

# Index

## A

**Absolute value**  
 explanation of, 40, 81–82  
 of slope of lines, 453

**addition**  
 applications involving, 43  
 associative law for, 506–508, 570  
 commutative law for, 238, 505–509, 570  
 English phrases for, 19  
 of fractions, 28–30, 81  
 of left and right sides of two equations, 340  
 of polynomials, 390–392  
 of real numbers with different sign, 41–43, 82  
 of real numbers with same sign, 40–41, 82

**Addition property of equality**  
 explanation of, 518–519, 571  
 to solve linear equations in one variable, 519, 522

**Addition property of inequality**, 558–559

**Addition Rule**  
 for disjoint events, 301–303  
 general, 303–306

**AND**, 137–138, 208

**approximately exponentially related**, 634

**approximate solutions, quadratic formula and**, 548

**Approximation, of square roots**, 67–68

**area**  
 of part of object, 73  
 of rectangle, 3  
 of rectangular objects, 481–483  
 solving problems, 482

**Arithmetic mean. *See* Mean**

**Associations**  
 characteristics of, 389–391, 424  
 correlation coefficient and, 384–386  
 direction of, 369–373, 424, 449–450  
 exact, 383, 424  
 explanation of, 369, 424  
 between explanatory and response variables, 369  
 linear, 381, 384–386, 401–411, 424, 445–447 (*See also* Linear association)  
 lines to model, 401–403  
 negative, 369, 370, 424  
 no, 382–383  
 nonlinear, 382, 384, 424, 450  
 outliers and, 386–389  
 positive, 369, 370, 424  
 review of, 424–425  
 shape of, 381–383  
 strength of, 383–384, 424

**strong**, 383, 389–391, 424  
**weak**, 383, 389–391, 424

**associative laws**  
 for addition, 506–508, 570  
 for multiplication, 189, 507–508, 570  
 use of, 508

**asymptotes**  
 horizontal, 720

**average. *See also* mean**

**axis**  
 of symmetry, 393  
 $x$   
   in graphs of exponential functions, 620  
   as horizontal asymptote, 720  
   reflecting quadratic function graphs across, 496

**Axes**  
 of coordinate systems, 367, 423  
 explanation of, 8

## B

**Bar graphs**  
 frequency, 135–137  
 impact of starting value of vertical axis of, 195–198  
 multiple, 139–141, 208  
 relative frequency, 136–139, 208

**base**  
 $e$ , 715

**base multiplier property**  
 definition, 618  
 for equations of exponential functions, 626–627  
 for exponential models, 634–636

**Bimodal distribution**  
 explanation of, 182, 209  
 mean and median of, 228–229

**binomials**  
 definition, 400  
 multiplication of, 402

## C

**Categorical variables**  
 explanation of, 131–132, 208  
 frequency distribution of, 133, 208  
 relative frequency distribution of, 135

**Category, frequency of**, 132–133, 208

**Center. *See also* Measures of center**

**Center of distribution**, 209

**Change. *See* Rate of change**

**Charts, pie**, 147–149, 209

**Class width, of histogram**, 194–195

**coefficients**  
 explanation of, 511

**leading**  
 definition, 389  
 factoring with negative, 452

**combined like terms**  
 definition, 389  
 polynomials, 389–390  
 common logarithm, 679

**Commutative laws**  
 for addition and multiplication, 505–509, 570  
 use of, 508

**Complement**, 299

**Complement Rule**  
 explanation of, 299–300  
 use of Multiplication Rule with, 318

**complex numbers**  
 definition, 533  
 in square root property for solving quadratic equations, 532–533

**composite functions**  
 definition, 656–657  
 equations of, 658–659  
 evaluating, 658  
 for modeling, 661–662  
 tables for, 658

**Compound inequalities**  
 explanation of, 10–11  
 substituting values for variables in, 564

**Conditional probability**  
 explanation of, 311–312  
 method to find, 312–314  
 thinking critically about, 313

**constant of proportionality**, 806

**constant rate of change**, 177, 445–447

**Constants**, 3, 80

**constant terms**, 506

**negative**, 444–445  
**positive**, 442–444  
**trinomials with**, 442–444

**Continuous variables**, 209

**coordinates**  
 explanation of, 8, 80  
 method to find, 408  
 $x$ -coordinates, 507

**Coordinate system**  
 columns of tables and axes of, 367, 423  
 explanation of, 8  
 plotting points on, 8–9

**Correlation**, 369. *See also* Associations

**Correlation coefficient, linear**, 384–386, 424

**counting numbers**, 3, 80

**powers**, 388

**cubes**, 65  
 factoring differences of, 462  
 factoring sums of, 462

**cubic equations**

in one variable, 473–474  
 solution set of, 474  
 solving by factoring, 473

**cubic function**  
 definition, 394  
 graphs of, 394  
 $x$ -intercepts on, 474

## D

**data**  
 displayed in tables, 638–639  
 displayed in words, 637–638  
 explanation of, 6, 80  
 graphing, 6–7  
 misleading graphical displays of, 194–200, 210

**modeling**  
 exponential function for, 634–641  
 rate of change for, 348–349  
 systems of linear equations for, 347–350  
 tables for, 347

**decimals**  
 converting between percent and, 55–56, 82  
 in equations, 531  
 in linear inequalities, 563  
 solving equations containing, 211, 531  
 writing numbers as, 74

**decreasing curves, in functions**, 256, 480

**Decreasing lines, slope of**, 451–452

**decreasing order**, 388

**decreasing property**, 618

**degree**  
 of polynomials, 389  
 of terms, 389

**Denominators**  
 explanation of, 4, 28–29  
 least common, 29

**Density**, 178

**Density histograms**  
 explanation of, 178, 209, 247  
 finding probabilities with, 292–293  
 finding proportions with, 179–181  
 interpreting, 178–179

**Dependent events**, 314, 315

**dependent systems**  
 elimination for, 343  
 graphs of, 326–327  
 substitution for, 336–337

**Dependent variables. *See* Response variables**

**difference function**  
 definition, 394  
 modeling with, 395–396

**Direction, of association**, 369–373, 424, 449–450

## I-2 Index

- Discrete variables  
 explanation of, 209  
 discriminant, 550  
 Disjoint events  
 Addition Rule for, 301–303  
 explanation of, 300  
 finding probability involving, 300–301  
 Distributions. *See also* Normal distributions  
 bimodal, 182, 209  
 center of, 209  
 histograms and shape of, 181–184  
 histograms and spread of, 184–185  
 multimodal, 182, 209  
 skewed-left, 183, 210  
 skewed-right, 183, 210  
 symmetric, 183, 227, 246–248  
 unimodal, 181–183, 209, 227, 246–248  
 Distributive law  
 associative law for multiplication vs., 509  
 explanation of, 508, 570  
 to solve linear equations, 529  
 use of, 508–510  
 Division  
 English phrases for, 19  
 of fractions, 24–25, 27–28, 81  
 of real numbers, 59–60  
 by zero, 5, 24  
 domain  
 explanation of, 477  
 of exponential function, 621  
 of linear model, 486  
 of quadratic functions, 499–501  
 of relation, 477, 499  
 Dotplots  
 explanation of, 209
- E**  
 Elevation, 48–49  
 elimination  
 for dependent systems, 343  
 for inconsistent systems, 343  
 for solving systems of linear equations, 339–344  
 Empirical Rule  
 application of, 247–250  
 explanation of, 246–247  
 finding probabilities with, 293  
 empty set  
 solution, 326  
 English phrases/sentences  
 for mathematical expressions, 18–20  
 translated to and from mathematical expressions, 18–20, 48, 72, 513  
 equality  
 addition property of, 518–519, 522, 571  
 logarithm property of, 688  
 multiplication property of, 522, 571  
 Equally likely probability  
 formula, 288  
 Equal sign, 531  
 equations. *See also* linear equations; quadratic equations; linear equations in one variable; linear equations in two variables  
 addition of left and right sides of two, 340  
 comparing expressions and, 531–532  
 of composite functions, 658–659  
 cubic, 473–474  
 decimals in, 531  
 equivalent, 518  
 exponential, 712–715  
 of exponential curve, 630  
 of exponential functions, 626–631  
 exponential regression, 639  
 finding approximate, 579–580  
 formulas as, 221  
 of form  $ymxb$ , 244–, 256, 433–436, 462–464  
 fractions in, 520, 530–531  
 that describe functions, 477–478  
 general exponential, 690  
 for horizontal lines, 435  
 inverse function, 671–673  
 of line, 576–581  
 of line from y-intercepts, 151  
 logarithmic, 712–715  
 of linear models, 430–431, 465–469, 485–486, 584–590  
 to make predictions, 535–538  
 making predictions by solving, 535–538  
 polynomial, 468–476  
 of quadratic models, 501  
 Rule of Four for, 435–436, 498  
 solution of, 238, 431–432, 517–518  
 solution set of, 321–324, 474, 431, 517, 518  
 solving, in one variable, 691  
 for vertical lines, 435, 498, 580  
 Equivalent equations, 518  
 Equivalent expressions, 511, 570  
 errors  
 in estimation, 405–406, 430  
 when describing slope, 469  
 in simplifying expressions, 238  
 estimates and predictions  
 errors in, 405–406, 430  
 with exponential models, 715  
 factoring for, with quadratic models, 479  
 area of rectangular objects, 481–483  
 projectile motion in, 480–481  
 graphs of systems of linear equations for, 325–326  
 linear models to make systems of, 325–326  
 models used for, 403–406, 535–536  
 power property for, 694–697  
 with quadratic models in vertex form, 531–532  
 solving equations to make, 535–538  
 solving systems of linear equations, 347–349  
 Evaluation  
 of expressions, 18, 20, 28, 71, 81, 510–511  
 of formulas, 547  
 of functions, 482–484  
 Events  
 dependent, 314, 315  
 disjoint, 300–303  
 explanation of, 287  
 impossible, 289  
 independent, 314–318  
 non-disjoint, 304–306  
 single-outcome, 289  
 sure, 289  
 Exact association  
 connection between constant rate of change and, 445–447, 498  
 explanation of, 383, 424  
 Exams. *See* Tips for Success  
 Experiments  
 random, 284  
 Explanatory variables  
 association of, 369, 370  
 correlation and, 369  
 identification of, 366  
 response variables and, 365–367, 423  
 exponential curve  
 equation of, 630  
 of exponential function, 617  
 exponential equations, 712–715  
 exponential functions  
 definition of, 602–603  
 domain of, 621  
 equations of  
 base multiplier property for, 626–627  
 in form of  $ab^2k$  for  $b$ , 627–628  
 left side and right side of, 630  
 one variable, 628  
 two points for finding, 629–631  
 evaluating, 611  
 graphs of, 622  
 with  $b > 1$ , 616–617  
 base multiplier property, 618  
 decreasing property, 618  
 exponential curve, 617  
 form of  $y = ab^2$  and  $y = -ab^2$ , 620–621  
 increasing property, 618  
 reflection property for, 620–621  
 x-axis in, 620  
 y-intercept of, 619  
 linear functions *versus*, 627  
 logarithmic functions and, 681  
 for modeling data, 634–641  
 range of, 621  
 exponential/logarithmic forms  
 property, 686–687  
 exponentially related, 634  
 exponential model  
 with base  $e$ , 715  
 base multiplier property for, 634–636  
 definition, 634  
 finding, using data in tables, 638–639  
 finding, using data in words, 637–638  
 half-life applications, 636–637  
 meaning of base of, 637  
 power property with, 694–697  
 predictions with, 715  
 regression, 640  
 selecting, 639–641  
 exponential/natural logarithmic forms property, 711  
 exponential regression curve, 639  
 exponential regression  
 equation, 639  
 Exponentiation, 64, 65  
 exponents  
 explanation of, 64–65, 82–83  
 integer, 597–606  
 properties of, 600  
 negative, 65–66  
 negative-integer, 83, 597  
 definition, 598  
 models with, 603–604  
 simplifying power expressions involving, 598–602  
 product property for, 400  
 properties of, 421  
 combinations of, 419–420  
 quotient property, 417  
 raising powers to powers, 419  
 raising product to power, 416  
 raising quotients to powers, 418–419  
 zero as exponent, 418  
 rational, 614  
 definition, 610–611  
 principal square roots in, 610  
 product property for, 612  
 properties of, 612–613  
 quotient property for, 612  
 raising power to power, 612  
 raising product to power, 612  
 zero as, 65, 82  
 expressions  
 associative laws to simplify, 507–509, 570  
 authentic quantities described with, 17  
 commutative laws to simplify, 505–509, 570  
 comparing equations and, 531–532  
 to describe quantities, 21  
 distributive laws to simplify, 508–510, 570  
 equivalent, 511, 570  
 evaluation of, 18, 20, 28, 71, 81

explanation of, 16–17, 81  
 methods to simplify, 505–513,  
 532, 570–571  
 power, 598–602  
 translating English phrases to  
 and from, 18–20, 48, 72, 513  
 use of table to find, 17  
 Extrapolation, 406–407, 425

## F

### factoring

cubic equations solved by, 473  
 difference of two squares,  
 445–446  
 differences of cubes, 462  
 GCF out, 449–451  
   opposite of, 452  
   then trial by error  
     factoring, 458  
 by grouping, 454  
   definition, 453  
   factoring GCF out and,  
     461–462  
   trinomials, 460–462  
 multiplication *versus*, 441  
 with negative leading  
   coefficient, 452  
 polynomial equations  
   cubic equations in one  
     variable, 473–474  
   factoring polynomials *versus*  
     solving, 475–476  
   more quadratic equations,  
     470–471  
   quadratic equations in one  
     variable, 468–469  
   solving by graphing, 474–475  
   *x*-intercepts in, 469–470  
 polynomial equations solved  
   by, 468–476  
 polynomials completely,  
 451–452, 459–460  
 for predictions with quadratic  
   models, 479–480  
   area of rectangular objects,  
     481–483  
 quadratic equations solved by,  
 471, 473  
 sums of cubes, 462  
 trinomials  
   of form  $ax^2 + bx + c$ , 456–462  
   of form  $x^2 + bx + c$ , 441–447  
   by grouping, 460–462  
   by trial and error, 456–460  
   with two variables, 445, 459

### Factors, 18

### formulas

evaluation of, 547  
 explanation of, 221, 545, 571  
 quadratic  
   approximate solutions  
     and, 548  
   definition, 546  
   real number solutions to,  
     550–551  
   for solving quadratic  
     equations, 545–553  
   *x*-intercepts in, 549

review of, 571–572  
 solved for variable, 547–551  
 with square roots, 551–552  
 statistics, 546–547  
 substituting values for some  
   variables in, 545–546  
 vertex, 509–511  
 Fraction bar, 4  
 fractions  
   addition of, 28–30, 81  
   applications for, 23  
   division by zero and, 24  
   division of, 24–25, 27–28, 81  
   equal fractions with negative  
     signs, 61  
   equations containing, 520,  
     530–531  
   explanation of, 23  
   least common denominators  
     of, 28–29  
   multiplication of, 24, 25, 81  
   prime factorization and,  
     25–26  
   as proportions, 31–34  
   in quadratic equations, 472  
   review of, 81  
   simplification of, 26–27, 81  
   subtraction of, 29–30, 81  
   units of quantities and, 34–35  
 Frequency. *See* Relative fre-  
   quency  
 Frequency bar graphs  
   explanation of, 135–136  
   relative, 136–139  
 Frequency distribution  
   of categorical variable, 133,  
     135, 208  
   example of, 133  
   of numerical variable, 175, 209  
 Frequency of category,  
 132–133, 208  
 Frequency of class, 175, 209  
 Frequency of observation, 209  
 Frequency tables, 133, 174–175  
 Function notation  
   explanation of, 482, 484, 499  
   used for predictions,  
     484–485, 537  
   use of, 485–486  
 functions  
   composite  
     definition, 656–657  
     equations of, 658–659  
     evaluating, 658  
     for modeling, 661–662  
     tables for, 658  
   cubic  
     definition, 394  
     graphs of, 394  
     *x*-intercepts on, 474  
   difference, 394  
     definition, 395  
     modeling with, 395–396  
   domain and range of, 477,  
     481, 486  
   evaluation of, 482–484  
   explanation of, 477, 499  
   exponential  
     definition of, 602–603

domain of, 621  
 evaluating, 611  
 function of, 626–631  
 graphs, 616–622  
   logarithmic function and, 681  
   range of, 621  
 graphs of, 478–483  
 identification of, 477–488  
 input and output of, 477  
 inverse  
   composing, 673–674  
   definition, 667–669  
   equations, 671–673  
   graphing, 670  
   one-to-one, 674  
   property of, 668  
   reflection property of, 670  
 linear, 479–480, 499, 534–535  
 logarithmic, 679–683  
   definition, 679, 680  
   exponential function  
     and, 681  
 for modeling a value  
   situation, 358  
 one-to-one, 674  
 product  
   definition, 404  
   for modeling, 404–405  
 quadratic  
   definition, 392  
   domain of, 499–501  
   graphs of, 392–393, 495–502,  
     506–514  
   maximum value, 511–514  
   minimum value, 511–514  
   modeling with, 552–553  
   range of, 499–501  
   standard form of, 392  
   review of, 499  
 Rule of Four for, 480, 499  
 sum, 394  
   definition, 395  
   modeling with, 395–396  
 tables for input and output  
   of, 263  
 vertical line test and, 478–479

## G

GCF. *See* greatest common factor  
 General Addition Rule, 304–306  
 general exponential equation, 690  
 graphs  
   bar, 135–141, 195–198, 208  
   of cubic function, 394  
   *x*-intercepts on, 474  
   of data on number line, 6–7  
   definition of, 432–433  
   that describe functions, 478  
   of equations of form  $y = mx + b$ ,  
     433–436, 462–464, 498  
   of equations of linear models,  
     436–438, 465–469, 498, 499  
   equations whose graphs are  
     lines, 435  
   of exponential functions,  
     616–622  
     with  $b > 1$ , 616–617  
     decreasing property, 618

form of  $y = ab^2$  and  $y = -ab^2$ ,  
 620–621  
 increasing property, 618  
 reflection property for,  
 620–621  
*x*-axis in, 620  
*y*-intercept of, 619  
 of functions, 478–483  
 graphing calculators  
   to find/verify intersection  
     point, 323  
   for quadratic equations, 470  
   for quadratic models, 479  
   for systems of linear  
     equations, 324–325  
 of inequalities, 10  
 of linear equations by solving  
   for  $y$ , 552–553  
 of linear equations in two  
   variables, 435, 572  
 of logarithmic functions, 682  
 of negative quantities, 8  
 of polynomial equations,  
 474–475  
 of quadratic equations, *x*-  
   intercepts on, 469–470  
 of quadratic functions, 392–393  
   in form  $f(x) = ax^2$ , 496–497  
   reflecting across *x*-axis, 496  
   in standard form, 506–514  
   translating, 497–499  
   using symmetric points to  
     find vertex, 506–509  
   vertex of, 499  
 of real numbers, 6  
 to solve linear equations in one  
   variable, 524–526, 533  
 of systems of linear equations  
   dependent, 326–327  
   empty set solution, 326  
   finding ordered pairs that  
     satisfy both of two given  
     equations, 322  
   graphing calculator for,  
     324–325  
   inconsistent, 326–327  
   infinite number of  
     solutions, 327  
   intersection point of, 326  
   to make predictions, 325–326  
   one-solution, 327  
 three-dimensional, 199–200  
 translating  
   horizontally, 497–498  
   vertically, 497  
 using vertex formula,  
 509–511  
 greatest common factor (GCF)  
   definition, 450  
   factoring out, 449–451  
   opposite of, 452  
   then factoring by grouping,  
     461–462  
   then trial by error  
     factoring, 458  
   in factoring polynomials  
     completely, 451  
 Grouping symbols, 68

## I-4 Index

**H**

half-life applications  
 definition, 636  
 for exponential models, 636–637

Hands-On Projects  
 Balloon Project, 497–498  
 Climate Change Project, 421–423, 495–498  
 Stocks Project, 79–80  
 Student Loan Default Project, 207–208

Histograms  
 class width of, 194–195  
 to compare two groups of data, 184–185  
 construction of, 175–176  
 density, 178–181, 209, 247, 292–293  
 as examples of models, 185–186  
 explanation of, 175  
 relative frequency, 176–178  
 review of, 209–210  
 shape of distribution and, 181–184  
 spread of distribution and, 184–185

horizontal asymptote,  $x$ -axis as, 720

Horizontal lines  
 equations for, 435, 498  
 slope of, 453, 454

Hypothesis testing, use of, 250

**I**

imaginary numbers  
 definition, 533  
 pure, 532  
 as solutions to quadratic formula, 549–550

imaginary units, 532

Impossible event, 289

inconsistent systems  
 elimination for, 343  
 graphs of, 326–327  
 substitution for, 336–337

increasing curves, in functions, 256, 480

increasing lines, slope of, 176, 451–452

increasing property, 618

Independent events  
 determining whether two events are, 314–315  
 explanation of, 314  
 Multiplication Rule for, 315–318

Independent variables. *See* Explanatory variables

Inequalities. *See also* Linear inequalities in one variable  
 addition property of, 558–559  
 compound, 10–11, 564–565  
 explanation of, 9–10, 80  
 graphs of, 10  
 linear, 560–564, 566

to make predictions, 566  
 methods to solve, 561–564  
 multiplication property of, 559–560  
 satisfying, 560  
 solution of, 560–561  
 solution set of, 561, 565

Inequality symbols, 9–10

Infinite, 3

inner terms, 457

Input  
 in domain of relation, 477  
 explanation of, 405, 425  
 of linear function for given output, 534–535  
 use of tables to find function, 483

integer exponents, 597–606  
 negative, 83, 597  
 definition, 598  
 simplifying power expressions involving, 598–602  
 properties of, 600

Integers, 3–4, 80

Intercepts  
 explanation of, 425  
 of graphs of linear equations, 434  
 of linear models, 409–420  
 of lines, 407–408, 425

interest problems  
 $r$  percent, compounded annually, 635

Interpolation, 406–407, 425

intersection point, 322  
 in graphs of systems of linear equations, 326  
 of linear models, 347

Interval notation, 10, 565

inverse functions  
 composing, 673–674  
 definition, 667–669  
 equations of, 671–673  
 three-step process for, 672  
 graphing, 670  
 one-to-one, 674  
 property of, 668  
 reflection property of, 670

Irrational numbers  
 explanation of, 5, 6, 67, 80  
 written as decimals, 5

**K**

$k$ th percentile, 209

**L**

LCD, 29, *See* least common denominator

leading coefficient  
 definition, 389  
 factoring with negative, 452

Least common multiple (LCM), 29

Left tail, 183, 210

like terms

combining, 511–512, 523  
 definition, 389  
 polynomials, 389–390  
 explanation of, 511, 570

Linear association  
 constant rate of change and exact, 445–447, 498  
 correlation coefficient and, 384–386  
 explanation of, 381, 424  
 modeling, 401–411 (*See also* Linear models)  
 scatterplots and, 386, 401–404, 424, 586, 587

Linear correlation coefficient, 384–386, 424

linear equations. *See also* systems of linear equations; Linear equations in one variable; Linear equations in two variables  
 making predictions by solving, 535–538, 571  
 point-slope form to, 580–581  
 slope-intercept method to find, 577–578  
 solving for  $y$  by graphing, 552–553  
 use of slope and point to find, 577–578  
 use of two points to find, 578–579

Linear equations in one variable. *See also* Equations; Linear equations  
 addition property of equality and, 518–519  
 decimals in, 531  
 distributive law to solve, 529  
 equivalent equations and, 518  
 explanation of, 517, 571  
 fractions in, 520, 530–531  
 graphing to solve, 524–526, 533  
 methods to solve, 520–523, 529–538, 571  
 percentage problems and, 523–524  
 satisfy, solution, solution set and solve for, 517–518  
 tables to solve, 526, 533

Linear equations in two variables. *See also* Equations; Linear equations  
 explanation of, 435  
 graphs of, 435, 572

linear functions. *See also* Functions  
 curves in graphs of, 480  
 explanation of, 479–480, 499  
 exponential functions versus, 627  
 input of, 534–535

Linear inequalities in one variable. *See also* Inequalities  
 addition property of, 558–559  
 decimals in, 563  
 to make predictions, 566  
 methods to solve, 561–564

multiplication property of, 559–560  
 satisfying, 560  
 solution of, 560–561  
 solution set of, 561

linear models. *See also* Models  
 domain and range of, 486  
 equations of, 430–431  
 estimates and predictions using, 403–406  
 example of, 403  
 explanation of, 403, 425  
 finding equations of, 430–431, 465–469, 485–486, 584–590  
 graphs of equations of, 436–438, 465–466, 499  
 input and output and, 405  
 intercepts of, 409–410  
 interpolation and extrapolation and, 406–407  
 intersection point of, 347  
 to make estimates and predictions, 325–326  
 model breakdown and, 52, 407  
 modification of, 410–411  
 slope to graph, 499  
 solved for one of its variables, 233, 550–551

lines  
 equations whose graphs are, 435  
 horizontal, 175, 435, 453, 454, 498  
 intercepts of, 407–408, 425  
 measuring steepness of, 452–453  
 method to find equation of, 464–465  
 perpendicular, 273  
 point-slope form to find equation of, 580–581  
 slope-intercept form to find equation of, 576–580  
 slope of, 450–454 (*See also* Slope)  
 used to model association, 401–403  
 vertical, 272, 435, 453–454, 498, 580

logarithmic equations, 712–715

logarithmic functions, 683  
 definition, 679, 680  
 exponential function and, 681  
 graphing, 682

logarithms  
 common, 679  
 definition, 679  
 for modeling situations, 682–683  
 natural, 711–716  
 definition, 711  
 power property of, 714  
 properties of, 713  
 quotient property of, 714  
 properties of, 680–681  
 of equality, 688  
 exponential/logarithmic forms, 686–687



- exponential/natural logarithmic forms property, 711
- power property, 687–688
- solving equations in one variable, 691
- Lurking variables
  - determining possible, 390–391
  - explanation of, 390
- M**
- Math class. *See* Tips for Success
- Mathematical expressions
  - English phrases for, 18–20
  - translated to and from English, 18–20, 48, 72, 513
- maximum point, 393
- maximum value
  - of quadratic functions, 511–514
- mean. *See also* average
  - of bimodal and multimodal distributions, 228–229
  - calculation of, 221
  - comparison of, 223–224
  - comparison of median and, 225–228
  - effect of outliers on, 225
  - explanation of, 220–221
  - as measure of center, 221
  - method to find, 222–223, 250
  - standard deviation and, 244–245, 250
- Measures of center
  - arithmetic mean and, 220–223
  - comparing mean and median and, 225–228
  - comparing mean of two groups of data and, 223–224
  - finding mean and median of bimodal and multimodal distributions and, 228–229
  - median and, 217–219
  - mode and, 230–231
  - sigma notation and, 219–220
- Measures of spread
  - comparing mean and standard deviation of two groups of data and, 244–245
  - Empirical Rule and, 245–250
  - range and, 240–241
  - range vs. standard deviation and, 251
  - standard deviation and, 241–244
  - unusual observations and, 250–251
  - variance and, 251
- Median
  - comparison of, 218–219
  - comparison of mean and, 225–228
  - effect of outliers on, 225
  - explanation of, 53–54, 217–218
  - method to find, 218
  - minimum point, 393
  - minimum value
    - of quadratic functions, 511–514
- Misleading graphical displays
  - impact of class width of histogram, 194–195
  - impact of starting value of vertical axis of bar graph or time-series plot, 195–198
  - nonuniform scaling, 198–199
  - review of, 210
  - three-dimensional graphs, 199–200
- Mode
  - explanation of, 230
  - as measure of center, 230–231
- Model breakdown, 407, 425
- modeling
  - composite functions for, 661–662
  - data
    - exponential function for, 634–641
    - rate of change for, 348–349
    - systems of linear equations for, 347–350
    - tables for, 347
  - with difference function, 395–396
  - exponential
    - with base  $e$ , 715
    - base multiplier property for, 634–636
    - definition, 634
    - finding, using data in tables, 638–639
    - finding, using data in words, 637–638
    - half-life applications, 636–637
    - meaning of base of, 637
    - power property with, 694–697
    - predictions with, 715
    - regression, 640
    - selecting, 639–641
    - intersection point of, 347
    - to make estimates and predictions, 325–326
  - logarithms for, 682–683
  - with negative-integer exponents, 603–604
  - product function for, 404–405
  - quadratic
    - definition, 479
    - equations of, 501
    - factoring for predictions with, 479–483
    - graphing calculator for, 479
    - predictions with, in vertex form, 531–532
    - in vertex form, 501–502
    - with quadratic functions, 552–553
  - quadratic regression, 640
  - rational
    - for percentage of quantity, 736
  - with sum function, 395–396
  - value problems with functions, 358
- Models. *See also* Exponential models; Linear models; Linear regression models
  - domain and range of, 486
  - equations of, 430–431, 465–469, 485–486, 499
  - explanation of, 185, 210, 403, 425
  - making predictions using, 403–405, 535–536
  - modification of, 410–411
- monomials
  - definition, 388, 400
  - multiplication of, 400–403
    - with polynomial, 401
- Multimodal distribution
  - explanation of, 182, 209
  - mean and median of, 228–229
- Multiple bar graphs
  - construction of, 140–141
  - explanation of, 139, 208
  - interpreting, 139–140
- multiplication
  - associative law for, 506–508, 570
  - of binomials, 402
  - commutative law for, 505–509, 570
  - English phrases for, 19
  - factoring *versus*, 441
  - of fractions, 24, 25, 81
  - of monomials, 400–403
    - with polynomials, 401
  - of polynomials, 400–406
    - two, 401–403
  - of real numbers with different signs, 57–58
  - of real numbers with same signs, 58–59
- Multiplication property of equality
  - explanation of, 520, 571
  - to solve linear equations in one variable, 520, 522
- Multiplication property of inequality, 559–560
- Multiplication Rule, for independent events, 316–318
- Multiplication symbol, 17
- Mutually exclusive events. *See* Disjoint events
- N**
- natural logarithms, 711–716
  - definition, 711
  - exponential/natural logarithmic forms property, 711
  - power property of, 714
  - properties of, 713
  - quotient property of, 714
- natural numbers. *See* counting numbers
- Negative association, 369, 370, 424
- negative constant terms, 444–445
- Negative exponents, 65–66
- negative-integer exponent, 597
  - explanation of, 83
  - definition, 598
  - models with, 603–604
  - simplifying power expressions involving, 598–602
- Negative integers, 4
- Negative numbers
  - explanation of, 7, 80
  - graphs of, 8
  - square root of, 67
  - subtraction of, 47–48
- Non-disjoint events, finding probabilities involving, 304–306
- Nonlinear association
  - explanation of, 382, 384, 424
  - rate of change and, 450
- nonlinear systems of equations, 951
- Nonnegative numbers, 7
- Nonpositive numbers, 7
- Nonuniform scaling, 198–199
- notation. *See* Symbols/notation
  - scientific, 604–606
  - standard decimal, 605
- Note taking, 13
- $n$ th power, 64
- Number line
  - compound inequalities on, 11
  - explanation of, 4
  - graphing data on, 6–7
  - graphing integers on, 4
  - real numbers on, 6
- numbers
  - complex
    - definition, 533
    - in square root property for solving quadratic equations, 532–533
  - counting, 3, 80
  - imaginary
    - definition, 533
    - pure, 532
    - as solutions to quadratic formula, 549–550
  - pure imaginary, 532
  - infinite number of, 3
  - integers, 3–4, 80
  - irrational, 5, 6, 67, 80
  - negative, 7, 8, 47–48, 80
  - opposite of, 39, 81
  - positive, 7, 80
  - prime, 25, 26
  - rational, 4–6, 80
  - real, 5–6 (*See also* Real numbers)
  - powers, 617
  - as solutions to quadratic formula, 550–551
  - in scientific notation, 605–606
- Numerator, 4
- Numerical variables
  - characteristics of distribution with, 185
  - explanation of, 131–132, 208
  - frequency distribution of, 175, 209
- O**
- Observations
  - frequency of, 209
  - typical, 210
  - unusual, 250–251

## I-6 Index

- one-to-one functions, 674
- operations. *See also* addition; division; multiplication; subtraction
- explanation of, 16
- order of, 68–72, 83
- strengths of, 69–70, 83
- with three rational expressions, 760
- Opposites, 39, 81
- OR, 137–138, 208
- ordered pairs
- describing authentic situations with, 366–367
- explanation of, 8, 430
- interpreting, 367, 372
- satisfying systems of linear equations, 322
- in table of solutions, 328
- values of, 366, 423
- Order of operations
- associative laws and, 507
- on calculator, 70–71
- evaluating expressions and, 71–72
- explanation of, 68–69, 83
- strengths of operations and, 69–70, 83
- Origin, 8
- Outliers
- association and, 386–389
- effect on mean and median, 225
- explanation of, 209
- sensitivity to, 225
- outer terms, 457
- Output
- in domain of relation, 477
- explanation of, 405, 425
- input of linear function for given, 534–535
- use of tables to find function, 483
- P**
- parabola, 481
- definition, 393
- maximum point of, 393
- minimum point of, 393
- vertex of, 393
- $x$ -intercepts of, 531
- Parentheses
- distributive law and, 510
- when evaluating expressions, 18
- Percentiles
- density histograms and, 180–181
- Percent/percentage
- applications of, 523–524, 536–537
- converting between decimals and, 55–56, 82
- explanation of, 54–55, 82
- method to find, 56–57
- Perfect square, 67
- Pie chart
- constructing and interpreting, 148–149
- explanation of, 147, 209
- finding probabilities with, 290–291
- Plotting points
- on coordinate system, 8–9
- on number line, 4
- Point-slope form
- explanation of, 580
- to find equation of line, 580–581
- to find linear equations, 580–581
- polynomial equations, factoring
- cubic equations in one variable, 473–474
- factoring, 468–476
- more quadratic equations, 470–471
- polynomials *versus* solving, 475–476
- quadratic equations in one variable, 468–469
- solving by graphing, 474–475
- $x$ -intercepts in, 469–470
- zero factor property for, 468
- polynomials
- addition of, 390–392
- combining like terms, 389–390
- cubic function, 394
- definition, 388
- degrees of, 389
- describing, 389
- difference function, 394–395
- factoring completely, 451–452, 459–460
- leading coefficient, 389
- multiplication of, 400–406
- with monomial, 401
- two, 401–403
- prime, 445
- quadratic functions, 392–393
- subtraction of, 391–392
- sum function, 394–395
- Positive association, 369, 370, 424
- positive constant terms, 442–444
- Positive integers, 4
- Positive numbers, 7, 80
- Power
- explanation of, 64
- power expressions, 598–602
- power property
- definition, 688
- with exponential models, 694–697
- for logarithms, 687–688
- of natural logarithms, 714
- for predictions, 694–697
- powers
- counting number, 388
- raising, to powers, 419, 612
- raising products to
- product property and, 416
- raising quotients to, 418–419
- real number, 617
- simplifying power expressions, 416
- predictions
- with exponential models, 715
- factoring for, with quadratic models, 479
- area of rectangular objects, 481–483
- projectile motion in, 480–481
- finding expression to make, 72–73
- graphs of systems of linear equations for, 325–326
- linear models to make
- systems of, 325–326
- power property for, 694–697
- with quadratic models in vertex form, 531–532
- solving linear equations to make, 535–538, 571
- solving linear inequalities to make, 566
- solving linear models to make, 403–406, 425
- solving systems of linear equations, 347–349
- use of function notation to make, 484–485, 537
- Prime factorization
- explanation of, 25–26
- simplifying fractions and, 26–27
- Prime numbers, 25, 26
- prime polynomials, 445
- principal  $n$ th root, 610
- principal square roots
- explanation of, 66–67, 83
- in rational exponents, 610
- squaring, 551, 571
- Probability
- calculation of, 288–289
- conditional, 311–314
- density histogram to find, 292–293
- to describe authentic situations, 56
- Empirical Rule to find, 293
- experiment and, 287
- explanation of, 283–284
- for normal distribution, (*See also* Normal curve; Normal distributions)
- pie chart to find, 290–291
- properties of, 289–290
- of randomly selecting a person not in a certain category, 298–299
- simulation to estimate, 284–287
- summary of rules for, 318
- Probability formula, equally likely, 288
- Procedure descriptions, 11–12
- product
- explanation of, 18
- function
- definition, 404
- for modeling, 404–405
- raising to power, 612
- product property and, 416
- product property
- for exponents, 400
- raising product to power, 416
- for rational exponents, 612
- projectile motion, 480–481
- Proportion
- density histogram to find, 179–181
- to describe authentic situations, 56
- explanation of, 31, 81
- methods to find, 31–33
- relative frequencies as, 133
- relative frequency bar graphs to find, 138–139
- relative frequency histogram to find, 176–178
- of the rest, 31–33, 139
- rounding of, 134
- tables to find, 33–34
- two-way tables to compute, 150–152
- pure imaginary numbers, 532
- Q**
- Quadrants, 8
- quadratic equations
- with fractions, 472
- graphing calculators for, 470
- graphs of,  $x$ -intercepts on, 469–470
- imaginary number solutions, 549–550
- methods for solving, 551–552
- quadratic formula for solving, 545–553
- solving, by factoring, 471, 473
- solving, in one variable, 468–469
- solving more, 470–473
- square root property for, 527–535
- complex numbers, 532–533
- solving in form of , 529–531
- solving in form of  $x^2 = k$ , 527–529
- solving in form of  $x^2 = k$ , where  $k > 0$ , 533–534
- $x$ -intercepts, 531
- quadratic formula
- approximate solutions and, 548
- definition, 546
- real number solutions to, 550–551
- for solving quadratic equations, 545–553
- $x$ -intercepts in, 549
- quadratic functions
- definition, 392
- domain of, 499–501
- graphs of, 392–393
- in form  $f(x) = ax^2$ , 496–497
- reflecting across  $x$ -axis, 496
- in standard form, 506–514
- translating, 497–499
- using symmetric points to find vertex, 506–509
- in vertex form, 495–502

- vertex of, 499
  - maximum value, 511–514
  - minimum value, 511–514
  - modeling with, 552–553
  - range of, 499–501
  - standard form of, 392
  - quadratic models
    - definition, 479
    - equations of, 501
    - factoring for predictions
      - with, 479
      - area of rectangular objects, 481–483
      - projectile motion in, 480–481
    - graphing calculator for, 479
    - predictions with, in vertex form, 531–532
    - in vertex form, 501–502
  - quadratic regression model, 640
  - Qualitative variables. *See* Categorical variables
  - Quantitative variables. *See* Numerical variables
  - Quantities
    - changes in, 45–46, 49–50, 82
    - converting units of, 34–35
    - description of, 17
    - expressions to describe, 21
    - percentage of, 56–57
    - ration of, 53–54
    - variables to represent, 2
  - quotient
    - explanation of, 18
    - raising to powers, 418–419
    - of real numbers, 60
    - of two fractions, 27
  - quotient property
    - for exponents, 417
    - of natural logarithms, 714
    - for rational exponents, 612
- R**
- Radical, 67
  - Radical expression, 67
  - radical equations
    - squaring property of equality, 861
  - Radical sign, 67
  - Radicand, 67
  - Random experiment
    - explanation of, 284
    - outcomes of, 288
  - Random variables, 291
  - range
    - calculation of, 241
    - explanation of, 240–241, 477
    - of exponential functions, 621
    - of model, 486
    - of quadratic functions, 499–501
    - of relation, 477, 499
    - standard deviation vs., 251
  - rate of change
    - constant, 445–447
    - direction of association and, 449–450
    - estimation of, 448–449
    - of linear association, 446–447
    - method to find, 443–445
  - review of, 498–499
  - for systems for modeling data, 348–349
  - use of rise and run to compute, 447–449
  - Rate of change formula, 444, 498
  - rational exponents, 614
    - definition, 610–611
    - principal square roots in, 610
    - product property for, 612
    - properties of, 612–613
    - quotient property for, 612
    - raising power to power, 612
    - raising product to power, 612
  - Rational numbers, 4–6, 80
  - Ratios
    - addition of, 40–43, 82
    - comparison of, 53–54
    - division of, 5–6, 59–60, 80
    - explanation of, 53
    - of real numbers, 60
    - multiplication of, 57–59
    - on number line, 6
    - ratio of, 60
    - subtraction of, 46–48, 82
    - unit, 53–54, 82
  - real numbers
    - powers, 617
    - as solutions to quadratic formula, 550–551
  - Reciprocal, 27, 34
  - Rectangle, area of, 3
  - rectangular objects, 481–483
  - reflection property
    - definition, 620
    - for graphs of exponential functions, 620–621
    - of inverse functions, 670
  - regression exponential model, 640
  - Relations
    - domain of, 499
    - explanation of, 477, 499
  - Relative frequency
    - to estimate probability, 285–287
    - estimation of, 137
    - explanation of, 133
    - rounding of, 134
    - sum of, 135, 175, 208, 209
  - Relative frequency bar graphs
    - construction of, 136–137
    - explanation of, 136, 208
    - finding proportions with, 138–139
  - Relative frequency distributions
    - of categorical variables, 135
    - example of, 134
  - Relative frequency histograms, 176–178
  - Relative frequency of class, 175, 209
  - Relative frequency tables
    - construction of, 134, 174–175
    - explanation of, 133–134
  - Residuals
    - sum of squared, 532
  - Response variables
    - association of, 369, 370
    - correlation and, 369
    - explanatory variables and, 365–367, 423
    - identification of, 366
  - Right tail, 183, 210
  - Rise, rate of change and, 447–448, 498
  - Rounding
    - probabilities, 304
    - of relative frequencies and proportions, 134
  - $r$  percent interest compounded annually, 635
  - Rule of Four, 327
    - for equations, 435–436, 498
    - for functions, 480, 499
  - Run, rate of change and, 447–448, 498
- S**
- Sample space, 287
  - Sampling. *See also* Simple random sampling
  - Satisfies
    - the equation, 517, 571
    - the inequality, 560, 572
  - satisfying
    - finding ordered pairs that satisfy both of two given equations, 322
    - systems of linear equations, 322
  - Scatterplots
    - construction of, 368–371, 425
    - direction of association and, 369–373
    - explanation of, 368, 424
    - linear association and, 386, 401–404, 586, 587
    - with outliers, 386–388
    - review of, 423–424
    - shape of association and, 381–383
    - strength of association and, 383–384
  - scientific notation
    - converting from standard decimal notation to, 75, 83
    - definition, 604–606
    - explanation of, 73–74, 83
    - standard decimal notation and, 605
    - writing numbers in, 74–75, 605–606
  - Sensitive to outliers, 225
  - set. *See also* solution set
  - simplifying
    - power expressions, 598–602
  - Simulation
    - estimating probability with, 284–287
    - explanation of, 284
  - Single-outcome event, 289
  - Skewed-left distribution
    - explanation of, 183, 210
    - mean and median in, 227
  - Skewed-right distribution
    - explanation of, 183, 210
    - mean and median in, 227
  - Slope
    - common error when describing, 469
    - compared between two lines, 452–453
    - to find equation of line from  $y$ -intercepts and, 465
    - to graph linear equations, 462–469, 499
    - to graph linear models, 499
    - of horizontal lines, 453, 454
    - of increasing and decreasing lines, 451–452
    - method to find, 462–463
    - of nonvertical line, 450–451
    - review of, 499
    - sketching line using  $y$ -intercept and, 462
    - used to find linear equation, 577–578
    - of vertical lines, 453, 454
  - Slope formula, 451
  - Slope-intercept form
    - explanation of, 463, 499
    - to find equation of line, 576–580
    - graph of equation in, 464
  - Solution
    - of equations, 431, 431–432, 517, 518, 517–518, 571
    - of inequalities, 561, 572, 572
    - Rule of Four and, 435–436
  - solution set
    - of cubic equations, 474
    - definition, 322
    - of systems of linear equations, 321–324
  - Spread, 184–185. *See also* Measures of spread
  - square
    - factoring difference of two, 445–446
  - Square, perfect, 6
  - square root property for solving quadratic equations, 527–535
    - complex numbers, 532–533
    - solving in form of, 529–531
    - solving in form of  $x^2 = k$ , 527–529
    - solving in form of  $x^2 = k$ , where  $k > 0$ , 533–534
    - $x$ -intercepts, 531
  - square roots
    - approximation of, 67–68
    - explanation of, 66
    - of negative numbers, 532
    - principal, 66–67, 83, 551, 571, 610
    - solving formula with, 551–552
  - standard decimal notation, 605
  - Standard deviation
    - comparing mean and, 244–245
    - explanation of, 242–243
    - method to find, 243–244
    - range vs., 251
  - standard form
    - definition, 392
    - graphs of quadratic functions in, 506–514
    - of quadratic functions, 392

## I-8 Index

## StatCrunch

applications for, 218–219,  
223–224, 229, 230, 241, 244

Statistics formulas, with summation notation, 546–547

steepness, 452–453. *See also* slope

## Stemplots

explanation of, 209

Strong association, 383, 424

Study time, 21

## substitution

for dependent systems, 336–337

for inconsistent systems,  
336–337

for solving systems of linear  
equations, 333–337

isolating a variable in, 335

of real numbers, 46–48, 82

## subtraction

of polynomials, 391–392

## sum function

definition, 394

modeling with, 395–396

## Summation notation

explanation of, 219–220

statistics formulas with,  
546–547

Sum of relative frequencies, 135,  
175, 208, 209

## Sure event, 289

## Symbols/notation

equal sign, 531

fraction bar, 4

function notation, 482–486,  
499, 537

grouping, 68

inequality, 9–10

interval, 10, 565

multiplication, 17

radical, 67

scientific notation, 73–75, 83

summation notation, 219–220,  
546–547

## Symmetric distribution

Empirical Rule and, 246–248

explanation of, 183

mean and median in, 227

## symmetry

axis of, 393

symmetric points for finding  
vertex, 506–509

systems of inequalities in two  
variables, . *See also*  
inequalities

systems of linear equations,  
321–328. *See also* linear  
equations

comparing solution methods,  
343–344

definition, 321

elimination to solve, 339–344

dependent systems, 343

inconsistent systems, 343

graphing calculators for,  
324–325

graphs of

dependent, 326–327

empty set solution, 326

finding ordered pairs that  
satisfy both of two given  
equations, 322

graphing calculator for,  
324–325

inconsistent, 326–327

infinite number of

solutions, 327

to make predictions, 325–326

one-solution, 327

intersection point of, 326

for modeling data, 350

rate of change for, 348–349

solving to make predictions,  
347–349

table of data for, 347–348

solution set of, 321–324

substitution to solve, 333–334

dependent systems, 336–337

inconsistent systems, 336–337

isolating a variable in, 335

table of solution for, 327–328

types of, 326–327

## T

tables, *See also specific types of  
tables*

columns of, 367, 423

for composite functions, 658

of data, 347

exponential model using data  
displayed in, 638–639

to find expressions, 17

to find input and output of  
functions, 483

to find proportions, 33–34

of solutions

ordered pairs in, 328

for systems of linear  
equations, 327–328

to solve equation in one vari-  
able, 526, 533–534

two-way, 149–152, 209

Technology. *See also* StatCrunch;  
TI-84

## terms

constant, 506

negative, 444–445

positive, 442–444

trinomials with, 442–444

definition, 388

degrees of, 389

explanation of, 506

inner, 457

like, 511–512, 523, 570, 571

like terms, combining

definition, 389

polynomials, 389–390

order of, 507

outer, 457

unlike, 511

variable, 506

## TI-84

to graph linear models, 466, 467

to solve formula for a variable,  
548–549

## Time-series plots

explanation of, 209

impact of starting value of  
vertical axis of, 195–198

## Tips for Success

affirmations, 61

ask questions, 307

assignment completion, 454

breaks, 328

choose a good time and place  
to study, 294

complete the rest of the assign-  
ment, 231

cross-checks, 344

do five new study activities, 319

get in touch with classmates, 35

get the most out of working  
exercises, 187

graphing calculator

appendix, 125

make changes, 153

make good use of this text, 43

plan for final exam, 539

practice exams, 76

quiz retaking, 483

read your response, 201

re-reading problems, 350, 456

review material, 252, 675

review your notes as soon as  
possible, 50

study groups, 421

study time, 21

study with classmate, 142

summary writing, 337

take a break, 374

taking notes, 13

use 3-by-5 cards, 514

value of learning mathemat-  
ics, 412

verify your work, 590

working out with problem  
solving, 405, 487

write a summary, 391

trial and error, factoring by,  
456–470

factoring GCF out and, 458

possibilities ruled out while,  
458–460

## trinomials

definition, 400

factoring

of form  $ax^2 + bx + c$ , 456–462

of form  $x^2 + bx + c$ , 441–447

by grouping, 460–462

by trial and error, 456–460

with two variables, 445, 459

with positive constant terms,  
442–444

## Two-way tables

computing proportions with,  
150–152

explanation of, 149–150, 209

## U

## Unimodal distribution

Empirical Rule and, 246–248

explanation of, 181–183, 209

mean and median in, 227

Unit ratios, 53–54, 82

Units of quantity, method to  
convert, 34–35, 81

Unlike terms, 511

Unusual observations

explanation of, 250–251

## V

## variables

categorical, 131–135, 208

comparing constants and, 3

cubic equations in one, 473–474

describing values of, 11

for diagrams, 186, 210

discrete or continuous, 209

equations of exponential func-  
tions in one, 628

explanation of, 1–2, 12, 80

explanatory, 365–367, 369,  
370, 423

factoring trinomials with two,  
445, 459

isolating, 335

lurking, 390–391

numerical, 131–132, 185, 208

one variable equations involv-  
ing exponents, 628

quadratic equations in one,  
468–469

random, 291

to represent quantities, 2

response, 365–367, 369, 370, 423

solving equations in one, 691

solving quadratic equations in  
one, 468–469

## Variable terms

equations with, 523

explanation of, 506

## Variance, 251

## Venn diagram

explanation of, 299

General Addition Rule and,  
304–305

## vertex

form

graphing quadratic functions  
in, 495–502

quadratic models in,  
501–502, 531–532

formula, 509–511

of graph of quadratic function,  
499

of parabola, 393

symmetric points for finding,  
506–509

x-coordinate of, 507

Vertical axis, started at nonzero  
value, 195–196

## Vertical lines

equations for, 435, 498, 580

slope of, 453–454

Vertical line test, 478–479, 499

## W

Weak association, 383, 424



**X**

*x*-axis  
in graphs of exponential functions, 620  
as horizontal asymptote, 720  
reflecting quadratic function graphs across, 496  
*x*-coordinates  
of vertex, 507  
*x*-intercepts, 408, 425

in factoring polynomial equations, 469–470  
on graph of cubic function, 474  
on graph of quadratic function, 469–470  
of parabola, 531  
in quadratic formula, 549  
in square root property for solving quadratic equations, 531

**Y**

*y*-intercepts  
explanation of, 408, 425  
finding equation of line from slope and, 465  
in graph of  $y = mxb$ , 434  
of graphs of exponential functions, 619–620  
sketching line using slope and, 147, 462–469

**Z**

Zero  
division by, 5, 24, 81  
as exponent, 65  
zero exponent, 418  
zero factor property, 468