

# PROBLEM INDEX + MAPPING

## PROBLEMS MAPPED TO COMMON CORE STATE STANDARDS

*Forty-three states, the District of Columbia, four territories and the Department of Defense Education Activity (DoDEA) have adopted the Common Core State Standards (CCSS). As such, MATHCOUNTS considers it beneficial for teachers to see the connections between the 2017-2018 MATHCOUNTS School Handbook problems and the CCSS. MATHCOUNTS not only has identified a general topic and assigned a difficulty level for each problem but also has provided a CCSS code in the Problem Index (pgs. 41-42). A complete list of the Common Core State Standards can be found at [www.corestandards.org](http://www.corestandards.org).*

The CCSS for mathematics cover K-8 and high school courses. MATHCOUNTS problems are written to align with the NCTM Standards for Grades 6-8. As one would expect, there is great overlap between the two sets of standards. MATHCOUNTS also recognizes that in many school districts, algebra and geometry are taught in middle school, so some MATHCOUNTS problems also require skills taught in those courses.

In referring to the CCSS, the Problem Index code for each of the Standards for Mathematical Content for grades K-8 begins with the grade level. For the Standards for Mathematical Content for high school courses (such as algebra or geometry), each code begins with a letter to indicate the course name. The second part of each code indicates the domain within the grade level or course. Finally, the number of the individual standard within that domain follows. Here are two examples:

- *6.RP.3* → *Standard #3 in the Ratios and Proportional Relationships domain of grade 6*
- *G-SRT.6* → *Standard #6 in the Similarity, Right Triangles and Trigonometry domain of Geometry*

Some math concepts utilized in MATHCOUNTS problems are not specifically mentioned in the CCSS. Two examples are the Fundamental Counting Principle (FCP) and special right triangles. In cases like these, if a related standard could be identified, a code for that standard was used. For example, problems using the FCP were coded 7.SP.8, S-CP.8 or S-CP.9 depending on the context of the problem; SP → Statistics and Probability (the domain), S → Statistics and Probability (the course) and CP → Conditional Probability and the Rules of Probability. Problems based on special right triangles were given the code G-SRT.5 or G-SRT.6, explained above.

There are some MATHCOUNTS problems that either are based on math concepts outside the scope of the CCSS or based on concepts in the standards for grades K-5 but are obviously more difficult than a grade K-5 problem. When appropriate, these problems were given the code SMP for Standards for Mathematical Practice. The CCSS include the Standards for Mathematical Practice along with the Standards for Mathematical Content. The SMPs are (1) Make sense of problems and persevere in solving them; (2) Reason abstractly and quantitatively; (3) Construct viable arguments and critique the reasoning of others; (4) Model with mathematics; (5) Use appropriate tools strategically; (6) Attend to precision; (7) Look for and make use of structure and (8) Look for and express regularity in repeated reasoning.

# PROBLEM INDEX

In addition to the Common Core Mapping, we have provided a difficulty rating for each problem. Our scale is 1-7, with 7 being the most difficult. These are only approximations, and how difficult a problem is for a particular student will vary. Below is a general guide to the ratings:

**Difficulty 1/2/3:** One concept; one- to two-step solution; appropriate for students just starting the middle school curriculum.

**Difficulty 4/5:** One or two concepts; multistep solution; knowledge of some middle school topics is necessary.

**Difficulty 6/7:** Multiple an/or advanced concepts; multistep solution; knowledge of advanced middle school topics and/or problem-solving strategies is necessary.

It is difficult to categorize many of the problems in the *MATHCOUNTS School Handbook*. It is very common for a MATHCOUNTS problem to straddle multiple categories and cover several concepts. This index is intended to be a helpful resource, but since each problem has been placed in exactly one category and mapped to exactly one Common Core State Standard (CCSS), the index is not perfect. In this index, the code **9 (3) 7.SP.3** refers to problem 9 with difficulty rating 3 mapped to CCSS 7.SP.3.

ALGEBRAIC EXPRESSIONS & EQUATIONS	38 (3) 6.EE.2	COORDINATE GEOMETRY	79 (3) G-C.2	MEASUREMENT	40 (4) 8.G.5	NUMBER THEORY	45 (3) 4.OA.4
	42 (4) 6.EE.9		93 (5) 8.G.8		49 (3) 5.MD.1		56 (3) 4.OA.4
	47 (4) 8.F.3		112 (5) 8.F.3		50 (4) G-SRT.5		59 (3) SMP
	51 (3) A-REI.4		166 (5) 8.F.3		55 (4) 8.G.8		68 (4) N-RN.1
	52 (3) 6.EE.9		203 (3) 6.G.1		67 (3) 6.G.1		69 (3) S-CP.9
	71 (3) 6.EE.7		238 (4) 8.G.1		96 (5) 7.G.6		78 (3) SMP
	73 (5) A-REI.4		249 (6) 8.G.8		126 (6) 8.G.8		84 (2) SMP
	80 (5) 8.EE.8				132 (4) 8.G.5		109 (5) SMP
	81 (2) 6.EE.3				143 (5) 8.G.7		110 (5) 8.EE.2
	89 (4) N-RN.1				155 (4) 7.RP.3		111 (2) 7.NS.2
	91 (2) 7.EE.4	GENERAL MATH	172 (4) 6.RP.3	119 (2) 4.OA.4			
	99 (4) N-RN.1		31 (1) 3.OA.8	181 (3) 6.EE.7	121 (3) 6.NS.4		
	101 (3) A-CED.1		33 (2) SMP	183 (5) 8.G.7	130 (4) SMP		
	120 (4) N-RN.1		35 (3) 6.EE.2	198 (2) 6.RP.3	134 (4) 6.NS.4		
	142 (5) N-RN.1		36 (2) 4.OA.2		139 (3) SMP		
	150 (5) 8.EE.8		37 (2) 3.OA.8		148 (3) 7.NS.3		
176 (3) 6.EE.2	39 (4) SMP			151 (4) SMP			
185 (4) 6.EE.7	44 (2) 5.OA.1			153 (3) 6.EE.2			
199 (4) A-SSE.3	62 (4) SMP			156 (5) 6.NS.4			
202 (3) A-REI.4	88 (2) 7.NS.3			161 (4) F-BF.2			
209 (3) A-CED.1	100 (3) N-RN.2		193 (3) SMP				
210 (4) A-SSE.3	114 (4) N-RN.2		194 (4) SMP				
217 (3) 7.EE.4	124 (3) 6.NS.4		201 (2) 7.NS.3				
218 (4) A-REI.4	174 (3) 6.NS.3		227 (3) 8.EE.2				
224 (3) A-CED.1			229 (4) 6.NS.4				
	LOGIC	83 (3) S-CP.9	231 (4) 6.NS.4				
		92 (4) SMP	233 (4) SMP				
		131 (4) SMP	237 (5) 6.NS.4				
		145 (3) SMP	241 (4) N-RN.2				
		167 (6) SMP	246 (5) SMP				
	216 (3) S-CP.9						
	235 (5) SMP						

PERCENTS & FRACTIONS

48 (3) 6.RP.3  
 77 (4) 7.RP.3  
 86 (4) 7.NS.3  
 137 (4) A-CED.1  
 179 (3) 7.RP.3  
 184 (2) 6.RP.3  
 188 (2) 6.NS.1  
 195 (3) 6.NS.1  
 200 (3) A-CED.1  
 205 (3) 7.RP.3  
 222 (2) 7.RP.3  
 239 (3) 7.NS.3

PLANE GEOMETRY

32 (2) 4.G.2  
 43 (4) 7.G.6  
 53 (5) 7.G.4  
 61 (3) 7.G.6  
 66 (4) G-C.2  
 82 (4) 7.G.6  
 106 (4) 7.G.4  
 107 (5) 7.G.6  
 113 (5) 8.G.8  
 118 (7) G-SRT.4  
 123 (5) G-SRT.6  
 133 (5) 7.G.6  
 136 (6) G-SRT.5  
 149 (6) A-REI.4  
 152 (3) G-SRT.6  
 158 (5) G-SRT.6  
 160 (4) G-C.2  
 163 (5) G-SRT.5  
 170 (5) G-SRT.5  
 178 (4) 8.G.5  
 187 (5) G-SRT.6  
 192 (3) 8.G.5  
 197 (3) G-C.2  
 204 (5) 7.G.1  
 211 (5) G-SRT.5  
 215 (5) G-SRT.6  
 221 (5) G-SRT.6  
 225 (5) G-SRT.6  
 232 (6) G-C.2  
 236 (5) G-C.2  
 240 (5) 7.G.6  
 245 (6) G-SRT.6  
 250 (6) G-SRT.6

PROBABILITY, COUNTING & COMBINATORICS

Probability Stretch<sup>1</sup>  
 34 (3) 7.SP.8  
 46 (3) 7.SP.8  
 64 (4) S-CP.9  
 75 (3) S-CP.9  
 76 (2) 7.SP.8  
 85 (5) S-CP.9  
 95 (3) 7.SP.8  
 103 (4) 8.EE.1  
 104 (3) 7.SP.7  
 116 (3) S-CP.9  
 125 (5) S-CP.9  
 135 (5) 7.SP.8  
 140 (5) 7.SP.7  
 144 (3) S-CP.9  
 146 (5) S-CP.9  
 154 (4) S-CP.9  
 159 (5) SMP  
 168 (4) S-CP.9  
 171 (2) 7.SP.7  
 189 (4) S-CP.9  
 196 (3) 7.SP.8  
 206 (4) 7.SP.8  
 207 (3) 7.SP.7  
 213 (5) S-CP.9  
 226 (5) SMP  
 234 (3) 7.SP.8  
 242 (5) S-CP.9  
 247 (5) S-CP.9  
 248 (6) 8.G.7

PROBLEM SOLVING (Misc.)

54 (3) SMP  
 58 (3) 4.OA.4  
 70 (5) S-CP.9  
 72 (2) SMP  
 128 (5) SMP  
 157 (4) G-CO.3  
 162 (2) A-CED.1  
 180 (3) 7.NS.3  
 212 (4) SMP

PROPORTIONAL REASONING

21 (5) 6.RP.3  
 22 (4) 6.EE.7  
 23 (3) 6.RP.3  
 24 (4) 6.EE.7  
 25 (4) 6.RP.3  
 26 (3) 6.RP.3  
 27 (5) 6.RP.3  
 28 (3) 6.RP.3  
 29 (4) 6.RP.3  
 30 (3) 6.RP.3  
 41 (2) 5.MD.1  
 63 (3) 4.OA.2  
 90 (3) 7.RP.2  
 102 (3) 6.RP.3  
 108 (5) 6.RP.3  
 117 (4) 6.RP.3  
 122 (3) 7.RP.3  
 127 (4) 7.RP.3  
 169 (5) SMP  
 173 (5) 6.RP.3  
 182 (5) 7.RP.2  
 220 (4) 7.EE.4  
 228 (3) 7.RP.2  
 244 (4) SMP

SEQUENCES, SERIES & PATTERNS

Patterns Stretch<sup>2</sup>  
 94 (3) F-BF.2  
 97 (4) F-BF.2  
 115 (4) F-BF.2  
 141 (3) F-LE.1  
 164 (4) F-LE.2  
 165 (5) F-LE.2  
 191 (3) F-LE.2  
 214 (5) F-LE.2  
 243 (6) F-BF.2

SOLID GEOMETRY

60 (3) 7.G.6  
 74 (3) G-GMD.3  
 129 (6) G-GMD.3  
 177 (3) 8.G.9  
 190 (4) 8.G.9  
 208 (2) 8.G.9  
 219 (2) 7.G.6  
 230 (4) G-GMD.3

STATISTICS

57 (4) 6.SP.5  
 65 (4) 6.SP.5  
 87 (2) 6.SP.5  
 98 (4) 6.SP.5  
 105 (3) 6.SP.5  
 138 (4) SMP  
 147 (4) 7.EE.4  
 175 (2) 6.SP.2  
 186 (2) 6.SP.2  
 223 (4) 6.SP.5