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# MATHCOUNTS

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■ Chapter Competition ■  
Practice Test 2  
Sprint Round Problems 1–30

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Name \_\_\_\_\_

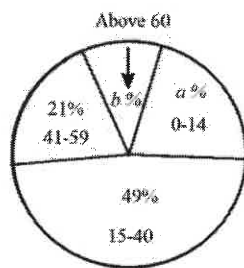
**DO NOT BEGIN UNTIL YOU ARE INSTRUCTED  
TO DO SO.**

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.

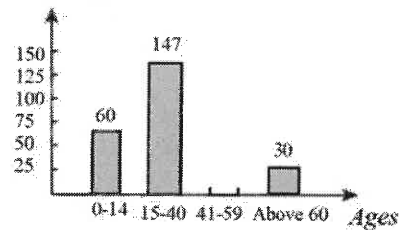
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Total Correct	Scorer's Initials

1. A gardener plans to build a fence to enclose a square garden plot. Seventeen fence posts are used to fence each side of the square plot. One post is placed at each corner. How many posts will he use to fence the entire plot?
2. A particular triangle has sides of length 15 cm, 12 cm and 9 cm. In square centimeters, what is the area of the triangle?
3. The difference of the squares of two positive integers is 17. What is the product of the two positive integers?
4. Kathy randomly picks up a clever integer defined as an even integer that is greater than 30, less than 200, and such that the sum of its digits is 9. What is the probability that the clever integer is divisible by 12? Express your answer as a common fraction.
5. Two graphs show the incomplete data from a small town about the percentages of people in four age groups ( 0 – 14 years old, 15 – 40 years old, 41 – 59 years old, and above 60 years old). How many people are in the age group from 41 to 59 years old?



Number of people

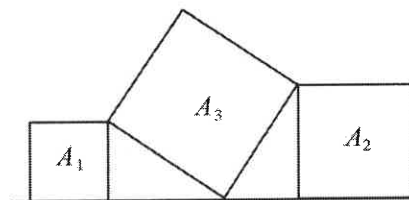


6. Solve for  $x$ :  $\frac{1 - \frac{3x}{100}}{\frac{1}{10}} = \frac{1 - \frac{x}{20}}{\frac{1}{16}}$ .

7. The points  $(x, y)$  represented in this table lie on a straight line. The point  $(27, t)$  lies on the same line. What is the value of  $t$ ?

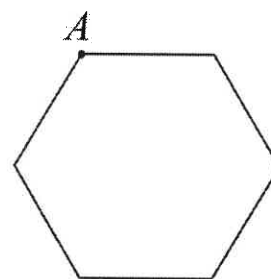
$x$	$y$
1	9
3	17
5	25
27	$t$

8. In the sequence 2, 2, 4, 8, 2, ..., each term after the second term is the units digit of the product of the previous two terms. What is the 2016<sup>th</sup> term?
9. A pizza costing \$19.36 is cut into 8 equal pieces. Bill eats 3 pieces. In dollars, how much was the portion of the pizza that Bill ate? Express your answer as a decimal to the nearest hundredth.
10. Three squares are put on the table as shown.  $A_1$ ,  $A_2$ , and  $A_3$  are the areas of three squares. If  $A_1 + A_2 = 2106 \text{ cm}^2$ , find  $A_3$ .



11. Richard has a piggy bank containing at least one penny, at least two nickels, at least three dimes, and at least four quarters. The total value of the coins in the piggy bank is \$ 2.25. What is the sum of the largest possible number of nickels and the smallest possible number of nickels in the piggy bank?
12. On Friday, a snowboard originally priced at \$100 was discounted 50%. On Monday, that sale price was reduced by 50%. On Tuesday, that sale price was reduced by 20%. On Wednesday, that sale price was reduced by 20%. In dollars, what is the price of the snowboard after the Wednesday reduction?

13. Let  $a - 2b = 3c$  where  $a$ ,  $b$ , and  $c$  are three consecutive terms in a positive geometric sequence. Find the value of  $a/b$ .
14. Calculate:  $\frac{1}{1 \times 2 \times 3} + \frac{1}{2 \times 3 \times 4} + \frac{1}{3 \times 4 \times 5} + \frac{1}{4 \times 5 \times 6} + \frac{1}{5 \times 6 \times 7}$ .
15. How many different letter arrangements can you get by picking up 4 letters from the word MATHCOUNTS?
16. An ant crawls along the edge of a regular hexagon from the vertex  $A$  clockwise. How far is the ant from the vertex  $A$  after it crawls 2016 inches? Each edge of the hexagon is 9 inches.



17. The number of diagonals of a regular  $n$ -sided polygon contain is 27. What is the value of  $n$ ?
18. You are given five cards labeled 0, 2, 4, 6, and 9. How many different 4-digit numbers divisible by 12 can be formed using these cards? Note that rotation of cards is not allowed.
19. A unit fraction is a fraction with numerator 1. Some unit fractions can be written as the difference of two unit fractions with the positive integer denominators differing by 1. For example,  $\frac{1}{6} = \frac{1}{2} - \frac{1}{3}$ ,  $\frac{1}{20} = \frac{1}{4} - \frac{1}{5}$ . How many unit fractions among all the unit fractions  $\frac{1}{1}, \frac{1}{2}, \frac{1}{3}, \dots, \frac{1}{200}$  cannot

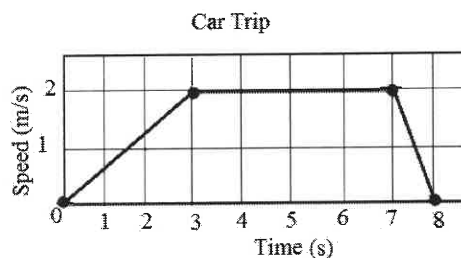
be written as the difference of two unit fractions with the denominators differing by 1?

20. Assume you have 10 chips numbered 0, 1, 2, ..., 9 and that you choose 2 chips at random. What is the chance that at least one of these numbers is either 8 or 9? Express your answer as a common fraction.

21. If  $|5x + 2| < 27$ , find the sum of the distinct possible integer values of  $x$ .

22. The sum of the reciprocals of four consecutive positive integers is  $\frac{19}{20}$ . What is the sum of these four consecutive positive integers?

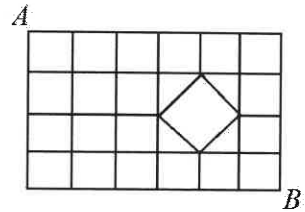
23. The accompanying graph describes the motion of a toy car across the floor for 8 seconds. What was the total distance in meters travelled by the toy car for the entire 8 second interval shown?



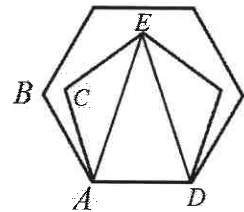
24. One hundred athletes are standing in a row facing Mr. Strong. Each athlete's jersey is numbered with one number from 1 to 100, consecutively. Mr. Strong says: "If your number is a multiple of 4, please turn round". All athletes with the number on their jersey a multiple of 4 turn round. Mr. Strong then says: "If your number is a multiple of 5, please turn round". All athletes with the number on their jersey a multiple of 5 turn round. Mr. Strong last says: "If your number is a multiple of 6, please turn round". All athletes with the number on their jersey a multiple of 6 turn round. How many athletes are facing Mr. Strong now?

25. Both  $a$  and  $b$  are real numbers with  $2a^2 - 2ab + b^2 + 4a + 4 = 0$ . Find the value of  $ab$ .

26. You are a traveler in city  $A$  and you must reach city  $B$  by nightfall or else you will be eaten by a lion. Obviously, you want to take the shortest path. How many ways can you go if you must follow the path from  $A$  to  $B$ ?



27. A regular pentagon and a regular hexagon are coplanar and share a common side  $AD$ , as shown. What is the degree measure of  $\angle EAC - \angle BAC$ ?



28. The coordinates of the vertices of a parallelogram are  $(5, 8)$ ,  $(3, -2)$ ,  $(6, 1)$  and  $(x, y)$ . What is the sum of the distinct possible values for  $x$ ?

29. The first digit of a six-digit number  $\overline{1abcde}$  is 1. The product of this six-digit number and 3 is  $\overline{abcde1}$ . Find  $\overline{1abcde}$ .

30. A particular right square-based pyramid has a volume of  $\frac{5\pi}{3}$  cubic meters and a lateral height of  $\frac{\sqrt{29}}{2}$  meters, where  $s$  is the side length of the square base. What is the greatest value of  $s$ ?

