, 779

standard form of the equation of,
601

Circular motion, modeling, 842, 863

Circular permutations, 707

Circumference, 914

Classification

of conics, 626–627

of lines by slope, 76

of parallel and perpendicular lines,
77

of triangles, 589

Closure property, 5

Coefficient, 13

leading, 329

Cofunction identities, 848

Column matrix, 199

Combinations, 708–709, 756

probability and, 717

Common difference, 659

Common factor, 908

Common logarithm, 487

Common ratio, 666

Communication, *See also Critical Thinking; Logical Reasoning*

discussion, 1, 49, 65, 82, 108, 137,
147, 195, 197, 222, 281, 321,
345, 379, 397, 399, 421, 463,
465, 473, 517, 531, 533, 587,
622, 649, 674, 699, 738, 765,
791, 829, 839, 893

presenting, 195, 397, 585, 745,
765, 893

writing, 47, 63, 72, 81, 88, 98, 145,
153, 175, 183, 191, 195, 206,
213, 229, 235, 245, 255, 269,
279, 280, 305, 328, 336, 349,
371, 385, 393, 397, 406, 413,
420, 436, 459, 461, 479, 484,
498, 506, 507, 516, 529, 539,
545, 560, 581, 585, 600, 605,
614, 620, 640, 664, 672, 697,
714, 751, 765, 774, 797, 805,
827, 846, 854, 866, 880, 893

Commutative property, 5, 201

Comparing

matrices, 199

methods for dividing polynomials,
358

real numbers, 4

Complement of an event, 726

probability and, 731

Completing the square, 282–289, 315

area model for, 282

using algebra tiles, 281

Complex conjugates, 274, 367

Complex fractions, 564, 566–567

Complex numbers, 272–280, 315

absolute value of, 275, 315

adding and subtracting, 273, 315

additive inverse of, 279

dividing, 274, 315

multiplicative inverse of, 279

multiplying, 274, 315

plotting, 273

standard form of, 272

Complex plane, 273

Composition of functions, 416–417

Compound event, 724–729, 757

normal distribution and, 747

Compound interest, 468

Computer, *See also Calculator; Graphing Calculator; Technology Activities*

evaluating recursive rules, 688

graphing linear equations in three
variables, 176

Concept Activities

Absolute Value Equations and
Inequalities, 49

Combining Equations in a Linear
System, 147

The Difference of Two Cubes, 345

Equations with More than One
Variable, 26

Exploring Conic Sections, 622

Exploring Finite Differences, 379

Exploring Inverse Functions, 421

Exponential Growth and Decay, 473

Fitting a Line to a Set of Data, 99

Graphs of Absolute Value
Functions, 122

Graphs of Logistic Growth
Functions, 517

Investigating Binomial
Distributions, 738

Investigating End Behavior, 331

Investigating the Graph of an
Inequality, 108

Investigating Graphs of
Exponential Functions, 465

Investigating Graphs of Radical
Functions, 431

Investigating Graphs of Rational
Functions, 540

Investigating Graphs of Systems of
Inequalities, 156

Investigating Identity and Inverse
Matrices, 222

Investigating an Infinite Geometric
Series, 674

Investigating Inverse Trigonometric
Functions, 791

Investigating Inverse Variation, 533

Investigating Linear Motion, 813

Investigating Linear Programming,
163

Investigating Matrix Equations, 230

Investigating the Natural Base e , 480

Investigating the Number of
Solutions, 366

Investigating Parabolas, 249

Investigating Pascal's Triangle, 710

Investigating Points of Intersection,
632

Investigating Polynomial Division,
353

Investigating Properties of
Inequalities, 41

Investigating Properties of Square
Roots, 264

- Investigating a Property of Logarithms, 493
 - Investigating Recursive Rules, 681
 - Investigating Slope and y -intercept, 82
 - Investigating Trigonometric Identities, 848
 - Products and Quotients of Powers, 323
 - Translating and Reflecting Trigonometric Graphs, 839
 - Using Algebra Tiles to Complete the Square, 281
 - Writing a Quadratic in Standard Form, 307
 - Concept Summary**
 - Areas Under a Normal Curve, 746
 - Classifying Conics, 626
 - Eccentricity of Conic Sections, 639
 - End Behavior for Polynomial Functions, 331
 - Evaluating Trigonometric Functions, 786
 - Graph of a Quadratic Function, 249
 - Number of Solutions of a Linear System, 140
 - Operations on Functions, 415
 - Properties of Exponents, 323
 - Properties of Rational Exponents, 407
 - Writing an Equation of a Line, 91
 - Zeros, Factors, Solutions, and Intercepts, 373
 - Condensing a logarithmic expression**, 494, 525
 - Conditional probability**, 732–736
 - Conics**, 622–630, 644
 - degenerate, 630
 - eccentricity of, 639–640
 - Connections**, *See also Applications; Math & History; Multicultural connections*
 - art, 262, 805
 - biology, 105, 161, 254, 288, 327, 405, 410, 411, 412, 414, 459, 572, 750
 - geometry, 10, 15, 23, 24, 30, 31, 61, 72, 97, 145, 153, 174, 206, 228, 262, 287, 305, 312, 327, 341, 342, 350, 357, 383, 405, 412, 435, 443, 452, 491, 539, 560, 579, 581, 592, 600, 656, 680, 690, 720, 744, 773, 797, 873
 - history, 9, 80, 262, 266, 268, 451, 452, 506, 599, 721, 805
 - science, 37, 39, 46, 55, 97, 153, 217, 220, 253, 269, 289, 395, 442, 459, 479, 487, 489, 491, 497, 515, 536, 538, 552, 573, 579, 583, 707, 728, 790
 - social studies, 9, 16, 183, 220, 327, 342, 789
 - statistics, 8, 73, 98, 280, 451, 594, 721, 735, 867
 - Consistent linear system**, 145
 - Constant term**, 13, 329
 - Constant of variation**, 94, 534
 - Constraints**, 163
 - Continuously compounded interest**, 482
 - Coordinate**
 - plane, 67
 - of a point, 3
 - three dimensional system, 170
 - Correlation coefficient**, 991–992
 - Correlation, determining**, 100–105, 131
 - Corresponding sides of similar figures**, 923
 - Cosecant**, 769, *See also Trigonometric functions*
 - Cosine**, 769
 - difference formula for, 869–874
 - derivation of, 902–903
 - double-angle formula for, 875–881
 - derivation of, 903
 - half-angle formula for, 875–881
 - derivation of, 904
 - inverse, 792
 - law of, 807–812, 824
 - derivation of, 901
 - sum formula for, 869–874
 - Cosine functions**, *See also Trigonometric functions*
 - graphing, 831–833, 835–838, 884
 - transformations of graphs of, 839–842, 844–846
 - Cotangent**, 769, *See also Trigonometric functions*
 - Cotangent identity**, 848
 - Coterminal angles**, 777
 - Counterexample**, 927–928
 - Co-vertices, of an ellipse**, 609
 - Cramer’s rule**, 216–220, 241
 - Critical Thinking**, 24, 47, 72, 81, 87, 105, 113, 118, 144, 154, 162, 183, 269, 279, 289, 296, 319, 335, 364, 378, 413, 419, 435, 443, 450, 471, 479, 485, 492, 498, 544, 552, 567, 605, 619, 636, 637, 686, 706, 713, 714, 729, 790, 797, 811, 818, 827, 839, 845, 853, 866, 874, *See also Logical Reasoning*
 - Critical x -values**, 302
 - Cross multiplying**, 569–573
 - Cross-curriculum connections**, *See Connections*
 - Cube root function**, 431–436, 457
 - Cubes**
 - of a binomial, 339
 - difference of two, 345–346
 - sum of, 345
 - Cubic regression**, 382
 - Cumulative Practice**, *See Reviews*
- D**.....
- Dantzig, George**, 169
 - Data**, *See also Graphs; Modeling*
 - fitting a curve to, 307–308
 - fitting a line to, 99–105
 - fitting a model to, 509–516, 584–585, 862–867, 989–992
 - interpreting
 - using inverse variation, 535
 - using measures of central tendency, 445
 - using measures of dispersion, 446, 458
 - using range, 446, 458
 - using standard deviation, 446, 458
 - organizing
 - using a bar graph, 997
 - using a box-and-whisker plot, 447, 997
 - using a circle graph, 997
 - using a frequency distribution, 448
 - using a histogram, 448, 738, 997
 - using a line graph, 997
 - using matrices, 202
 - using a table, 738
 - using a tree diagram, 701, 733
 - using a polynomial to model, 380–385
 - using a quadratic function to model, 307–308, 989–992
 - using a trigonometric function to model, 862–867
 - Decay functions, exponential**, 473–479, 524

Decimals, converting, 906

Decision making, *See* **Choosing a method; Critical Thinking; Logical Reasoning**

Deductive reasoning, *See* **Logical Reasoning**

Degree
 measure of a circle, 777–778
 of a polynomial function, 329

Dependent events, 732–733, 758

Dependent linear system, 145

Dependent variable, 69

Derivation
 of the difference formula for cosine, 902–903
 of the double-angle formula for cosine, 903
 of the equation of an ellipse, 896–897
 of the equation of a hyperbola, 898–899
 of the equation of a parabola, 895–896
 of the formula for arc length, 900
 of the half-angle formula for cosine, 904
 of the law of cosines, 901
 of the law of sines, 900–901
 of negative angle identities, 902
 of the quadratic formula, 895

Determinant, 214–220, 241

Difference
 formulas, 869–874, 886
 derivation of cosine, 902–903
 of two cubes, 345–346
 of two squares, 257

Dilation, 922

Dimensions, of a matrix, 199

Direct argument, 924–925

Direct variation, 94, 534

Directrix, of a parabola, 595, 642

Discrete mathematics, *See also* **Algorithm; Logical Reasoning**
 counting methods, 701–707, 756
 greatest common factor, 908
 inductive reasoning, 689–690
 linear programming, 163–167, 187–188
 matrices, 199–242
 recursion, 681–686, 694
 scatter plot, 100–105
 sequences, 651–652, 659–672, 692
 tree diagram, 701, 733, 738

Discriminant, 293
 classification of conics and, 626

Dispersion, measures of, 446, 458, 998–1000

Distance, between two points, 589, 591–594, 642

Distribution
 binomial, 738–744, 758
 normal, 746–751, 758

Distributive property, 5, 13, 928
 matrix operations and, 201, 209
 for solving linear equations, 20, 59

Division
 of complex numbers, 274, 315
 definition of, 5
 of functions, 415–416
 inequalities and, 41
 by a polynomial, 556
 polynomial, 352–358
 property of equality, 19, 928
 with rational expressions, 556–561, 577
 synthetic, 353

Domain
 of a function, 67
 restricted, 424

Double-angle formulas, 875–881, 886
 derivation for cosine, 903

E.....

Eccentricity, of conic sections, 639–640

Eliminating the parameter, 814

Ellipse
 area of, 764–765
 eccentricity of, 639–640
 equation of, 609–614, 643
 derivation of, 896–897
 graphing, 609–614, 643
 standard form, 609
 translated, 624, 626–630

End behavior, for polynomial functions, 331

English-to-Spanish Glossary, 1011–1022

Enrichment, *See* **Challenge exercises; Extensions**

Equations, *See also* **Formulas; Functions; Inequalities; Linear equations; Quadratic equations; Polynomials; Rational equations**
 absolute value, 49–55, 60

of circles, 601–608, 624–626, 628–630, 639–640
 of conic sections, 623–630, 639–640
 definition of, 19
 of ellipses, 609–614, 624, 626–630, 639–640
 equivalent, 19
 exponential, 501–507
 general second-degree, 626
 of hyperbolas, 615–620, 625–630, 639–640
 involving n th roots, 402
 logarithmic, 486, 501–507, 526
 matrix, 201, 230
 of parabolas, 249–255, 595–600, 623, 626–627, 639–640
 parametric, 813–818, 820, 824
 quadratic, 256–271, 282–284, 291–298
 radical, 437–443, 458
 rational, 402–406, 566–573, 578
 recursive, 681–688
 trigonometric, 793–798, 855–861, 870–874, 877–881, 885
 in two variables, 69

Equivalent equations, 19

Equivalent expressions, 13

Error analysis, 14, 22, 103, 125, 181, 218, 260, 277, 286, 326, 341, 348, 411, 418, 434, 490, 505, 543, 604, 612, 705, 712, 780, 795, 852, 859

Estimation, *See also* **Prediction**
 approximating best-fitting line, 99–106, 131–133
 approximating the coordinates of turning points, 374
 approximating maximum volume, 375
 of area, 606
 of n th roots, 402, 404, 406
 of real zeros, 368
 of square root, 264, 266
 using the distance formula, 591
 using an exponential growth model, 467, 470, 471, 476, 478, 479
 using a formula, 452
 using function operations, 417
 using a geometric series, 669
 using graphs of functions, 247, 433, 434, 989–992
 using an inverse function, 425, 428
 using joint variation, 536

using the law of sines, 799–801, 803–805
 using a logarithmic function, 487, 489, 491, 495, 507
 using matrices, 207
 using the Monte Carlo method, 764–765
 using a normal curve, 746–751
 using parametric equations, 814–815, 820
 using a polynomial model, 332
 using properties of rational exponents, 410, 412, 413
 using a quadratic model, 284, 285
 using a rational model, 542, 543, 544, 570
 using regression, 382, 989–992
 using a scatter plot, 321, 399
 using a square root function, 433, 434
 using a trigonometric equation, 856–858, 860
 using a trigonometric function, 787, 789, 790

Euler, Leonhard, 480, 481
Euler number, 480
Expanding a logarithmic expression, 494, 525
Expected value, 753–754
Experimental probability, 717, 757
Explicit rule, 681
Exponential equations, solving, 501–507, 526
Exponential expressions, evaluating, 324
Exponential functions
 decay, 473–479, 524
 graphing, 466, 475
 growth, 465–472, 524
 modeling with, 509–516, 526, 989–992
 natural base, 481–485, 525
 writing, 509

Exponents
 definition of, 11
 evaluating, 11–16
 irrational, 412, 472
 properties of, 323
 using, 323–328, 388
 rational, 401–413

Expressions
 equivalent, 13
 evaluating, 11–16, 58

exponential, 324
 with natural base e , 480–481
 logarithmic, 487, 494
 numerical, 11
 polynomial, factoring, 345–350
 quadratic, factoring, 256–263
 radical, simplifying, 407–413
 rational, 402, 407–413, 554–567, 577–578
 square root, simplifying, 264–265
 terms of, 13
 trigonometric
 evaluating, 869–870, 872–873, 875–876, 879, 880
 simplifying, 849, 870, 873
 value of, 12

Extensions
 Additive and Multiplicative
 Inverses of Complex Numbers, 279
 Eccentricity of Conic Sections, 639
 Expected Value, 753–754
 Irrational Exponents, 412
 Mathematical Induction, 689–690
 Solving Systems Using Augmented Matrices, 237–238

Extra Practice, See Reviews

Extraneous solutions
 for a logarithmic equation, 504
 for a radical equation, 439
 for a trigonometric equation, 857

F.....

Factor, 908
 common, 908

Factor theorem, 354

Factorial values, 681, *See also*
Combinations; Permutations

Factoring
 the difference of two squares, 257
 by grouping, 346
 polynomial expressions, 345–350, 354, 938
 quadratic expressions, 256–263, 314
 the sum or difference of cubes, 345–346
 to solve a trigonometric equation, 856
 zero product property and, 257

Factorization, prime, 908

Fair game, 753

False position, rule of, 40

Feasible region, 163

Fermat, Pierre, 737

Fibonacci, Leonardo, 687

Fibonacci sequence, 687
 recursive rule for, 681

Finite differences, 379–385, 390
 properties of, 381

Finite sequence, 651

First-order differences, 379

Focus (Foci)
 of an ellipse, 609
 of a hyperbola, 615
 of a parabola, 595, 642

Focus on
 Applications, 6, 9, 27, 35, 36, 38, 44, 46, 52, 54, 73, 78, 87, 97, 104, 119, 126, 144, 154, 165, 174, 183, 205, 212, 215, 219, 225, 232, 254, 262, 268, 302, 325, 340, 357, 363, 364, 368, 370, 377, 382, 403, 410, 417, 425, 440, 467, 470, 487, 491, 497, 498, 507, 515, 521, 535, 536, 544, 564, 570, 591, 599, 603, 605, 617, 620, 625, 629, 656, 662, 669, 677, 706, 713, 721, 726, 741, 750, 771, 773, 779, 787, 794, 809, 815, 817, 833, 842, 851, 860, 866, 878, 881

Careers, 16, 21, 23, 30, 68, 102, 112, 151, 158, 172, 202, 217, 234, 252, 279, 296, 304, 308, 327, 330, 335, 342, 347, 355, 419, 427, 433, 435, 450, 468, 482, 495, 551, 559, 566, 593, 606, 634, 636, 664, 671, 679, 683, 685, 702, 728, 735, 748, 789, 801, 805, 811, 836, 858, 871

People, 8, 13, 70, 80, 93, 161, 167, 210, 226, 275, 288, 311, 361, 385, 442, 447, 481, 484, 504, 512, 538, 557, 597, 654, 661, 710, 743, 781, 789, 797, 873

FOIL method, 251

Formulas
 area
 of a circle, 28, 914–915
 of an ellipse, 29
 of a parallelogram, 914, 915
 of a rectangle, 28, 914
 of a square, 914
 of a trapezoid, 28, 914
 of a triangle, 28, 914, 915

Beaufort number, 440
 Beaufort wind scale, 440

change-of-base, 494
 circumference of a circle, 24, 28
 combining, 28
 distance, 28, 589, 642
 double-angle, 875
 Doyle log rule, 406
 Fahrenheit/Celsius, 23, 28, 427
 half-angle, 875
 height of falling objects, 266, 268
 height of launched objects, 294
 Heron's area, 809
 hexagonal number, 384
 interest
 compound, 468
 continuously compounded, 482
 simple, 28
 length of a standard nail, 442
 mean of a binomial distribution, 744
 midpoint, 590, 642
 normal curve, 751
 n th term of an arithmetic sequence, 659
 n th term of a geometric sequence, 666
 number of combinations, 708
 number of permutations, 703
 pentagonal number, 384
 perimeter, of a rectangle, 28
 pH of soil, 573
 probability
 binomial, 739
 compound events, 724
 dependent events, 732
 independent events, 730
 mutually exclusive events, 724
 quadratic, 291
 radius
 of a cone, 435
 of a sphere, 452
 rewriting, 28–32, 59
 slant height of a truncated pyramid, 443
 for special series, 654
 standard deviation, 446, 451
 sum of an infinite geometric series, 675
 sum of n terms of an arithmetic series, 661
 sum of n terms of a geometric series, 668
 surface area
 of a cylinder, 413
 of a sphere, 413

Table of, 963–968
 theoretical probability, 716–717
 triangular number, 380
 trigonometric difference, 869
 trigonometric sum, 869
 volume
 of a cube, 72
 of a cylinder, 271, 413
 of a dodecahedron, 405
 of an icosahedron, 405
 of a pyramid, 361
 of a sphere, 72
 water pressure at depth, 73
Fractal geometry, 275–276
 Koch snowflake, 680
 Mandelbrot set, 275–276
 Sierpinski triangle, 672
Fractions
 complex, 564, 566–567
 converting, 906
 linear equations with, 20
 writing a repeating decimal as, 676
Frequency, of a periodic function, 833
Frequency distribution, 448
Function notation, 69
Functions
 absolute value, 122–127, 132
 composition of, 416–417
 cosine, 831–833, 835–842, 844–846
 evaluating, 69–70
 exponential
 decay, 473–479, 524
 growth, 465–472, 524
 modeling with, 509–516, 526, 989–992
 natural base, 481–485, 525
 graphing, 69–70
 absolute value, 122–127, 132, 985–988
 exponential, 466, 475, 524, 985–988
 general rational, 547–552, 577
 logarithmic, 488–489, 500, 525
 logistic growth, 517–518, 526
 natural base, 481–482, 525,
 polynomial, 331–332, 373–378, 388, 390
 quadratic, 249–255, 314, 985–988
 radical, 431–436, 985–988
 simple rational, 540–546
 trigonometric, 831–837, 884

horizontal line test for, 424
 identifying, 67
 inverse, 421–429, 457
 logarithmic, 486–492, 525
 logistic growth, 517–522, 526
 natural base exponential, 481–485, 525
 objective, 163
 operations on, 415–420, 457
 parent, 985
 periodic, 831
 piecewise, 114–121, 132
 power, 415–420, 457, 511–516, 526
 problem solving, 70, 73
 quadratic, 249–255, 285, 306–312, 314–316, 985–992
 intercept form of, 250, 251, 259, 306
 standard form of, 250–252, 307
 vertex form of, 250–252, 285, 306
 radical, 431–436, 457
 rational, 540–552, 576–577
 representing, 67, 130
 sine, 831–833, 835–842, 844–846
 step, 115, 116
 ceiling function, 118
 greatest integer function, 115
 rounding function, 118
 tangent, 834–837
 trigonometric
 of any angle, 784–790, 823
 inverse, 791–798, 823
 of a quadrantal angle, 785
 right triangle, 769–774, 822
 of two variables, 171–172, 174–175
 vertical line test for, 68
Fundamental counting principle, 701–702, 756
 permutation and, 703–707, 756
Fundamental theorem of algebra, 366–371

G.....
Gauss, Karl Friedrich, 661
General rational functions, 547–552
General second-degree equation, 626
Geometric probability, 718, 757
Geometric sequence, 666–672, 693
 recursive rule for, 682
Geometric series, 668–672, 693
 infinite, 674–680, 694

Geometry, *See also* **Angles; Applications; Circles; Connections; Formulas; Triangles; Trigonometric functions**
 conics, 622–630, 639–640, 644
 parallel lines, 77, 92, 140
 perimeter, area, and volume, 914–917
 perpendicular bisector, 590–591
 Pythagorean theorem, 917–918
 reflection, 839–846, 921
 similar figures, 923
 symmetry, 919–920
 transformations, 921–922
 triangle relationships, 917–919

Glossary, 1001–1010, *See also* **English-to-Spanish Glossary**

Graphing calculator, *See also* **Calculator; Student Help; Technology Activities**
 absolute value feature, 126
 binomial probability distribution function, 745
 common logarithm function, 487, 500
 draw inverse feature, 430
 evaluate feature, 176
 evaluating expressions, 18
 evaluating recursive rules, 683
 e^x function, 481, 482
 exercises, 54, 118, 126, 154, 161, 228, 234, 254, 268, 304, 305, 309, 311, 336, 370, 376, 434, 435, 442, 483, 490, 514, 520, 529, 551, 566, 567, 619, 685, 728, 751, 804, 853, 854, 860, 867, 868, 887
 exponential regression feature, 510
 graphing feature, 90, 121, 146, 249, 271, 290, 308, 331, 372, 374, 382, 430, 433, 500, 517, 608, 658, 839, 848, 858, 864, 870
 graphing modes, 546, 561, 848
 greatest integer function, 118
 intersect feature, 146, 372, 382, 433, 435, 442, 482, 489, 570, 858, 870
 linear regression feature, 107
 list feature, 308, 723, 745, 838, 864
 logistic regression feature, 519
 matrix feature, 207, 224, 231, 232

maximum feature, 290, 308, 374, 375, 838
 minimum feature, 290, 374, 549, 838
 natural logarithm function, 487, 500
 parametric mode, 820
 power regression feature, 512
 quadratic regression feature, 308
 random number generator, 723, 738
 root feature, 271, 368, 838
 sequence mode, 658
 sinusoidal regression feature, 864
 sort feature, 723
 stat calc feature, 107, 382, 453
 stat edit feature, 107, 453, 454
 stat plot feature, 107, 308, 382, 453, 454, 745
 summation feature, 658
 table feature, 25, 268, 510, 561, 658
 test feature, 48
 trace feature, 121, 126, 453, 454, 517, 658, 820
 window, 90, 337, 372, 453, 546, 608, 658, 820, 838
 zero feature, 271, 368, 374

Graphs
 of absolute value equations and inequalities, 49–51
 of absolute value functions, 122–127, 132, 985–988
 bar, 934, 997
 box-and-whisker plot, 447, 453, 458, 997
 circle, 934, 997
 misleading, 998
 of a complex number, 273
 of a cosine function, 831–833, 835–838, 884
 transformations of, 839–842, 844–846, 884–885
 of an equation of a circle, 601–608, 643
 of an equation of an ellipse, 609–614, 643
 of an equation of a hyperbola, 615–620, 643–644
 of an equation of a parabola, 595–596, 598–600
 of exponential functions, 466, 475, 524, 985–988
 of a geometric sequence, 667

histogram, 448, 458, 738, 740–741, 997
 of a horizontal line, 85
 line, 935, 997
 of a linear equation, 82–88, 131
 system, 139–146, 186
 in three variables, 170–176, 188
 of a linear function, 69–70, 130
 of a linear inequality
 in one variable, 41–43
 system, 156–162
 in two variables, 108–113, 132
 of a logarithmic function, 488–489, 500, 525
 of logistic growth functions, 517–518, 526
 of a natural base function, 481–482, 525
 of parametric equations, 813, 820
 of a piecewise function, 114–121, 132
 of points in the coordinate plane, 933
 of polynomial functions, 331–332, 373–378, 390
 of quadratic functions, 249–255, 306–312, 314, 316, 985–988
 of quadratic inequalities, 299–305, 316
 of radical functions, 431–436, 985–988
 of rational functions
 general, 547–552, 577
 simple, 540–546, 576–577
 of a real number, 3
 of a relation, 68
 scatter plot, 100–105
 of a sequence, 652
 of a sine function, 831–838, 884
 transformations of, 839–842, 844–846, 884–885
 of a system of quadratic inequalities, 300
 of a tangent function, 834–837, 884
 transformations of, 843–846, 884–885
 three dimensional, 170–176, 188
 of a vertical line, 85

Greatest common factor (GCF), 908
Greatest integer function, 115
Growth factor, 467
Growth functions
 exponential, 465–472, 524
 logistic, 517–522

H.....

Hales, Thomas, 654
Half-angle formulas, 875–881, 886
derivation for cosine, 904
Half-plane, 108
Heron's area formula, 809
Hexagonal numbers, 384
Histogram, 448, 458, 738–741, 997
History, *See Applications;*
Connections; Math & History; Mathematics history
Horizontal asymptote, 540
Horizontal line
graph of, 85
slope of, 76
Horizontal line test, 424
Horizontal translation, of a trigonometric graph, 839–846
Hyperbola
eccentricity of, 639–640
equation of, 615–620, 643–644
derivation of, 898–899
translated, 625–630
as graph of a function, 540
Hypothesis testing, 741–744

I.....

Identity, 13
trigonometric, 848–854
Identity matrix, 222–229, 242
Identity property
of addition, 5
of multiplication, 5
If-then statements, 926–927
Imaginary axis, 273
Imaginary number, 272
Imaginary unit i , 272
powers of, 280
Inconsistent linear system, 145
Independent events, 730–731, 758
Independent variable, 69
Index of a radical, 401
Index of summation, 653
Indirect argument, 924–925
Indirect variation, 94
Induction, mathematical, 689–690
Inductive reasoning, 689–690
Inequalities, *See also Linear inequalities*
absolute value, 49–55, 60
compound, 43–44
quadratic, 299–305, 316

real number, 4
systems of, 156–162, 187, 300
Infinite geometric series, 674–680, 694
Infinite sequence, 651
Infinity, positive and negative, 331
Initial side, of an angle, 776
Integers, 3
Intercept form
of a quadratic function, 250, 251
writing, 259, 306
Internet Connections
Application Links, 1, 35, 38, 40, 46, 65, 78, 89, 112, 119, 126, 137, 169, 174, 188, 197, 210, 225, 232, 236, 247, 254, 268, 270, 311, 321, 325, 351, 357, 377, 399, 403, 425, 440, 444, 463, 467, 482, 491, 497, 499, 507, 531, 536, 574, 587, 597, 617, 620, 631, 649, 669, 687, 699, 713, 721, 737, 741, 767, 775, 778, 817, 829, 842, 860, 868, 878
Career Links, 16, 21, 23, 30, 68, 97, 102, 112, 151, 158, 172, 202, 217, 234, 252, 279, 296, 304, 308, 327, 330, 335, 342, 347, 355, 419, 427, 433, 435, 450, 468, 482, 495, 551, 559, 566, 593, 606, 634, 636, 664, 671, 679, 683, 685, 702, 728, 735, 748, 789, 801, 805, 811, 836, 858, 871
Data Updates, 6, 16, 93, 119, 154, 161, 205, 212, 280, 297, 305, 309, 325, 327, 342, 370, 385, 395, 427, 478, 522, 552, 572, 669, 672, 719, 735, 751, 787, 815
Extra Challenge, 10, 16, 24, 32, 39, 55, 74, 113, 120, 127, 145, 162, 168, 175, 183, 213, 220, 229, 235, 255, 263, 269, 280, 289, 297, 305, 312, 328, 336, 343, 350, 358, 364, 371, 378, 385, 406, 420, 428, 436, 443, 451, 472, 492, 498, 507, 552, 560, 567, 573, 600, 620, 630, 657, 665, 680, 686, 707, 729, 744, 751, 782, 797, 806, 812, 818, 861, 874, 881
Student Help, 6, 15, 18, 20, 25, 31, 38, 43, 48, 51, 54, 70, 88, 90,

92, 110, 118, 119, 126, 127, 140, 153, 160, 167, 171, 172, 178, 204, 207, 209, 216, 224, 234, 254, 259, 265, 271, 279, 285, 290, 292, 304, 308, 310, 324, 332, 337, 343, 349, 354, 372, 405, 408, 409, 419, 428, 430, 435, 438, 446, 453, 467, 471, 476, 484, 487, 497, 500, 502, 515, 518, 519, 538, 541, 546, 551, 556, 561, 564, 568, 593, 596, 602, 608, 610, 619, 624, 637, 656, 658, 664, 668, 676, 685, 688, 703, 704, 706, 711, 718, 723, 726, 729, 735, 743, 745, 751, 754, 770, 777, 786, 796, 804, 807, 811, 817, 820, 836, 838, 845, 851, 857, 862, 873, 877, 892

Intersection

of graphs of quadratic systems, 632–637
of sets, probability and, 724–725
Inverse functions, 421–429, 457
trigonometric, 791–798, 823
Inverse matrix, 222–229, 242
Inverse property
additive, 5
of a complex number, 279
for a logarithmic function, 488
multiplicative, 5
of a complex number, 279
Inverse relation, 422
Inverse variation, 533–535, 576
Investigations, *See Concept Activities; Technology Activities*
Irrational exponent, 472
Irrational number, definition of, 3

J.....

Joint variation, 536–539, 576

K.....

Karmarkar, Narendra, 169
Kepler, Johannes, 512, 631
Koch snowflake, 680

L.....

Latus rectum, of a parabola, 600
Law of cosines, 807–812, 824
derivation of, 901
Law of sines, 799–806, 823–824
derivation of, 900–901
Leading coefficient, 329

Least common denominator (LCD), 908–909, 939

Least common multiple (LCM), 908

Left distributive property, 209

Like terms, 13

Line graph, 935, 997

Line symmetry, 919

Linear combination method

for solving linear systems, 149–150, 178, 187

for solving quadratic systems, 633–637

Linear equations

absolute value, 49–55, 60

for a best-fitting line, 99–105, 131–132

definition of, 19

direct variation, 94

of the form $y = f(x)$, 90

given two points, 91, 93

graphing, 82–88, 131

point-slope form of, 91

rewriting, 26–32, 59

slope-intercept form of, 82–83, 91

solving, 19–24, 59

standard form of, 84–85

subscripts and, 27

systems of

solving algebraically, 148–154, 177–183, 186–187, 188

solving graphically, 139–146, 170–176, 186

in three variables

graphing, 170–176

solving algebraically, 177–183

writing, 21, 91–98, 131

Linear functions

definition of, 69

evaluating, 69–70

graphing, 69–70

inverse of, 422–423

modeling with, 99–107, 989–992

Linear inequalities

absolute value, 49–55, 60

compound, 43–44

constraints and, 163

graphing

in one variable, 41–43

in two variables, 108–113, 132

solving, 41–48

systems of, 156–162, 187

Linear motion, modeling, 814

Linear programming, 163–167, 187–188

Linear regression, 107, 989–992

best-fitting line and, 107

Linear systems

consistent, 145

definition of, 139

dependent, 145

inconsistent, 145

with many solutions, 140, 150, 179

with no solutions, 140, 150, 179

number of solutions of, 140

solving

algebraically, 148–154,

177–183, 186–187

by graphing, 139–146, 170–176

using augmented matrices,

237–238

using Cramer's rule, 216–220, 241

using elementary row operations,

237–238

using the linear combination

method, 149–150, 178, 187

using matrices, 230–235, 242

using the substitution method,

148, 186

in three variables

graphing, 170–176

solving algebraically, 177–183

Lines

classifying by slope, 76

horizontal, slope and, 76

parallel, slope and, 77

perpendicular, slope and, 77

of reflection, 921

slope of, 75–81

of symmetry, 919

vertical, slope of, 76

Local maximum, 374

Local minimum, 374

Logarithmic equations, solving,

501–507, 526

Logarithmic expressions

condensing, 494, 525

evaluating, 487, 525

expanding, 494, 525

Logarithmic functions, 486–492, 525

graphing, 488–489, 500, 525

Logarithms

change-of-base formula, 494

common, 487

definition of, 486

natural, 487

properties of, 493–498, 525

Logical Reasoning, *See also Critical Thinking*

and rule, 924–925

chain rule, 924

counterexample, 927–928

direct argument, 924–925

exercises, 8, 10, 56, 80, 96, 104,

212, 220, 255, 261, 278, 304,

357, 413, 418, 471, 498, 539,

565, 572, 614, 636, 657, 665,

679, 686, 713, 714, 729, 836,

846, 880

false solutions, 439

hypothesis testing, 741–744

if-then statements, 926–927

indirect argument, 924–925

justify reasoning, 928–929

logical argument, 924–925

mathematical induction, 689–690

or rule, 924–925

Logistic growth functions, 517–522

graphing, 517–518, 526

Lucas, Edouard, 656, 687

M.....

Major axis, of an ellipse, 609

Mandelbrot, Benoit, 275

Mandelbrot set, 275–276

Manheim, Amendee, 499

Manipulatives

algebra tiles, 281

coins, 738

flashlight, 622

index cards, 49

ruler, 99, 147, 194, 533

straightedge, 421

Mapping, 67

Math & History

Columbus's Voyage, 775

Deep Water Diving, 574

The Fibonacci Sequence, 687

History of Conic Sections, 631

Linear Programming in World

War II, 169

Logarithms, 499

Music and Math, 868

Probability Theory, 737

Problem Solving, 40

Solving Polynomial Equations, 351

Systems of Equations, 236

Telescopes, 270

Transatlantic Voyages, 89

Tsunamis, 444

Mathematical induction, 689–690

Mathematical model, *See also*

Modeling

definition of, 12

Mathematics history

Ahmes papyrus, 665

Archimedes' burning mirror, 599

Chiu chang suan shu, 263

magic squares, 396

natural base e , 480–481

sum of an arithmetic series, 661

Tower of Hanoi, 656

Great trigonometric survey of

India, 805

Zeno's paradox, 679

Matrix (Matrices)

adding and subtracting, 200, 240

augmented, 237–238

comparing, 199

of constants, 230

Cramer's rule and, 216–220, 241

definition of, 199

determinants and, 214–220, 241

dimensions of, 199

equations, 201, 240

writing, 230

identity, 222–229, 242

inverse, 222–229, 242

multiplying, 208–213, 241

by a scalar, 200

properties

of multiplication, 209

of operations, 201

rotational, 213

row operations, 237–238

for solving linear systems,

216–220, 230–235, 237–238

square, 199, 214–220

of variables, 230

zero, 199

Maximum value

of a quadratic function, 290

of sine and cosine functions, 832

Mean, 445, 453, 458, 999

of a binomial distribution, 744

standard deviation and, 746–751,
999

Measures, Table of, 962

Median, 445, 453, 458, 999

Midpoint, of a line segment,

590–594, 642

Minimum value

of a quadratic function, 290

of sine and cosine functions, 832

Minor axis, of an ellipse, 609

Mixed Problem Solving, 971–984

Mode, 445, 458, 999

Modeling, *See also* **Concept**

Activities; Manipulatives;

Technology Activities

best-fitting quadratic model, 308

circular motion, 842, 863

with cubic regression, 382

with an ellipse, 611, 613–614

with finite differences, 381

fitting a model to data, 509–516,

584–585, 862–867, 989–992

with a hyperbola, 617, 620

with parametric equations,

814–815, 817–818, 851

with a power function, 511–516,

526

with a sine function, 833

a sinusoid, 863

with a tangent function, 843

using absolute value functions,

124–127

using an algebraic model, 12, 13,

21, 27, 33–39, 52, 60, 85, 93,

110, 141, 151, 172, 180, 232,

258, 347, 355, 361, 375, 417,

542, 570, 683

using an area model, 262, 282, 284,

718, 937

using a circular model, 603,

605–606, 625

using combinations, 708–709

using a direct variation equation,

94

using an equation of a parabola,

597

using an exponential model, 325,

467–468, 476, 478, 479, 482,

509–516, 989–992

using a function of two variables,

172, 174–175

using a geometric sequence, 669

using a geometric series, 669

using graphs of linear equations,

83, 85, 87–88

using a histogram, 448, 458, 738,

740–741

using an infinite series, 677

using an inverse model, 423, 425

using a linear equation, 21, 27, 93

using a linear expression, 13

using a linear function, 70, 73,

989–992

using a linear inequality

in one variable, 44, 46–47

in two variables, 110, 112–113

using linear programming, 165,

167

using a linear system, 141,

144–145, 151, 153–154, 217,

232, 234–235

in three variables, 180, 182–183

using logarithms, 489, 495, 497,

498, 504, 509–516

using a logistic growth model, 519

using mapping, 67

using matrices, 202, 204–205, 210,

212, 215, 232, 234–235

using the Monte Carlo method,

764–765

using a normal distribution,

747–748, 750–751

using n th roots, 403, 405–406

using a number line, 3–4, 716, 718

using permutations, 702–704

using a piecewise function, 116

using a polynomial equation, 347,

349–350

using a polynomial function, 330,

332, 368

using polynomial models, 340,

342–343, 355, 357, 361, 375,

380–385

using probability, 717–718, 726,

731–733

using a quadratic inequality, 300,

302, 304–305

using a quadratic model, 252–255,

258–262, 266–269, 284–286,

288–289, 294–298, 300,

302–305, 307–312, 316, 634,

989–992

using a radical function, 433, 435

using rational exponents, 410

using a rational model, 542, 549,

557, 563, 570

using a recursive rule, 683

using scientific notation, 325

using a sequence, 662

using a series, 662

using a system of linear

inequalities, 158, 161

using a tree diagram, 701, 733

using a trigonometric model, 787,

789, 790, 858, 860, 862–867,

878, 886

using unit analysis, 6, 12, 33

using a variation model, 535, 536
 using a Venn diagram, 716, 724–725
 using a verbal model, 12, 13, 15, 21, 27, 33–39, 52, 60, 85, 93, 110, 141, 151, 172, 180, 232, 258, 347, 355, 361, 375, 417, 542, 570, 683

Monomials, 257
 multiplying rational expressions involving, 555

Multicultural connections, 1, 6, 8, 9, 13, 33, 37, 38, 40, 61, 70, 80, 87, 110, 111, 161, 165, 169, 204, 220, 225, 236, 263, 325, 327, 351, 396, 427, 444, 499, 502, 515, 535, 614, 679, 773, 781, 789, 811, 866, 881, 891

Multiple representations, 12, 13, 21, 26, 27, 33–36, 41–43, 49–52, 68, 69, 84, 92, 93, 101, 102, 107, 110–112, 114–116, 122–125, 139–141, 156–158, 202, 215, 249–252, 258, 259, 265, 266, 273, 281–283, 291–293, 299–302, 306–308, 314, 316, 347, 360, 367–368, 373–375, 379–382, 388, 424–425, 431–433, 439, 440, 445–448, 453–454, 465, 466, 467, 469, 481–482, 484, 486, 488, 489, 500, 509–512, 524, 525, 526, 540–542, 546, 547–549, 563, 590, 596, 601–603, 632–634, 652, 667, 701, 703, 710–711, 738, 740, 746–748, 831–835, 838–843, 858, 862–864, *See also Manipulatives; Modeling*

Multiplication
 combinations and, 709
 of complex numbers, 274, 315
 cross multiplying, 569–573
 of functions, 415–416
 inequalities and, 41
 linear combination method and, 149–150
 of a matrix by a scalar, 200
 by a polynomial, 555, 937
 of polynomials, 338–343
 properties of, 5, 19, 209, 257, 928
 with rational expressions, 554–561, 577
 of two matrices, 208–213, 241

Multiplicative inverse, 5
 of a complex number, 279

Mutually exclusive events, 724

N.....

Napier, John, 499

Natural base e , 480–485, 525

Natural base exponential functions, 481–485, 525

Natural logarithm, 487

Negative angle identities, 848
 derivation of, 902

Negative correlation, 100

Negative exponent property, 323, 407

Normal curve, 746
 general equation of, 751

Normal distribution, 746–751, 758

n th roots, 401–406, 456

Number line
 graphing linear inequalities on, 41–43
 graphing real numbers on, 3
 ordering real numbers on, 4

Numerical expression, 11

O.....

Objective function, 163

Octants, 170

Odds of an event, 729

Opposite, of a number, 5, 936–937

Optimal solution, 163

Optimization, 163–167

Or rule, 924–925

Order of operations, 11

Ordered pair, 67

Ordered triple, 170

Ordering, real numbers, 4

Origin
 of a coordinate graph, 67, 68
 of a coordinate plane, 67
 of a real number line, 3
 of a three-dimensional coordinate system, 170

Oughtred, William, 499

Outlier, 998

P.....

Parabola, 249
 axis of symmetry, 249, 595–596
 directrix of, 595, 642
 eccentricity of, 639
 equation of, 249–255, 595–600
 derivation of, 895–896

translated, 623, 626–627
 focus of, 595, 642
 graph of, 249–255, 595–596
 latus rectum of, 600
 standard equation of, 596
 vertex of, 595, 642

Parallel lines
 linear systems and, 140
 slope and, 77
 writing equations of, 92

Parallelogram, area of, 914, 915

Parameter, 813
 eliminating, 814

Parametric equations, 813–818, 824, 851, 854
 eliminating the parameter, 814
 graphing, 813, 820

Parent function, 985

Pascal, Blaise, 710, 737

Pascal's triangle, 710

Patterns
 angle measure and triangle area, 804
 binomial products, 339
 difference of two cubes, 345
 end behavior, 334
 factoring, 257
 Pascal's triangle, 712
 powers of i , 280
 sum of two cubes, 345

Pentagonal numbers, 384, 690

Percents
 calculating, 907–907
 converting, 906

Perfect square trinomial, 257

Perimeter
 of a polygon, 914
 of a rectangle, 28

Periodic function, 831

Permutation, 703–707, 756
 circular, 707
 probability and, 717

Perpendicular bisector, 590–591

Perpendicular lines
 slope and, 77
 writing equations of, 92

Perspective, drawing, 194–195

Piecewise function, 114–121, 132

Piecewise-defined sequence, 686

Point-slope form, 91

Polynomial equations
 fundamental theorem of algebra and, 366–371
 number of solutions of, 366

solving
 by factoring, 347–350, 389
 by graphing, 368, 372

Polynomial functions
 analyzing graphs of, 373–378, 390
 definition of, 329
 degree of, 329, 379–385
 end behavior for, 331
 evaluating, 329–330, 388
 using synthetic substitution, 330
 finding rational zeros of, 359–364, 390
 finite differences and, 379–385
 graphing, 331–332, 388
 power function and, 415
 standard form of, 329
 turning points of, 374–378
 using zeros to write, 367
 zeros of, 354

Polynomial long division, 352

Polynomials
 adding, 338, 341–343
 dividing, 352–358
 factoring, 345–350, 354, 938
 multiplying, 338–343
 multiplying by, 555
 multiplying rational expressions involving, 555
 quadratic form of, 346
 subtracting, 338, 340–343, 389

Positive correlation, 100

Postulates of algebra, 928–929

Power functions, 415–420, 457, 511–516, 526
 inverses of, 424–425

Power of a power property, 323, 407

Power of a product property, 323, 407

Power property of logarithms, 493

Power of a quotient property, 323, 407

Powers, 11, See also Exponential functions; Exponents

Powers property of equality, 437

Prediction, See also Estimation
 using a best-fitting line, 99, 104
 using a graph, 65
 using inverse variation, 533
 using a linear equation, 93
 using the Monte Carlo method, 764–765
 using a polynomial model, 385
 using transformations of trigonometric graphs, 839

Prime factorization, 908

Prime number, 908

Probability
 binomial, 739–744, 748
 binomial distribution and, 738–744
 combination, 708–709, 756
 complement of an event, 726
 compound events, 724–729, 757
 conditional, 732–733, 736
 definition of, 716
 dependent events, 732–733, 758
 expected value, 753–754
 experimental, 717, 757
 fundamental counting principle, 701–702, 756
 geometric, 718, 757
 independent events, 730–731, 758
 intersection and, 724–725
 mutually exclusive events, 724
 normal distribution and, 746–751
 number of possible events, 701–702
 odds of an event, 729
 permutation, 703–707, 756
 random number generation, 723
 standard deviation and, 746–751
 theoretical, 716–717, 757
 union and, 724–725
 using permutations and combinations, 717

Probability Theory, 737

Problem-Solving Strategies, See also Choosing a method; Modeling
 break a problem into simpler parts, 931
 draw a diagram, 21, 35, 768, 821
 guess, check, and revise, 36
 look for a pattern, 36
 make a list or table, 930
 solve a simpler problem, 931
 translating phrases into algebraic expressions, 929–930
 use an algebraic model, 12, 13, 21, 27, 33–39, 52, 60, 85, 93, 110, 141, 151, 258, 355, 361, 375, 542
 use a formula, 931
 use a verbal model, 12, 13, 21, 27, 33–39, 52, 60, 85, 93, 110, 141, 151, 258, 355, 361, 375, 542
 write an equation, 21, 27, 33–39, 93
 write an expression, 12, 13

Product of powers property, 323, 407

Product property
 of logarithms, 493
 of square roots, 264

Programming, linear, 163–167

Projects
 Drawing with Linear Perspective, 194–195
 Magic Squares, 396–397
 Mathematical Models of Learning, 584–585
 The Mathematics of Music, 892–893
 Monte Carlo Methods, 764–765

Properties
 of addition, 5, 19, 201, 928
 of division, 19, 928
 of equality, 19, 928
 of finite differences, 381
 of integer exponents, 323
 of linear inequalities, 41
 of logarithms, 493–498, 525
 of matrix multiplication, 209
 of matrix operations, 201
 of multiplication, 5, 19, 209, 257, 928
 powers property of equality, 437
 of rational exponents, 407
 reflexive property of equality, 928
 of square roots, 264
 of a negative number, 272
 of subtraction, 19, 201, 928
 Table of, 969–970
 zero product, 257

Proportions, See also Variation
 solving, 910–911

Pure imaginary number, 272

Pythagorean identities, 848

Pythagorean theorem, 917–918

Q.....

Quadrantal angle, 785

Quadrants, of a coordinate plane, 67

Quadratic equations
 with complex solutions, 272, 283, 292–293
 number and type of solutions of, 293
 solving
 by completing the square, 281–289, 315
 by factoring, 256–263, 314

by finding square roots, 264–270, 314
 by graphing, 271
 with the quadratic formula, 291–298
 using the discriminant, 293
 standard form of, 257
 systems of, 632–637, 644

Quadratic expressions, factoring, 256–263

Quadratic form, 346

Quadratic formula, 291–298, 316
 derivation of, 895
 discriminant and, 293
 trigonometric equations and, 857

Quadratic functions
 graphing, 249–255, 314
 intercept form of, 250, 251, 259, 306
 maximum and minimum values of, 290
 modeling with, 306–312, 316, 989–992
 standard form of, 250–252, 307
 vertex form of, 250–252, 285, 306
 writing, 306–312
 zeros of, 259

Quadratic inequalities
 in one variable, 301–302, 316
 system of, 300
 in two variables, 299–300, 316

Quadratic regression, 308, 989–992

Quotient of powers property, 323, 407

Quotient property
 of logarithms, 493
 of square roots, 264

R.....

Radian
 conversion to degrees, 777–778, 822–823
 measure of an angle, 777–778, 822–823

Radical equations, solving, 437–443, 458

Radical functions, graphing, 431–436, 457, 995–998

Radicals, 264
 adding, 408–409
 index of, 401
 notation, 264, 401
 simplest form of, 264, 408
 simplifying, 264–265, 407–413
 subtracting, 408–409

Radicand, 264

Radius, of a circle, 601, 914

Random number generation, 723, 738

Range
 of a data set, 446, 453, 999
 of a function, 67

Rate, of change, 78

Rational equations, solving, 402–406, 568–573

Rational exponents, 401–406, 456
 notation, 401–402
 properties of, 407–413, 456
 solving an equation with, 437

Rational expressions
 adding, 562–563, 565–567, 578
 dividing, 556–561, 577
 evaluating, 402, 939
 multiplying, 554–561, 577
 simplifying, 407–413, 554
 subtracting, 562–563, 565–567, 578

Rational functions
 graphing
 general, 547–552, 577
 simple, 540–546, 576–577

Rational numbers, definition of, 3

Rational zero theorem, 359

Rationalizing the denominator, 265

Ratios
 common, 666
 trigonometric, 769
 writing, 910–911

Real axis, 273

Real numbers
 calculating percents, 907–908
 converting decimals, fractions, and percents, 906
 graphing, 3
 least common denominator, 908–909
 n th roots, 401
 operations with, 5–6, 58
 signed numbers, 905–906
 ordering, 4
 properties of, 5
 scalar, 200
 scientific notation, 913
 significant digits, 911–912
 writing ratios and solving proportions, 910–911

Reasoning, See Critical Thinking; Logical Reasoning

Reciprocal, 5

Reciprocal identities, 848

Rectangle
 area of, 28, 914

perimeter of, 28

Recursive rules, for sequences, 681–686, 694

Reference angle, 785–786

Reflections, 921
 of trigonometric graphs, 839–846

Reflexive property of equality, 928

Relation, 67
 inverse, 422
 representing, 67

Remainder theorem, 353

Repeated solution, 366

Repeating decimal, 676

Reviews, See also Assessment; Projects
 Chapter Review, 58–60, 130–132, 186–188, 240–242, 314–316, 388–390, 456–458, 524–526, 576–578, 642–644, 692–694, 756–758, 822–824, 884–886
 Chapter Summary, 57, 129, 185, 239, 313, 387, 455, 523, 575, 641, 691, 755, 821, 883
 Cumulative Practice, 192–193, 394–395, 582–583, 762–763, 890–891
 Extra Practice, 940–960
 Mixed Review, 10, 17, 24, 32, 39, 47, 56, 74, 81, 88, 98, 106, 113, 120, 128, 145, 155, 162, 168, 175, 184, 206, 213, 221, 229, 235, 255, 263, 269, 280, 289, 298, 305, 312, 328, 336, 344, 351, 358, 365, 371, 378, 386, 406, 414, 420, 429, 436, 444, 452, 472, 479, 485, 492, 499, 508, 516, 522, 539, 545, 553, 560, 567, 573, 594, 600, 607, 614, 621, 631, 638, 657, 665, 673, 680, 686, 707, 715, 722, 729, 736, 744, 752, 775, 783, 790, 798, 806, 812, 819, 837, 847, 854, 861, 867, 874, 882
 Skill Review, 2, 66, 138, 198, 248, 322, 400, 464, 532, 588, 650, 700, 768, 830
 Skills Review Handbook
 Algebra, 936–939
 Geometry, 914–923
 Graphing, 933–936
 Logical Reasoning, 924–929
 Problem Solving, 929–932
 Real Numbers, 905–913

Study Guide, 2, 66, 138, 198, 248,
322, 400, 464, 532, 588, 650,
700, 768, 830

Richter, Charles, 504

Right distributive property, 209

Right triangle trigonometry,
769–774, 882

Roots, *See also* **Radicals; Solutions**
adding, 408–409
*n*th, 401–406
properties of, 264, 272
square, 264–270, 272
subtracting, 408–409

Rotation, 921

Rotational symmetry, 919

Rounding function, 118

Row matrix, 199

Row operations, 237–238

Rule of false position, 40

S.....

Sample,
biased, 993
margin of sampling error and, 994
population and, 993
survey to obtain, 993
unbiased, 993

Scalar, definition of, 200

Scalar multiplication, 200

Scale factor, 922

Scatter plot, 100–105

Science, *See* **Applications; Connections**

Scientific notation, 325, 913

Secant, 769, *See also* **Trigonometric functions**

Second-order differences, 379

Sector, of a circle, 779

Semiperimeter, of a triangle, 809

Sequences
arithmetic, 659–665, 693
definition of, 651
finite, 651
geometric, 666–672, 693
graphing, 652
infinite, 651
piecewise-defined, 686
recursive rules for, 681–686, 694
terms of, 651, 692
writing rules for, 652
writing terms of, 651

Series
arithmetic, 661–665, 693
definition of, 653

geometric, 668–672, 693
infinite geometric, 674–680, 694
summation notation and, 653–657,
692

Sierpinski triangle, 672

Sigma notation, 653

Significant digits, 911–912

Similar figures, 923

Simple interest, formula, 28

Simplest form, of a radical, 408

Simulation, 993–996

Sine
definition of, 769
difference formula for, 869–874
double-angle formula for, 875–881
half-angle formula for, 875–881
inverse, 792
law of, 799–806, 823–824
derivation of, 900–901
sum formula for, 869–874

Sine functions, *See also*
Trigonometric functions
graphing, 831–833, 835–838, 884
transformations of graphs of,
839–842, 844–846

Sinusoidal regression, 864

Sinusoids, 862–866

Skewed distribution, 740

Skill Review, *See* **Reviews**

Skills Review Handbook, *See*
Reviews

Slope
classification of lines by, 76
definition of, 75
finding, 75
linear equations and, 92

Slope-intercept form, linear equations and, 82–83, 91

Solution
of a linear equation, 19
in two variables, 69
of a linear inequality, 41
in two variables, 108
of a linear system, 139
in three variables, 177
of a polynomial equation, 373
of a quadratic equation, 293
repeated, 366
of a system of linear inequalities,
156

Spreadsheet, 172, 336
for evaluating recursive rules, 688
exercises, 672

Square
of a binomial, 339
difference of two, 257

Square matrix, 199
determinants and, 214–220

Square pyramidal numbers, 384

Square root, 264
of a negative number, 272
properties of, 264
solving quadratic equations by
finding, 264–270, 314

Square root function, 431–436

Standard deviation, 446, 453, 458
normal curve and, 746–751

Standard form
of a complex number, 272
of the equation of a circle, 601
of the equation of an ellipse, 609
of the equation of a hyperbola, 615
of the equation of a parabola, 596
of equations of translated conics,
623
of a linear equation, 84–85
of a polynomial function, 329
of a quadratic equation, 257
of a quadratic function, 250–252

Standard position, for an angle,
776–778

Statistics, *See also* **Data; Graphs; Probability**
best-fitting line, 99–105, 131–132
best-fitting quadratic model, 308
binomial distribution, 738–744
direct and indirect variation, 94
frequency distribution, 448
measures of central tendency, 445,
453, 458, 998–1000
measures of dispersion, 446, 458,
998–1000
normal distribution, 746–751
range, 446, 458, 999
standard deviation, 446, 453, 999
statistical graphs, 447–448,
453–454, 997–1000

Step function, 115, 116
ceiling function, 118
greatest integer function, 115
rounding function, 118

Student Help, *See also* **Internet Connections; Reviews; Study Strategies; Test-Taking Strategies**
Keystroke Help, 18, 25, 48, 54, 90,
107, 118, 121, 126, 146, 161,

176, 207, 224, 271, 290, 308, 337, 372, 430, 453, 471, 500, 519, 546, 561, 608, 658, 703, 704, 709, 723, 729, 745, 820, 838, 892

Look Back, 75, 84, 109, 121, 157, 179, 201, 223, 231, 250, 258, 300, 301, 307, 331, 338, 339, 407, 416, 422, 424, 439, 466, 488, 504, 510, 536, 541, 548, 549, 555, 563, 566, 590, 591, 596, 626, 632, 633, 651, 661, 668, 719, 728, 731, 732, 764, 790, 800, 809, 815, 855, 857, 990, 1000

Software Help, 688

Study Tips, 2, 5, 13, 25, 34, 42, 43, 67, 69, 76, 85, 109, 138, 149, 157, 164, 171, 198, 200, 231, 248, 257, 259, 283, 290, 322, 324, 330, 347, 353, 402, 416, 423, 437, 453, 454, 494, 544, 570, 588, 602, 650, 652, 676, 700, 703, 710, 733, 740, 741, 747, 768, 770, 777, 789, 793, 808, 830, 832, 841, 850, 856, 875, 876, 989

Study Strategies

- Building on Previous Skills, 138, 185
- Connect to Your Life, 700, 755
- Dictionary of Functions, 532, 575
- Dictionary of Graphs, 588, 641
- Draw Diagrams, 768, 821
- Learn by Teaching, 650, 691
- Making a Flow Chart, 322, 387
- Multiple Methods, 830, 883
- Quiz Yourself, 400, 455
- Skills File, 66, 129
- Study Group, 464, 523
- Troubleshoot, 248, 313
- Vocabulary File, 2, 57
- Writing Out the Steps, 198, 239

Substitution method

- for checking solutions, 19, 42, 48, 108, 139, 148, 216, 223, 224, 265, 283, 292, 367, 438, 439, 501, 502, 503, 632, 856
- for solving linear systems, 148, 186
- for solving quadratic systems, 633–637

Substitution property, 928

Subtraction

- of complex numbers, 273

definition of, 5

- of functions, 415
- inequalities and, 41
- of matrices, 200, 240
- of polynomials, 338, 340–343
- properties of, 19, 201, 928
- of radicals, 408–409
- with rational expressions, 562–563, 565–567, 578
- of roots, 408–409

Sum formulas, 869–874, 886

Sum of two cubes, 345

Summation notation, 653–654

Surface area, 915

Symbols

- approximately equal to, 3
- common ratio, 666
- factorial, 681
- function notation, 69
- imaginary unit, 272
- inequality, 4
- infinity, 653
- negative infinity, 331
- plus or minus, 265
- positive infinity, 331
- radical sign, 264
- sigma, 653
- Table of, 961
- theta, 769

Symmetric distribution, 740

Symmetry, 919–920

Synthetic division, 353

Synthetic substitution, 330

T.....

Table

- frequency distribution, 448
- organizing data with, 738
- solving linear equations with, 25

Tables

- Formulas, 963–968
- Measures, 962
- Properties, 969–970
- Symbols, 961

Tangent

- definition of, 769
- difference formula for, 869–874
- double-angle formula for, 875–881
- half-angle formulas for, 875–881
- identity, 848
- inverse, 792
- sum formula for, 869–874

Tangent functions, *See also*

- Trigonometric functions**
 - graphing, 834–837, 884
 - transformations of graphs of, 843–846

Technology, *See* **Calculator**;
Graphing calculator;
Technology Activities

Technology Activities

- Constructing a Binomial Distribution, 745
- Evaluating Expressions, 18
- Evaluating Recursive Rules, 688
- Finding Maximums and Minimums, 290
- Generating Random Numbers, 723
- Graphing Circles, 608
- Graphing Equations, 90
- Graphing Inverse Functions, 430
- Graphing Linear Equations in Three Variables, 176
- Graphing Logarithmic Functions, 500
- Graphing Parametric Equations, 820
- Graphing Piecewise Functions, 121
- Graphing Rational Functions, 546
- Graphing Systems of Equations, 146
- Graphing Trigonometric Functions, 838
- Operations with Rational Expressions, 561
- Setting a Good Viewing Window, 337
- Solving an Inequality, 48
- Solving Polynomial Equations, 372
- Solving Quadratic Equations, 271
- Statistics and Statistical Graphs, 453–454
- Using Linear Regression, 107
- Using Matrix Operations, 207
- Using Tables to Solve Equations, 25
- Working with Sequences, 658

Terminal side of an angle, 776

Terms

- constant, 13, 329
- of an expression, 13
- like, 13
- of a sequence, 651, 692

Test Preparation

- multi-step problem, 10, 24, 47, 81, 98, 105, 113, 145, 175, 183, 206, 235, 255, 269, 305, 311, 328, 336, 371, 385, 406, 413,

436, 479, 507, 516, 522, 539, 560, 567, 600, 614, 620, 665, 672, 714, 729, 751, 774, 797, 806, 846, 854, 874

multiple choice, 39, 55, 88, 127, 162, 168, 213, 229, 263, 289, 343, 350, 358, 378, 443, 451, 472, 485, 498, 545, 552, 606, 630, 637, 680, 686, 722, 744, 790, 812, 818, 837, 861, 867

quantitative comparison, 16, 31, 74, 120, 154, 220, 280, 297, 364, 420, 428, 492, 573, 594, 657, 707, 736, 782, 881

Test-Taking Strategies, 62, 134, 190, 244, 318, 392, 460, 528, 580, 646, 696, 760, 826, 888

Theorems

- binomial theorem, 710–714, 756
- factor theorem, 354
- fundamental theorem of algebra, 366–371
- Pythagorean theorem, 917–918
- rational zero theorem, 359
- remainder theorem, 353

Theoretical probability, 716–717, 757

Third-order differences, 379

Three-dimensional coordinate system, 170

Transformations, 921–922

- of absolute value inequalities, 51
- of functions, 985–988
- that produce equivalent equations, 19
- that produce equivalent inequalities, 41
- of trigonometric graphs, 839–846

Translations, 921

- of trigonometric graphs, 839–846

Transverse axis, of a hyperbola, 615

Trapezoid, area of, 28, 914

Tree diagram

- for finding conditional probability, 733
- for finding theoretical probability, 738
- fundamental counting principle and, 701

Triangles

- AAS, 799
- area of, 28, 215, 802–806, 809–812, 914, 915
- Heron’s area formula and, 809

- law of cosines and, 807–812
- law of sines and, 799–806
- relationships, 917–919
 - right-triangle trigonometric, 769–774
- SAS, 807, 808
- semiperimeter of, 809
- SSA, 800–801
- SSS, 808

Triangular numbers, 380

Triangular pyramidal numbers, 381

Trigonometric equations, solving, 793–798, 855–861, 870–874, 877–881, 885

Trigonometric expressions

- evaluating, 869–870, 872–873, 875–876, 879, 880
- simplifying, 849, 854, 870, 873, 876, 879, 880

Trigonometric functions

- of any angle, 784–790, 823
- graphing, 831–838
- inverse, 791–798, 823
- modeling with, 862–867
- of a quadrantal angle, 785
- right triangle, 769–774, 822
- writing, 862

Trigonometric identities, 848–854, 876, 885

- verification of, 850, 853, 876, 885

Trinomials, 256, *See also*

- Polynomials**
- irreducible, 257
- perfect square, 257

Turing, Alan, 226

Turning points, of a polynomial function, 374–378

U.....

- Unbounded region**, 163, 164
- Union, of sets, probability and**, 724–725
- Unit analysis**, 6, 12, 33
 - exercises, 8, 32

V.....

Value

- of an expression, 12
- of a variable, 12

Variable

- on both sides
 - of an equation, 20
 - of an inequality, 42
- definition of, 12

- dependent, 69
- equations with more than one, 26–27, 69
- independent, 69
- on one side
 - of an equation, 19
 - of an inequality, 42
- subscripts and, 27
- value of, 12

Variation

- constant of, 94, 534
- direct, 94, 534
- inverse, 533–535, 537–539, 576
- joint, 536–539, 576

Venn diagram, compound events and, 724–725

Verbal model, 12, 13, 15, 21, 27, 33–39, 52, 60, 85, 93, 110, 141, 151, 172, 180, 232, 258, 347, 355, 361, 375, 417, 542, 570, 683

Verification, of trigonometric identities, 850, 853, 876

Vertex

- of an ellipse, 609
- of the graph of an absolute value function, 122
- of the graph of a quadratic function, 249, 250
- of a hyperbola, 615
- of a parabola, 595, 642

Vertex form

- of a quadratic function, 250–252, 285
- writing, 306

Vertical asymptote, 540

Vertical line

- graph of, 85
- slope of, 76

Vertical line test, 68

Vertical translation, of trigonometric graphs, 839–840, 842–846

Visual Thinking, 96, 113, 119, 162, 254, 262, 278, 296, 406, 427, 428, 451, 514, 630, 772, 780, *See also* **Graphs; Manipulatives; Modeling; Multiple representations**

Volume, 916, *See also* **Formulas**

W.....

Whole numbers, 3

X.....

- x-coordinate**, 67
- x-intercept**, 84
 - of the graph of a polynomial function, 373
 - of sine and cosine functions, 832
 - of a tangent function, 834
- x-values, critical**, 302

Y.....

- y-coordinate**, 67
 - of a turning point, 374
- y-intercept**, 82
 - linear equations and, 91

Z.....

- z-axis**, 170
- Zeno's paradox**, 679
- Zero exponent property**, 323, 407
- Zero matrix**, 199
- Zero product property**, 257
- Zeros**
 - approximating, 368
 - complex, 367
 - of a polynomial function, 354, 373, 390
 - finding, 367
 - finding the number of, 366
 - of a quadratic function, 259

