
MATHCOUNTS

1994-95

■ Chapter Competition ■
Sprint Round

Name _____

School _____

**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, slide rules, books, or any other aids during this round. 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.

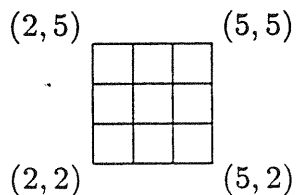
Total Correct	Scorer's Initials

MATHCOUNTS is a cooperative project of the National Society of Professional Engineers, the CNA Insurance Companies, the General Motors Foundation, the Intel Foundation, Texas Instruments Incorporated, the National Council of Teachers of Mathematics, and the National Aeronautics and Space Administration.

1. Let ∇ be defined as $\nabla(a, b) = \sqrt{a^2 + b^2}$, for all real numbers a and b . Find $\nabla(12, 5)$. 1. _____

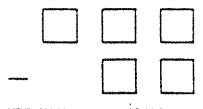
2. What is $\frac{1}{2}\%$ of 100? Express your answer as a decimal. 2. _____

3. In a rectangular coordinate system, a lattice point (a, b) is defined as a point (a, b) whose coordinates a and b are integers. If a dot is placed in the diagram on every lattice point whose coordinates are relatively prime, how many dots will there be? 3. _____



4. Starting on January 1, what month will it be when exactly one-fifth of the year has passed? 4. _____

5. Place each of the digits 2, 4, 5, 6, and 9 in exactly one box to make the smallest possible difference. What is that difference? 5. _____



6. A data set of three positive integers has a mean of 10 and a median of 6. Find the largest possible member of this set. 6. _____

7. How many units apart is any pair of parallel sides of a regular hexagon with a side of 6 units? Express your answer in simplest radical form. 7. _____

8. In a class of 20 students, 8 girls were absent due to a basketball team trip. Fifty percent of the students present are girls. Given that no boys are absent, what percent of the total class is boys?

8. _____

9. You have a whole pizza in the refrigerator. On your first trip to the refrigerator, you eat half of the pizza. On each successive trip, you eat half of the remaining pizza. After five trips to the refrigerator, what fractional part of the pizza have you eaten?

9. _____

10. How many different arrangements of the six letters of the word "YELLOW" can be made if the first letter must be "W" and the last letter must be "L"?

10. _____

11. You want to buy the same number of grapefruits and oranges to make holiday fruit baskets. What is the least number of oranges you can buy if grapefruits are shipped in boxes of 12, and oranges are shipped in boxes of 16?

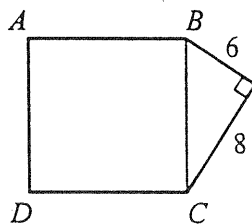
11. _____

12. The calorie count of a blueberry muffin was reduced by 8% to 230 calories. What was the previous calorie count?

12. _____

13. What is the number of square units in the area of square $ABCD$?

13. _____



14. Find the greatest common factor of 9,009 and 14,014.

14. _____

15. Ned and Nellie were playing on the elevator in their 12-story apartment complex one evening. They entered the elevator on the first floor, and decided to reach their eleventh-floor apartment by continually repeating the following sequence of steps. Ned pushed the button of the floor that was three floors above where they were currently, and upon arriving, Nellie then pressed the floor of the nearest even floor below where Ned's button led them. Assuming no one interrupted their game, how many times did they have to press a button before they could get out on the eleventh floor?

15. _____

16. A botanist had a plant which was 30 cm tall. Each successive month the plant grew by an amount equal to $\frac{2}{5}$ of its previous month's height. How many centimeters tall was it at the end of the second month? Express your answer to the nearest tenth.

16. _____

17. Which choice, A or B, is less expensive?

<u>Choice A</u>	<u>Choice B</u>
buying a \$10,000 car	buying a \$10,000 car
paying a 7% tax	receiving a \$1,000 rebate
then receiving a \$1,000 rebate	then paying a 7% tax
	on the remainder

17. _____

18. What is the largest prime divisor of 855?

18. _____

19. The probability that Chris will win the first set of a tennis match is $\frac{2}{3}$ and that he will win the second is $\frac{1}{2}$. Assuming independence of the two sets, what is the probability that he wins both sets? Express your answer as a common fraction.

19. _____

20. Hal purchased 15 plants at a nursery, some at \$3 and the rest at \$5. The total cost was \$55. How many \$5 plants did he buy?

20. _____

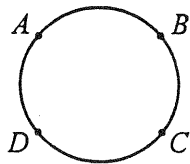
21. What is the maximum number of square inches in the area of a rectangle with a perimeter of 12 inches? 21. _____

22. A and B are sets. If A contains 6 elements, B contains 8, and together A and B contain 10, how many elements in A are also in B ? 22. _____

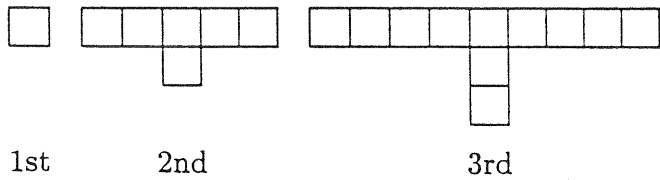
23. Which of the following, a , b , c , or d , does not equal the other three? 23. _____

- (a) $22 + 0.75(22)$
- (b) $22(1.75)$
- (c) $22(1 + 0.75)$
- (d) $22(0.75) + 1$

24. Given distinct points A , B , C , and D on a circle, how many distinct lines can be drawn that pass through two of these points? 24. _____



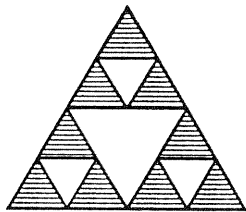
25. Each arrangement of squares is formed from the preceding arrangement by adding two additional squares to each end of the horizontal row and one square to the vertical column. How many squares will be in the sixth figure in the sequence? 25. _____



26. Micah is building a corral for his pet buffalo. He equally spaces and consecutively numbers the posts as he pounds them around a circle. The seventh and seventeenth posts lie on the same diameter. How many posts are there? 26. _____

27. The Mathletes won 2 of their first 10 meets. They went on to win all their remaining meets and finished the year with an equal number of wins and losses. What is the total number of meets in which the Mathletes competed? 27. _____

28. The area of the shaded region is what fractional part of the total area? Each of the triangles is equilateral. 28. _____



29. Simplify the following and express your answer in standard numerical form. 29. _____

$$\frac{(4.2 \times 10^{-5})(2.1 \times 10^6)}{(1.4 \times 10^3)(7 \times 10^{-5})}$$

30. From the given bar graph of monthly rainfall for Dry Gulch, find the number of inches in the mode for the monthly rainfall. 30. _____

