

Wolsborn-Drazovich STATE MATHEMATICS CONTEST, 2006
50th Anniversary



Test 1

NAME: _____

CLASS 7 & 8 Grade

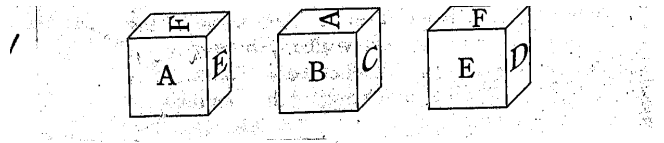
SCHOOL: _____

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

1. Juan needs to enlarge a rectangular photo that is 4 inches by 5 inches. He wants the enlarged area to be 180 square inches. What is the sum of the dimensions of the enlarged photo?

(A) 90 (B) 81 (C) 60 (D) 36 (E) 27 [1] _____

2. The three figures below show the same object from different views. Pick a pair of letters that appear on opposite sides on this cube.



(A) A and D (B) B and F (C) B and D (D) C and E (E) none of these [2] _____

3. The design below is a composition of shaded half-circles and quarter-circles placed on a white circle of radius 10. What is the area of the shaded portion?



(A) 100π (B) 75π (C) 50π (D) 25π (E) 15π [3] _____

4. Matt is going to a basketball game out of town. If he could travel 75 mph for the whole trip, he would arrive one hour early for the game. If he travels 45 mph for the whole trip, he will arrive one hour late. How many miles is the trip he's making for the game?

(A) 35 (B) 120 (C) 225 (D) 375 (E) 2250 [4] _____

5. Consider a 3-digit prime number. Reverse its units and hundreds digits, and now multiply the original and reversed numbers together. Suppose the product equals 65,125. What is its middle digit? **Hint:** consider the prime factors of 65,125.

- (A) 1 (B) 2 (C) 3 (D) 5 (E) 6 [5] _____
-

6. Consider the 3-digit number $7c2$. How many different digits can replace c so that the resulting number is divisible by 3?

- (A) 4 (B) 3 (C) 2 (D) 1 (E) none [6] _____
-

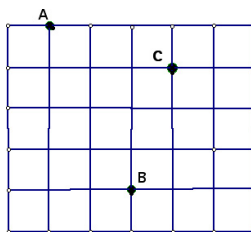
7. You begin walking on a road. You travel 78 feet during the first minute, 85 feet the second minute, 92 feet the third, increasing by 7 feet each minute. If the total time you travel is 8 minutes, how far do you travel?

- (A) 255 feet (B) 673 feet (C) 693 feet (D) 820 feet (E) 1016 feet [7] _____
-

8. A positive number is divided by its reciprocal. The result is $\frac{4}{9}$. Find the **sum** of the number and its reciprocal.

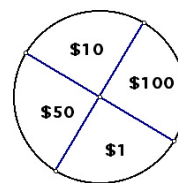
- (A) $\frac{13}{6}$ (B) $\frac{13}{9}$ (C) $\frac{97}{36}$ (D) 1 (E) $\frac{1}{3}$ [8] _____
-

9. On the grid below, three grid points are marked. Point A has coordinates $(1, 5)$, B has coordinates $(3, 1)$, and C has coordinates $(4, 4)$. Measuring **only** along the grid lines, the distance between A and B is 6. Measuring distance in this same way, point C is the same distance from point A as from point B . Including C , how many points on the grid are the same distance from both points A and B ?



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

10. On a new game show called “Who Wants to Spin?” the contestant spins a wheel twice and sums the results of the two spins to determine his or her winnings. The wheel is divided in quarters, and pegs along the dividing lines ensure that the spinner’s pointer never lands on a dividing line, but always inside one of the quarter regions. What is the probability that the contestant wins more than \$100 in this game?



- (A) $\frac{1}{4}$ (B) $\frac{3}{16}$ (C) $\frac{3}{8}$ (D) $\frac{7}{16}$ (E) $\frac{7}{8}$ [10] _____
-

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Test 2

NAME: _____

CLASS 7 & 8 Grade

SCHOOL: _____

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

1. Jo, Pat and Kris went on a picnic. Jo brought two sandwiches and Pat brought three sandwiches, but Kris forgot to bring food. If the three friends shared their food equally and Kris paid Pat and Jo a total of 5 dollars for the sandwiches that they shared, how much money should **Pat** get? Assume that Jo and Pat are paid proportionally according to how much they shared. **Hint:** think about what Jo and Pat don't eat and give to Kris.

(A) \$1 (B) \$2 (C) \$3 (D) \$4 (E) \$5 [1] _____

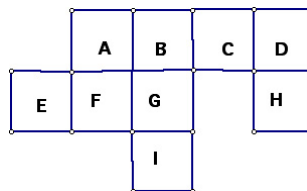
2. In a class of ninth and tenth graders, each student completes a project and may either work alone or with a partner. A ninth grader's partner must be in tenth grade, and a tenth grader's partner must be in ninth grade. If two-thirds of the ninth graders and three-fifths of the tenth graders work in pairs, what proportion of the class works alone?

(A) $\frac{11}{15}$ (B) $\frac{7}{19}$ (C) $\frac{9}{19}$ (D) $\frac{10}{19}$ (E) $\frac{15}{19}$ [2] _____

3. Which is the largest number less than 10,000 that is divisible by both 36 and 60?

(A) 9900 (B) 8640 (C) 6480 (D) 2160 (E) 180 [3] _____

4. Suppose that you are given nine stamps that are connected along the edges shown in the diagram below. How many different ways can five connected stamps be torn off? To be connected, stamps must meet along an entire edge, not just at a vertex.



(A) 10 (B) 12 (C) 14 (D) 15 (E) 16 [4] _____

5. Zero is one solution of $\sqrt{1 - \sqrt{1 - 2x^2}} = x$. How many other real numbers x make the statement true?

- (A) none (B) 1 (C) 2 (D) 3 (E) 4 [5] _____

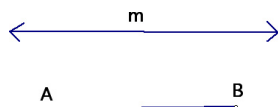
6. Dates can be abbreviated as three two-digit numbers in the form mm-dd-yy. Numbers 1-9 are preceded by 0. For example, June 30, 2001 would be written as 06-30-01. A date is called a *multiplication date* if the product of the first two numbers is the last. For example, March 2, 2006, written as 03-02-06, is a multiplication date because $03 \cdot 02 = 06$. How many of these multiplication dates will occur during the calendar year 2006?

- (A) 1 (B) 2 (C) 4 (D) 6 (E) 8 [6] _____

7. You and your family leave for a two-week vacation. Your little brother accidentally left the bathroom faucet dripping once each second. If the water leaks at a rate of a gallon per hour, approximately how many gallons will be wasted while you are gone?

- (A) 50 (B) 336 (C) 5040 (D) 10,080 (E) 1,209,600 [7] _____

8. Line m is parallel to \overline{AB} , and the distance between them equals half the measure of \overline{AB} . How many points on line m can be found that determine an isosceles triangle, one of whose sides is \overline{AB} ?



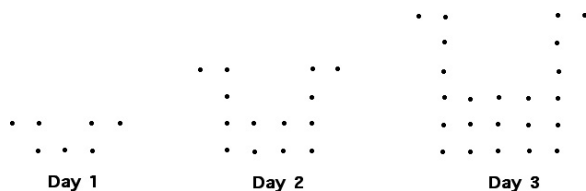
- (A) 2 (B) 3 (C) 4 (D) 5 (E) 6 [8] _____

9. Consider the pattern in the first four rows of the pyramid of numbers shown below. If you continue building, what number would be directly above 120?



- (A) 90 (B) 96 (C) 100 (D) 114 (E) 116 [9] _____

10. If the pattern of dots continues, how many dots will the pattern have on day 12?



- (A) 84 (B) 142 (C) 167 (D) 194 (E) 223 [10] _____

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Test 3

NAME: _____

CLASS 7 & 8 Grade

SCHOOL: _____

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

1. A giant watermelon weighed 50 pounds and was 99 percent water. After sitting in the hot sun, enough of the water has evaporated so that it was only 98 percent water. What is the new weight of the watermelon?

(A) 24.5 lbs. (B) 25 lbs. (C) 48 lbs. (D) 49 lbs. (E) 49.5 lbs [1] _____

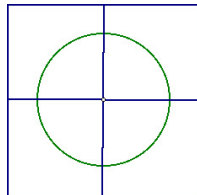
2. During the eight days of the Jewish holiday Hanukkah, one more candle per day is lighted and displayed on a special candleholder called a menorah. The menorah has room for a ninth candle used for lighting the others. All lit candles are allowed to burn down completely each day, and they are replaced for the next day, including the lighting candle. This is true for the ninth candle also. How many candles are needed for the eight days?

(A) 36 (B) 37 (C) 39 (D) 44 (E) 45 [2] _____

3. What are the most pieces into which a circle can be cut by drawing only four straight line segments across the circle?

(A) 11 (B) 10 (C) 9 (D) 8 (E) 6 [3] _____

4. What is the area of the circle that passes through the centers of the four unit squares, as shown below?



(A) π (B) $4 - \frac{1}{2}\pi$ (C) $\frac{1}{2}\pi$ (D) $4 - \frac{1}{4}\pi$ (E) $\frac{1}{4}\pi$ [4] _____

5. What is the smallest prime number that is a factor of the sum of 3^{15} and 15^{17} ?

(A) 11 (B) 7 (C) 5 (D) 3 (E) 2 [10] _____

-
6. Becky wants to make a long distance call to her friend Sarah from a pay phone. She has only \$5.00 on her calling card to pay for the call. The call costs \$0.90 for the first three minutes and \$0.24 for each additional minute. How many minutes can the two friends talk?

(A) 20 (B) 19 (C) 18 (D) 17 (E) 16 [6] _____

7. Find the value of n for which the following statement is true:

$$3^{2002} - 3^{2001} + 3^{2000} - 3^{1999} = n(3^{1999})$$

(A) 40 (B) 22 (C) 21 (D) 20 (E) 14 [7] _____

8. Suppose that 24 tins of caramel corn are cubes measuring 15 cm. on a side. Ron packs the tins for shipping in one large box so that the least amount of cardboard is used. If we don't include the overlapping cardboard ends, approximately how many square centimeters of cardboard are used?

(A) 5400 (B) 11,700 (C) 13,500 (D) 15,300 (E) 81,000 [8] _____

9. At Patrick's Diner, the appetizer special is a basket of fried mushrooms, onion rings, and mozzarella sticks. The cook has fried 24 mozzarella sticks, 30 onion rings, and 42 mushrooms to exactly fill several orders. What is the largest number of orders of appetizer baskets that the cook can prepare? Each basket must contain the same number of each individual kind of appetizer.

(A) 2 (B) 3 (C) 5 (D) 6 (E) 8 [9] _____

10. A farmer at a local market sells much of his produce for \$1.50 per pound. A customer first selects eggplant, spinach, and red-leaf lettuce, for a total cost of \$12. This indecisive customer then asks to leave off the lettuce, for a total of \$10.50. Changing his mind, this customer finally puts the lettuce back in, and removes half of the eggplant, and pays a total of \$8.25. How many pounds of eggplant did the customer take home?

(A) 2 (B) 2.5 (C) 3.5 (D) 4 (E) 4.5 [5] _____

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Test 4

NAME: _____

CLASS 7 & 8 Grade

SCHOOL: _____

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

1. The average age of the 40 members of a computer science camp is 17 years. Of those attending, 20 are girls, 15 are boys, and 5 are adults. If the average age of the girls is 15, and the average age of the boys is 16, what is the average age of the adults?

(A) 30 (B) 28 (C) 27 (D) 24 (E) 21 [1] _____

2. What is the approximate speed in miles per hour of a race car that traverses a football field 100 yards long in one second?

(A) 360 mph (B) 36 mph (C) 34 mph (D) 205 mph (E) 60 mph [2] _____

3. Let A, B and C represent different positive digits. Consider the expression below, noting that ABC signifies a 3-digit number where A is the hundreds digit, B is the tens digit, and C is the ones digit.

$$\frac{ABC}{A + B + C}$$

Which of the following statements best describes its minimum value m ?

(A) $m < 3$ (B) $3 \leq m < 6$ (C) $6 \leq m < 9$ (D) $9 \leq m < 12$ (E) $m \geq 12$ [3] _____

4. Four dimes and four pennies are randomly placed in a row. What is the probability that the first and last coins are both pennies?

(A) $\frac{1}{8!}$ (B) $\frac{6!}{8!}$ (C) $\frac{1}{12}$ (D) $\frac{1}{70}$ (E) $\frac{3}{14}$ [4] _____

5. The point (a, b) is reflected over the y -axis to the point (c, d) , which is then reflected over the x -axis to the point (e, f) . Compute the value of $ab - ef$.

(A) $2ab$ (B) $ab + b^2$ (C) -1 (D) 0 (E) 1 [5] _____

6. Hiking boots that cost \$150 a pair are reduced by 40% for a special weekend sale. By what percent must the special sales price be increased to bring the price back to \$150?

- (A) 40% (B) 60% (C) $66\frac{2}{3}\%$ (D) 100% (E) $166\frac{2}{3}\%$ [6] _____
-

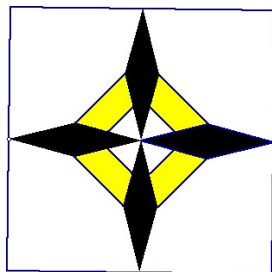
7. Consider the four positive integers 1, 3, 120 and n . If you multiply any two of them the product is one less than a perfect square. Select the best statement about the smallest possible value of n .

- (A) $n \leq 3$ (B) $3 < n \leq 8$ (C) $n = 15$ (D) $n = 21$ (E) $n = 33$ [7] _____
-

8. The faces of a cube are marked with the numbers 1 through 6. Each corner of the cube is assigned a *vertex number* that is equal to the sum of the numbers on the faces that meet at that vertex. What is the sum of all the vertex numbers?

- (A) 21 (B) 36 (C) 42 (D) 84 (E) 168 [8] _____
-

9. The figure below represents one quilt block of a design called “The Beautiful Star”. How many different **types** of convex polygons can be found in the design? Don’t forget to count the outer block shape.



- (A) 9 (B) 6 (C) 5 (D) 4 (E) 3 [9] _____
-

10. The following frequency table contains the test scores for Math 100. What is the **median** exam score?

Score	1	6	7	8	9	10	11	12	13	14	15	16	24
Frequency	1	1	2	6	10	16	13	9	8	5	2	1	1

- (A) 13 (B) 12 (C) 11 (D) 10 (E) 9 [10] _____
-

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Test 5

NAME: _____

CLASS 7 & 8 Grade

SCHOOL: _____

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

1. Ralph has a jar that contains seven pennies, two nickels, three dimes, and five quarters. If he randomly removes coins from the jar, how many must he take out to guarantee that he will have enough pennies and nickels to make nine cents in change?

(A) 5 (B) 6 (C) 8 (D) 14 (E) 16 [1] _____

2. A unit fraction is a proper fraction with a numerator of 1. There are two ways to express $\frac{4}{5}$ as a sum of three different unit fractions. Which of the following could be used together with $\frac{1}{20}$?

(A) $\frac{1}{3}$ (B) $\frac{1}{4}$ (C) $\frac{1}{5}$ (D) $\frac{1}{6}$ (E) $\frac{1}{8}$ [2] _____

3. Study the following table for a pattern between the input values x and output values y . Applying the same rule, find the output value be for an input of $x = 18$.

x	36	53	43	23	942	18
y	8	7	6	4	14	

(A) 2 (B) 3 (C) 5 (D) 8 (E) 9 [3] _____

4. Seventy-five students have just returned from a class trip to Washington D.C. The students visited the following sites. How many students visited none of the three sites?

- Twenty students visited the Washington Monument.
- Thirty-five students visited the White House.
- Fifteen students visited the Kennedy Center.
- Ten students visited the Kennedy Center and the White House.
- Eight students visited the White House and the Washington Monument.
- Six students visited the Washington Monument and the Kennedy Center.
- Four students visited all three sites.

(A) 15 (B) 10 (C) 25 (D) 29 (E) 50 [4] _____

5. Three solid balls, each of radius 3.25 cm, are stored in a cylindrical can with the smallest possible radius and volume. What fraction of the can's volume is air?

- (A) $\frac{2}{3}$ (B) $\frac{2}{9}$ (C) $\frac{7}{9}$ (D) $\frac{1}{2}$ (E) $\frac{1}{3}$ [5] _____
-

6. My son is five times as old as my daughter, and my wife is five times as old as my son. I am twice as old as my wife, and my grandmother, who is as old as all of us put together, is 81 years old today. What is the sum of the ages of my son and wife?

- (A) 25 (B) 26 (C) 28 (D) 30 (E) 35 [6] _____
-

7. A student's score on the first four Inter-school Math Contests were 5, 4, 3, and 3. What score does she need on the fifth and final contest to finish with a mean score of 4 on the five contests?

- (A) 1 (B) 2 (C) 3 (D) 4 (E) 5 [7] _____
-

8. Suppose that $\triangle x$ means $x + 3$, that $\square x$ means x^2 , and that $\bigcirc x$ means $x + 1$. Find the value of the expression below.

$$\square \bigcirc 3 + \bigcirc \square 3 + \bigcirc \triangle 3$$

- (A) 35 (B) 33 (C) 31 (D) 16 (E) 9 [8] _____
-

9. Emma, Louise, Will, and Carlos each have two favorite hobbies that include collections. The collections are seashells, stamps, baseball cards, coins, comic books, dolls, bugs, and rocks. No two students collect the same things. From the clues below, decide which person collects stamps.

- Emma always finds things for both of her collections outdoors.
- One of Carlos's friends enjoys collecting coins.
- The person who collects comic books does not collect baseball cards.
- One of Carlos's hobbies involves a lot of reading.
- One girl collects dolls.
- Louise's family has a beach house, the perfect place for one of her collections.

- (A) Carlos (B) Emma (C) Louise (D) Will (E) insufficient information [9] _____
-

10. A trapezoid is inscribed in a circle of diameter 6. One base is the diameter of the circle. The other base has length 3. What is the perimeter of the trapezoid?

- (A) 12 (B) 13 (C) 15 (D) $9 + 2\sqrt{2}$ (E) $9 + 2\sqrt{3}$ [10] _____
-

Grades 7-8
2006 Math Contest Exam Answer Key

Exam	T1	T2	T3	T4	T5
P1	E	D	B	B	E
P2	A	B	D	D	B
P3	B	A	A	D	D
P4	C	D	C	E	C
P5	B	A	E	D	E
P6	A	C	A	C	D
P7	D	B	D	B	E
P8	A	D	B	D	B
P9	B	C	D	B	A
P10	D	D	B	C	C