

MATHCOUNTS®

2020

■ Chapter Competition ■ Sprint Round Problems 1–30

HONOR PLEDGE

I pledge to uphold the highest principles of honesty and integrity as a Mathlete®. I will neither give nor accept unauthorized assistance of any kind. I will not copy another's work and submit it as my own. I understand that any competitor found to be in violation of this honor pledge is subject to disqualification.

Signature _____ Date _____

Printed Name _____

School _____

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. 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 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

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02-C20SPR

1. _____ minutes How many minutes are in 4.5 hours?

2. _____ apples Herbert's gift basket contains three oranges for every five apples.
If the basket has nine oranges, how many apples does it have?



3. _____ If $x = \frac{1}{2}$ and $y = 6$, what is the value of $12xy$?

4. _____ mi/h The table shows the minimum and maximum wind speeds for four categories of hurricanes. What is the absolute difference between the minimum wind speed of a category four hurricane and the maximum wind speed of a category one hurricane?

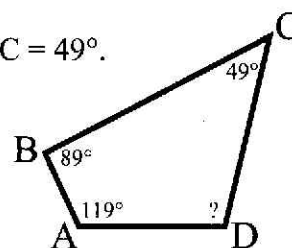
HURRICANE WIND SPEEDS (mi/h)

Category	Min Speed	Max Speed
Four	130	156
Three	111	129
Two	96	110
One	74	95

5. _____ cm What is the perimeter of a square whose area is 144 cm^2 ?

6. furlongs If 3 miles equal 1 league and 1 league equals 24 furlongs, how many furlongs are equal to 1 mile?

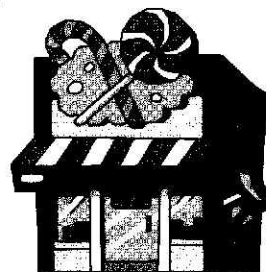
7. degrees In quadrilateral ABCD, $m\angle A = 119^\circ$, $m\angle B = 89^\circ$ and $m\angle C = 49^\circ$. What is the degree measure of $\angle D$?



8. If the first four terms of a geometric sequence are 2, 4, 8, 16 what is the fifth term of this sequence?

9. sides Gladys draws two polygons. Her second polygon has two fewer than twice as many sides as her first polygon. If Gladys' first polygon is a triangle, how many sides does her second polygon have?

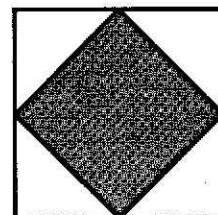
10. \$ Lolli's Candy Store sells fruit-flavored candy rope, priced by length, at \$4.00 per meter. At this rate, how much will it cost to buy 50 cm of candy rope?



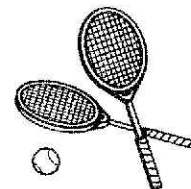
11. _____ Misko had an average score of 70 for her first three rounds of golf. If her scores for the first two rounds were 68 and 72, what was her score for the third round?



12. _____ cm^2 In the figure shown, the shaded inner square has area 36 cm^2 , and each of its vertices intersects the midpoint of a side of the outer square. What is the area of the outer square?



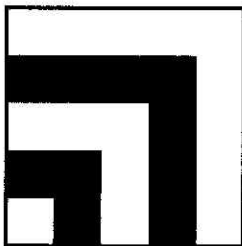
13. _____ meters Rafa and Sascha played a long 320-point tennis match. If Rafa ran an average of 12.7 meters per point and Sascha ran an average of 11.8 meters per point, how many more meters did Rafa run over the course of the match?



14. _____ units^2 The length and width of a rectangle add up to 16 units, and the length is three times the width. What is the area of the rectangle?

15. _____ What is the value of $\sqrt{5 \cdot 6 \cdot 10 \cdot 12}$?

16. _____ in²



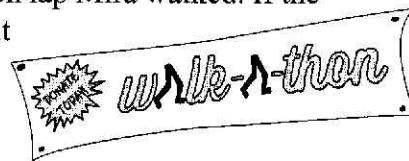
The figure shown is a square with sides of length 5 inches. The shaded stripes run parallel to the sides of the square, and they divide the bottom and left-hand sides of the square into segments of length 1 inch. What is the total area of the shaded stripes?

17. _____ numbers

How many two-digit prime numbers have 1 as their units digit?

18. _____ laps

For a charity walk-a-thon, Jen donated \$10 and pledged to donate 10¢ for each lap Mira walked. Joy pledged to donate 35¢ for each lap Mira walked. If the total amount Jen donated equals the total amount Joy donated, how many laps did Mira walk?



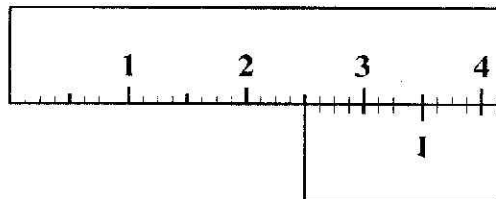
19. _____ values

$$\begin{array}{r} 4A \blacksquare \\ + 53 \blacksquare \\ \hline 1 \blacksquare \blacksquare \blacksquare \end{array}$$

Some of the digits in the following correctly-worked arithmetic problem are missing. How many possible values are there for the digit represented by A?

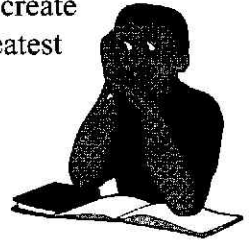
20. _____

This figure shows two transparent foot-long rulers; the numerical markings on each ruler are in inches. If the marking on the top ruler for 6 inches will line up with the marking on the bottom ruler for q inches, what is the value of q ? Express your answer as a mixed number.



21. _____

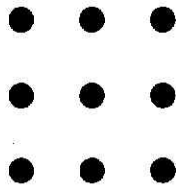
Noah wants to fill in the two blanks in the numeral 5_1_2 to create a five-digit positive integer that is divisible by 6. What is the greatest five-digit multiple of 6 that he can create?



22. _____

What is the integer nearest to x if $3^x = 1500$?

23. _____ lines



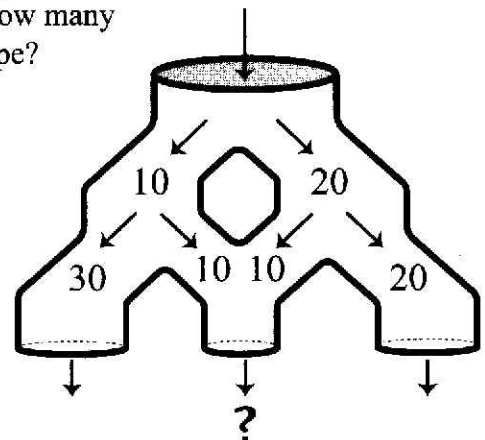
How many different lines pass through at least two of the nine points in the grid below?

24. _____

If $(2x - 3)^3 = a_3x^3 + a_2x^2 + a_1x + a_0$, what is the value of $a_3 + a_2 + a_1 + a_0$?

25. _____ marbles

Ten thousand marbles are released into the top pipe as shown and roll down the pipe system. Anytime the pipe forks, the marbles split in proportion to the cross-sectional areas of the pipes. All pipes have circular cross-sections with diameters as indicated in the figure. How many marbles exit through the bottom, middle pipe?

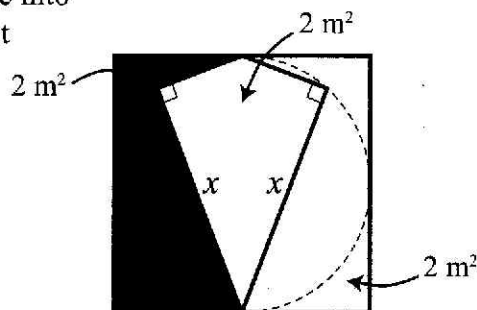


26. _____ prisms A rectangular prism of size $3 \times 4 \times 5$ is made from 60 unit cubes. Including the full $3 \times 4 \times 5$ prism and the 60 unit prisms, how many total rectangular prisms can be found in the large rectangular prism by taking a subset of the 60 cubes?

27. _____ Ms. Pauling's chemistry class has 5 lab benches, each of which seats 2 students. If 6 students file into her otherwise empty classroom, and each student picks a random available open seat, what is the probability that at least one of the lab benches is completely empty? Express your answer as a common fraction.



28. _____ In the figure, a kite with two right angles is circumscribed by a circle. The circle is then circumscribed by a square such that the diagonals of the kite are parallel to the sides of the square as shown. The longer sides of the kite each have length x meters. The sides of the kite divide the square into three regions, shaded dark gray, white and light gray as shown, with each region of area 2 m^2 . If $x^2 = a + \sqrt{b}$, what is the value of $a + b$?



29. (_____ , _____) When $9!$ is expressed as an integer in base 9, the result ends in m zeros, and the last nonzero digit immediately preceding the m zeros is n . What is the value of the ordered pair (m, n) ?

30. _____ Triangle ABC has vertices $A(0, 5)$, $B(12, 0)$ and $C(0, 0)$ in the coordinate plane. The image when triangle ABC is rotated clockwise about the origin is triangle $A'B'C'$ with vertex $A'(3, 4)$. What fraction of the area of triangle $A'B'C'$ is below the x -axis? Express your answer as a common fraction.