# 2010 SCSU MATH CONTEST
7th and 8th Grade Test

DIRECTIONS: Select the BEST completion or response from among those given. Scientific and graphing calculators are allowed. Symbolic calculators are not allowed.

1. At noon there were 20 children in the gym. Later, when 2 boys and 3 girls left for home, the ratio of boys to girls in the gym was 2:1. What was the ratio of boys to girls in the gym at noon?

A. 2:1   B. 3:1   C. 3:2   D. 5:3   E. 5:2

2. Sam bought a car. That same day, he installed a brand new stereo that he purchased for $200, sold the old stereo for $50, and spent $20 on an oil change. The next day he sold the car for $4000. His net profit was $300. How much did Sam pay for the car?

A. $3000   B. $3530   C. $3700   D. $4000   E. none of these

3. Cathy is 4 years old. Adam is three times as old as Cathy, and Ben's age is half of Adam's age. When Cathy's age is half of Adam's, how old is Ben?

A. 6   B. 8   C. 10   D. 12   E. 16

4. One interior angle of a triangle measures 30° and another interior angle measures 60°. The length of the shortest side of this triangle is 30 inches. What is the length of the longest side of this triangle?

A. 30 inches   B. 60 inches   C. 90 inches   D. $30\sqrt{2}$ inches   E. $30\sqrt{3}$ inches

5. Each edge of a cube measures 1.5 cm. What is the surface area of the cube?

A. 3.375 cm^2 B. 4.5 cm^2 C. 6.75 cm^2 D. 9 cm^2 E. 13.5 cm^2

6. An electric drill is used to bore a hole through a piece of wood. The drill is rotating at 10,000 revolutions per minute. If it takes 24,000 revolutions to drill completely through the piece of wood, how many seconds does this operation take?

A. 1   B. 2.4   C. 12   D. 144   E. 720

7. Your bank requires you to select a password for your account. The password must be 2 characters long. Upper and lower case letters are considered different (the letter *a* is different from the letter *A*). If you can use upper or lower case letters, the digits 0 – 9, and 15 special characters (such as the dollar sign), how many unique passwords are possible?

A. 154   B. 1296   C. 2601   D. 5929   E. 67,108,864

8. The sum of three distinct prime numbers is 40. What is the product of these three prime numbers?

A. 175   B. 330   C. 396   D. 434   E. none of these

9. The sum of the digits of a five-digit counting number is 2. How many such numbers exist?
(Note: The smallest 5-digit number is 10,000).

A. 6   B. 5   C. 4   D. 3   E. none of these

10. If $\frac{2}{3}$ of a cup of fish food can feed eight goldfish, then 4 cups of fish food should feed how many goldfish?

A. 13   B. 24   C. 32   D. 48   E. none of these

11. How many two-digit numbers are divisible by both 2 and 7?

A. 64   B. 11   C. 7   D. 3   E. none of these

12. A rectangular wall is being covered with 4-inch by 4-inch square tiles. How many tiles are needed to completely cover a wall that is 5 feet by 7 feet?

A. 3   B. 9   C. 20   D. 315   E. 1260

13. An urn is filled with coins and beads, all of which are either silver or gold. Twenty percent of the objects in the urn are beads. Forty percent of the coins in the urn are silver. What percentage of the objects in the urn are gold coins?

A. 8%   B. 32%   C. 48%   D. 60%   E. not enough information

14. The reciprocal of $\left(\frac{1}{2} \times 4\right)$ is _____.

A. $2 \times \frac{1}{4}$ B. $\frac{1}{2} \times \frac{1}{4}$ C. $\frac{1}{2} \times 4$ D. 2×4 E. $\frac{4}{2} \times \frac{2}{4}$

15. John's list is made up of 10 counting numbers. He finds the mean of the 10 numbers and then divides the sum of the numbers by their mean. What answer should John get?

A. 1   B. 5   C. 10   D. 20   E. Impossible to tell

16. The formula for the area of a trapezoid is $A = \frac{1}{2}(a + b)h$.
What is the area of a trapezoid when $a = 26$, $h = \frac{1}{2}b$, and $a = \frac{1}{3}b$?

A. 26 square units   B. $75\frac{1}{9}$ square units   C. $225\frac{1}{3}$ square units   D. 2028 square units   E. none of these

17. A portion of the number line is divided into four equal parts, as shown. What is the value of p?

A. 0.2309   B. 0.2354   C. 0.2804   D. 0.2854   E. 0.3304

18. A person traveled from A to B at 40 miles per hour and then from B to A at 60 miles per hour. What was the person's average speed (in miles per hour) during the entire journey?

A. 52 mph   B. 51.2 mph   C. 50 mph   D. 48 mph   E. not enough information

19. Paul has twice as many brothers as sisters. His sister, Mary, has five times as many brothers as sisters. How many sons and daughters do their parents have?

A. 4 sons, 2 daughters   B. 5 sons, 1 daughter   C. 2 sons, 5 daughters   D. 3 sons, 1 daughter   E. 5 sons, 2 daughters

20. The radii of three concentric circles are in the ratio of 1:2:3. What is the probability that a random shot that hits the target will hit inside the second circle but outside the innermost circle?

A. $\frac{8}{11}$ B. $\frac{1}{3}$ C. $\frac{3}{7}$ D. $\frac{1}{2}$ E. $\frac{2}{5}$

21. Consider three squares. The outer square has a side of length 2. Square ABCD is constructed by joining the midpoints of the sides of the outer square. The innermost square is constructed by joining the midpoints of the sides square ABCD. What is the ratio of the perimeter of the innermost square to its area?
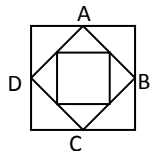
A. $\frac{1}{\sqrt{2}}$ B. $\frac{\sqrt{2}}{1}$ C. $\frac{1}{1}$ D. $\frac{2}{1}$ E. $\frac{4}{1}$

22. For all nonzero real numbers x and y such that $x - y = xy$, find $\dfrac{1}{x} - \dfrac{1}{y}$.

A. -3 B. -1 C. 0 D. $\dfrac{2}{3}$ E. $\dfrac{7}{8}$

23. How many two-digit whole numbers are increased by exactly 9 when the digits are reversed?

A. 8   B. 7   C. 6   D. 5   E. none of these

24 . Nine different two-digit numbers can be formed with the digits 1, 3, and 7. How many of these numbers are prime?

A. 5   B. 6   C. 7   D. 8   E. 9

25. Suppose that $A, B,$ and C are three numbers for which $1001C - 2002A = 4004$ and $1001B + 3003A = 5005$. Find the average of the three numbers $A, B,$ and C.

A. 2   B. 3   C. 4   D. 5   E. 9

26. Noah was asked by his teacher to subtract 3 from a certain number and then divide the result by 9. Instead, he subtracted 9 and then divided the result by 3, obtaining an answer of 43. What would his answer have been if he had worked the problem correctly?

A. 15   B. 45   C. 129   D. 135   E. 138

27. Each of the small circles in the figure has radius 1. The innermost circle is tangent to the six circles that surround it, and each of those circles is tangent to the large circle and each adjacent small circle. Find the area of the shaded region.
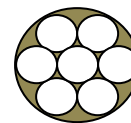
A. π B. 2π C. $2\pi^2$ D. 8π E. $8\pi^2$

28. How many integers k exist such that the equation $kx - 12 = 3k$ has an integer solution for x?

A. 4   B. 6   C. 9   D. 12   E. 67

29. For nonzero numbers $a, b,$ and $c,$ define $(a, b, c) = \dfrac{a}{b} + \dfrac{b}{c} + \dfrac{c}{a}.$ Find $(2, 12, 9)$

A. 1   B. $\dfrac{41}{36}$ C. 6   D. $\dfrac{37}{6}$ E. $\dfrac{251}{36}$

30. Ten chickens are raised using organic feed. Three of the chickens weigh 3.2 pounds each, four of them weigh 3.5 pounds each, and the remaining three chickens weigh 3.6 pounds each. How much less than the average weight of the 10 chickens is the weight of the lightest chickens?

A. 0.10 pounds   B. 0.23 pounds   C. 0.24 pounds   D. 0.30 pounds   E. 0.40 pounds

31. Among 100 applicants for a technical position, 10 had never taken a course in chemistry or physics. Seventy-five had taken at least one chemistry course, and 83 had taken at least one physics course. How many had taken both a chemistry course and a physics course?

A. 17   B. 25   C. 48   D. 58   E. 68

32. Consider three married couples; Mark and his wife Mary, Joe and his wife Jane, and Al and his wife Anna. Mark is three years older than Mary, Joe is two years younger than Jane, and Al is 25. Find Anna's age if the average age of the husbands for these three married couples is two years more than the average age of the wives.

A. 20   B. 23   C. 25   D. 30   E. none of these

33. Determine m given that $m > 0$ and the points $(m, 5)$ and $(1, m)$ lie on a line with slope m.

A. 4   B. $\sqrt[3]{7}$ C. $-\frac{1}{5}$ D. $\sqrt{5}$ E. 8

34. If carpeting costs $21.95 per square yard and carpet padding costs $2.55 per square yard, how much will it cost to carpet the region shown in the figure to the right?
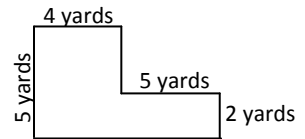
A. $539.00   B. $1075.55   C. $735.00   D. $482.90   E. $1200.50

35. Set L contains four consecutive, positive, odd integers. The sum of the greatest integer and twice the least integer is 39. Find the least integer in the set.

A. 7   B. 9   C. 13   D. 15   E. none of these

36. A 17-foot ladder is placed against a wall so the foot of the ladder is 8 feet from the base of the wall. If the upper end of the ladder slides 3 feet down the wall, how far does the base of the ladder slide along the ground? Express your answer to the nearest tenth of a foot.

A. 1.2 feet   B. 2.5 feet   C. 3.0 feet   D. 3.3 feet   E. 4.0 feet

37. If $\frac{1}{4}$ of 2^{20a} is 4^x, then $x =$

A. $20a - 1$ B. $10a - 1$ C. $5a - 1$ D. $5a$ E. $\frac{5}{2}a$

38. Circle A has a radius of 4 and is centered at the origin; every second, its radius increases by 3 units. Circle B has a radius of 12 and is centered at the point $(30, 0)$; every second its radius decreases by 1 unit. This process continues until the circles meet at a single point for the first time. At that time, the point $(27, 4)$ lies

A. inside circle A.   B. on circle A.   C. inside circle B.   D. on circle B.   E. outside both circles.