2015 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. Randomly select 3 different numbers from the set {2, 3, 4, 5, 6}. What is the probability that the three selected numbers can be used as the measures of three sides of a triangle?

a. $\frac{1}{10}$ b. $\frac{2}{5}$ c. $\frac{9}{20}$ d. $\frac{3}{5}$ e. $\frac{7}{10}$

2. The surface area of a sphere is $\frac{25\pi}{16}\,m^2$. Find the sphere's volume in cubic meters.

a. $\frac{5\pi}{3}$ b. $\frac{5\pi}{8}$ c. $\frac{25\pi}{12}$ d. $\frac{25\pi}{48}$ e. $\frac{125\pi}{384}$

3. The diagonals of a rhombus are 36 cm and 48 cm. Find the perimeter of the rhombus in centimeters.

a. 60 b. 84 c. 120 d. 168 e. 336

4. Terik and Mia work in a factory building computer parts. Terik can build 9 parts in one hour while Mia can build 3 parts in 10 minutes. At these rates, how many hours will it take them to build 200 parts if they work together the entire time? Round your answer to the nearest tenth of an hour.

a. 6.8 b. 7.4 c. 8.3 d. 12.1 e. 16.0

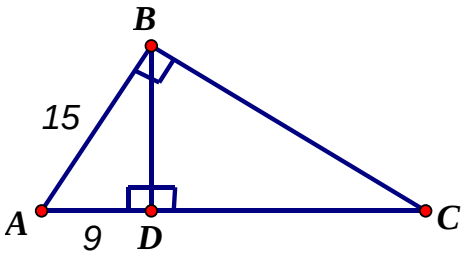
5. A cube has side length 2 cm. A cylinder with diameter 1 cm is carved out of the cube perpendicular to its base. What is the volume, in cubic centimeters, of the remaining solid?

a. $8-\frac{1}{2}\pi$ b. $8-\frac{1}{4}\pi$ c. $\frac{1}{2}\pi-8$ d. $8-2\pi$ e. $2\pi-8$

6. All of the numbers in the summation are consecutive counting numbers.
1 + 2 + 3 + … + M = 496 Find M.

a. 22 b. 23 c. 28 d. 31 e. 32

7. In the figure shown, AD = 9 and AB = 15. Find the length of segment DC.



a. 12 b. 16 c. 20 d. 24 e. 25

8. The average of nine numbers is 17. If the average of four of these numbers is 13.5, what is the average of the remaining five numbers?

a. 15.25 b. 15.9 c. 19.8 d. 20.5 e. 30.5

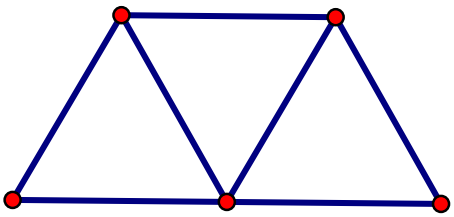
9. In a quadrilateral two angles are congruent. The third angle is equal to the sum of the two congruent angles. The fourth angle is 60° less than twice the sum of the other three angles. What is the measure of the largest angle in this quadrilateral?

a. 150° b. 180° c. 196° d. 212° e. 220°

10. Two fair dice are rolled. Which of the events below is the least likely to occur?

a. The sum is a multiple of 6. b. Both dice show prime numbers. c. The sum is a factor of 12.
d. The sum is a prime number. e. The sum is greater than 8.

11. Three identical equilateral triangles form a trapezoid, as shown. The perimeter of the trapezoid is 20 cm. What is the area of the trapezoid, in square centimeters?



a. 16 b. 24 c. $12\sqrt{3}$ d. $24\sqrt{3}$ e. $48\sqrt{3}$

12. A number of employees participated in a fitness program. After 1 month, $\frac{4}{5}$ of them were still participating. Of those, $\frac{5}{6}$ were still participating after 3 months, and of those, $\frac{9}{10}$ were still participating after 5 months. Determine the number of employees originally participating in the fitness program if there were still 72 of them still active after 5 months.

a. 80 b. 108 c. 120 d. 144 e. 216

13. M is the midpoint of segment AB. If B = (−2, −6) and M = (8, 2), find A.

a. (3, −2) b. (5, 4) c. (6, −4) d. (14, 6) e. (18, 10)

14. How many times does the graph of the function $f(x) = x^3 + x^2 - 14x - 242$ cross the x-axis?

a. 0 b. 1 c. 2 d. 3 e. 4

15. A sequence is formed such that the next term is the sum of squares of all digits in the previous term. If the sequence starts with the number 2015, what is the 2015^{th} term in this sequence?

a. 37 b. 58 c. 61 d. 65 e. 89

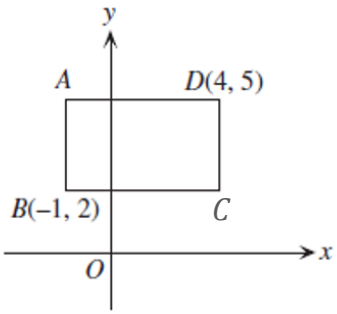
16. A straight skinny straw 10 inches long is dropped into a tall cylinder with radius 3 inches. One end of the straw falls to the bottom and against the wall of the cylinder. How far up the cylinder's wall is the straw's other end?

a. 6 inches b. 8 inches c. 9.5 inches d. 10.1 inches e. 10.4 inches

17. f(n) is a function on the natural numbers. If f(1) = 1 and f(n) = n + f(n-1), what is f(6)?

a. 6 b. 10 c. 15 d. 21 e. 34

18. What is the area of rectangle ABCD in the figure below?



a. 9 square units b. 15 square units c. 16 square units d. 18 square units e. 30 square units

19. Rudy and Sadie camped out at a state park. They then hiked back to their cars, which were parked on opposite ends of the park. Rudy headed due north at 3 kilometers per hour, and Sadie hiked due south at 7 kilometers per hour. In how long were the two friends 3 kilometers apart?

a. 9 minutes b. 10 minutes c. 18 minutes d. 20 minutes e. 21 minutes

20. At the beginning of March, a store bought a tent at a cost of $75 and marked the price up 100%. At the end of the month, the tent had not sold, so the store marked the price down 66%. What was the discounted price?

a. $34 b. $49.50 c. $51 d. $66 e. $99

21. A worker at a paper company is making paper pulp that contains cotton fiber. She already has 4 gallons of 11% cotton pulp left over from a previous batch. To that, she will add some pre-mixed pulp that contains 21% cotton. How many gallons of the pre-mixed pulp should she mix with the leftover pulp to obtain a batch that contains 20% cotton fiber?

a. 10 b. 24 c. 28 d. 36 e. 40

22. A rectangle is 4 times as long as it is wide. If the length is increased by 4 inches and the width is decreased by 1 inch, the area will be 60 square inches. What were the dimensions of the original rectangle in inches?

a. 1 by 4 b. 2 by 8 c. 3 by 12 d. 4 by 16 e. 5 by 20

23. A baker uses both white and whole wheat flour. She plans to purchase five times as much white flour as whole wheat flour. The white flour costs $0.95 per pound and the whole wheat costs $1.50 per pound. She has $150 for the purchase of flour. How many pounds of whole wheat flour should she purchase?

a. 18 b. 24 c. 61 d. 89 e. 120

24. Two parents and 2 young children go to the movies. One of the parents sits in the aisle seat. How many seating arrangements are possible assuming they sit in consecutive seats?

a. 4 b. 6 c. 8 d. 10 e. 12

25. Tyler is making cabinets. He has two 18-foot lengths of board from which to make shelves. He wants to make 3-foot shelves from these boards. Each cut will take 15 seconds. How long will it take him to cut these boards into 3-foot shelves?

a. 0.8 minutes b. 1.5 minutes c. 1.8 minutes d. 2.5 minutes e. 3.0 minutes

26. A flight leaves Chicago at 10:50 a.m. on Sunday. It arrives in Shanghai at 1:20 p.m. on Monday. The flight time was 17 hours and 30 minutes. If it is 4:00 p.m. in Chicago now, what is the time in Shanghai?

a. 1:00 a.m. b. 2:00 a.m. c. 7:00 a.m. d. 2:00 p.m. e. 10:00 p.m.

27. The cost of gasoline in a region is $1.89 per gallon. A 20-ounce bottle of water costs $1.45. How much more per gallon does this water cost than a gallon of this gasoline? (Remember 1 gallon equals 128 ounces.)

a. $4.91 b. $5.82 c. $6.39 d. $7.05 e. $7.39

28. John has a sack that is 3 inches wide by 2 inches deep by 5 inches high. It will hold 5 cups of rock candy. Sam has a sack that is 3 inches wide by 3 inches deep by 4 inches tall. How many cups of rock candy will Sam's sack hold?

a. 4.20 b. 4.80 c. 5.00 d. 6.00 e. 6.25

29. The math carnival is giving out red, black, and white pencils for prizes. Liza ordered 170 pencils but two red pencils were broken so she can't use them. Of the remaining pencils, $\frac{2}{7}$ are red and $\frac{1}{6}$ are black. How many white pencils are there?

a. 39 b. 76 c. 92 d. 102 e. 129

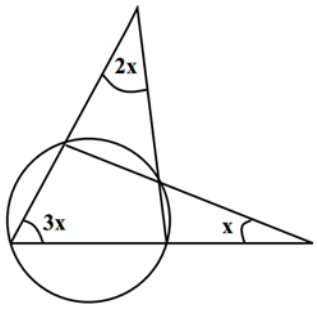
30. A bag has 5 marbles, 2 green and 3 red. To increase the probability of selecting a green marble from the bag to 60%, x more green marbles and y more red marbles must be added to the bag. If the capacity of the bag is 99 marbles, what is the maximum number of red marbles that can be added?

a. 35 b. 40 c. 48 d. 55 e. 70

31. An SUV gets 18 miles per gallon in city driving and 24 miles per gallon in highway driving. The SUV is driven 465 miles on 23 gallons of gasoline. How many miles were driven in the city?

a. 168 b. 238 c. 261 d. 281 e. 318

32. What is the measure of angle *x* in this figure?



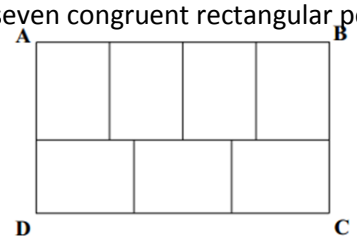
a. 10° b. 15° c. 18° d. 20° e. 25°

33. A, B, C, D, and E are five different integers between 2 and 19 inclusive.
- A is a two-digit prime number whose digits add up to a prime number.
- B is a multiple of 5.
- C is an odd number, but not a prime number.
- D is the square of a prime number.
- E is a prime number that is also the mean (average) of A and B.

Which number is the largest?

a. A b. B c. C d. D e. E

34. The layout of a barn is represented by rectangle ABCD in the figure below. The area of the interior of the barn is 1344 square meters. It is divided into seven congruent rectangular pens, as in the figure below. What is the perimeter of the barn (rectangle ABCD)?



a. 152 m b. 184 m c. 216 m d. 224 m e. 248 m

35. Max, Nan, and Olivia spent their afternoon picking apples and oranges. Max had twice as many apples as Nan, while Nan had twice as many apples as Olivia. Nan had three times as many oranges as Olivia, who had three times as many oranges as Max. At the end of the day they had fewer than 250 pieces of fruit in total, and an equal number of apples and oranges. How many pieces of fruit did they pick?

a. 180 b. 182 c. 184 d. 186 e. 188

36. Marsha is purchasing pizzas for the study group. She wants to get the most pizza for her money. The pizza parlor has the following options for $20. All pizzas are circular and the size is the diameter of each pizza.

A) Five 8-inch pizzas
B) Two 14-inch pizzas
C) One 18-inch pizza

Which option is the best buy and which is the worst buy?

a. C is the best buy, A is the worst buy
b. B is the best buy, A is the worst buy
c. C is the best buy, B is the worst buy
d. B is the best buy, C is the worst buy
e. A is the best buy, C is the worst buy