# COASTAL CAROLINA UNIVERSITY


## March 4, 2016


## The 37th 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 4, 2016

1. In the regular season of Major League Baseball, each team plays 162 games. In the 2015 season, the Cincinnati Reds won 17 fewer than half of the games they played. The St. Louis Cardinals won 36 more games than the Reds. The Atlanta Braves won 5 more games than the Cardinals lost. The Chicago Cubs won 2 more games than the Braves lost. How many games did the Chicago Cubs lose in the 2015 Major League Baseball regular season?

   A) 62    B) 64    C) 65    D) 67

2. Find the next term in the sequence  3   7   15   31   63

   A) 64    B) 73    C) 94    D) 127

3. Jack walked up the hill at 2 miles per hour. He came tumbling down the hill along the same path at 10 miles per hour. If the total time for his trip up and down the hill was half an hour, how long is the path up the hill?

   A) 1/2 mile    B) 3/4 mile    C) 5/6 mile    D) 3/2 miles

4. In the NCAA's Big 12 conference there are 10 teams (Baylor, Iowa State, Kansas, Kansas State, Oklahoma, Oklahoma State, TCU, Texas, Texas Tech, and West Virginia). In football, each team plays every other team in the conference one time during the season. How many total conference games are played? (A conference game is when one of the 10 teams in the conference plays another one of the 10 teams in the conference.)

   A) 45    B) 81    C) 90    D) 100

5. Lance starts at one end of a 300 mile bike trail and at the same time Alberto starts at the other end of the trail. Alberto rides two miles per hour faster than Lance. After six hours they meet each other on the trail. Which of the following is true?

   A) Alberto is riding 24 miles per hour

   B) Alberto rode 144 miles of the trail before meeting Lance

   C) Lance rode 156 miles of the trail before meeting Alberto

   D) Lance rode 144 miles of the trail before meeting Alberto

6. Let $x =$ the area of a circle with radius equal to 20 inches, $y =$ the circumference of a circle with diameter equal to 50 inches, and $z =$ the area of a trapezoid with height equal to 8 inches, one base equal to 12 inches, and the other base equal to 24 inches. Which of the following is true?

   A) $x < y < z$    B) $x < z < y$    C) $y < z < x$    D) $z < y < x$

7. In the sequence $a_1, a_2, a_3, a_4, a_5, a_6, a_7, a_8$ the sum of any three consecutive terms is equal to 25. If $a_1 = 7$ and $a_8 = 9$ find $a_6$

   A) 6    B) 7    C) 8    D) 9

8. A clock has a minute hand which is 10 inches long. Find the area swept out by the minute hand between 10:33 AM and 10:38 AM on any given day.

   A) $\frac{5\pi}{3}$ sq. inches    B) $\frac{25\pi}{12}$ sq. inches    C) $\frac{25\pi}{18}$ sq. inches    D) $\frac{25\pi}{3}$ sq. inches
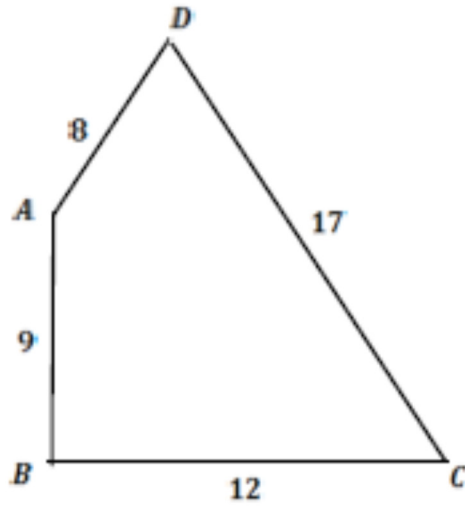
9. In the figure below, $\overleftrightarrow{AB}||\overleftrightarrow{CD}$ . What is sum of the measures of $\angle x$ and $\angle y$ ? The drawing is not to scale.
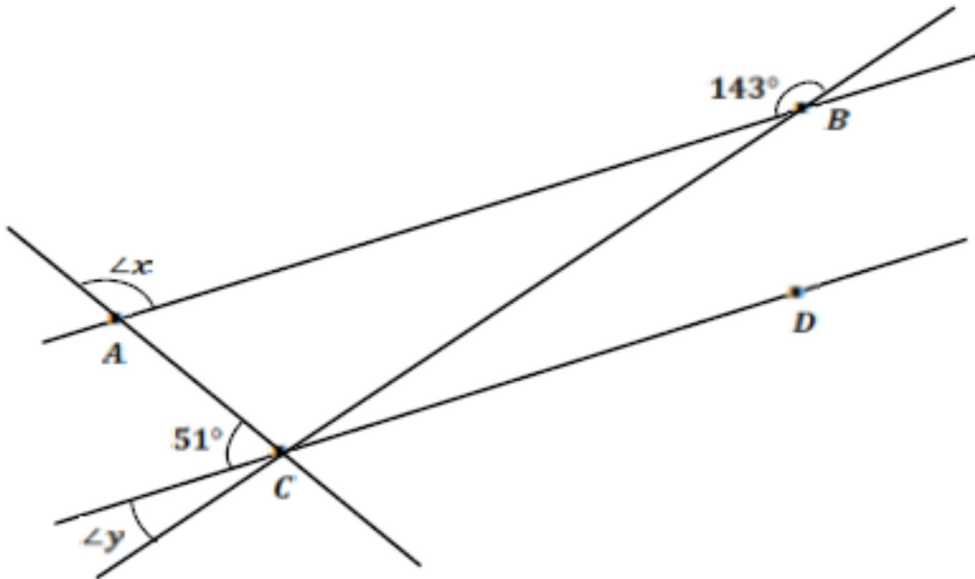


A) 37°     B) 129°     C) 166°     D) 226°

10. Given the points $A(-5,9)$ and $(7,11)$ , find the equation of the perpendicular bisector of $\overline{AB}$ .

A) $y = -6x + 16$     B) $y = -\frac{1}{6}x + \frac{61}{6}$     C) $y = 6x + 4$     D) $y = \frac{1}{6}x + \frac{59}{6}$

11. Find the area of quadrilateral $ABCD$ with lengths as shown. $\angle ABC$ is a right angle. The drawing is not to scale.



A) 108 sq. units    B) 114 sq. units    C) 126 sq. units    D) none of these

12. In a large box there are 118 hats. They come in two colors, red or black, and two styles, with or without stripes. If there are 44 red hats, 64 hats with stripes, and 33 red hats with stripes, how many black hats without stripes are there?

A) 41    B) 43    C) 21    D) more information is required

13. A square of unknown size has 12 inches added to its perimeter to make a new square. If this new square has twice the area of the old square, what is the length of the new square's sides?

A) $6 + 3\sqrt{2}$ inches    B) 6 inches    C) $3 + 3\sqrt{2}$ inches    D) 9 inches

14. A ship travels west for 15 miles, then northwest for $\sqrt{162}$ miles, then north for 9 miles. How far is it from its starting point?

A) 30 miles    B) $24\sqrt{2}$ miles    C) 48 miles    D) $24\sqrt{2}$ miles

15. The diagonal of the rectangle shown has length $c$. The perimeter, , is $p = 2a + 2b$. Find an expression for the area of the rectangle in terms of $p$ and $c$
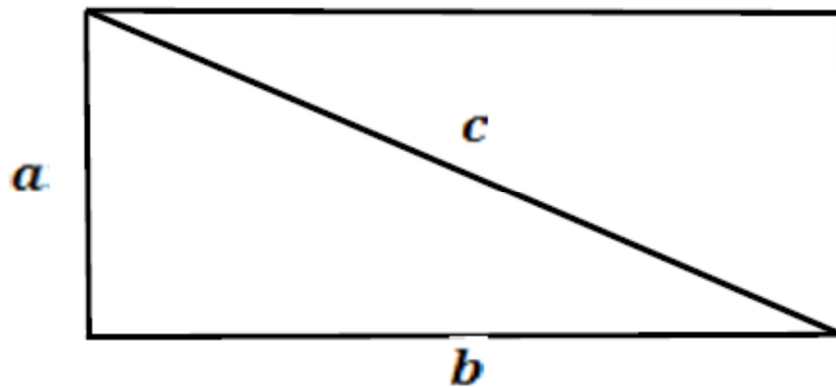


A) $\dfrac{p^2 - 4c^2}{8}$    B) $\dfrac{p^2 - c^2}{4}$    C) $\dfrac{p^2}{4} - c^2$    D) $p^2 - 2c^2$

16. At some point in a NASCAR race, Jimmie Johnson, Dale Earnhardt Jr., Brad Keselowski, and Kyle Busch are running in 1st, 2nd, 3rd, and 4th place but not necessarily in that order. The following information describes the running order:
- Jimmie Johnson is 12 seconds behind the car directly in front of him
- The 1st place car is 20 seconds ahead of the 4th place car
- Dale Earnhardt Jr. is 1 second ahead of somebody
- Kyle Busch is 19 seconds ahead of Brad Keselowski

Which of the following gives the running order from 1st to 4th place?

A) Kyle Busch, Dale Earnhardt Jr., Jimmie Johnson, Brad Keselowski
B) Dale Earnhardt Jr., Kyle Busch, Jimmie Johnson, Brad Keselowski
C) Dale Earnhardt Jr., Kyle Busch, Brad Keselowski, Jimmie Johnson
D) Kyle Busch, Jimmie Johnson, Dale Earnhardt Jr., Brad Keselowski

17. A rectangle is divided into four rectangles as shown. Find $x$ .

| $25\ in^2$ | $45\ in^2$ |
| --- | --- |
| $15\ in^2$ | $x$ |

A) $23\ in^2$    B) $27\ in^2$    C) $30\ in^2$    D) $32\ in^2$

18. If $k$ is divisible by 2, 3, and 15, which of the following is also divisible by these numbers?

A) $k + 5$    B) $k + 15$    C) $k + 20$    D) $k + 30$

19. The table below shows some values for the function $f$.  If $f$ is a linear function, what is the value of $d$ in terms of $c$ ?

| $x$ | $f(x)$ |
|---|---|
| $c$ | $d$ |
| 8 | 55 |
| 9 | 61 |

  A) $d = 5c + 15$   B) $d = 6c + 7$   C) $d = 8c - 9$   D) $d = 5c + 16$

20. Find the value of  $A + B$  if  $\dfrac{A}{x+2} + \dfrac{B}{2x-3} = \dfrac{5x-11}{2x^2+x-6}$

  A) 2   B) 0   C) 1   D) $-3$

21. If $f(x) = f(x - 2) + x$ and $f(7) = 11$, find $f(5)$

  A) 10   B) 8   C) 6   D) 4

22. If $\dfrac{9+3^{2x}}{10} = 3^x$ , then the value of $x^2 + x + 1$ is

  A) 1 or 3   B) 3 only   C) 1 or 7   D) 7 only

23. What is the $2016^{\text{th}}$ digit in the decimal expansion of $\dfrac{3}{7}$ ?

  A) 4   B) 2   C) 1   D) 5

24. In a ticket line there are $x$ people behind Mark. Mark is $y$ places in front of Sam. There are z people in front of Sam. How many people are in line?

A) $z - x + y + 2$ 　　　　　　　　B) $z + x - y + 1$

C) $z - x + y - 1$ 　　　　　　　　D) $z + x - y$


25. If $m = 1.46666\ldots$ and $n = 0.407407407407\ldots$ , find $\dfrac{m}{n}$

A) $\dfrac{66}{185}$ 　　B) $\dfrac{18}{5}$ 　　C) $\dfrac{36}{11}$ 　　D) $\dfrac{120}{37}$