

Index

- Abbott, Edwin. A, 134; *quoted*, 129
Abul-Wefa (940–998 *a.d.*), 37, 41
Addition formulas, 93, 152, 154, 184
Agnesi, Maria Gaetana (1718–1799),
108–109; “witch,” 109–111
Ahmes (ca. 1650 *b.c.*), 4, 6–8, 10n.13,
11–14
A’h-mose. *See* Ahmes
Albategnius (al-Battani, ca. 858–929
a.d.), 37–38, 40n.5, 41
Almagest. *See* Ptolemy
Alpha Centauri (star), 77, 79n.15
Angles, 15–19
Arabs, 35, 37, 39
Arago, François Jean Dominique
(1786–1853), *quoted*, 198
Archimedes of Syracuse (ca. 287–212
b.c.), 66, 119
Aristarchus of Samos (ca. 310–230
b.c.), 23, 63–65
Arithmetic-geometric mean theorem,
47, 153
Artillery, 51–52
Aryabhata (475–ca. 550 *a.d.*), 35, 37,
41; *Aryabhatiya*, 35
Astroid, 98–99, 100–101, 106n.2, n.3
Atlas, 171, 180n.4
‘A-user-Re’ (ca. 1650 *b.c.*), 4
Azimuthal equidistance projection,
69–70, 136–138, 169

Babylonians, 15, 20, 30, 33–34, 87
Barrow, Isaac (1630–1677), 178, 218
Batter, 8
Bernoulli family, 53, 81, 99, 161;
Daniel (1700–1782), 53, 99; Jacob
(1654–1705), 58
Bessel, Friedrich Wilhelm
(1784–1846), 75–78; equation,
77–78; functions, 77–78, 79n.16
Binomial coefficients, 154–156
Bonaparte, Napoleon (1769–1821), 3,
73, 199; *quoted*, 3
Bond, Henry (seventeenth century),
178

Bonger, Pierre (1698–1758), 71
Bowditch, Nathaniel (1773–1838), 147
Brahe, Tycho (1546–1601), 46

Cajori, Florian (1859–1930), *quoted*,
16, 59, 112
Cardioid, 101, 107n.6
Cardano, Girolamo (1501–1576), 85
Carnot, Lazar Nicolas Marguerite
(1753–1823), 198; Nicolas Léonard
Sadi (1796–1832), 198
Caroll, Lewis (Charles Lutwidge
Dodgson, 1832–1898), *quoted*, 165
Cassini family, 69–73; César
François (1714–1784), 71;
Jacques (1677–1756), 70–71;
Jean Dominique (1625–1712),
69–70, 79n.11; Jean Dominique IV
(1748–1845), 71–73
Champollion, Jean François
(1790–1832), 4
Champollion-Figeac, Jacques Joseph,
200
Chase, Arnold Buffum (1845–1932),
4, 9, 14n.1; *quoted*, 8–9
Circles of latitude (“parallels”),
166–167, 171–174
Circles of longitude (meridians),
166–167, 171–174
Circular motion, 97
Clairaut, Alexis Claude (1713–1765),
71
Clark, Alvan Graham (1832–1897), 77
Collins, John (1625–1683), 178
Colson, John (d. 1760), 109
Columbus, Christopher (1451–1506),
24, 43
Complex numbers, 53, 83–86,
181–185, 191n.1
Compound tone(s), 207–208
Condamine, Charles Marie de la
(1701–1774), 71
Conformal mapping(s), 168, 171–172,
174, 179, 186, 188–189

- Convergence, 141–142, 159, 162, 164n.12, n.13, 202, 209n.3, n.4
- Copernicus, Nicolas (1514–1576), 45–46, 63, 75, 104
- Cosecant, 33, 37, 51, 214–215
- Cosine, 37, 54, 90, 114, 122, 150, 200–203, 205–206, 209, 210n.9, n.14; defined as projection, 213; infinite product for, 157; notation for, 37, 38, 51; of complex values, 184; origin of name, 37; power series for, 156
- Cotangent, 20–21, 37–38, 40n.5, 51, 161, 213, 217n.1
- Cotes, Roger (1682–1716), 52, 80, 82, 182–183, 191n.2
- “Counterclockwise clock,” 17–18
- Cubic equation, 85, 86n.5
- Cubit (Egyptian unit of measurement), 6, 8
- 61 Cygni (star), 76–77, 79n.15
- Cylindrical projection, 166–167, 176
- D’Alembert, Jean-le-Rond (1717–1783), 53
- Dantzig, Tobias (1884–1956), *quoted*, 139
- Deferent, 104
- Degree, 15–16; of latitude, 68–72, 172–173
- De Moivre, Abraham (1667–1754), 52, 80–86, 183; *quoted*, 83; theorem, 52–53, 83, 86n.3, 156, 181, 198
- Descartes, René (1596–1650), 50, 56, 61n.7, 70, 198; rule of signs, 199
- Dirichlet, Peter Gustav Lejeune (1805–1859), 132; discontinuity factor, 133; integral, 132
- Double-angle formulas, 90, 146, 161
- Double generation theorem, 99–102, 106n.5
- Dürer, Albrecht (1471–1528), 48, 151, 162n.2
- Eclipses, 20; lunar, 43; solar, 64–66, 78n.3
- Egyptian mathematics, 5–14; multiplication, 11–13
- Einstein, Albert (1879–1955), 86
- Eisenlohr, August, 4
- Elementary functions, 132
- Ellipse(s), 98–99, 106n.2, 146, 187
- Ellipsograph, 104, 105, 106n.2
- Epicycles, 23, 103–104
- Epicycloids, 95, 101–102
- Equal-tempered scale, 210n.12
- Eratosthenes of Cyrene (ca. 275–194 *b.c.*), 66–68
- Escher, Maurits Cornelis (1898–1972), *Smaller and Smaller* (1956), 119, 121; *Sphere Surface with Fish* (1958), 170
- Euclid (third century *b.c.*), 15; *Elements* (the Thirteen Books of Euclid), 24–25, 87, 119–121
- Euler, Leonhard (1707–1783), xiii, 52–53, 128n.6, 150, 156, 160–162, 163n.7, 165, 179, 182–183, 185, 190; formula ($e^{i\phi} = \cos \phi + i \sin \phi$), 52, 150, 198; formula ($\phi^2/6 = \sum_{n=1}^{\infty} 1/n^2$), 160, 205; formulas (integration), 203; *Introductio in analysi infinitorum* (1748), 52–53
- Everest, Sir George (1790–1866), 73–74; Mount, 74–75, 79n.13.
- Exponential function (e^x), 188–189
- Fejér, Lipót (1880–1959), 116
- Fermat, Pierre de (1601–1665), 50, 110
- Ferro, Scipione del (ca. 1465–1526), 85
- Fibonacci (Leonardo Pisano, ca. 1170–ca.1250), 14, 39
- Fincke, Thomas (1561–1646), 38
- Finger (Egyptian unit of measurement), 8
- Finite-difference equation, 174–175, 178
- Fourier, Jean Baptiste Joseph (1768–1830), 3, 54, 198–200, 209n.1; analyzer, 208; integral, 209; series, 54, 200–206, 209, 210n.14; theorem, 198, 200–210
- Fractals, 119–120
- Friedmann, Aleksandr (1888–1925), 86
- Frisius, Cornelius Gemma (1535–1577), 79n.8
- Frisius, Gemma (Regnier, 1508–1555), 68, 79n.8
- Fundamental frequency, 205, 207
- Fundamental theorem of algebra, 190
- Gamow, George (1904–1968), *quoted*, 117
- Gassendi, Pierre (1592–1655), 41–42, 48n.4

- Gauss, Carl Friedrich (1777–1855), 36–37, 112, 190, 196n.1
- Geodesy, 68–69, 73
- Geometric progressions, 5, 11, 13–14, 117–128, 141, 163n.10
- Geometry, meaning of word, 63
- Gherardo of Cremona (ca. 1114–1187), 35
- Gillings, Richard J., quoted, 13, 14
- Girard, Albert (1595–1632), 37
- Gnomon, 20–22, 37–38
- Golden section, 222
- Gradian, 16
- Grandi, Luigi Guido (1671–1742), 110–111
- Great circle, 136, 177
- Great Trigonometrical Survey of India, 73–75
- Greeks, 26, 63, 67, 102–104, 117–119, 121–122, 127
- Gregory, James (1638–1675), 159, 178; series, 159, 205
- Gunter, Edmund (1581–1626), 36, 37, 38, 178
- Habash al-Hasib (Ahmed ibn Abdallah al-Mervazi, d. ca. 870 *a.d.*), 37
- Hadamard, Jacques Salomon (1865–1963), 196n.1
- Half-angle formulas, 90, 140
- Halley, Edmond (1656–1742), 80–81, 178
- Hamilton, Sir William Rowan (1805–1865), 190
- Harmonic mean, 209, 210n.13
- Harmonic series, 208–209
- Harmonics, 205, 207–209, 210n.10
- Harmonograms, 149
- Hebrew University of Jerusalem, 192
- Helmholtz, Hermann Ludwig Ferdinand von (1821–1894), 208
- Henry IV, King of France (1553–1610), 56, 58
- Herodotus (ca. 450 *b.c.*), 20
- Hillary, Sir Edmund (1919–), 79n.13
- Hindu-Arabic numerals, 39, 178
- Hindus, 35–36, 40n.1, 54n.1
- Hipparchus of Nicaea (ca. 190–120 *b.c.*), 22–24, 65–66, 94, 167
- Hooke, Robert (1635–1703), 52
- Huygens, Christiaan (1629–1695), 52, 62n.7, 81
- Hyperbola(s), 186, 188, 191n.3
- Hyperbolic functions, 183, 191n.3
- Hypocycloids, 95–99, 101–102
- Imaginary numbers, 52, 181–183, 190, 191n.1
- Infinite products, 50, 51, 61, 140–141, 156–158, 163n.7, 221
- Infinite series, 156, 159, 161, 164n.12, 221. *See also* Power series
- Infinity and infinite processes, 117–118, 122, 124, 127, 128n.9, 140, 152, 162, 168, 204
- Inverse tangent ($\tan^{-1} x$), 159, 163n.10
- Inversion, 168
- Jaki, Stanley L., *quoted*, 63
- Jupiter, 70, 177
- Kästner, Abraham Gotthelf (1719–1800), 53, 55n.5
- al-Khowarizmi, Mohammed ibn Musa (ca. 780–ca. 840 *a.d.*), 39
- Kline, Morris, 18n.5
- Koch, Helge von (1870–1924), 120; curve, 120
- Kovalevsky, Sonia (1850–1891), 108
- Lambton, Captain William (1753–1823), 73
- Landau, Edmund Yehezkel (1877–1938), 192–197; *Differential and Integral Calculus* (1934), 193, 194, 196; *Foundations of Analysis* (1930), 193–194, 195
- Law of Cosines, 152, 216–217
- Law of Sines, 40, 44, 68, 87–91, 142–143, 152, 216–217
- Law of Tangents, 57–58, 152, 162n.3
- Leibniz, Gottfried Wilhelm Freiherr von (1646–1716), 36, 80, 127, 159
- L'Hospital, Guillaume François Antoine (1661–1704), 108, 163n.9
- Limit, 118, 122, 127, 132, 141–142, 162. *See also* Convergence
- Lindemann, Carl Louis Ferdinand (1852–1939), 192
- Lissajous, Jules Antoine (1822–1880), 145, 146–147, 149; figures, 145–149
- Logarithm, 52, 177, 178, 179, 189, 190, 218–219
- Loomis, Elisha Scott, 92, 94n.4
- Loxodrome. *See* Rhumb line
- Lunar dichotomy, 63–64

- Magellan, Ferdinand (ca. 1480–1521), 68
- Mapping(s), 185–189, 191n.6;
conformal, *see* Conformal mapping(s)
- Map projections, 24, 69–70, 165–180, 189
- Mascons, 74
- Mathias Huniades Corvinus, King of Hungary, 43
- Maupertuis, Pierre Louis Moreau de (1698–1759), 70–72
- Mercator, Gerardus (Gerhard Kremer, 1512–1594), 165, 171–174, 177, 180n.3, n.4, n.6; projection, 167, 171–180, 189; *quoted*, 173
- Mercator, Nicolaus (ca. 1620–1687), 178
- Meridians. *See* Circles of longitude
- Mersenne, Marin (1588–1648), 128n.6; primes, 128n.6
- Minkowski, Hermann (1864–1909), 192
- Minute (of arc), origin of word, 16
- “Mistakes,” 152, 162n.4
- Monge, Gaspard (1746–1818), 198, 199
- Moore, Sir Jonas (1617–1679), 37
- Moscow Papyrus, 9n.5
- Musical intervals, 206, 208–209, 210n.12
- Napier, John, Laird of Merchiston (1550–1617), 50, 177–178, 180n.9
- Napoleon, Bonaparte. *See* Bonaparte
- Navier, Claude Louis Marie Henri (1785–1836), 199
- Navigation, 169–171, 173–174, 177
- Negative numbers, 181, 190, 191n.1
- Ne-ma’et-Re’ (ca. 1800 *b.c.*), 4
- Neptune, 78
- “New Math,” xii, 213
- Newton, Sir Isaac (1642–1727), 23, 70–71, 80, 156, 182, 199; law of cooling, 199; *quoted*, 87
- Newton, John (1622–1678), 37
- Nicholas of Cusa, Cardinal (1401–1464), 41
- Noether, Emmy (1882–1935), 108
- Norwood, Richard (1590–1665), 38
- Number theory, 34, 119, 121, 192
- Numerical integration, 174–175
- Núñez, Pedro (1502–1578), 170
- Oblate spheroid, 68, 70
- Ortelius, Abraham (1527–1598), 180n.4
- Orthogonality relations, 202
- Oscillations, 52. *See also* Vibrations
- Oscilloscope, 145
- Oughtred, William (1574–1660), 36, 38, 50–51
- Pi (π), 6, 10n.13, 40n.1, 51, 52, 54n.1, 61n.4, 99, 140–141, 150, 157–162, 192, 197n.5
- Palm (Egyptian unit of measurement), 8
- Parabola, 119, 146
- Parallax, 65, 69, 75–77
- “Parallels.” *See* Circles of latitude
- Partial fractions, decomposition into, 157–158, 178, 218–219
- Pascal’s tangent triangle, 154
- Peet, Thomas Eric, 4
- Perfect numbers, 121, 128n.6
- Periodic functions, 52, 54, 150, 162n.1, 188, 200–210
- Perspective, 150–151
- Peurbach, Georg von (1423–1461), 39, 41–42, 44
- Picard, Abbé Jean (1620–1682), 69
- Pitch (musical), 206, 210n.8
- Pitiscus, Bartholomäus (1561–1613), 40
- Plimpton* 322, 30–34
- Poncelet, Jean Victor (1788–1867), 198
- Pope, Alexander (1688–1744), *quoted*, 81
- Power series, 119, 132, 156, 163n.10, 191n.4, 196, 209n.4, 221
- Prime Number Theorem, 192, 196n.1
- Probability, theory of, 81–82, 111n.7
- Product-to-sum formulas, 113, 202, 220–221
- Projections, 114–116, 141–142, 213–217. *See also* Map projections
- Prolate spheroid, 68–70
- Proper motion, 76
- Ptolemy (Claudius Ptolemaeus, ca. 85–ca. 165 *a.d.*), 24–25, 94; *Almagest*, 24–25, 27, 35, 41–42, 91; *Geography*, 24; theorem, 91–94; table of chords, 25–28, 91, 94, 198
- Pure tone(s), 207–208, 210n.9
- Pyramids, 3, 6–10, 22

- Pythagoras (ca. 572–ca.501 *b.c.*), 53, 66, 119
- Pythagorean Theorem, 24, 28, 30, 92–93, 94n.4, 196
- Pythagorean triples, 30–34
- Quadrant (surveying instrument), 69
- Radian, 16–17
- Ramus, Peter (1515–1572), 49n.5
- Rayleigh, Lord (John William Strutt, 3rd Baron, 1842–1919), 146
- Regiomontanus, Johann (Müller, 1436–1476), 39, 40–44, 45–46, 48, 49n.5, n.6, 162n.3; *Ephemerides* (1474), 43; *On Triangles of Every Kind* (1464), 39, 43, 44–46
- Regular pentagon, 222
- Repeating decimals, 119, 122
- Resonators, 208
- Retrograde motion, 102–104
- Rhæticus, Georg Joachim (1514–1576), 37, 45–46
- Rhind, A. Henry (1833–1863), 3; Papyrus, 3–14
- Rhumb line (loxodrome), 170, 177, 179n.2
- Roder, Christian, 46
- Roemer, Olaus (1644–1710), 104
- Roomen, Adrian van (1561–1615), 58, 60
- Rosetta Stone, 3–4
- Rule of false position, 6
- Saturn, 69, 79n.11, 177
- Schooten, van, Frans Jr., (1615–1660), 61; Frans, Sr. (1581–1646), 61n.7; Petrus (1634–1679), 61n.7
- Secant, 37, 38, 51, 172, 174–175; defined as projection, 214–215; integral of, 174, 176, 178, 218–219
- Second (of arc), 16
- Seked, 6–8, 10n.14
- Sexagesimal system, 15, 26, 28, 30–34
- “Shadow reckoning.” *See* Gnomon
- Sign function, 133
- Sikdar, Radhanath, 74
- Simple harmonic motion, 146–147, 207. *See also* Oscillations, Vibrations
- Simple tone(s). *See* Pure tone(s)
- Sine, 28, 35, 39–40, 41, 44, 54, 83, 90–91, 113–114, 122, 129–130, 139–140, 145–146, 150, 182, 200–206, 207, 209, 210n.9, n.14; defined as projection, 213; infinite product for, 156–157; notation for, 36–37, 38, 51; of complex values, 183–184, 186–188, 189–190, 191n.6; origin of name, 35–36; power series for, 156, 196; $(\sin x)/x$, 129–138, 139–144; special values of, 222–223
- Sine integral, 132–133
- Smith, David Eugene (1860–1944), 16
- Snell, Willebrord van Roijen (1581–1626), 68, 79n.9, 179n.2
- Snowflake curve. *See* Koch curve
- Sound, 145, 205–210
- Spectrum (acoustic), 207–208
- Spirograph, 95–96
- “Squaring the circle,” 10n.13, 181, 192. *See also* Pi (π)
- Stadium (Greek distance unit), 67, 78n.6
- Stereographic projection, 167–169, 179, 189
- Stirling, James (1692–1770), 82; formula, 82
- Summation formulas, 113–116
- Sum-to-product formulas, 57, 113, 152, 220–221
- Tangent, 36, 37–38, 40, 44, 114, 130, 150–164, 166; decomposition into partial fractions, 158; defined as projection, 213–214, 216, 217n.1; infinite product for, 157; notation for, 51; origin of, 37–38, 150
- Tartaglia, Nicolo (ca. 1506–1557), 85
- Telescopic series, 114, 163n.11
- Thales of Miletus (ca. 640–546 *b.c.*), 21–22, 87
- Theon of Alexandria (fl. ca. 390 *a.d.*), 23, 42, 44
- Theory of functions of a complex variable, 179, 181, 184, 186, 191
- Thomson, James, 17
- Trebizond, George of (1396–1486), 42, 44
- Triangle inequality, 216
- Triangulation, 68–75
- Trigonometric functions, defined as infinite series, 194, 196; as pure projections, 213–216; as pure numbers, 53; as ratios in a triangle, 91; on the unit circle, 38, 90–91. *See also* Cosecant, Cosine, Cotangent, Secant, Sine, Tangent

- Trigonometric tables, 23–28, 37–39, 40n.5, 41, 175, 178
- Trigonometry, analytic, 51–53, 82, 182, 198; origin of word, 20; “proto,” 9, 22
- Triple-angle formulas, 59, 106n.1
- Tyndall, John (1820–1893), 146
- Ulugh Beg (1393–1449), 41
- Unit circle, 38, 90–93, 213–216
- Unit fractions, 5–7, 10n.9
- Uranus, 78
- Vallée-Poussin, Charles de la (1866–1962), 196n.1
- Vanishing point, 152
- Vibrating string, 53, 205
- Vibrations, 145–149, 205–206. *See also* Oscillations
- Viète, François (1540–1603), xiii, 50, 56–62, 152; *In artem analyticam isagoge* (1591), 56–57; infinite product, 50, 61, 140–141; *quoted*, 50
- Wallis, John (1616–1703), 38, 51; product, 51, 80, 157–158, 163n.8
- Waugh, Captain Andrew, 74
- Wave equation, 53–54
- Weierstrass, Karl Wilhelm Theodor (1815–1897), 191n.4, 194; theorem, 194, 197n.4
- Wright, Edward (ca. 1560–1615), 174–178, 180n.9, n.10
- Young, Thomas (1773–1829), 4
- Zeno of Elea (fl. ca. 450 *b.c.*), 117, 127; paradoxes, 117–119, 122, 127, 128n.3