MATHCOUNTS®

0
1
2
3
4
5
6
7
8
9

2020
■ School Competition ■
Sprint Round
Problems 1–30

Name _____

DO NOT BEGIN UNTIL YOU ARE INSTRUCTED TO DO SO.

This section of the competition consists of 30 problems. You will have 40 minutes to complete all the problems. You are not allowed to use calculators, books or 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 left-hand column of the competition booklet. If you complete the problems before time is called, use the remaining time to check your answers.

In each written round of the competition, the required unit for the answer is included in the answer blank. The plural form of the unit is always used, even if the answer appears to require the singular form of the unit. The unit provided in the answer blank is the only form of the answer that will be accepted.

Total Correct	Scorer's Initials

1. _____ cm   According to the ruler, how many centimeters long is the piece of washi tape shown here?
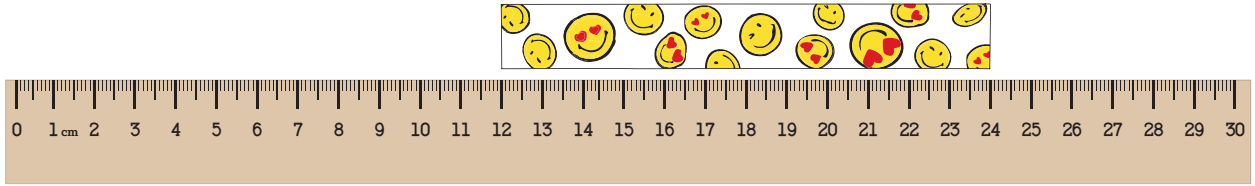
2. _____   What is the tens digit of this sum?

$$12{,}345$$
$$+\ 56{,}789$$

3. _____ ounces   Dora drinks a 12-ounce can of cola. Erika drinks half of a 20-ounce bottle of cola. How many more ounces of cola does Dora drink than Erika?
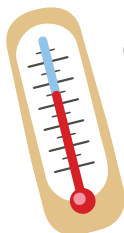
4. _____   What is the result when one hundred twenty-eight thousand is subtracted from one million?

5. _____ inches   What is the side length of a rectangle that has width 7 inches and area 105 in^2?

6. _____ What integer is closest to -7π?

7. _____ degrees On Monday at 8 p.m., the temperature measured −17 degrees. Between 8 p.m. on Monday and 6 a.m. on Tuesday, the temperature increased 23 degrees. On Tuesday, between 6 a.m. and 3 p.m., the temperature decreased 5 degrees. What was the temperature on Tuesday at 3 p.m.?

STUDENT LUNCH DATA

8. _____ %

LUNCH	ORDERS
PIZZA	132
NUGGETS	112
BURGER	88
SPAGHETTI	44
SALAD	24

This table shows all five lunch options on Friday at a middle school and the number of students that ordered each. Based on this, what percent of the lunch orders on Friday were for spaghetti?

9. _____ What is the 40th positive odd integer?

10. _____ What is the value of the expression $1 + \dfrac{2}{1 - \dfrac{2}{3}}$, in simplest form?

11. _____ If $(x^2y^3)^2 = x^ay^b$, what is the value of $a + b$?

12. _____ matches For each rock-paper-scissors match, paper beats rock, rock beats scissors, scissors beat paper and two identical items result in a tie. Based on this table, which summarizes the results of Kalyani and Mark's last 200 matches, how many matches did Kalyani win?

|		KALYANI		
		ROCK	PAPER	SCISSORS
MARK	ROCK	30	24	20
	PAPER	26	21	21
	SCISSORS	20	20	18

13. _____ inches Given that a mile equals 5280 feet, how many inches are in one-sixth of a mile?

14. _____ Maria was born on January 1, 2000. Her mother was born on January 1, 1975 and her father was born on January 1, 1970. In what year was the sum of their ages 100?

15. _____ % A bicycle that originally cost $200 is on sale for $140. By what percent was the price reduced?

16. _____ feet   Jay's dog outgrew his rectangular pen that measured 10 feet by 14 feet. To make it larger, he increased each side length by the same amount, which increased the pen's area by 81 square feet. What is the greater side length of the larger pen?
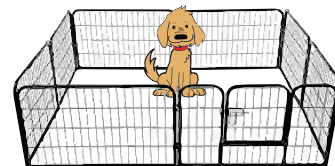
17. _____ years   Parker has three sons: Alfred, Beto and Dell. When Alfred turned 11 years old, Beto was 9 years old and Dell was 4 years old. What was the average of their ages when Alfred turned 37?

18. _____ units²   Triangle ABC has an area of 40 units². Point D is on side AC, and AD:DC = 3:1. What is the area of triangle BDC?

19. _____ people   Kendra surveyed 100 people who own a dog or a cat, or both. Of those surveyed, 15 own both a dog and a cat, and the number of people who own a dog is four times the number of people who own a cat. How many people surveyed own a cat?

20. _____ units²   What is the area of the region in the first quadrant that lies between the lines $x + 3y = 12$ and $x + 3y = 18$?
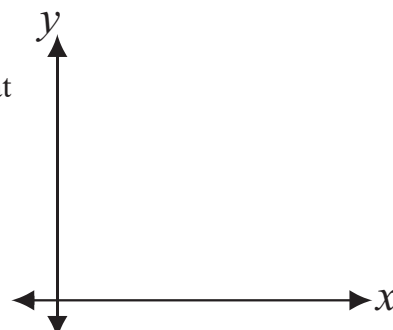
21. _____   What is the absolute difference between the mean and median of the first 100 positive integers?

22. _____ units²   The square labeled A has area 81 units². The square labeled B has area 16 units². The square labeled C has area 36 units². These three squares along with the shaded, non-overlapping rectangles labeled D, E and F are arranged to form a large square as shown. What is the area of rectangle D?
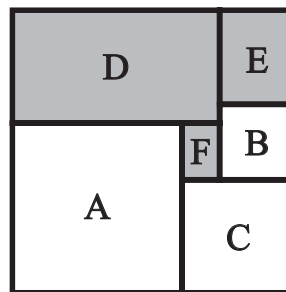
23. _____   If a fair coin is tossed four times, what is the probability of it landing heads up at least three times? Express your answer as a common fraction.

24. _____   If n is an integer for which the greatest common factor of n and 18 is 6 and the least common multiple of n and 9 is 126, what is the value of n?

25. _____   The lines given by the equations $y = 9 - \dfrac{1}{3}x$ and $y = mx + b$ are perpendicular and intersect at a point on the x-axis. What is the value of b?

26. _____ If two standard, fair 6-sided dice are rolled, what is the probability that the product of the two numbers rolled is a perfect square? Express your answer as a common fraction.

27. _____ gallons Gracie has made 2 gallons of punch that contains 50% juice. After Gracie pours out some of her mixture and replaces it with an equal amount of pure 100% juice, she has 2 gallons of punch that contains 65% juice. How many gallons of the original mixture did Gracie pour out? Express your answer as a common fraction.

28. _____ hours Ursula's starting location (✚) is on the shore of a river that measures 8 km across. Her destination (✖) is 27 km downshore on the opposite side of the river. Ursula rows a boat in a straight line, at a speed of 5 km/h, to a point that is 6 km downshore on the opposite side, and then runs the remaining distance, at a speed of 14 km/h. How many hours will it take Ursula to reach her destination? Express your answer as a mixed number.
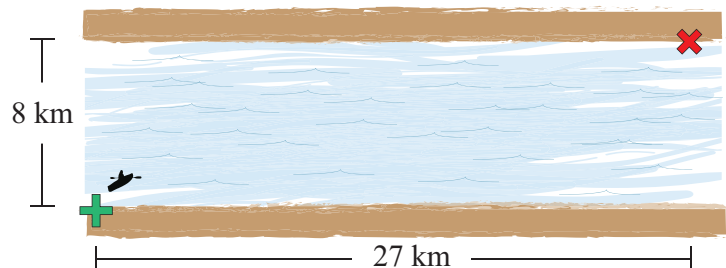
29. _____ A cylinder whose height is 3 times its radius is inscribed in a cone whose height is 6 times its radius. What fraction of the cone's volume lies inside the cylinder? Express your answer as a common fraction.

30. _____ What value of x yields the minimum value of the sum
$|x - 2^0| + |x - 2^1| + |x - 2^2| + |x - 2^3| + \cdots + |x - 2^{10}|$?