11th Annual
Oklahoma School of Science and Mathematics
Middle School Mathematics: An Awesome Contest
February 23, 2013

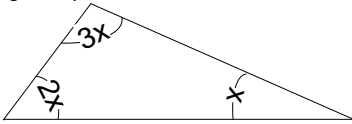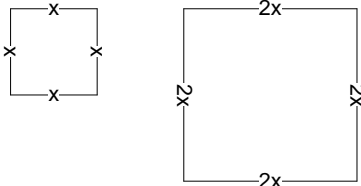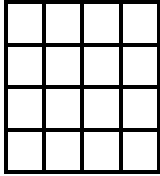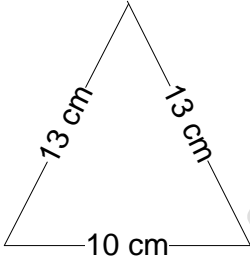| NAME: (Please print) _____ **Email** _____	AGE _____	DATE OF BIRTH mm/dd/yy _ _ / _ _ / _ _	GRADE LEVEL (Circle one) **7 8**
SCORE (For official use) L: _____ R: _____ Total: _____ TB: Y N	**GENDER** (Circle one) **M F**	**HOME ADDRESS** (Please print) Street _____ City _____ Zip _____ School _____	
Parents' names: (Please print)			

Directions: Use the scratch paper provided to do your work. Calculators are allowed, but not necessary. Write the answer(s) to each question in the box to the right of the question. Units are given in plural form even if the singular form is correct. <u>All fractions should be in simplest form</u>, $\frac{3}{2}$ not $1\frac{1}{2}$.

This is a 28-question, 1-hour contest. The 28th question is on the last page and it will be used to break ties. You must show your work on the 28th question. Each question is worth one point. Your score will be the number of correct answers (excluding the tie-breaker). There is no partial credit or penalty for wrong answers. Please continue working or reworking problems until time is called.

Do Not Open or Turn Over Until Instructed To Do So

1.	1.
2. $a \times b = 30$ and $c \times d = 4$ Calculate $a \times b \times c \times d$.	2. 120
3. $2x + 3y = 95$ and $x - y = 10$ What is the value of x?	3. 25
4. In the triangle below, what is x (in degrees)?	4. $30\,°$
5. $a + b = 200$ and $a - b = 100$. What is $2 \times b$?	5. 100
6. Given $x \otimes y = \dfrac{\left(x^3 - y^3\right)}{x^2 y}$ find $7 \otimes 4$. Express your answer as a fraction.	6. $\dfrac{279}{196}$
7. k and n are the smallest integers such that k $\div$ 2 $\div$ 2 $\div$ 2 $\div$ 2 and n $\div$ 2 $\div$ 2 $\div$ 2 are each a positive integer. Find $k + n$.	7. 24
8. In the two squares shown, the perimeter increases 100% from the smaller to the larger square. What is the percentage <u>increase</u> in area?	8. 300%
9. $(a + 5) \times b = 340$ and $(a - 4) \times b = 187$ What is the value of $a \times b$?	9. 255
10. If $\begin{cases} a + 2b + 4c = 321 \\ \quad\text{and} \\ b + 2c = 160 \end{cases}$ then a =?	10. 1

11. How many 6 digit numbers end in 2013?
     a) 90   **b)** 99   **c)** 100   **d)** 2013
	11. Circle one:
	     a b c d

12. Six OSSM students can assemble 24 bicycles in 8 hours. How many bicycles can three OSSM students make in four hours?	12. 6 bicycles
13. Express the decimal sum as a reduced fraction. $0.45 + 0.305 + 0.05$	13. $\dfrac{161}{200}$
14. Solve the inequality for x. $-\dfrac{x + \dfrac{4}{3}}{7} > \dfrac{10}{21}$	14. $x < -\dfrac{14}{3}$
15. Anna is 10 years old. Her mother Rose is 5 times as old. How old will Rose be when Anna is twice as old as she is now?	15. 60 years old
16. In the sequence below, the sum of the numbers in any 3 consecutive boxes is the same. Find z. z	t	u	219	16. 219
17. There are 8 students in a very small high school. If the student council is composed of 5 students, how many different student councils could be chosen?	17. 6,720

18. Bart rolled two dice and got two 1's. He rolled again and got two 1's once more. What is the probability of rolling two one's twice in a row? Express your answer as a fraction.	18. $\dfrac{1}{1,296}$
19. In the figure below, a large square is made up of 16 smaller squares. How many different squares of varying sizes can one find in the figure?	19. 30
20. What is the area of this triangle?	20. 60 cm²
21. Solve for x.	21. 55 °
22. Michael participates at a free throw basketball contest. For each successful throw he makes, he gets 8 points and for each miss he is penalized 5 points. After 26 throws he has 0 points. How many successful throws did he make?	22. 10 successful throws
23. At 6:00 AM Sam leaves home driving 40 km per hour. Sally leaves 2 hours later driving 50 km per hour. What time will it be when Sally catches up with Sam? Specify AM or PM.	23. 4:00 PM
24. Sally can mow the lawn in two hours. Tom can mow the lawn in three hours. If they had two lawn mowers and worked together how long would it take Sally and Tom to mow the lawn (in minutes)?	24. 72 minutes
25. Consider the positive integer with decimal representation $n = \overline{73961a}$. If n divided by 5 has a remainder of 4, and n divided by 3 has a remainder of 0, what is the value of a?	25. a=4
26. A museum acquired a solid gold crown owned by the ancient Greek king Hiero. Because of suspicions that the crown might contain some silver, the crown was submerged in water and its volume was determined to be 4 cubic inches. Its weight was found to be 42 ounces. Since gold weighs 11 ounces per cubic inch, the crown must contain some silver. If silver weighs 6 ounces per cubic inch, how much silver (in ounces) was in the crown.	26. 2/5 oz or 0.4 oz
27. Find a first quadrant lattice point that is exactly the same distance from the origin as (5, 5).	27. (1,7) or (7,1)
28. Pat and Kim were out in a rowboat one day, and Kim spied a water lily. Kim demonstrated how it was possible to use the plant to calculate the depth of the water under the water lily. Without uprooting the plant, Kim gently pulled it sideways, causing it to disappear at a point that was 35 inches from its original position. The top of the plant originally stood 5 inches above the water surface. What was the depth of the water (in inches) under the water lily?	28. 120 inches

Tie-Breaker: The figure below depicts an arch over the Washington Parkway in Washington D.C. The arch is 100 feet wide and 20 feet high in the middle. The formula $y = kx(100 - x)$ describes the arch if the origin is located at the left end of the arch. Can I drive an oversize load that is 15 feet high and 45 feet wide through the arch? **Please determine how wide the arch is when it is 15 feet high.**

20'

100'
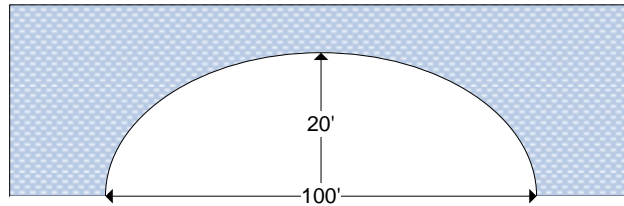
Show your work.
Place a box around your answer.

Yes – When arch is 15 feet high, it is 50 feet wide.