

GRADE 6 MONTHLY PROBLEMS

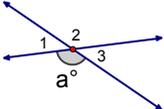
The math standards referenced in the Solutions are for the State of Minnesota. A Common Core alignment will be available soon, but the problems will work in any sixth grade classroom. Because the problems are designed to meet the needs of talented math students, they are also appropriate for older students.

Notes and Suggestions:

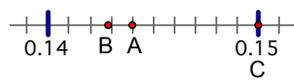
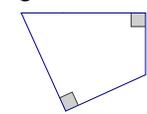
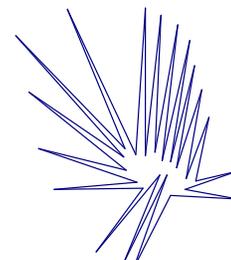
- The standards addressed by a problem may vary depending on the strategies that students choose.
- Some cells do not have standards listed. These problems may address more advanced standards. Problems from the "General" column may not be focused on specific standards.
- The problems vary substantially 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 6
DECEMBER PROBLEMS**

	Number and Operation (NO)	Algebra (A)	Geometry and Measurement (GM)	Data and Probability; Ratios and Rates (DR)	General (G)
1	<p>Place these values in their approximate positions on the number line.</p> <p>(A) 3/10 of 48% (B) 1/7 (C) 45% of 1/3</p> 	<p>Write the expression $a - (b - c)$ as an equivalent expression without parentheses. Support your answer by choosing values for a, b, and c, and evaluating the expression.</p>	<p>Write algebraic expressions for the measures of angles 1, 2, and 3. Explain your thinking.</p> 	<p>Maalik's family is on vacation. Using the stopwatch on his phone, Maalik finds that it takes 3 minutes and 40 seconds to travel between mile markers 47 and 51. If they leave the car on cruise control, how long will it take them to arrive at the next town 38 miles away?</p>	<p>You have eight coins that are identical except that one weighs less than the others. Using a balance scale, how can you find the light coin in just two weighings?</p>
2	<p>The prime factorization of m is $2^4 \cdot 7^2 \cdot 13^2$. The prime factorization of n is $2^3 \cdot 11^2 \cdot 13$. Use exponents to write the prime factorization of $m \cdot n$.</p>	<p>Whether you multiply me by 6 or add me to 6, the answer is the same. What number am I?</p>	<p>Draw a quadrilateral that (1) has one pair of opposite right angles and (2) is not a parallelogram. What can you say about the other two angles?</p>	<p>A reduced fat brand of milk claims to have 75% less fat than whole milk. The reduced fat milk contains 0.9% fat. What percentage of the whole milk is fat?</p>	<p>If $R = 60$ and $T = 100$, find the product of the least common multiple and the greatest common factor of R and T.</p>
3	<p>Which number can be made closer (but not equal) to one half: a decimal containing exactly four digits that are all different, or a fraction containing exactly four digits that are all different? For more challenge, use only mental math (with some estimation).</p>	<p style="text-align: center;">$E = a^{b^c} = a^{(b^c)}$</p> <p>a, b, and c are equal to 2, 3, and 4 in some order. (All three numbers are different.) How many different values can E have? What are the two smallest values?</p>	<p>Draw a two-dimensional figure that has a very large perimeter and a small area. Fit it within a box about the size of the one that holds this problem.</p>	<p>80% of the students at a fundraiser are from Claire's school. When fourteen people from her school leave for a band concert, the percentage decreases to 62.5%. How many people are at the fundraiser now?</p>	<p>N is a 3-digit number abc (where a, b, and c represent the digits). When the last digit c is moved from the end to the beginning of the numeral, the value of N increases by 369. How does the value of N change when you move the beginning digit a to the right end instead?</p>

GRADE 6 DECEMBER SOLUTIONS

	Number and Operation (NO)	Algebra (A)	Geometry and Measurement (GM)	Data and Probability; Ratios and Rates (DR)	General (G)
1	 <p>Values: A: 0.144 B: approx. 0.1429 C: 0.15</p> <p style="text-align: right;">6.1.1.1 6.1.1.2</p>	<p>$a - b + c$ Example: If $a = 10$, $b = 4$ and $c = 2$ then $a - (b - c) = 10 - (4 - 2) = 8$ $a - b + c = 10 - 4 + 2 = 8$</p> <p>Encourage students to choose some negative values for a, b, or c if they know how to add and subtract negative numbers!</p> <p style="text-align: right;">6.2.2.1</p>	<p>angle 1: $180 - a^\circ$ angle 2: a° angle 3: $180 - a^\circ$</p> <p>Angles 1 and 3 both combine with the given angle to make a straight angle (180°). Angle 2 combines with angle 1 (or 3) to make a straight angle.</p> <p style="text-align: right;">6.3.2.1</p>	<p>About 35 minutes</p> <p style="text-align: right;">6.1.2.3 6.1.2.4</p>	<p>Put three coins on each side. If they balance, then weigh the other two coins to see which one is lighter. If they do not balance, choose any two coins from the lighter side. If they balance, the light coin is the other one. If not, choose the lighter one! (There are other methods.)</p>
2	<p>The prime factorization of $m \cdot n$ is $2^7 \cdot 7^2 \cdot 11^2 \cdot 13^3$.</p> <p>(Can you see an easy way to find this?)</p> <p style="text-align: right;">6.1.1.5</p>	<p>1.2</p> <p>$6 + 1.2 = 7.2$ $6 \cdot 1.2 = 7.2$</p>	<p>You can't draw rectangles, because they are parallelograms!</p>  <p>The other two angles are <i>supplementary</i>. (They have a sum of 180°.)</p>	<p>3.6%</p> <p>If the fat content is reduced by 75%, then 25% of the original amount remains. The original amount must be 4 times greater.</p> <p>$0.9\% \cdot 4 = 3.6\%$</p> <p style="text-align: right;">6.1.2.2</p>	<p>6000 ($20 \cdot 300$)</p> <p>Notice that 6000 is also the product of R and T!</p> <p style="text-align: right;">6.1.1.6</p>
3	<p>.5012 is closer to one half than $\frac{50}{98}$ is, because $\frac{50}{98}$ is $\frac{1}{98}$ greater than one half, and $\frac{1}{98} > 0.01$ (Why?). By the way, the decimal for $\frac{1}{98}$ is very cool!</p> <p style="text-align: right;">6.1.1.2 6.1.1.4 6.1.3.4 6.1.3.5</p>	<p>E can have five different values. The two smallest are 65,536 and 262,144. (There would have been six values except for the fact that $2^4 = 4^2$. The two smallest values come from using $a = 4$. The two largest values, which come from $a = 2$, are enormous!)</p> <p style="text-align: right;">6.2.2.1</p>	<p>A sample drawing:</p> 	<p>16 people</p> <p style="text-align: right;">6.1.2.2 6.1.3.4</p>	<p>The value of N increases by 306.</p> <p>Possible values of N are 145, 256, 367, 478, and 589. What patterns do you see?</p>