



Indiana State Math Contest

2022

Pre-Algebra

Exam

This test was prepared by faculty of
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Mark your calendar:

ICTM State Awards Ceremony 2022: Friday, June 3, 2022

ICTM State Math Contest 2023: Saturday, April 22, 2023

Do not open this test booklet until you have
been advised to do so by the test proctor.

Indiana Council of Teachers of Mathematics
State Mathematics Competition
Pre-Algebra 2022

Indiana State University, Department of Mathematics and Computer Sciences

1. $\frac{2^3 \times 9 \times 11}{4 \times 5 \times 20} \times \frac{4^2 \times 5^2}{8 \times 9 \times 11} =$
 (A) 1 (B) $\frac{1}{4}$ (C) 20 (D) $\frac{1}{20}$ (E) None of these

2. $\frac{(0.2)^2}{2} =$
 (A) 0.002 (B) 0.02 (C) 0.2 (D) 2 (E) 20

3. A family has 6 children whose ages total 30. In four years, what will the ages of the children total?
 (A) 39 (B) 42 (C) 54 (D) 60 (E) None of these

4. Compute $89201.6 + 90201.8 + 91201.5 + 92201.9 + 93201.69 + 94201.71 + 95201.68 + 96201.72 + 97201.67 + 98201.73 + 99201.7 =$
 (A) 936218.7 (B) 1036218.7 (C) 1096218.7 (D) 11162187 (E) 1136218.7

5. A ream of paper containing 1000 sheets is 0.05 m thick. Approximately how many sheets of this type of paper would there be in a stack 75 cm high?
 (A) 5000 (B) 11000 (C) 13340 (D) 15000 (E) None of these

6. If $x = -2$, the least number in the set $\{2x, -4x, x^2, \frac{4}{x}, \frac{0}{x}\}$ is
 (A) $2x$ (B) $-4x$ (C) x^2 (D) $\frac{4}{x}$ (E) $\frac{0}{x}$

7. The product of the 11 factors
 $(1 - \frac{1}{100})(1 - \frac{1}{99})(1 - \frac{1}{98})(1 - \frac{1}{97})(1 - \frac{1}{96})(1 - \frac{1}{95})(1 - \frac{1}{94})(1 - \frac{1}{93})(1 - \frac{1}{92})(1 - \frac{1}{91}) \times \frac{1}{9} =$
 (A) $\frac{1}{10}$ (B) $\frac{1}{9}$ (C) $\frac{1}{2}$ (D) $\frac{10}{11}$ (E) $\frac{11}{2}$

8. The number halfway between $\frac{49}{84}$ and $\frac{8}{64}$ on the number line is
(A) $\frac{29}{48}$ (B) $\frac{17}{48}$ (C) $\frac{11}{48}$ (D) $\frac{1}{3}$ (E) $\frac{1}{2}$
9. A square and a triangle have equal perimeters. The lengths of the three sides of the triangle are 6.2 cm, 8.3 cm and 9.5 cm. The area of the square is
(A) 24 cm^2 (B) 36 cm^2 (C) 48 cm^2 (D) 64 cm^2 (E) 144 cm^2
10. How many positive factors of 36 are also multiples of 6?
(A) 2 (B) 3 (C) 4 (D) 5 (E) 6
11. If the length and width of a rectangle are each increased by 10%, then the area of the rectangle is increased by:
(A) 1% (B) 10% (C) 20% (D) 21% (E) None of these
12. If you walk for half an hour at a rate of 4 mph and then run for half an hour at a rate of 10 mph, how many miles have you gone at the end of one hour?
(A) 7 miles (B) 8 miles (C) 9 miles (D) 480 miles (E) None of these
13. There are twenty-four 4-digit numbers that can be formed, each using all the digits 1, 2, 3, 4. The 3rd smallest such number is:
(A) 1234 (B) 1423 (C) 1432 (D) 1324 (E) 1243
14. The ratio of boys to girls in a school is 2:3. If there are 1000 students in the school, how many more girls than boys are in the school?
(A) 100 (B) 200 (C) 300 (D) 400 (E) None of these
15. The integer 119 is exactly divisible by
(A) 2 (B) 3 (C) 5 (D) 7 (E) None of these
16. A sequence is 1, 2, 4, 7, 11, A possible eighth number in this sequence is:
(A) 25 (B) 27 (C) 29 (D) 31 (E) None of these

17. If $xy = 8$, $z^3 + 3 = 219$, then the value of xyz is
(A) 64 (B) 1296 (C) 36 (D) 48 (E) None of these
18. The integer closest to $\sqrt{\frac{6010}{99} + \frac{395}{100}}$ is
(A) 3 (B) 8 (C) 9 (D) 25 (E) 64
19. If the product of all prime numbers between 1 and 2020 is divided by 209, what is the remainder?
(A) 3 (B) 2 (C) 1 (D) 0 (E) None of these
20. Henry has \$24 more than Joe, and Joe has \$15 more than Ann. Together the three people have \$57. The amount Ann has, in dollars, is:
(A) \$18 (B) \$20 (C) \$39 (D) \$45 (E) None of these
21. The side, front, and bottom faces of a rectangular solid have areas of x , y , and xy cm^2 respectively. The volume of the solid, in cubic centimeters, is
(A) xy (B) x^2y (C) x^2y^2 (D) xy^2 (E) None of these
22. A rectangular garden 40 feet long and 20 feet wide is enclosed by a fence. To make the garden larger, while using the same fence, its shape is changed to a square. By how many square feet does this enlarge the garden?
(A) 100 (B) 200 (C) 300 (D) 400 (E) 500
23. If $\frac{1}{5} : x$ is equivalent to $\frac{2}{3} : \frac{5}{3}$, then x equals:
(A) $\frac{3}{8}$ (B) $\frac{1}{2}$ (C) $1\frac{1}{8}$ (D) $1\frac{1}{2}$ (E) None of these
24. The second exit on a highway is located at milepost 30 and the tenth exit is at milepost 150. There is a service center on the highway located three-fourths of the way from the second exit to the tenth exit. At what milepost would you expect to find this service center?
(A) 90 (B) 100 (C) 110 (D) 120 (E) 130
25. How many positive integers less than 1000 are neither multiples of 2 or 3?
(A) 330 (B) 331 (C) 332 (D) 333 (E) None of these

26. A complete cycle of a traffic light takes 60 seconds. During each cycle the light is green for 25 seconds, yellow for 5 seconds, and red for 30 seconds. At a randomly chosen time, what is the probability that the light will be green?

- (A) $\frac{1}{4}$ (B) $\frac{1}{3}$ (C) $\frac{5}{12}$ (D) $\frac{1}{2}$ (E) $\frac{7}{12}$

27. If $\frac{x}{4} + \frac{y}{5} = \frac{18}{20}$, where x and y are positive integers, then $4x+4y$ is

- (A) 15 (B) 16 (C) 17 (D) 18 (E) None of these

28. The volume V of a sphere is equal to $\frac{4}{3}\pi r^3$ where r is the radius. If the radius is doubled, by how many times is the volume increased?

- (A) 8 (B) 27 (C) 24 (D) 3 (E) None of these

29. The ratio of the number of games lost to the number of games won (no ties) by the Middle School A is $\frac{4}{11}$. To the nearest whole percent, what percent of its games did the team lose?

- (A) 24% (B) 27% (C) 36% (D) 45% (E) 73%

30. The average age of the 35 members of a mathematics camp is 17 years. There are 15 girls, 15 boys, and 5 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) 26 (B) 27 (C) 28 (D) 29 (E) 30

31. Given that $a^2 - 3a + 1 = 0$, then $\frac{1}{a^2 + \frac{1}{a^2}} =$

- (A) $\frac{1}{3}$ (B) $\frac{1}{5}$ (C) $\frac{1}{7}$ (D) $\frac{1}{9}$ (E) None of these

32. Let $a = 2019$ and $x+1 = 2019^2 + 2020^2$ then $\sqrt{2x+1} =$

- (A) $2a$ (B) $2a+1$ (C) $2a-1$ (D) $2a+2$ (E) None of these

33. Let $x + y + xy = 21$ where x and y are positive integers. Then $x + y =$
(A) 8 (B) 9 (C) 10 (D) 11 (E) None of these
34. If $b = 2d$, $c = 3d$, and $b + c + 2d = 42$, then what does b equal?
(A) 12 (B) 21 (C) 24 (D) 42 (E) None of these
35. Three bags of jelly beans contain 26, 28, and 30 beans. The ratios of yellow beans to all beans in each of these bags are 50%, 25%, and 30%, respectively. All three bags of candy are dumped into one bowl. Which of the following is closest to the ratio of yellow jelly beans to all beans in the bowl?
(A) 31% (B) 32% (C) 33% (D) 35% (E) 95%
36. Two angles are supplementary with one angle 70 degrees greater than the other. What is the smaller angle, in degrees?
(A) 90 (B) 40 (C) 50 (D) 55 (E) None of these
37. There is a set of five positive integers whose average (mean) is 5, whose median is 5, and whose only mode is 8. What is the sum of the smallest integer and median in the set?
(A) 3 (B) 5 (C) 6 (D) 7 (E) 8
38. At the grocery store last week, small boxes of facial tissue were priced at 8 boxes for \$10. This week they are on sale at 10 boxes for \$8. The percent decrease in the price per box during the sale was closest to
(A) 30% (B) 36% (C) 40% (D) 45% (E) 65%
39. How many whole numbers are between $\sqrt{6}$ and $\sqrt{145}$?
(A) 7 (B) 8 (C) 9 (D) 10 (E) None of these
40. If the product $\frac{3}{2} \times \frac{4}{3} \times \frac{5}{4} \times \frac{6}{5} \times \dots \times \frac{x}{y} = 10$, what is the sum of x and y ?
(A) 11 (B) 13 (C) 37 (D) 39 (E) None of these