2014 SCSU MATH CONTEST
9th and 10th Grade Test

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

1. A grandfather clock chimes once on the half hour and chimes the number of the hour on the hour (for example three times at 3:00 and one time at 3:30). A young boy could not yet tell time but was counting the number of times the clock chimed. At 3:40 he told his mother that the clock had chimed 34 times. What time was it when the boy began counting the chimes?

A. 10:30 B. 11:00 C. 11:30 D. 12:00 E. 12:30

2. Today's date is 4-3-14. How many **prime number** factors does 4314 have?

A. 1 B. 2 C. 3 D. 4 E. more than 4

3. One circle has an area of 64π. A second circle has a radius that is 3 units larger than the first. What is the circumference of this second circle?

A. 11π B. 16π C. 22π D. 35π E. 48π

4. For real numbers a and b, $|a|+|b|-|a+b|$ is always

A. positive B. negative C. zero D. non-positive E. non-negative

5. Mary bought a house for $130,000 on January 1, 2005. By January 1, 2014 the value had increased to $150,000. Approximately what is the compound annual growth rate for the value of Mary's home?

A. 0.12% B. 0.15% C. 1.016% D. 1.12% E. 1.6%

6. Angle A and B are supplementary angles. The measure of angle A is 36° less than twice that of angle B. Find the measure of angle A.

A. 42° B. 48° C. 72° D. 108° E. 132°

7. Which of the following lines is **not** parallel to the line 3x = 2y + 10?

A. $y = \frac{3}{2}x - 7$ B. $6x + 5 = 4y - 6$ C. $9x - 6y = 4$ D. $8x = 12y - 1$ E. $10y = 15x$

8. Which of the following is a counterexample for this conditional statement: If a capital letter is a symmetrical figure, then it is the letter A.

A. H B. J C. L D. P E. R

9. Annie bought some DVDs. She paid $98.58, including 6% sales tax. Some DVDs were $12 each and some were $15 each. How many of the $15 DVDs did she buy?

A. 2 B. 3 C. 4 D. 5 E. 6

10. A year ago a man was eight times the age of his son. Now his age is equal to the square of his son's age. Find the present age of the father.

A. 25 B. 36 C. 49 D. 64 E. 81

11. A restaurant owner needs to order both beef and chicken. He must purchase exactly four times as many packages of chicken as beef. The beef costs $6.50 per package and the chicken costs $5.00 per package. He has at most $500 for the purchase of chicken and beef and he wants to buy as much as he can. How many packages of chicken should he order?

A. 16 B. 18 C. 64 D. 72 E. 80

12. Each of four students received a score on an exam. The average of the first two students' scores is 50. The average of the second and third students' scores is 75 and the average of the third and fourth students' scores is 70. What is the average of the first and fourth students' scores?

A. 45 B. 48.75 C. 60 D. 65 E. 72.5

13. In a small town, 60% of the households have a pet dog. If a household has a pet dog, there is a 70% chance that the household also owns a cat. If a household does not have a dog, there is a 30% chance that the household owns a cat. What is the probability that a randomly selected household owns a cat?

A. 0.12 B. 0.30 C. 0.42 D. 0.54 E. 0.72

Figures for questions 14-16.

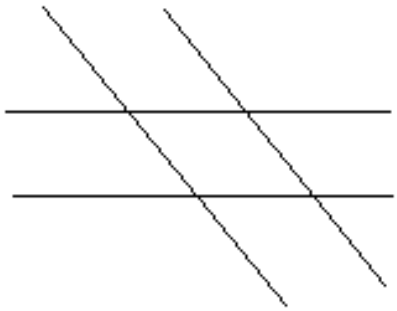

Figure 1

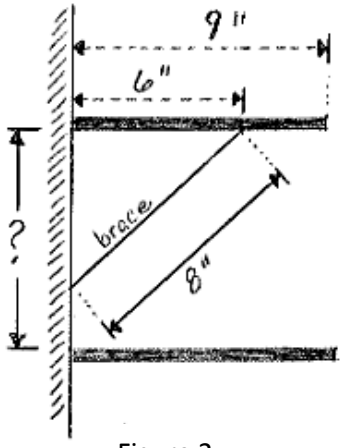

Figure 2

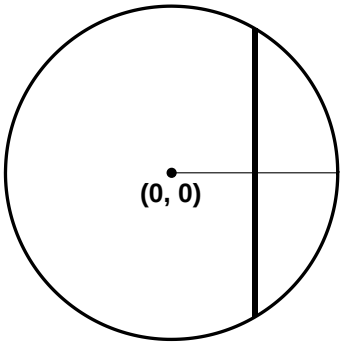

Figure 3

14. Figure 1 (above left) shows two pairs of parallel line segments. How many **pairs** of equal acute angles are there?

A. 4 B. 8 C. 16 D. 28 E. 32

15. A 9" shelf is held up by an 8" brace. The brace attaches to the shelf at a point 6" from the wall (see Figure 2, above center). There is a two-inch clearance from the bottom of the brace to the top of the next shelf. How far below the bottom of the 9" shelf is the top of the next shelf placed?

A. 6.1 inches B. 7.3 inches C. 8.7 inches D. 10.0 inches E. 12.0 inches

16. The equation of the circle in Figure 3 (above right) is $x^2 + y^2 = 16$. The chord shown is a perpendicular bisector of the radius. Find the length of this chord, to the nearest tenth of a unit.

A. 6.9 B. 7.0 C. 7.9 D. 8.0 E. 10

17. A rectangle has a perimeter of 34. A second rectangle has a length 30% longer and width 30% shorter than the original rectangle. How much larger or smaller is the area of the second rectangle?

A. 9% smaller B. 10% smaller C. No difference D. 9% larger E. 10% larger

18. After dining out, three friends paid their bill and noticed a bowl of mints on the front counter. Sean took one-third of the mints but then returned 4. Faizah next took one-fourth of what was left but then returned 3 of them. Gene took half of the remainder, but returned two mints to the bowl. At this time, the bowl had only 17 mints in it. How many mints were in the bowl at the start?

A. 24 B. 27 C. 36 D. 42 E. 48

19. How many different 11-letter words (real or imaginary) can be formed if the letters in the word MATHEMATICS are each used once?

A. 4,989,600 B. 6,652,800 C. 9,979,200 D. 13,305,600 E. 39,916,800

20. The graph of $9x^2 + y^2 = 9$ is which of the following?

A. circle B. ellipse C. parabola D. hyperbola E. cardioid

21. An isosceles trapezoid has bases of length 4 cm and 10 cm and an area of 56 cm^2. Find the perimeter of this trapezoid, to the nearest tenth cm.

A. 24.0 cm B. 31.1 cm C. 33.0 cm D. 38.3 cm E. 44.5 cm

22. Jake's favorite three-digit odd number has the following properties:
    - All the digits are different and have a sum of 15.
    - The difference between the first two digits is the same as the difference between the last two digits.
    - The hundreds digit is greater than the sum of the tens and units digits.

    If we let x represent Jake's favorite number, what is true about x?

A. $750 < x \leq 800$ B. $800 < x \leq 850$ C. $850 < x \leq 900$ D. $900 < x \leq 950$ E. $950 < x \leq 999$

23. A truck tire rotates at 150 revolutions per minute when the truck is travelling 40 kilometers per hour. What is the radius of the tire to the nearest hundredth of a meter?

A. 0.59 meters B. 0.63 meters C. 0.71 meters D. 0.89 meters E. 0.93 meters

24. Simplify $\frac{(4x^{-1}y^{\frac{1}{3}})^{\frac{3}{2}}}{(xy)^{\frac{3}{2}}}$

A. $4y^2$ B. $8xy^2$ C. $\frac{6y}{x^3}$ D. $\frac{4x}{y}$ E. $\frac{8}{x^3y}$

25. If $y_1 = x^2$ and $y_2 = 2x + 3$, what is the smallest possible value of $y_1 + y_2$?

A. -1 B. 0 C. 1 D. 2 E. 3

26. Many children and adults attended a party. When $\frac{1}{4}$ of the adults left, the ratio of adults to children was 1:2. Then 30 children left the party and the ratio of adults to children became 3:4. How many adults were at the party at the start?

A. 20 B. 40 C. 60 D. 80 E. 100

27. If $\frac{x+3}{x-1} > 5$, then x is in which interval(s)?

A. (-∞,1) ∪ $(2, \infty)$ B. (-∞,1) C. $(2, \infty)$ D. (1,2) E. (-∞,-2) ∪ $(1, \infty)$

28. The mean of a set of $3n$ numbers is 50. The set is divided into two sets, one containing $2n$ numbers and the other the remaining n numbers. The mean of the numbers in the larger group is twice that of the smaller group. What is the mean of the numbers in the smaller group?

A. 25 B. 30 C. 35 D. 40 E. 45

29. If $a + b$ = 12.25 and ab = 16, then $\sqrt{a} + \sqrt{b} =$

A. .5 B. 4.5 C. 5.5 D. 6.5 E. 7.5

30. In the equation $\frac{a}{x} - \frac{a}{b} = \frac{b}{x} - \frac{b}{a}$, the value of x is

A. $\frac{ab}{a+b}$ B. $\frac{b}{a} - \frac{a}{b}$ C. $\frac{a+b}{a-b}$ D. $\frac{ab}{a^2-b^2}$ E. $\frac{a-b}{a^2+b^2}$

31. If $x + r + x^2 = r^2$ is solved for x, what is the sum of the solutions?

A. $2r$ B. $-2r$ C. 1 D. -1 E. $r^2 - r$

32. Solve: $log_5(x + 6) + log_5(x + 2) = 1$

A. $x = -1$ B. $x = 1$ C. $x = 7$ D. $x = -1 \; or \; -7$ E. $x = 1 \; or \; 7$

33. Suppose that the 1st, 3rd, 6th, 10th, 15th, 21st, … numbers are deleted from the sequence of 1, 2, 3, …, 2014. How many numbers remain undeleted?

A. 1950 B. 1951 C. 1952 D. 1953 E. 1954

END OF EXAM.