

Index

- $\exists\mathbb{R}$, 44, 177
- Abu-Khizam, Faisal N., 51
 Agarwal, Pankaj K., 61, 190
 Aichholzer, Oswin, 10, 34, 131
 Ailon, Nir, 59
 algorithm, 33
 Alimonti, Paola, 45
 Alon, Noga, 71
 alphabet, 88
 Anderson, David Brent, 73
 Anning, Norman H., 142
 anti-symmetry, **20**
 antichain, **21**, 22, 66, 123, 128, 135, 175, 201
 antimatroid, 164
 Apollonian network, 185, 186
 Appel, Kenneth, 45
 approximation ratio, 45, 67, 68, 70, 71, 75, 81–83, 98, 100, 118, 119, 130, 172, 196, 197, 209, 210
 APX, 45, 67, 75, 119, 172, 209
 area, 35
 Arkin, Esther M., 106, 117, 118, 130
 Aronov, Boris, 128
 arrangement of lines, 59, 62, 116, 177–179, 191, 193
 arrow symbol, 88, 90
 Aurenhammer, Franz, 10
 AVOIDS, 27–29, 31, 39, 48, 49, 52, 55, 72, 75, 106, 119, 120, 126, 171, 172
- Balko, Martin, 10
 Balogh, Jozsef, 93
 Bannister, Michael J., 151, 179, 181, 182
 Baran, Ilya, 60
 Barnett, Vic, 129
 Beck, József, 89
 betweenness, 14
 Bézout's theorem, 74
 binary relation, **20**
 binary search, 139
 BINOMIAL, 107–109
 binomial coefficient, 2, **107**
 bipartite graph, **168**, 173–175
 bitangent, 16, 17
 Björner, Anders, 11
 Borwein, Peter, 53
 bounded obstacles, **25**
 bounding box, 198
 Brahmagupta, 142
 Brandenburg, Franz J., 181, 182
 Bremner, David, 136
 Brinkmann, Gunnar, 184
 brute force search, 44, 51, 62, 77, 172, 184
 Bukh, Boris, 151, 157
 Burr, Michael A., 140
 Burr, Stefan A., 54, 55
- Cabello, Sergio, 184
 cap, **108**
 cap-set, 91, 92
 Carathéodory, Constantin, 106

- Carathéodory's theorem, 106, 125, 131
 Cardinal, Jean, 182, 184
 Cartesian coordinates, 16, 33, 34, 43, 117, 139, 151–154, 160
 ceiling, **151**, 151, 153, 154, 157
 centerpoint, 136, 137
 centroid, 113, 135
 Chan, Timothy M., 60, 136
 characteristic function, 24
 Chazelle, Bernard, 59, 129, 130, 190
 Chen, Dan, 136
 Chen, Jianer, 62, 171
 Cheng, Zhanpeng, 151, 181, 182
 Chervonenkis, Alexey Ya., 69
 chessboard, 73
 Chew, L. Paul, 36
 Chor, Benny, 14
 Chrobak, Marek, 181
 Chvátal, Václav, 115
 Clarkson, Kenneth L., 70
 clockwise, 10
 cocircular points, 147, 148
 COLLINEAR, 55, 56, 207
 complete bipartite graph, **168**, 176
 complete graph, **167**, 171, 176, 180, 185
 complete quadrilateral, 65
 configuration, **12**
 CONVEX, 106, 115, 125, 207
 convex cover number, 106
 convex hull, 1, 34, 111–113, 115, 122, 125, 126, 129–131, 133, 134, 136, 157, 194, 195, 207
 convex layers, 129
 convex polygon, 13
 convex position, 106, 125, 180
 CONVEX-PARTITION, 106, 111, 113–115, 117–121, 127, 131–134, 147, 150, 159, 187, 195, 208
 counterclockwise, 10
 cover order type, **201**
 Craggs, D., 73
 Croot, Ernie, 92
 cross-ratio, 142, 143
 crossing family, **128**
 Csima, Joseph, 54
 cup, **108**
 cycle graph, **168**, 175
 cyclic permutation, 10
 cyclic sequence, 23
 data depth, 136
 de Fraysseix, Hubert, 181, 182
 de Zeeuw, Frank, 148
 decision problem, 43
 DELETE-TO-CONVEX, 106, 113, 116, 120–124, 133, 136, 138, 139, 209
 DELETE-TO-GENERAL, 66, 67, 72, 75, 76, 79, 80, 82, 83, 120, 121, 172, 209
 Demaine, Erik D., 44, 60
 DEPTH, 137–140, 209
 determinant, 34
 Devanny, William E., 151, 179, 181, 182
 Dey, Tamal K., 18
 diagonal, 128
 Dickson, Leonard Eugene, 23
 Dickson's lemma, **23**, 201
 dimension, 87, 90, 91
 Diophantine equation, 144
 DIST, 142
 distinct distances, 6
 Dolev, Danny, 182
 domination, 22
 Donoho, David L., 136
 Downey, Rodney G., 46
 DRAWN, 25
 Dudeney, Henry, 72, 73
 Dujmović, Vida, 179
 Dumitrescu, Adrian, 67, 70
 duplicate detection, 43
 dynamic programming, 115, 134
 Eddy, William F., 129
 Edelman, David, 92
 Edelsbrunner, Herbert, 11, 58, 116
 egg, 53
 Ellenberg, Jordan S., 92
 elliptic curve, 55
 Ellmann, Gabor, 74
 entropy compression, 83
 Eppstein, David, 110, 134, 151, 178, 179, 181, 182
 equivalence of parameters, **30**
 equivalence relation, **12**

- Erdős, Paul, 1, 2, 49, 74, 80, 81, 106, 119, 128, 142, 158
 Erdős–Anning theorem, 142
 Erdős–Rado sunflower lemma, 49
 Erdős–Szekeres theorem, 158, 204
 Erdős–Ulam conjecture, 148, 149, 159
 Erickson, Jeff, 59
 Estivill-Castro, Vladimir, 62
 Euler, Leonhard, 144
 existential theory of the real numbers, 44
 exponential growth, 10
 exponential time hypothesis, 48, 171
- false negative, **39**
 false positive, **39**
 Fáry, István, 150
 Fáry's theorem, 150
 Fekete, Sándor P., 106, 117, 118, 130, 196
 Fellows, Michael R., 46
 finite plane, 74
 fixed-parameter tractable, 5, **46**, 61, 64, 66, 76, 78, 79, 101, 105, 164, 165, 176, 184, 201, 208, 209
 Flammenkamp, Achim, 73
 Flum, Jörg, 46, 49
 FORBIDDEN, 26–28, 40, 49, 55, 72, 106, 109, 125, 126
 Fortnow, Lance, 43
 four-color theorem, 45
 free point, 197, 202, 210
 Freimer, Robert Wilson, 196, 197
 Fulek, Radoslav, 151
 Füredi, Zoltán, 80, 88, 91
 Furstenberg, Hillel, 91
- Gajentaan, Anka, 59, 60
 Garey, Michael R., 95
 Gasko, Miriam, 136
 GENERAL-PARTITION, 87, 89–96, 98–101, 104, 105, 120, 121, 134, 209
 general position, 1, 10, **11**, 72, 83, 89, 141, 149, 150, 153, 200, 207, 209
 GENERAL-POSITION, 72, 207
 generalized node deletion, 171
 geometric measure theory, 194
 Gijswijt, Dion, 92
 Gil, Joseph, 140
 Giménez, Omer, 183
 Goddard, Wayne D., 128
 golden ratio, 54, 143
 Goldreich, Oded, 38
 Goodman, Jacob E., 6, 10, 33
 Goodrich, Michael T., 36
 Gordon, Gary, 91
 Gordon, Hannah, 91
 Gordon, Rebecca, 91
 Grantson, Magdalene, 62
 graph, 166
 graph coloring, 45, 47
 graph drawing, 166, 167
 graph minor, 6
 graph theory, 166
 greedy algorithm, 67, 68, 70, 81–83
 Green, Ben, 55
 GRID, 13, 14, 19, 56, 57, 73–75, 87, 89, 92, 95, 100, 110, 111, 121, 125, 130, 139, 141, 142, 179, 182, 188, 192–194, 198, 199, 206
 grid graph, 179
 Grohe, Martin, 46, 49
 Grønlund, Allan, 60
 Grünbaum, Branko, 12, 54, 55, 142, 144
 Grzegorzczak hierarchy, 90
 Guibas, Leonidas J., 58, 60, 116, 129
 Guillemot, Sylvain, 164
 Guth, Larry, 6
 Guy, Richard K., 73, 74
- Haken, Wolfgang, 45
 Hales, Alfred W., 89, 90
 Hales–Jewett theorem, **90**, 90, 91
 halfplane, 136, 138
 Hall, Richard R., 74
 halving partition, 17
 Hamiltonian cycle, **168**
 happy ending theorem, 1, 4, 119, 128, 135, 158
 Har-Peled, Sariel, 130, 192, 196, 197
 Harborth, Heiko, 144, 145, 148
 Harborth's conjecture, 148, 150, 159
 Hartnett, Kevin, 2
 hash table, 58
 Haussler, David, 69
 Hearn, Robert A., 44
 heavy line, 199

- HEAVY-LINES, 53, 55–57, 199, 200, 209
 Heednacram, Apichat, 62
 Hesse, Otto, 92
 Hesse configuration, 92
 Higman, Graham, 23
 Higman's lemma, **23**, 122
 HITTING, 28, 29, 39, 48–52, 55, 56, 72, 75, 83, 106
 Hoffmann, Michael, 182
 Huang, Xiuzhen, 171
 Huemer, Clemens, 131
 Hughes-Jones, Richard, 73
 Hurtado, Ferran, 106, 117, 118, 130
 Huttenlocher, Daniel P., 36
 hyperbola, 74
- Iacono, John, 136
 Impagliazzo, Russell, 48
 IN-TRIANGLE, 135, 209
 input representation, 33
 instance, **19**
 integer coordinates, 5, 33, 58, 110, 141, 142, 144, 148, 170, 182, 207
 INTEGER-COORDINATES, 141, 144, 207
 integer distances, 5, 141, 142, 144, 148, 159, 208, 210
 INTEGER-DISTANCES, 141, 147–150, 159, 208
 isolated vertex, 169, 174
 iterated reweighting, 70, 191
- Jackson, John, 53, 125
 Jackson, Terence H., 74
 Jadhav, Shreesh, 136
 Jarník, Vojtěch, 110
 Jewett, Robert I., 89, 90
 Jiang, Minghui, 67, 70
 Johnson, David S., 95
 Jones, Mitchell, 192, 197
- k -set, 17
 Kainen, Paul C., 45
 Kalbfleisch, James G., 106
 Kanj, Iyad A., 171
 Kann, Viggo, 45
 Kappes, Sarah, 131
 Karloff, Howard, 181
 Károlyi, Gyula, 20, 109, 135
 Katz, Nets Hawk, 6
 Katznelson, Yitzhak, 91
 Kedem, Klara, 36
 Kelly, Leroy M., 54
 Kelly, Patrick A., 73
 Kemnitz, Arnfried, 148
 kernelization, **46**, 51, 61, 64, 76, 105
 Khuller, Samir, 140
 Kitaev, Sergey, 156
 Kleber, Michael, 147, 148
 Klee, Victor, 142
 Kleetope, 185
 Klein, Esther, 1, 4
 Kleinberg, Jon M., 36
 Kleitman, Daniel J., 128
 Klincsek, Gheza T., 115
 Kløve, Torleiv, 73
 Klugerman, Michael, 128
 Knuth, Donald E., 11, 34
 Komusiewicz, Christian, 29
 Krasser, Hannes, 10
 Kratsch, Stefan, 62
 Kravets, Dina, 36
 Kreisel, Tobias, 147, 148
 Kruskal, Joseph B., 21, 22
 Kynčl, Jan, 10
 Kurowski, Maciej, 181
 Kurz, Sascha, 147, 148
 Kusters, Vincent, 182
- Lagrange, Jean, 146
 Langerman, Stefan, 10, 61, 136
 Las Vergnas, Michel, 11
 Lee, Der-Tsai, 129
 Leech, John, 146
 Lefmann, Hanno, 80
 Leighton, F. Thomson, 182
 length, 194
 Lev, Vsevolod, 92
 Levcopoulos, Christos, 62
 Lewenstein, Moshe, 60
 Li, Wenjun, 62
 Lidický, Bernard, 130
 LINE, 13, 53, 72, 76, 83, 87, 100, 106, 110, 119, 120, 125, 126, 133, 192, 207
 LINE-COVER, 55–57, 60–71, 79, 101, 104, 105, 119, 132, 133, 139, 176, 180, 185–187, 198, 199, 202, 203, 206, 209

- line partition, **15**
 linear function, 35
 linear projection, 87
 Liu, Regina Y., 140
 Lovász, László, 81, 106
 Lovász local lemma, 81, 83
 Loyd, Sam, 53
 Lübbecke, Marco E., 196
- Marcus, Adam, 6
 Markov's inequality, 62, 78
 Marx, Dániel, 164
 Matiyasevich, Yuri V., 144
 Matoušek, Jiří, 139, 151, 157, 190
 matrix, 34
 matroid, 11
 MAX-CONVEX, 106, 109–113, 115, 116,
 119, 120, 122, 128, 176, 203, 206,
 209
 MAX-GENERAL, 72–83, 91, 93, 99, 119,
 120, 172, 176, 185, 187, 202, 203,
 209
 maximum clique, **167**
 maximum independent set, **167**, 172
 Mayer, Richard, 13
 Mazurkiewicz, Stefan, 188
 McKay, Brendan D., 184
 McMahan, Liz, 91
 median, 135
 Megiddo, Nimrod, 61
 Meijer, Henk, 196
 Middendorf, Matthias, 151
 Miltzow, Tillmann, 34
 mirror image, 9, 10
 Mitchell, Joseph S. B., 106, 117, 118,
 130, 140
 monotone, **24**
 Moon, John, 101
 Morin, Pat, 61, 136
 Morris, Walter D., 106
 Moser, Leo, 101
 Moser, Robin A., 83
 Moser, William O. J., 53, 54
 Mücke, Ernst Peter, 11
 Mukhopadhyay, Asish, 136
 Mustafa, Nabil H., 70
- NAE3SAT, 95
 natural parameter, 47
 nested triangles graph, 182, 185
 Niedermeier, Rolf, 29
 Nivasch, Gabriel, 151, 157
 no-three-in-line problem, 4, **72**, 81
 nonuniform, **46**
 not-all-equal-3-satisfiability, 95
 Noy, Marc, 106, 117, 118, 130, 183
 NP, 5, 43, 44, 44, 45, 47, 48, 52, 61, 75,
 93, 95–97, 117, 131, 171, 172, 176,
 184, 196, 197, 208–210
- obstacle, 21, **25**
 obstacle size, **27**, 48, 50, 51, 63, 64, 75,
 95, 113, 131, 134, 137, 140, 144, 162,
 164, 165, 172, 181–184, 196, 209,
 210
 OFFLINE, 55–58, 60, 63–67, 198, 199,
 202, 209
 On-line Encyclopedia of Integer
 Sequences, 53–55
 1-in-3 SAT, 117, 118
 ONION, 129–133, 138, 185, 209
 onion layers, 5, **129**, 131–134
 ONLINE, 55–61, 63, 64, 75, 79–86, 89,
 90, 92, 93, 99–101, 104, 105, 120,
 133, 134, 209
 opaque forest, 188, 206
 open problem, 2, 12, 18, 42, 49, 53, 71,
 73, 78, 83, 87, 91, 93, 100, 105, 113,
 118, 119, 122, 124, 128, 129, 139,
 141, 144–149, 159, 162, 182, 184,
 187, 190, 196, 210
 orchard-planting problem, 4, **53**, 53,
 55, 209, 210
 order-equivalence, **12**
 order type, **11**
 ordered graph, **169**, 170, 173–175
 ordinary line, 53–55, 92
 orientation, 9, **10**, 12, 15, 16, 34–36,
 58, 65, 120, 153, 154, 198, 200, 205
 oriented matroid, 11
 outlier, 135, 136
 Overmars, Mark H., 59, 60, 134
- Pach, János, 53, 128, 135, 181, 182
 Pach, Peter, 92
 parabola, 74
 parameter, **24**
 parameterized complexity, **46**

- partial order, **20**, 22
 PARTITION, 28, 29, 51, 52, 55, 56, 87,
 106, 126, 130
 PASCAL, 108, 109
 Pascal's triangle, 106
 PATH-STAB, 189, 190, 193–196, 210
 Pătrașcu, Mihai, 60
 Paturi, Ramamohan, 48
 pawn, 73
 Payne, Michael S., 80, 83, 84
 Peeples, William D. Jr., 146
 Pegg, Ed Jr., 74
 Perles, Micha, 142
 Perles configuration, **142**
 permutation, 6, 155, 156, 161, 163,
 164, 175, 182, 183
 permutation pattern, 6, **156**, 164, 183
 Pettie, Seth, 60
 Pfeiffer, Frank, 151
 Philip, Geevarghese, 62
 Pilz, Alexander, 10, 19, 34
 planar graph, 5, 148, 150, 167, 177,
 179–186, 210
 planar straight-line drawing, 179
 planarity puzzle, 177–179
 plane sweep, 117
 PLOT, 155, 156, 161, 163, 165, 183
 Pollack, Richard, 6, 10, 33, 181, 182
 POLYGON, 13, 14, 19, 37, 55, 57, 119,
 120, 122, 128, 133, 137, 139, 142,
 145, 156, 185, 192, 207
 polygonal curve, 151
 polynomial hierarchy, 44, 62
 polynomial time, 5, 36, 37, 43–46, 48,
 49, 77, 82, 97, 98, 100, 115, 117, 119,
 130, 136, 163, 165, 207–210
 polynomial-time approximation
 scheme, 45
 prime number, 74
 primitive recursive function, 90
 Procopiuc, Cecilia M., 61
 projective clustering, 61
 projective duality, 59, 62
 projective transformation, 142, 143
 proper subconfiguration, **20**
 property, **24**
 property testing, 5, **38**, 40–42, 62, 78,
 112, 144, 162
 pseudotriangle, 131
 Ptolemy's theorem, 144
 Pythagorean theorem, 143, 145
 quadratic equation, 74
 quasi-order, **21**
 QUINCUNX, 126
 Radcliffe, Mary, 177
 Rado, Richard, 49
 Rafalin, Eynat, 140
 Ramsey theory, 1
 randomized algorithm, 83, 136
 range searching, 188, **190**
 rational number, 142, 143
 Ray, Saurabh, 62, 70
 realization, **12**, 19, 25, 92, 137, 141,
 142, 147, 190, 198
 reduction, 44, 95
 reflexivity, **12**, **20**
 regular graph, **168**
 regular polygon, 13, 133, 138, 143
 right triangle, 144, 145
 Robert, Jean-Marc, 60
 Rote, Günter, 134
 Roth, Klaus F., 74
 ruled configuration, 101–103
 Saaty, Thomas L., 45
 Sacristán, Vera, 106, 117, 118, 130
 satisfiability problem, 48
 SAWTOOTH, 14, 21, 22, 111–113, 131,
 133–135, 139, 140, 181
 Sawyer, Eric T., 54
 Schaefer, Marcus, 44, 171
 Schnyder, Walter, 181, 182
 Schulman, Leonard J., 128
 Seidel, Raimund, 59
 semicircle, 169
 Set card game, 91
 set cover, 67
 Sethia, Saurabh, 106, 117, 118, 130
 Sharir, Micha, 53
 SHATTER, 191–193, 196, 197, 210
 Shearer, James B., 81
 Shelah, Saharon, 90
 Shor, Peter W., 44, 177
 sign, **35**
 simplicial depth, **140**
 size, **13**, 25, 28, 31, 38, 80, 119, 126

- Sloane, Neil J. A., 54, 55
 slope, 58
 Shneiderman, Ben, 13
 Soltan, Valeriu, 106
 Solymosi, József, 93, 109, 148
 sorting, 57
 Souvaine, Diane L., 140
 spanning tree, 189
 Speckmann, Bettina, 131
 Spencer, Joel, 81
 Sprinzak, Josef, 36
 stabbing number, **189**, 191, 195, 210
 stair-convex, 157
 Stanley–Wilf conjecture, 6
 Stanton, Ralph G., 106
 Steiger, William, 140
 Stein, Sherman K., 150
 Steinitz, Ernst, 125
 Steinitz’s theorem on enclosure by convex hulls, 125
 STRETCH, 152–158, 160, 161, 163, 165, 183
 STRETCHED, 154, 155, 159, 160, 162, 163, 165, 182, 189, 208
 stretched path, **160**, 161–163, 188
 strings, 88
 Sturmfels, Bernd, 11, 33
 subconfiguration, **19**
 subgraph, 6
 subsequence, 23
 Sudan, Madhu, 14
 Sudbery, Anthony, 74
 sudoku, 44
 Suk, Andrew, 2, 119
 sunflower, 49, 51
 superpattern, 183
 supports, 179, 184
 Suraweera, Francis, 62
 Sylvester, J. J., 55
 Sylvester–Gallai theorem, 53, 54, 92
 symmetry, 9, **12**, 19
 Székely, László A., 84
 Szekeres, George, 1, 2, 4, 106, 119, 158
 Szemerédi, Endre, 84
 Szemerédi–Trotter theorem, 84
 Tamir, Arie, 61
 Tantaló, John, 177
 Tao, Terence, 55
 Tardos, Gábor, 2, 6, 83
 TERNARY, 88–93, 100
 TETRAD, 106, 125, 126, 180, 181
 3SUM, **59**, 60
 tic-tac-toe, 89, 90
 topological sweeping, 59, 60, 116
 Tóth, Csaba D., 131, 151
 Tóth, Gábor, 18
 Tóth, Géza, 20, 109, 135
 transitivity, **12**, **20**
 TREE-STAB, 189, 190
 Trickey, Howard, 182
 Trotter, William T. Jr., 84
 Tukey, John W., 136
 Tukey center, 136
 Tukey depth, 136
 tuple, 22
 Umans, Christopher, 44, 171
 uncountability, 26
 unimodal, 158
 unit circle, 144
 UNIVERSAL, 177, 180–187, 196, 210
 universal configuration, 151, 180–184
 UNSTABBED, 197–203, 206, 210
 unstabbed segment, **197**, 199–202, 210
 UNSTRETCH, 160, 161, 163
 Urabe, Masatsugu, 130
 Valtr, Pavel, 135
 Vapnik, Vladimir N., 69
 Varadarajan, Kasturi, 70
 vertex cover, **167**, 172
 visibility, 188
 W[1], 47–49, 171, 172
 Wagner, Klaus, 150
 Wagon, Stan, 142
 Wang, Jianxin, 62
 WEAK-PARTITION, 126, 127, 132–134, 187, 195, 196, 210
 weakly convex, **125**, 132–134, 145, 189, 195, 207, 208, 210
 WEAKLY-CONVEX, 126, 127, 208
 well-partial-ordering, 22
 well-quasi-ordering, 5, **22**, 64, 66, 78, 122, 123, 128, 135, 174–176, 188, 197, 201, 202, 206, 208

- | | |
|----------------------------------------|------------------------------------|
| Welzl, Emo, 19, 69, 190, 191, 193, 194 | Xia, Ge, 171 |
| Werman, Michael, 36 | |
| White, Neil, 11 | Zane, Francis, 48 |
| Wigderson, Avi, 140 | Ziegler, Günter M., 11,
142 |
| Wild, Ken, 74 | |
| Wilson, Robin, 45 | |
| Woeginger, Gerhard, 134 | ϵ -net, 69–71 |
| Wood, David R., 80, 83, 84, 87, 179 | Σ_2^P , 44, 44, 45, 48, 184 |