

GRADE 5 MONTHLY PROBLEMS

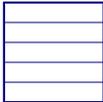
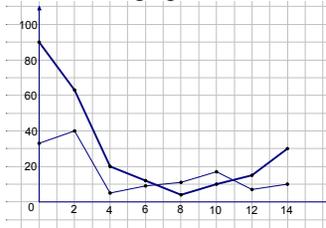
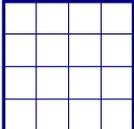
The math standards referenced in the Solutions are for the State of Minnesota. A Common Core alignment will be available soon, but the problems will work in any fifth grade classroom. Because the problems are designed to meet the needs of talented math students, they are also appropriate for older students.

Notes and Suggestions:

- The standards addressed by a problem may vary depending on the strategies that students choose.
- Some cells do not have standards listed. These problems may address more advanced standards. Problems from the "General" column may not be focused on specific standards.
- The problems vary substantially in difficulty. In general, they are quite challenging and will require time and persistence. Most students are unlikely to complete every problem within the month.
- When students solve a problem incorrectly, stress the importance of persistence!
- Some problems have many solutions. Others have no solution.
- Students should usually be able to work without direct instruction, but they may often get stuck. Encourage collaboration! Ask them to look up unfamiliar vocabulary.
- For most problems, students may decide whether to use a calculator. However, they should be able to justify their decision. Sometimes, they can learn a lot from solving them with and without!
- Some problems address content that students will not study until later in the school year. They may still attempt the problems using strategies that are based on what they already know.
- Avoid teaching rules and procedures before you discuss topics in class. If students don't know the rules, so much the better! Creating their own strategies will help them think more deeply.
- Many of these problems provide opportunities for mathematical communication, (even when the problem does not call for explanations). Consider having students write and submit their solution processes from time to time. Be sure to read their ideas carefully and offer one or two brief but thoughtful comments in response. This is very motivating!

Classroom teachers may freely copy and distribute these problems in their classroom. I ask only that you include my name and contact information as they appear at the bottom of each page. Please inform me of any typographical or mathematical errors by contacting me through 5280math.com. I would love to hear about how you are using the problems in your classroom, and I welcome your feedback and suggestions!

GRADE 5 NOVEMBER PROBLEMS

	Number and Operation (NO)	Algebra (A)	Geometry and Measurement (GM)	Data and Probability; Ratios and Rates (DR)	General (G)
1	Raymond divided two whole numbers. The decimal part of his answer was .625. Donna found the quotient and remainder for the same two numbers. What was Donna's remainder?	Three vertices of a trapezoid are located at (1, 2), (1, 8), and (3, 9). Where can the fourth vertex be if both coordinates are whole numbers between 0 and 10 inclusive? (<i>Inclusive</i> means including 0 and 10).	Two vertices of a triangle have coordinates of (2, -1) and (3, 3). Find coordinates of a third vertex to create a triangle with an area of 14 square units. (If you find an answer and still have time, look for more!)	If seven whole numbers have a mean of 20 and a median of 10, what is their smallest possible range?	Each letter represents a digit. Find values for each letter to make the equation true. UP • TO = IT • GO
2	About how many square tiles would it take to cover a football field if each tile were 8 inches on a side? (Don't forget the end zones.) Just for fun, make a guess first!	You may rearrange $-7 + 9 - 3$ in many ways without changing the answer. For example: $-3 + 9 - 7$. Find as many ways to do this as you can using only addition and subtraction with the numbers 3, 7, 9, and their opposites -3 , -7 , and -9 .	What do these capital letters have in common? One letter is missing. Which one? H, I, O, S, X, Z	If 8 popcorn vendors can sell 1080 bags of popcorn in 5 hours, how long will it take 9 popcorn vendors to sell 324 bags (if they all sell popcorn at the same constant rate)? (Inspired by a question about pretzel makers in <i>The Number Devil</i> , by Hans Magnus Enzensberger)	Multiply the smallest prime number greater than 100 by the greatest prime number less than 30. Divide the product by the number of millimeters in a meter. Take the whole number part of your answer and subtract the smallest prime number. What is the result?
3	Hope is making a pyramid of blocks. The top has 1 block. There are 3 blocks on the next layer, 5 blocks on the next layer, etc. If Hope uses 1000 blocks, how many layers tall is the pyramid? How many blocks are not used?	Make an input/output table for the expression. Find a pattern, and use it to write an algebraic equation that is true for (nearly) all values of x . $\frac{x^2 - 1}{x - 1}$ What is the one value of x for which your equation is not true?	A square is decomposed into five congruent rectangles, each having a perimeter of 30 centimeters. What is the area of the square? 	Create a title, labels, units, and a detailed story for the double-line graph. 	Place the greatest possible number of dots in the grid (one dot per square at most) so that every row, column, and diagonal has at most two dots. 

GRADE 5 NOVEMBER SOLUTIONS

	Number and Operation (NO)	Algebra (A)	Geometry and Measurement (GM)	Data and Probability; Ratios and Rates (DR)	General (G)
1	<p>It depends on what the divisor was. (Any positive multiple of 5 is a possible remainder.) Examples: Divisor: 8 Remainder: 5 Divisor: 16 Remainder: 10 Divisor: 24 Remainder: 15 Divisor: 32 Remainder: 20 Divisor: 1000 Remainder: 625</p> <p style="text-align: right;">5.1.1.1</p>	<p>There are locations! Eight of them are easier to find: (3, 0) (3, 1) (3, 2) (3, 4) (3, 5) (3, 6) (3, 7) (3, 8) The other three are trickier! (5, 4) (7, 5) (9, 6)</p> <p>Note: (3, 3) would make the figure a parallelogram, not a trapezoid.</p> <p style="text-align: right;">5.2.1.2</p>	<p>Many answers are possible. Students may find (9, -1) or (2, 27), because the base and height are easier to see for these. Other answers include: (6, -13), (7, -9), (8, -5), (10, 3), (11, 7), etc. There are interesting patterns here that may help you predict some other solutions!</p> <p style="text-align: right;">5.3.2.1 5.2.1.2</p>	<p>The smallest possible range is 24. The idea is to make the minimum as large as possible and the maximum as small as possible. The seven numbers that have this mean, median, and range are 10, 10, 10, 10, 33, 33, 34.</p> <p style="text-align: right;">5.4.1.1</p>	<p>One solution is $14 \cdot 65 = 26 \cdot 35$.</p> <p>Can you find others?</p>
2	<p>129,600 tiles (if you cut some tiles) Students may need to look up the length and width of the field (360 ft by 160 ft). Their answer may be a little different if they overlapped the edge or left a gap along it, or if they rounded during their calculations.</p> <p style="text-align: right;">5.1.1.4 5.3.2.1</p>	<p>There are many other possibilities. $-7 - 3 + 9$ $-3 - 7 + 9$ $9 - 3 - 7$ $9 - 7 - 3$ All of these expressions are equal to -1. Some students may use negative numbers in the second or third position: $-7 + -3 + 9$ or $-7 - 3 - -9$.</p> <p style="text-align: right;">5.2.2.1</p>	<p>The letter "N" is missing. All of the letters have half-turn symmetry. In other words, they look the same after they are rotated 180°.</p>	<p>1 hour 20 minutes</p> <p style="text-align: right;">5.1.1.1 5.1.1.4</p>	<p>0</p> <p>$101 \cdot 29 = 2929$ $2929 \div 1000 = 2.929$ $2.929 \rightarrow 2$ $2 - 2 = 0$</p>
3	<p>31 layers tall; 39 blocks left Some students may notice a pattern. When you find the sums of the blocks on the layers, you get square numbers. $1 + 3 = 2^2$ $1 + 3 + 5 = 3^2$ $1 + 3 + 5 + 7 = 4^2$, etc. ($31^2 = 961$)</p> <p style="text-align: right;">5.1.1.4</p>	<p>The output is always one greater than the input! Therefore, the equation is $\frac{x^2 - 1}{x - 1} = x + 1.$ It is true for all values except $x = 1$, because the left side would be 0/0, which is not a number.</p> <p style="text-align: right;">5.2.1.1 5.2.3.3</p>	<p>156.25 square centimeters Each side of the square has a length of 12.5 centimeters. (If students are unsure about multiplying decimals, they may create a picture on graph paper to help them <i>see</i> the number of square units.)</p> <p style="text-align: right;">5.3.2.1 5.1.3.4</p>	<p>Check that students' stories have a title, label, and units, that they make it clear what each line represents, and that the story fits the graphs. The horizontal label should be a time variable (second, hours, days, weeks, years, etc.)</p> <p style="text-align: right;">5.4.1.2</p>	<p>This is one way to fit eight dots. Can you do better?</p> <div style="text-align: center;"> </div>