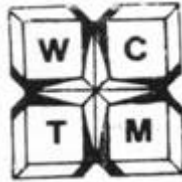


Wolsborn-Drazovich STATE MATHEMATICS 52nd CONTEST, 2008



Test 1

NAME: _____

CLASS 9 & 10 Grade

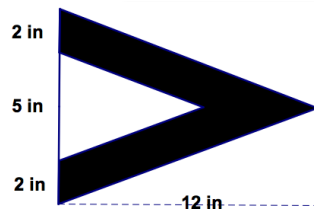
SCHOOL: _____

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

1. How many posts are required to support a straight fence that is 100 yards long if a post is placed every 10 yards?

(A) 9 (B) 10 (C) 11 (D) 15 (E) 20 [1] _____

2. Nautical flags are used to give messages at sea. Substitute flags are used to repeat a letter in a word written with flags. The first substitute flag, shown below, has true colors of blue and yellow but they are shown here as black and white, respectively. Assume that the outside black border of this flag is 2 inches wide, measured along the base — the left-hand edge — of the flag. What is the altitude of the white triangle if the base is 9 inches and the altitude of the flag is 12 inches?

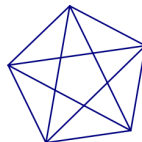


(A) $6\frac{2}{3}$ (B) $9\frac{1}{3}$ (C) $9\frac{2}{3}$ (D) 10 (E) 11 [2] _____

3. Yolanda's Yummy Ice Cream Shoppe was giving away samples of its new flavors: yum yum mint, choco chips, and nutty nosh. 45 people had mint, 56 had nosh and 63 had chips. 18 people sampled both mint and nosh, 26 tasted both chips and nosh, and 20 had both chips and mint. 8 people sampled all three. How many people tried the new flavors?

(A) 164 (B) 155 (C) 132 (D) 108 (E) 85 [3] _____

4. How many triangles are in a regular pentagon drawn with its diagonals?



(A) 11 (B) 25 (C) 30 (D) 35 (E) 36 [4] _____

5. A bicycle tire has a diameter of 66 centimeter. Approximately how many times must the tire rotate to travel 1 kilometer?

(A) 5 (B) 10 (C) 48 (D) 480 (E) 960 [5] _____

Go to back⇒

6. Three consecutive counting numbers have a sum that is 20% of their product. What is the product of these three numbers?

- (A) 12 (B) 17 (C) 60 (D) 336 (E) 720 [6] _____
-

7. Consider the following list of data points:

1, 2, 3, 4, 5, 6, 7, 8, 9, 10, 11

What one number should be removed from the list so that the resulting average is 6.1?

- (A) 3 (B) 5 (C) 7 (D) 9 (E) 11 [7] _____
-

8. Letters have replaced some of the digits in the addition expression below. Given that each digit 1 through 9 appears exactly once in the expression when the digits are revealed, which digit should replace the letter b?

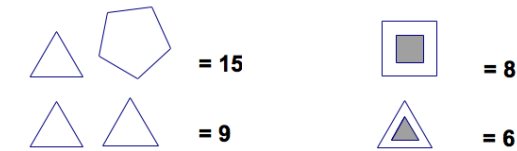
$$\begin{array}{r} a\ 4\ b \\ +\ 2\ c\ 5 \\ \hline d\ 1\ e \end{array}$$

- (A) 3 (B) 6 (C) 7 (D) 8 (E) 9 [8] _____
-

9. When Jorge took his place in the marching band, he was one person in a rectangular array of musicians. He noticed that he was 10th from the front, 7th from the back, 3rd from the left, and 8th from the right. How many musicians were in the band?

- (A) 110 (B) 160 (C) 170 (D) 176 (E) 187 [9] _____
-

10. The following examples come from a geometric system of codes.

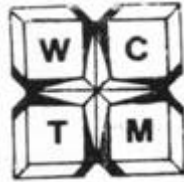


Using their values, find the value of the following symbol.



- (A) 28 (B) 22 (C) 19 (D) 16 (E) 11 [10] _____
-

Wolsborn-Drazovich STATE MATHEMATICS 52nd CONTEST, 2008



Test 2

NAME: _____

CLASS 9 & 10 Grade

SCHOOL: _____

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

11. What day of the week begins a month that has a Friday the 13th?
 (A) Sunday (B) Monday (C) Wednesday (D) Thursday (E) Saturday [11] _____

12. A certain brand of chocolate is packaged in a box that holds only one chocolate, a box that holds five chocolates, or a box that holds twenty-five chocolates. How many boxes are needed to fill an order for 116 chocolates if the least number of boxes are used and each box is filled?



- (A) 5 (B) 7 (C) 8 (D) 12 (E) 13 [12] _____

13. The n th term in a sequence is $2n + 3$ for all counting numbers n . What is the arithmetic mean of the first five terms in the sequence?

- (A) $8\frac{1}{2}$ (B) 9 (C) $9\frac{1}{2}$ (D) 10 (E) $10\frac{1}{2}$ [13] _____

14. You leave for your summer vacation from Seattle, Washington at 4:00 A.M. on Saturday morning, crossing the International Date Line on your way to India. You land in India at 10:00 P.M. Sunday night. Since you're traveling during Daylight Savings Time, Seattle is 7 hours *behind* Greenwich Mean Time, and India is $5\frac{1}{2}$ hours *ahead* of Greenwich Mean Time. Including any layovers, how many hours do you actually spend in transit? Hint: one way to keep things straight is to convert all times to Greenwich Mean Time.

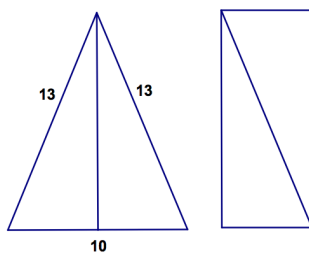
- (A) $27\frac{1}{2}$ (B) $29\frac{1}{2}$ (C) $40\frac{1}{2}$ (D) 42 (E) $54\frac{1}{2}$ [14] _____

15. Initially, three-digit codes were used to identify which long distance phone company you were using. If the initial digit wasn't zero, how many codes were available?

- (A) 720 (B) 729 (C) 810 (D) 900 (E) 1000 [15] _____

Go to back \Rightarrow

16. The isosceles triangle is cut in half and reassembled as the rectangle shown below. What is the perimeter of the rectangle?



- (A) 16.6 (B) 23 (C) 26 (D) 26.6 (E) 34 [16] _____

17. Max has only 20 minutes before he must go to bed, but he wants to play a soccer game that he found on the Internet. The computer downloads at a rate of 58,000 bytes an hour. The game that Max wants to play consists of 8,000 bytes. How much playing time, to the nearest second, does Max have after the game downloads but before he goes to bed?

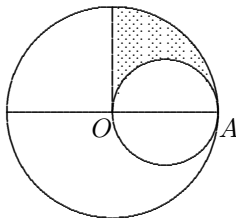
- (A) 8 minutes 16 seconds (B) 8 minutes 17 seconds (C) 10 minutes 43 seconds
 (D) 11 minutes 43 seconds (E) 19 minutes 52 seconds [17] _____

18. Predict the value of x in the table below.

In	0	2	8	10	18
Out	5	11	29	x	59

- (A) 35 (B) 41 (C) 44 (D) 47 (E) 54 [18] _____

19. Approximate the area, in square units, of the shaded region in the diagram below. Let the length of \overline{OA} be 6 units.

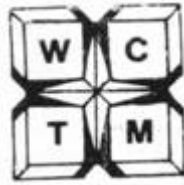


- (A) 3.1 (B) 14.1 (C) 21.9 (D) 28.3 (E) 113.1 [19] _____

20. Two positive integers have a sum of 30 and a product of 144. Find the sum of the reciprocals of the two integers.

- (A) $\frac{1}{30}$ (B) $\frac{1}{6}$ (C) $\frac{5}{24}$ (D) $\frac{5}{12}$ (E) $\frac{37}{72}$ [20] _____

Wolsborn-Drazovich STATE MATHEMATICS 52nd CONTEST, 2008



Test 3

NAME: _____

CLASS 9 & 10 Grade

SCHOOL: _____

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

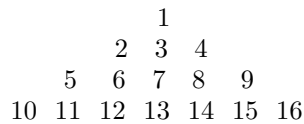
21. Jeremy travels from point A to point B at 2 minutes per mile and returns over the same route at 2 miles per minute. Find his average speed, in miles per hour, for the whole trip.

- (A) 30 mph (B) 48 mph (C) 60 mph (D) 75 mph (E) 120 mph [21] _____

22. A merchant pays an importation tax on certain goods at three different places. At the first he gives one-third of the goods' value; at the second he gives one-fourth of the value of the remainder. At the third he gives one-fifth the value of the remainder. The total tax is \$24. What is the original value of the goods?

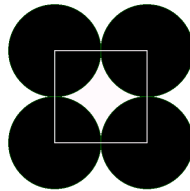
- (A) \$30.64 (B) \$40.00 (C) \$60.00 (D) \$110.77 (E) \$144.00 [22] _____

23. Imagine the continuation of the lattice below. What number would be **directly below** 100 in the continuation?



- (A) 101 (B) 111 (C) 120 (D) 121 (E) 144 [23] _____

24. Four circles are arranged as shown below. Their centers are the vertices of a square drawn in white. If each circle has radius Q , what is the area of the unshaded region inside that square.

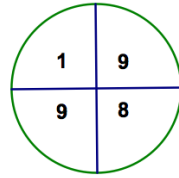


- (A) $Q^2(4 - \frac{\pi}{4})$ (B) $Q^2(1 - \pi)$ (C) $Q^2(2 - \pi)$ (D) $Q^2(4 - \pi)$ (E) $4Q^2(1 - \pi)$ [24] _____

25. Find the product of all the real solutions of the exponential equation $16^{x^2+x+4} = 32^{x^2+2x}$.

- (A) 4 (B) $\frac{4}{3}$ (C) -4 (D) -12 (E) -16 [25] _____

26. The circular target shown below is divided into four congruent sectors with point values 1, 9, 9, and 8. Four darts are thrown at random and each scores. What is the probability that the digits obtained can be arranged as 1998?

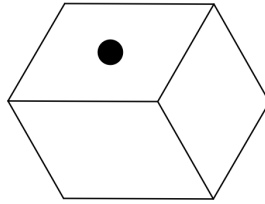


- (A) $\frac{1}{64}$ (B) $\frac{3}{64}$ (C) $\frac{3}{32}$ (D) $\frac{3}{256}$ (E) $\frac{3}{16}$ [26] _____

27. How many zeros does $f(x) = \cos(\log x)$ have on the interval $0 < x < 1$?

- (A) 1 (B) 2 (C) 3 (D) infinitely many (E) none [27] _____

28. In a cube with an edge length of 10 units, a hole with a diameter of 2 units is drilled completely through, perpendicular to the base. Find the surface area of the resulting solid.



- (A) $400 + 18\pi$ (B) $480 + 18\pi$ (C) $400 + 22\pi$ (D) $600 + 18\pi$ (E) $600 + 20\pi$ [28] _____

29. Four numbers are written in a row. The mean of the first two numbers is 7, the mean of the middle two numbers is 2.3, and the mean of the last two numbers is 8.4. What is the mean of the first and last number?

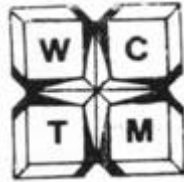
- (A) 5.9 (B) 7.7 (C) 8.9 (D) 11.4 (E) 13.1 [29] _____

30. We interviewed forty-eight students about recycling paper (P), bottles (B), and cans (C). The following chart show the number of students who do **not** recycle one, or a combination of, these items. For example, seven students recycle only bottles according to the chart. How many recycle all three items?

P	B	C	PB	PC	BC	PBC
13	6	9	3	7	4	2

- (A) 6 (B) 16 (C) 32 (D) 44 (E) 46 [30] _____

Wolsborn-Drazovich STATE MATHEMATICS 52nd CONTEST, 2008



Test 4

NAME: _____

CLASS 9 & 10 Grade

SCHOOL: _____

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

31. The sum of the first five terms of an arithmetic sequence is 40, and the sum of the first ten terms of the sequence is 155. Find the formula for the n th term.

- (A) $2n + 3$ (B) $3n + 1$ (C) $3n + 2$ (D) $3n - 1$ (E) $3n$ [31] _____

32. A game is played with two standard dice so that player A wins if the sum of 7 is rolled and player B wins if the sum of 4 or 10 is rolled. No one wins otherwise. What is the probability that B wins?

- (A) $\frac{1}{6}$ (B) $\frac{1}{4}$ (C) $\frac{1}{3}$ (D) $\frac{2}{3}$ (E) $\frac{1}{2}$ [32] _____

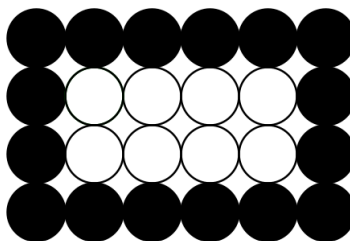
33. The area of a rectangle is 360 square meters. If its length is increased by 10 meters and its width is decreased by 6 meters, then its area does not change. Find the perimeter of the original rectangle.

- (A) 76 (B) 78 (C) 84 (D) 92 (E) 98 [33] _____

34. The point $(4, 3)$ is reflected about the horizontal x -axis to a point P . The P is reflected about the vertical y -axis to point Q . What is the sum of the coordinates of Q ?

- (A) 7 (B) 1 (C) 0 (D) -1 (E) -7 [34] _____

35. Consider a rectangular array of white poker chips. Place dark poker chips side-by-side around the white chips as illustrated below. Imagine an array for which the number of white chips equals the dark ones. In how many different ways can this happen? Do not count twice arrays that have a different orientation but have the same shapes. For example, don't count both a 3 by 5 and a 5 by 3 rectangle.

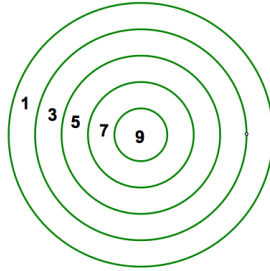


- (A) none (B) 1 (C) 2 (D) 3 (E) infinitely many [35] _____

36. Two missiles speed directly toward each other, one at 9000 miles per hour and one at 21,000 miles per hour. If they start at 1317 miles apart, how far apart are they, in miles, one minute before they collide?

- (A) 817 (B) 500 (C) 263 (D) 200 (E) 2.6 [36] _____
-

37. Luisa was playing darts. She threw six darts, and all hit the target shown below. The numbers 1, 3, 5, and 7 on the target are the scores awarded when a dart hits the ring, and 9 is the score for the center region. Which one of the following might have been her score?



- (A) 17 (B) 28 (C) 29 (D) 31 (E) 56 [37] _____
-

38. A whale's head is 72 inches long; its tail is as long as its head plus half the length of the body, and its body is half its entire length. How long is the whale, in inches?

- (A) 48 (B) 288 (C) 504 (D) 576 (E) 1152 [38] _____
-

39. The front wheel of Farmer Sprout's tractor has a radius of 25 cm and rotates at $2\frac{1}{2}$ revolutions per second. The back wheel has a diameter of 125 cm. At how many revolutions per second does it turn?

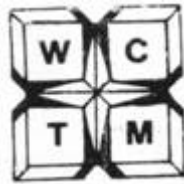
- (A) 0.5 (B) 1 (C) 2 (D) 5 (E) 6.25 [39] _____
-

40. A particle is moving along the y -axis such that its y -coordinate at time t is given by the function $y(t) = t^3 - 3t^2 - 45t$. At time $t = 0$ which of the following statements is true?

- (A) The particle is standing still.
(B) The particle is moving upward and gaining speed upward .
(C) The particle is moving upwards and losing speed upward.
(D) The particle is moving downward and gaining speed downward .
(E) The particle is moving downward and losing speed downward.

[40] _____

Wolsborn-Drazovich STATE MATHEMATICS 52nd CONTEST, 2008



Test 5

NAME: _____

CLASS 9 & 10 Grade

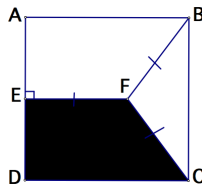
SCHOOL: _____

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

41. Two numbers have a product of 19,551 and a sum of 280. Find their positive difference.

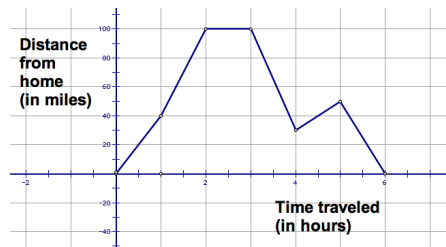
- (A) 14 (B) 133 (C) 196 (D) 280 (E) 19271 [41] _____

42. Figure $ABCD$ is a unit square. Find the area of the shaded region. Segments \overline{EF} , \overline{BF} and \overline{CF} all have the same length.



- (A) $\frac{1}{3}$ (B) $\frac{3}{8}$ (C) $\frac{5}{8}$ (D) $\frac{11}{32}$ (E) $\frac{13}{32}$ [42] _____

43. The graph below describes a six-hour trip that Ramon recently took, starting from his home. What was his average speed during that trip?



- (A) 30 mph (B) 40 mph (C) 50 mph (D) 240 mph (E) 300 mph [43] _____

44. What is the sum of all two-digit whole numbers whose squares end with the digits 21?

- (A) 111 (B) 139 (C) 161 (D) 189 (E) 200 [44] _____

45. A data set of five **unequal** numbers has range 6. Both the mean and the median of the set are 7. What is the product of the lowest and highest numbers in the set?

- (A) 16 (B) 27 (C) 40 (D) 42 (E) 55 [45] _____

46. The following four hockey teams have each played each other once. If Montreal defeated Boston with the score 3-0, what was the score of the game between Toronto and Boston?

Team	Games Played	Won	Lost	Tied	Goals <i>For</i>	Goals Against
Montreal	3	3	0	0	7	0
Boston	3	1	1	1	2	3
Toronto	3	1	1	1	3	3
New York	3	0	3	0	1	6

- (A) tie 3-3 (B) tie 1-1 (C) tie 0-0
 (D) Toronto beats Boston 3-0 (E) Boston beats Toronto 2-0 [46] _____

47. Wichita, Kansas is due north of Fort Worth, Texas. They lie on a circle centered at the Earth's center with approximate radius 3950 miles. The latitude of Wichita is approximately 37 degrees north, and Fort Worth is approximately 32 degrees north. What is the approximate distance, in miles, between the two cities?

- (A) 172 (B) 345 (C) 688 (D) 1376 (E) 2206 [47] _____

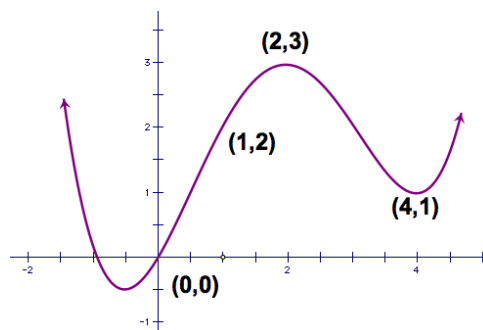
48. While shopping, a man purchased some scratch cards and won. His winnings equaled 20% of what he had when he left home. To celebrate, he went for dinner and spent 25% of everything he now had, leaving \$180 in his wallet. How much did he spend for the dinner?

- (A) \$200 (B) \$180 (C) \$60 (D) \$50 (E) \$10 [48] _____

49. Give the best approximation, in feet, for the smallest length for a diagonal of a rectangle with a perimeter of ten feet.

- (A) 3.5 (B) 3.6 (C) 3.8 (D) 4.1 (E) 5.0 [49] _____

50. Based on the information in the graph, which expression has the **smallest** value?



- (A) $\frac{f(4) - f(0)}{4}$ (B) $f'(1)$ (C) $f(2)$ (D) $f''(2)$ (E) $f''(4)$ [50] _____

Grades 9-10
2008 Math Contest Exam Answer Key

Exam	T1	T2	T3	T4	T5
P1	c	a	b	d	a
P2	a	c	b	a	e
P3	d	b	c	a	b
P4	d	b	d	e	e
P5	d	d	e	c	c
P6	c	e	e	b	c
P7	b	d	d	b	b
P8	a	a	d	d	c
P9	b	b	e	b	a
P10	a	c	c	d	d