MATHCOUNTS

■ **Chapter Competition** ■
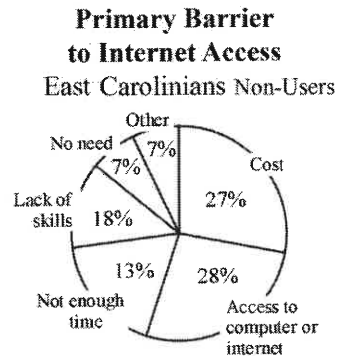**Practice Test 1**
Sprint Round Problems 1–30

Name _____

## DO NOT BEGIN UNTIL YOU ARE INSTRUCTED TO DO SO.

This round of the competition consists of 30 problems. You will have 40 minutes to complete the problems. You are not allowed to use calculators, books or any other aids during this round. If you are wearing a calculator wrist watch, please give it to your proctor now. Calculations may be done on scratch paper. All answers must be complete, legible and simplified to lowest terms. Record only final answers in the blanks in the right-hand column of the competition booklet. If you complete the problems before time is called, use the remaining time to check your answers.

Total Correct	Scorer's Initials

1. Calculate: $9 \times 8 \div 9 \times 8$.

2. The pie chart shown represents a survey of East Carolinians who do not use the Internet. What is the percent of East Carolinians non-users for whom cost and time are *not* the primary barrier?

**Primary Barrier
to Internet Access**
East Carolinians Non-Users

Other
No need 7%
7%
Lack of
skills 18%
Cost
27%
13% 28%
Not enough
time
Access to
computer or
internet

3. It is now 12:00:00 midnight, as read on a 12-hour digital clock. In 2016 hours, 20 minutes and 16 seconds the time will be $A : B : C$. What is the value of $A + B + C$?

4. Shooting hoops for 15 minutes burns 75 calories. How many calories would Kerry burn shooting hoops if he shot hoops 45 minutes every day for one month in February, 2016?

5. An ant crawls along the edge of a regular hexagon from the vertex A clock wisely. How far is the ant from the vertex A after it craws 2016 inches? Each edge of the hexagon is 32 inches.

A
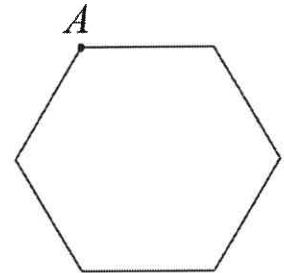
6. Four times the product of three consecutive positive integers is 2016. What is the sum of the three positive integers?

7. The ratio of the number of dollars Alex has to the number of dollars Bob has is 3 : 4. After Alex gives $40 to Bob, the ratio of the number of dollars Alex has to the number of dollars Bob becomes 1 : 3. How many dollars does Alex have at first?

8. An escalator moves up at a constant speed. If Alex walks up the escalator at the rate 120 steps per minute, he reaches the top in 30 seconds. If he walks up the escalator at the rate 80 steps per minute, he reaches the top in 40 seconds. How many steps does the escalator have?

9. Ross has ten boxes. Seven of the boxes contain pencils, five of the boxes contain pens, and four of the boxes contain both pens and pencils. How many boxes contain neither pens nor pencils?


10. How many combinations of pennies, nickels and/or dimes are there with a total value of 35¢?

11. What is the value of the following expression:
    $1 - 3 + 5 - 7 + 9 - 11 + \ldots - 2015 + 2017$?

12. A rectangular tile measures 4 inches by 5 inches. What is the fewest number of these tiles that are needed to completely cover a rectangular region that is 5 feet by 8 feet?

13. When plotted in the standard rectangular coordinate system, quadrilateral $ABCD$ has vertices $A(2, 5)$, $B(4, 1)$, and $C(1, -3)$ and $D(-1, 1)$. What is the area of quadrilateral $ABCD$?

14. Betsy receives a 15% commission on every sale she makes. On the sale of a $150 calculator (before any discounts), how many more dollars will she receive if her commission is based on the original price of the calculator rather than the price of the calculator after a 40% discount?

15. Five distinct points A, B, C, D and E lie on a line, but not necessarily in that order. Use the information below to determine the number of units in the length of segment BE.
    - B is the midpoint of segment AD.
    - C is the midpoint of segment BD.
    - Both E and B are the same distance from D.
    - The distance from A to B is 6 units.

16. Alex paid $945 to transport his animals by ferry. The costs were $3, $2 and $1 for each cats, dog, and squirrel, respectively. The ratio of cats to dogs was 2 : 9, and dog to squirrel 3 : 7. How many cats were there?

17. What is the sum of all the positive two-digit integers with 12 factors ?

18. The points $A(-4, 3)$, $B(-3, 6)$ and $C(0, 3)$ are plotted in the standard rectangular coordinate system to form triangle ABC. Triangle ABC is translated five units to the right and two units downward to triangle $A'B'C'$, in such a way that A' is the image of A, B' is the image of B, and C' is the image of C. What is the midpoint of segment $A'C'$? Express your answer as an ordered pair.

19. The positive difference of the cube of an integer and the square of the same integer is 1210. Find the integer.

20. A rectangular sheet of paper is folded three times and then cut, as shown below. All fold lines are dashed, and the portion that is to be cut away is shaded.
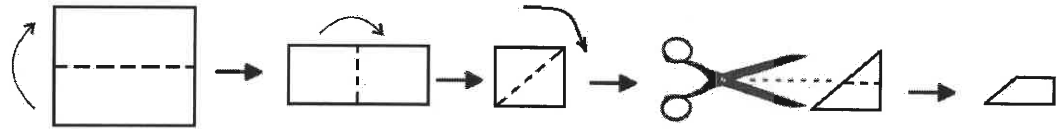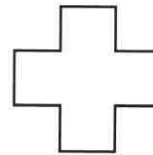
Which of the following drawings (*B, C, D,* or *E*) shows what the paper looks like when it is unfolded after the cuts?
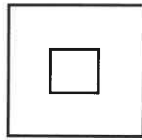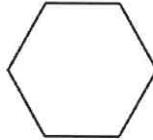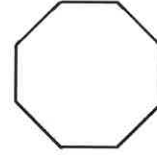

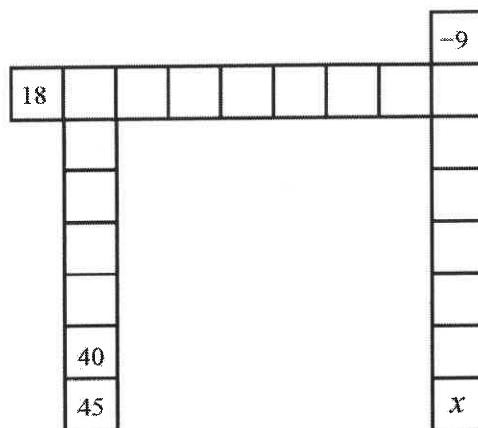|			
B	*C*	*D*	*E*

21. The average value of four distinct positive integers $a, b, c,$ and d is 18. If $b - a = 7$, and $d - c = 11$, find the greatest possible value of d. It is known that $a < b < c < d$.

22. How many 4-digit positive integers divisible by 15 can be formed by using the digits 0, 2, 4, 6, and 9? No digit is repeated in any of the 4-digit integers.

23. Zack has created this rule for generating sequences of whole numbers.
    If a number is less than 45, triple the number.
    If a number is 45 or more, subtract 30 from it.
    For example, if Zack starts with 12, he gets the sequence 36, 108, 78, 48, 18, ... If the third number in Zack's sequence is 45, what is the sum of the four distinct numbers that could have been the first number in his sequence?

24. Reverse the two digits of my age, divide by four, add 9, and the result is my age. How many years old am I?

25. The sequence of integers in the row of squares and in each of the two columns of squares form three distinct arithmetic sequences. What is the value of x?

5

```
                                              -9
  18 | | | | | | |
                                              | |
                                              | |
                                              | |
  40 |                                        | |
  45 |                                         x
```

26. In the figure shown, a circle passes through two adjacent vertices of a rectangle $ABCD$ (with $AB = 3\sqrt{3}$, and $AD = 6$) and is tangent to the opposite side of the rectangle. What is the area of the circle? Express your answer in terms of π.
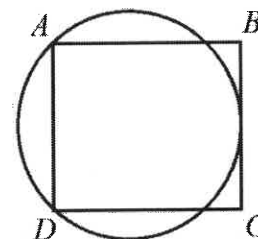
27. The function f is defined by $f(n) = f(n-1) + 2f(n-2)$. It is also true that $f(1) = 20$ and $f(3) = 16$. What is the value of $f(6)$?

28. If $x + \dfrac{1}{y} = y + \dfrac{1}{z} = z + \dfrac{1}{x}$, where x, y, and z are distinct real numbers, what is the positive value of the product xyz?

29. David has ten sticks measuring 1 cm, 2 cm, 3 cm, 4 cm, 5 cm, 6 cm, 7 cm, 8 cm, 9 cm, and 10 cm. Using at most two sticks in any one side of a square, how many squares are possible if the sticks are joined only at their endpoints?

6

30. As shown in the figure, AE and BF cut the rectangle $ABCD$ into 4 regions. The area of $\triangle EFG$ is 4 cm^2. The area of $\triangle ABG$ is 9 cm^2. The area of quadrilateral $ADFG$ is 10 cm^2. Find the area of quadrilateral $BCEG$.