GRADE 6
MONTHLY PROBLEMS

The math standards referenced in the Solutions are for the State of Minnesota, 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 copy and distribute these problems in their own 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.

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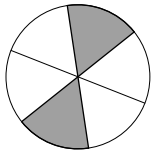
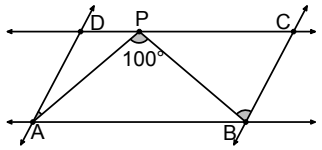
GRADE 6
MARCH PROBLEMS

	Number and Operation (NO)	Algebra (A)	Geometry and Measurement (GM)	Data and Probability; Ratios and Rates (DR)	General (G)
1	Solve for *x*. $$\frac{1}{1+\frac{3}{1+x}}=\frac{8}{29}$$ (Suggestion: Experiment with fractions and decimals if you like, but it may easier to think of *x* as a fraction.)	Estelle has finished 16 of the *M* questions on her test. How many more questions must she answer in order to complete 1/3 of the test? Show two ways to write the algebraic expression: (1) Multiply, then subtract. (2) Subtract, then divide.	The area of the circle is 81π units^2. It is divided into 6 equal parts. What is the perimeter of the shaded region in terms of π? 	A spinner has three colors: red, blue, and yellow. The red and blue sectors are the same size. If you spin twice, the probability that one spin will be red and the other will be blue is 8%. What is the measure of the yellow sector's central angle?	Which two of these expressions are equal? How do you know? 5^{2000} 3^{3000} 2^{4500} 6^{1500} 8^{1500} 4^{2500} Bonus: Order the expressions from least to greatest.
2	Let $X = 0.2\overline{3}$. Write 10% of *X* as a fraction in simplest form.	C is an even number, and D is an odd number. For what possible values of C and D will the expression $C^2 - C \bullet D + D^2$ be an even number? Explain your reasoning.	The largest faces of three identical rectangular prisms having whole number side lengths are joined to create a new rectangular prism whose volume is 10,455 cm^3. What are the dimensions of the new prism? How much surface area is lost when they are joined?	A faucet drips once every 5 seconds into a bathtub of (inner) dimensions L: 54", W:23", and D:15". A typical drop of water has a volume of about 0.25 milliliters. About how long does it take to fill the tub?	The nine factors of 36 are arranged in a 3 by 3 grid so that every row and column has the same product. What is this product?
3	In this problem, you explore what happens when you add the same number to a numerator and a denominator. Suppose that *p*, *q*, and *n* are all natural numbers. Then $$\frac{p+n}{q+n}$$ is always between ____ and ____.	Find one or more algebraic expressions that show a shortcut for calculating the sum of *N* consecutive whole numbers beginning with 30.	ABCD is a parallelogram.  What is the relationship between ∠DAP and ∠CBP? Explain your thinking.	Madar is driving from his house to the store and from there to work. He has traveled 75% of the way to the store, which is 40% of his total travel distance. Which of the two parts of his trip is longer? Use a ratio to compare the lengths of the two parts.	Can the multiplicative inverse (reciprocal) of a real number ever equal the additive inverse (opposite) of the number? If so, give an example. If not, explain why not.

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GRADE 6
MARCH SOLUTIONS

	Number and Operation (NO)	Algebra (A)	Geometry and Measurement (GM)	Data and Probability; Ratios and Rates (DR)	General (G)
1	$x = \frac{1}{7}$ Hint: *a* and 1/*a* are reciprocals of *each other* (even when *a* is not a whole number). 6.1.1.7 6.1.3.1 6.1.3.4 6.2.3.2	(1) $\frac{1}{3} \cdot M - 16$ (2) $(M - 48) \div 3$ What will happen if Estelle has already answered more than 1/3 of the questions? Will the expressions give you any useful information? 6.2.1.1 6.2.2.1 6.2.3.1	6π + 36 units	216° 6.1.2.2 6.4.1.1 6.4.1.2	$2^{4500} = 8^{1500}$ To see why, imagine writing out all 4500 2s and putting them into groups of 3. Bonus: (1) 6^{1500} (2) 8^{1500} and 2^{4500} (3) 5^{2000} (4) 3^{3000} and (5) 4^{2500} Hint: Arrange the factors of each number in 500 identical groups.
2	$\frac{7}{300}$ There are *many* strategies: (1) Begin with 10 • X. (2) Write the decimal over 10 and create equivalent fractions. (3) Compare to the decimal for 1/3, etc. 6.1.1.3 6.1.1.4 6.1.1.7	The expression will not represent an even number for any whole number values of C and D. C^2 and C•D are always even. D^2 is always odd. Even – even + odd = odd 6.1.1.5 6.2.1.1	New dimensions: 15 cm by 17 cm by 41 cm. Lost surface area: 2788 cm^2 Four faces are "lost" when the three prisms are joined. 17 • 41 • 4 = 2788 cm^2 6.3.1.1 6.1.1.5	About 71 days It would actually take longer, because this calculation does not take evaporation into account. 6.1.2.3 6.1.2.4 6.1.3.4 6.3.1.1 6.3.3.1	216 If you haven't done this already, try to create the 3 by 3 grid! 6.1.1.5
3	$\frac{p+n}{q+n}$ is between $\frac{p}{q}$ and 1. Must *p*, *q*, and *n* be natural numbers for this to be true? Does it matter whether *p* < *q* or *p* > *q*? 6.1.1.2 6.1.3.5 6.2.1.1	There are many correct expressions. Examples: $\left(30 + \frac{N-1}{2}\right) \cdot N$ $\left(\frac{60+N-1}{2}\right) \cdot N$ $30 \cdot N + \frac{N(N-1)}{2}$ What is the sum of *N* consecutive whole numbers starting with *A*? 6.2.1.1 6.2.1.2 6.2.3.1	∠DAP and ∠CBP have sum of 100°. 6.3.2.1 6.3.2.2	The trip from Madar's house to the store is a little longer (1 1/7 times as long) than his trip from the store to work. Or: His trip from the store to work is 7/8 as long as the trip from his house to the store. Can you compare the two parts of his trip using a difference instead of a ratio? 6.1.1.1 6.1.1.3 6.1.1.4 6.1.2.1 6.1.2.2 6.1.3.4	No. A real number and its reciprocal always have the same sign (positive or negative), because their product equals 1. Opposites always have opposite signs (except for 0, which does not have a reciprocal). Note: There is actually a pair of *imaginary* numbers that works (*i* and –*i*).

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