

# ***COASTAL CAROLINA UNIVERSITY***

March 6, 2015

The 36<sup>th</sup> Annual Dr. Subhash Saxena Math Contest

## **LEVEL 1**

### Notes and Directions:

- Do not turn this page until you are told to do so.
- Fill in the SCANTRON form according to your proctor's instructions. Make sure you put your name and your school's name at the top.
- Calculators are not permitted on this test.
- You have 50 minutes to complete the test. If you finish early, leave the classroom quietly and proceed to the Hicks Dining Hall for lunch.
- The test is yours to keep. Use any extra space for scratch work.

**Math Contest – Level 1**  
**March 6, 2015**

1. In the 2013 – 2014 NBA season, the eight teams with the best records in the Western Conference were, in alphabetical order: Dallas Mavericks, Golden State Warriors, Houston Rockets, Los Angeles Clippers, Memphis Grizzlies, Oklahoma City Thunder, Portland Trailblazers, and San Antonio Spurs. Given the following information
- Portland had 3 more wins than Golden State
  - Oklahoma City had 10 more wins than Dallas
  - San Antonio had 7 more wins than Houston
  - Dallas had 1 fewer win than Memphis
  - Houston had 1 more win than Portland
  - Golden State had 1 more win than Memphis
  - Los Angeles had 6 more wins than Golden State

List the teams in decreasing order of number of wins.

- A) Houston, Golden State, Los Angeles, San Antonio, Memphis, Dallas, Oklahoma City, Portland
- B) Dallas, Memphis, Golden State, Portland, Houston, Los Angeles, Oklahoma City, San Antonio
- C) San Antonio, Oklahoma City, Los Angeles, Houston, Portland, Golden State, Memphis, Dallas
- D) San Antonio, Oklahoma City, Houston, Los Angeles, Golden State, Portland, Memphis, Dallas
2. Three parallel lines in a plane are intersected by a fourth line, forming 12 angles. If one of the angles has measure  $28^\circ$ , how many of the other 11 angles have measure  $28^\circ$  ?
- A) 5   B) 6   C) 7   D) 8

3. Let  $m_1$  be the slope of the line  $y = -\frac{1}{3}x - 17$ . Let  $m_2$  be the slope of a horizontal line. Let  $m_3$  be the slope of a line parallel to  $y = -\frac{1}{4}x + 5$ . Let  $m_4$  be the slope of a line perpendicular to  $y = 5x + 21$ . Which of the following orderings is correct?

A)  $m_2 > m_4 > m_3 > m_1$     B)  $m_2 > m_1 > m_3 > m_4$     C)  $m_4 > m_3 > m_2 > m_1$

D)  $m_1 > m_3 > m_4 > m_2$

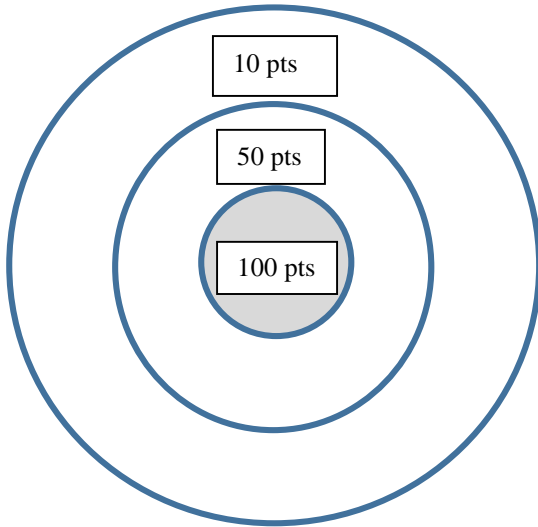
4. During his lunch break from 12:00 – 1:00, Bill eats his lunch, then checks his messages, then goes to the restroom, and then talks to a friend. Each activity after the first takes half as much time as the preceding activity. There are no intervening time intervals. At what time did Bill finish checking his messages?

A) 12:24    B) 12:30    C) 12:32    D) 12:40    E) 12:48

5. A circle and square have the same perimeter. What is the ratio of the area of the circle to the area of the square?

A)  $\frac{4}{\pi}$     B)  $\frac{6}{\pi}$     C)  $\frac{2}{\pi}$     D)  $\frac{3}{\pi}$

6. How many different total scores could you make if you hit the following dart board with three darts?



- A) 6   B) 9   C) 10   D) 12

7. A right circular cylinder has radius 3 and height 3. If A and B are two points on the surface of the cylinder, what is the maximum possible straight line distance between A and B?

- A)  $3\sqrt{5}$    B)  $3\sqrt{6}$    C) 6   D)  $3\sqrt{3}$

8. The lengths of a side of a triangle measured in inches are three consecutive integers. The length of the shortest side is 30% of the perimeter. What is the perimeter of the triangle?

- A) 18   B) 21   C) 24   D) 30

9. John's age is  $x$  years, which is also the sum of the ages of his two children. John's age  $y$  years ago was twice the sum of their ages then. What is  $\frac{x}{y}$  ?

- A) 2   B) 3   C)  $\frac{3}{2}$    D)  $\frac{4}{3}$

10. If  $\angle B$  is four times  $\angle A$ , and the complement of  $\angle A$  is four times the complement of  $\angle B$ , then what is the supplement of  $\angle A$ ?

- A)  $108^\circ$    B)  $144^\circ$    C)  $156^\circ$    D)  $162^\circ$

11. What is the perimeter of a right triangle with hypotenuse  $H$  and area  $A$ ?

- A)  $H + \sqrt{H^2 + 4A}$     B)  $H + \sqrt{H^2 + 2A}$     C)  $H + \sqrt{H^2 + A}$     D)  $H + \sqrt{H^2 + \frac{1}{2}A}$

12. If  $f(1) = 2$  and  $f(n + 1) = [f(n)]^2$ , what is the value of  $f(4)$ ?

- A) 4    B) 16    C) 64    D) 256

13. A wooden cube with volume equal to 64 cubic inches is sliced in half horizontally. The two halves are then glued together to form a rectangular solid which is not a cube. What is the surface area of this rectangular solid?

- A) 128    B) 112    C) 104    D) 96

14. John was contracted to work  $A$  days. For each of these  $A$  days that John actually worked, he received  $B$  dollars. For each of these  $A$  days that John did not work, he had to pay a penalty of  $C$  dollars. After the  $A$  days of contracted work was over, John received a net amount of  $D$  dollars for his work. How many of the  $A$  days of contracted work did John not work?

- A)  $\frac{AB-D}{B+C}$     B)  $\frac{AB+D}{B-C}$     C)  $\frac{AB+D}{B+C}$     D)  $\frac{AB-D}{B-C}$

15. Let  $f(x)$  be defined as the least integer greater than  $\frac{x}{5}$ . Let  $g(x)$  be defined as the greatest integer less than  $\frac{x}{5}$ . What is the value of  $g(18) + f(102)$ ?

- A) 21    B) 22    C) 23    D) 24    E) 25

16. What is the remainder when  $37^{2015}$  is divided by 5?

- A) 0    B) 1    C) 2    D) 3    E) 4

17. A 14 inch round pizza is cut into 12 slices of the same size. What is the distance around one piece of pizza?

- A)  $14 + \frac{\pi}{12}$     B)  $14 + 7\pi$     C)  $14 + \frac{7\pi}{3}$     D)  $14 + \frac{7\pi}{6}$

18. The area of a right triangle is 36 square inches. What is the shortest possible length of the hypotenuse?

- A)  $\sqrt{18}$     B) 6    C) 12    D) 16

19. How many distinct factors, other than 1, does 210 have?

- A) 4    B) 5    C) 15    D) 16    E) 19



20. A ladder leans against a house with its base 15 feet away from the house. When the base of the ladder is pulled 9 feet farther away from the house, the upper end of the ladder slides down 13 feet. What is the length of the ladder?

- A) 16    B) 22    C) 24    D) 25    E) 28

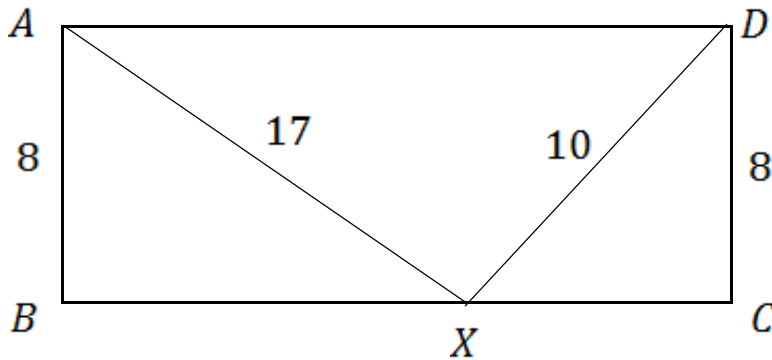
21. Find the next term in the sequence: 5 6 14 32 64 115 191

- A) 267    B) 283    C) 244    D) 299

22. If  $x$  is a positive number and  $x^2 + \frac{1}{x^2} = 4$ , what is  $x + \frac{1}{x}$ ?

- A) 6    B)  $\sqrt{6}$     C) 2    D)  $2 + \sqrt{3}$

23. In the rectangle  $ABCD$ , the point  $X$  is located on  $BC$  as shown. If  $AB = 8$ ,  $DX = 10$ , and  $AX = 17$  what is the area of  $\triangle AXD$  ?



- A) 108    B) 92    C) 85    D) 84
24. Let  $A(-7,4)$  and  $B(5,-12)$  be two points in the plane. Find an equation of the circle for which  $\overline{AB}$  is a diameter.
- A)  $(x + 1)^2 + (y + 4)^2 = 100$                       B)  $(x + 7)^2 + (y - 4)^2 = 10$   
C)  $(x - 5)^2 + (y - 12)^2 = 100$                       D)  $(x + 1)^2 + (y + 4)^2 = 400$   
E)  $(x + 1)^2 + (y + 4)^2 = 20$
25. A 3-inch wide border is removed from a rectangular sheet of paper resulting in a rectangle whose area is half that of the original rectangle. If the perimeter of the original rectangle was 84 inches, what was the area of the original rectangle?
- A) 280    B) 352    C) 432    D) 520    E) 616