Wolsborn-Drazovich STATE MATHEMATICS 53rd CONTEST, 2009

Test 1 **NAME**: _____

CLASS 7 & 8 Grade **SCHOOL**: _____

SCORING: *20 points for each correct answer, -5 for each wrong answer.*

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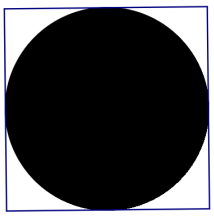
1. A square has perimeter of 8. A circle is inscribed in this square as shown below. Find the circle's area.



(A) 16π (B) 8π (C) 4π (D) 2π (E) π [1] _____

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2. Consider the operation $\star$ as defined by the following table. For example, $3 \star 2 = 1$. Evaluate $(2 \star 4) \star (1 \star 3)$.

$\star$	1	2	3	4
1	1	2	3	4
2	2	4	1	3
3	3	1	4	2
4	4	3	2	1

(A) 4 (B) 3 (C) 2 (D) 1 (E) not possible [2] _____

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3. The ratio of red marbles to green marbles in a package is 3 to 5. If 25 green marbles are in the package, how many red are in the package?

(A) 6 (B) 9 (C) 12 (D) 15 (E) 18 [3] _____

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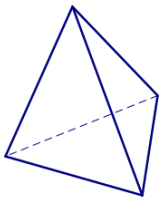
4. If an investment of \$8000 increases by 15 percent at the end of each year, what is the fewest number of years until it doubles in value?

(A) 13 (B) 7 (C) 5 (D) 4 (E) 2 [4] _____

Go to back⟹

5. The tetrahedron shown below has one blue, one red, one green, and one yellow face. If you toss the figure twice, what is the probability that the figure will land on the same color both times?



(A) $\frac{3}{4}$ (B) $\frac{1}{2}$ (C) $\frac{1}{4}$ (D) $\frac{1}{12}$ (E) $\frac{1}{16}$ [5] _____

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6. Each of the blocks below is called a geomlet.

6	72
18	24

36	48
6	30

60	12
18	42

and each of the blocks below is not a geomlet.

15	12
48	20

7	49
28	70

2	24
32	16

Select the block that is a geomlet.

(A)

78	18
84	90

(B)

9	27
45	81

(C)

5	25
50	35

(D)

3	15
9	17

(E)

16	28
36	84

[6] _____

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7. Find the minimum perimeter for a rectangle with an area of 25 square units. You may assume that the dimensions are whole numbers.

(A) 10 (B) 20 (C) 25 (D) 26 (E) 52 [7] _____

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8. A special rubber ball is dropped from the top of a wall that is sixteen feet high. Each time the ball hits the ground it bounces back only half as high as the distance it fell. The ball is caught when it bounces back to a high point of one foot. How many times does the ball hit the ground?

(A) 6 (B) 5 (C) 4 (D) 3 (E) 2 [8] _____

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9. The mean of a list of ten numbers if 8. If 17 and -1 are added to the list, what is the new mean?

(A) 16 (B) 10 (C) 9.6 (D) 8 (E) 2.4 [9] _____

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10. The display on a digital clock reads 6:38 . What will the clock display twenty-seven digit changes later?

(A) 7:01 (B) 7:02 (C) 7:03 (D) 7:04 (E) 7:05 [10] _____

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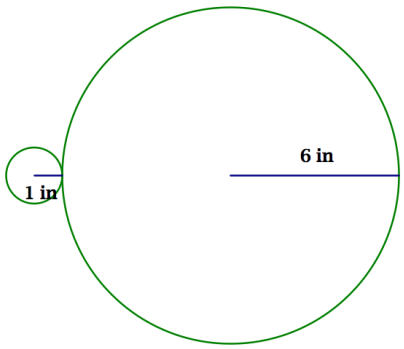
11. A wheel of radius one inch rolls (without slipping) around another wheel with a radius of six inches and returns to its original position. How many rotations will the smaller wheel make?



(A) 6 (B) 12 (C) 18 (D) 24 (E) 36 [11] _____

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12. Two positive numbers have a difference of 6, and the difference between their squares is 48. What is their sum?

(A) 8 (B) 10 (C) 14 (D) 18 (E) 49 [12] _____

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13. What is the probability of getting two heads and one tail when three pennies are tossed?

(A) $\frac{1}{8}$ (B) $\frac{1}{4}$ (C) $\frac{1}{3}$ (D) $\frac{3}{8}$ (E) $\frac{2}{3}$ [13] _____

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14. Find the positive difference between the largest and the second largest elements of the set $\left\{\frac{1}{3}, \frac{3}{10}, \frac{1}{5}, \frac{1}{4}\right\}$.

(A) $\frac{2}{15}$ (B) $\frac{1}{10}$ (C) $\frac{1}{12}$ (D) $\frac{1}{20}$ (E) $\frac{1}{30}$ [14] _____

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15. If the median for a set of scores equals 75, what percentage of the scores is below 75?

(A) 25% (B) 50% (C) 75% (D) 100% (E) cannot be determined [15] _____

Go to back⟹

16. Four married couples belong to a golf club. The wives are named Kay, Sally, Joan and Ann. The husbands are named Don, Bill, Gene, and Fred. Examine the following clues to help you decide who is married to Sally.

    (a) Bill is Joan's brother.

    (b) Joan and Fred were once engaged but broke up when Fred met his present wife.

    (c) Ann has two brothers, but her husband is an only child.

    (d) Kay is married to Gene.

    (A) Cannot be determined (B) Fred (C) Fred or Don (D) Don (E) Bill [16] _____

17. A patch of lily pads doubles in area each day, once it gets started growing in a pond. If a certain pond was completely covered today, what part of the pond was covered in lily pads five days ago?

    (A) $\frac{1}{5}$ (B) $\frac{1}{8}$ (C) $\frac{1}{16}$ (D) $\frac{1}{32}$ (E) $\frac{1}{64}$ [17] _____

18. A manager had **fewer than** 2500 folders. The folders were priced at 50 cents but found no buyers. The manager of the store decided to reduce their price. Within a few days, she had sold her entire stock of these folders for a total of \$31.93. By what amount was the price of a single folder **reduced**?

    (A) \$0.49 (B) \$0.31 (C) \$0.19 (D) \$0.03 (E) \$0.01 [18] _____

19. Pat and Lee counted leaves on two plants. Pat got a one-digit number. Lee got a three-digit number. If the difference of the numbers was 91, what was the sum?

    (A) 109 (B) 110 (C) 111 (D) 112 (E) 113 [19] _____

20. Two blocks of different weights are labeled A and B.

    - The weight of A and B together is 90 kilograms;
    - The weight of two As and B is 115 kilograms.

    What is the difference of their weights?

    (A) 25 (B) 40 (C) 65 (D) 75 (E) 140 [20] _____

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Test 3 **NAME**: _____

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21. When the fraction $\frac{49}{84}$ is expressed in simplest form, what is the sum of the numerator and denominator?

(A) 7 (B) 14 (C) 19 (D) 25 (E) 133 [21] _____

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22. Find the units digit for 7^{100} .

(A) 1 (B) 3 (C) 5 (D) 7 (E) 9 [22] _____

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23. If a field is 14 meters by 48 meters, how many meters will you save by running diagonally across the field than by running along the two sides?

(A) 8 (B) 12 (C) 34 (D) 50 (E) 62 [23] _____

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24. Joe's shadow is 8 feet long at the same time that the shadow of a nearby tree is 32 feet long. If Joe is 6 feet tall, how tall is the tree, in feet?

(A) $42\frac{2}{3}$ (B) 30 (C) $28\frac{1}{3}$ (D) 24 (E) 16 [24] _____

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25. A bag contains 8 red marbles, 3 blue marbles, and 1 green marble. If one marble is drawn at random from the bag, what's the probability of **not** drawing a blue marble?

(A) $\frac{4}{3}$ (B) $\frac{3}{4}$ (C) $\frac{2}{3}$ (D) $\frac{1}{4}$ (E) $\frac{1}{9}$ [25] _____

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26. M is 30 percent of Q , Q is 20 percent of P , and N is 50 percent of P. Find $\frac{M}{N}$.

(A) $\frac{3}{250}$ (B) $\frac{3}{25}$ (C) $\frac{6}{5}$ (D) $\frac{4}{3}$ (E) 1 [26] _____

Go to back⟹

27. Determine the complement of the supplement of an angle whose measure is 140 degrees.

(A) 30° (B) 40° (C) 50° (D) 100° (E) 140° [27] _____

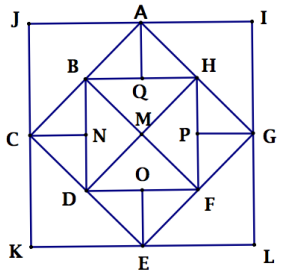
28. Toss a pair of dice and multiply the number of dots showing on the uppermost faces. What is the probability of getting a product that is a multiple of 3?

(A) $\frac{5}{9}$ (B) $\frac{11}{36}$ (C) $\frac{3}{4}$ (D) $\frac{1}{9}$ (E) $\frac{2}{3}$ [28] _____

29. How many more diagonals are in an octagon than a hexagon?

(A) 26 (B) 24 (C) 11 (D) 5 (E) 2 [29] _____

30. How many triangles are contained in the figure below?



(A) 16 (B) 18 (C) 20 (D) 22 (E) 24 [30] _____

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Test 4 **NAME**: _____

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31. Consider a cube with edges of length s . In simplest terms, what is the ratio of the number of cubic inches in the volume of a cube to the number of square inches in its surface area?

(A) $\frac{s}{6}$ (B) $\frac{s}{2}$ (C) $\frac{1}{6}$ (D) $\frac{1}{2}$ (E) $\frac{2}{3}$ [31] _____

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32. Minerva's school library charges a fine on each overdue book. The fine is \$0.25 plus \$0.12 per day. Minerva was fined \$1.09 . How many days overdue was Minerva's book?

(A) 5 (B) 6 (C) 7 (D) 8 (E) 9 [32] _____

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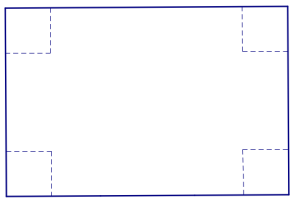
33. Square corners, five units on a side, are removed from a twenty unit by thirty unit rectangular sheet of cardboard. The sides are folded to form an open box. Find the surface area of the exterior of the box, in square units.



(A) 200 (B) 375 (C) 475 (D) 500 (E) 600 [33] _____

---

34. Six coins are in a sack. At least one penny, nickel and dime are in that sack. More nickels than dimes, and more dimes than pennies are in the sack. What is the probability of randomly selecting a nickel from the sack?

(A) $\frac{1}{6}$ (B) $\frac{1}{4}$ (C) $\frac{1}{3}$ (D) $\frac{1}{2}$ (E) $\frac{2}{3}$ [34] _____

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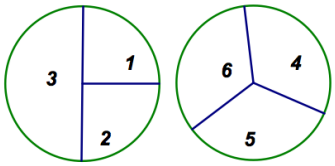
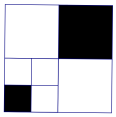
35. The two wheels shown are spun, and the resulting numbers are added. What is the probability that the sum of the two numbers is even?



(A) $\frac{1}{6}$ (B) $\frac{1}{4}$ (C) $\frac{1}{3}$ (D) $\frac{5}{12}$ (E) $\frac{4}{9}$ [35] _____

Go to back⟹

36. What part of the large square shown below is shaded?



(A) $\frac{1}{8}$ (B) $\frac{2}{7}$ (C) $\frac{7}{24}$ (D) $\frac{5}{16}$ (E) $\frac{5}{12}$ [36] _____

37. The data below represent the estimated and the actual costs of raisins in one-half ounce boxes belonging to a group of students. The format is called a back-to-back stem-and-leaf-plot. For example, the top line means that of all the costs, only one estimated cost fell of between 10 and 19, an estimated cost of 16. The second line says that ten estimated costs fell between 20 and 29, three of those being 25. It also says only one actual cost is in this range, 29. What is the median for the actual costs?

Actual costs Ones	Tens	Estimated Costs Ones
	1	6
9	2	0000223555
9999888855422221	3	00015
11100000	4	00005
	5	0000

(A) 39 (B) 38 (C) 35 (D) 31 (E) 30 [37] _____

38. A box containing 40 nails weighs 175 grams. The same box with 20 nails weighs 95 grams. What is the sum of the weight of the box and one nail?

(A) 4 (B) 9.5 (C) 15 (D) 19 (E) 69.7 [38] _____

39. After a summer vacation the 1000 students at Gauss Middle School decided to perform a schoolwide mathematical experiment. All students line up single file on the first day of school. When the doors were opened, the first student to enter opened each one of the lockers numbered from 1 to 1000. The second student then closed the even numbered lockers. The third student went to every third locker, shut it if it was open and opened it if it was closed. The fourth student went to every fourth locker, shut it if it was open and opened it if it was closed. This continued until the 1000th student had entered. What is the number of the 7th open locker?

(A) 13 (B) 17 (C) 49 (D) 64 (E) 81 [39] _____

40. Some people got on a bus. At the first stop, two-fifths of those people got off and three-fifths of that original number got on. At the second stop, one-half of the people got off, and one-third of the number left on the bus got on. At the last stop, three-quarters of the people got off the bus, leaving 5 people on the bus. How many people were on the bus before the bus reached its first stop?

(A) 20 (B) 25 (C) 30 (D) 40 (E) 50 [40] _____

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Test 5 **NAME**: _____

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41. Find the value of the expression $15-14+13-12+11-10+9-8+7-6+5-4+3-2+1$.

(A) -1 (B) 8 (C) 10 (D) 12 (E) 16 [41] _____

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42. Friends go to a party. At the first doorbell ring, one guest arrives. At the second ring, two more guests arrive than on the first ring. At the third ring, two more guests arrive than on the second ring, and so on. How many guests have arrived at the party after the eighth ring?

(A) 15 (B) 36 (C) 49 (D) 64 (E) 81 [42] _____

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43. How many subsets of the set $\{a, b, c, d, e\}$ have fewer than two elements?

(A) 1 (B) 5 (C) 6 (D) 10 (E) 26 [43] _____

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44. A family has three daughters. The product of the daughters' ages is 200. The oldest daughter is twice the age of the middle daughter. What is the sum of their ages?

(A) 18 (B) 20 (C) 22 (D) 27 (E) 31 [44] _____

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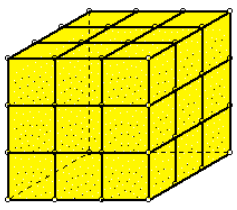
45. Your are given a cube, three inches on a side. This cube is painted, and then cut up into twenty-seven one-inch cubes. Some of the smaller cubes will have three painted faces; some two painted faces; some one and some none at all. Suppose you take these twenty-seven cubes and put them into a large paper bag, shake them up so that they are well-mixed, and then you reach inside the bag and pick one cube. What is the probability that this cube you picked will have paint on exactly two faces?



(A) $\frac{0}{27}$ (B) $\frac{6}{27}$ (C) $\frac{8}{27}$ (D) $\frac{12}{27}$ (E) $\frac{18}{27}$ [45] _____

Go to back⟹

46. A rumor starts by someone telling the rumor to two people on May 1. Each of these people is responsible for telling the rumor to two others, which they do on May 2. So, on May 2, seven people know the rumor. On May 3, the four who heard it on May 2 each tells two people. The rumor process continues like this each day. On what day will 256 new people be told the rumor?

(A) May 12 (B) May 11 (C) May 10 (D) May 9 (E) May 8 [46] _____

47. To the nearest whole number, how many miles an hour is a car traveling if the wheels have diameters of three feet and turn 400 times a minute?

(A) 128 (B) 43 (C) 40 (D) 21 (E) 17 [47] _____

48. The units digit, or the ones digit, of the product of any six consecutive positive whole numbers always equals which number?

(A) 8 (B) 6 (C) 4 (D) 2 (E) 0 [48] _____

49. The length of a rectangle is increased by 20 percent and its width is increased by fifty percent. By what percent does the area increase?

(A) 70 (B) 80 (C) 100 (D) 170 (E) 180 [49] _____

50. Below is a table of grades a class scored on a given test. How many students scored 70 or above?

Scores	Frequency
90-99	3
80-89	5
70-79	12
60-69	5
under 60	2

(A) 5 (B) 8 (C) 12 (D) 20 (E) 27 [50] _____