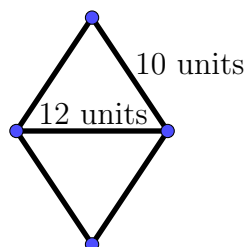


THE FORTY FIRST W.J. BLUNDON MATHEMATICS CONTEST

Sponsored by
The Canadian Mathematical Society *
in cooperation with
The Department of Mathematics and Statistics
Memorial University of Newfoundland

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1. Find the area of a rhombus with a side length 10 units and the shortest diagonal 12 units.



2. Consider the number consisting of 60 digits

1 0 1 1 1 2 1 3 1 4 1 5 1 6 1 7 1 8 1 9 2 0 2 1 2 2 2 3 2 4 2 5 2 6 2 7 2 8 2 9 3 0 3 1 3 2 3 3 3 4 3 5 3 6 3 7 3 8 3 9

What is the biggest 6-digit number that can be obtained by erasing 54 digits of your choice?

Note: remaining digits should be in the same order as in the original number.

3. A closed plastic rectangular box is partially filled with 160 m^3 of water. The depth of the water is either 2 m or 4 m or 5 m, depending on which face of the box is on the ground. What is the volume of the box?
4. Three different numbers are chosen at random from the set $\{1, 2, 3, \dots, 9\}$. What is the probability that one of them is the average of the other two?

5. (a) Find the integer part of the number $\sqrt{42 + \sqrt{42 + \sqrt{42 + \sqrt{42 + \sqrt{42 + \sqrt{42}}}}}}$.

(b) Find the integer part of the number $\sqrt{a + \sqrt{a + \sqrt{a + \sqrt{a + \sqrt{a + \sqrt{a}}}}}}$,

where $a = n(n+1)$ for some positive integer number n . Explain your result.

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*A grant in support of this activity was received from the Canadian Mathematical Society.
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6. (a) What is the smallest angle that is formed by the hour and the minute hands at 5:00?
 (b) What is the smallest angle that is formed by the hour and the minute hands at 11:10?
 (c) What is the first time after 1:00 when the two hands form an angle of 80 deg?
 (d) How many times during any 24 hour period do the minute hand and the hour hand form an angle of 90 degrees?
7. Find all values (if any) of the parameter a for which the equation $10 - |x| = ax$ has
 a) exactly one root, which is a positive number. Express this root in terms of a .
 b) exactly two distinct roots. Express these roots in terms of a .
 c) no roots.
8. The 5×5 square is filled with numbers in such a way that each row and each column contains the numbers 1, 2, 3, 4 and 5 exactly once.

The sum of the numbers in each of the three areas marked with either & or # or \$ is equal.

&	&	&	#	#
&	&	#	#	#
&	#	#	#	\$
#	#	#	\$	\$
#	#	\$	\$	\$

If the number in the upper left corner is 3, what are the other numbers (b , c , d , and e) on the diagonal of the square?

3				
	b			
		c		
			d	
				e

9. Five distinct points A, B, C, D, E lie on the same circle in this order. Let angle $\angle CAD = \alpha$. Find the sum of the angles $\angle ABC$ and $\angle AED$ in terms of α .
10. Do there exist positive integers $A > 0$ and $B > 0$ such that both $A^2 + B$ and $B^2 + A$ are perfect squares?

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