MATHCOUNTS®

2022 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. 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. _____ What is the value of $3^4 - 2 \times 4^2$?

2. _____ What is the value of the result when four million three hundred twenty-five thousand one hundred thirty-one is subtracted from four million three hundred twenty-six thousand fifty-two?

3. _____ What is the median of the data set {4, 16, 0, 8, 3, 11, 7}?

4. _____ pieces Parker and his three friends went trick-or-treating together. If Parker got 11 pieces of candy, and each of his friends got twice as much candy as he did, how many pieces of candy did Parker and his friends get in all?

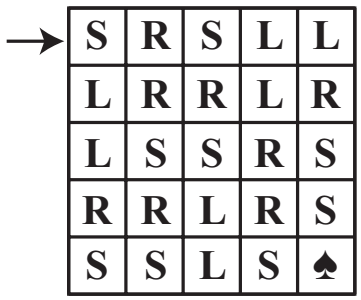
5. _____ Follow these steps:

1. Choose a two-digit positive integer.
2. Multiply it by 153.
3. Add the digits of the number obtained.
4. If the sum resulting from step 3 has more than one digit, repeat step 3. If the sum resulting from step 3 has one digit, stop.

What number is the result of following this algorithm?

6. _____ rooms

The 5 × 5 grid pictured represents 25 rooms. Annie walks into the top left room, and the direction she is facing as she enters the room is indicated by the arrow. In each room, she is instructed to either walk straight (S), make a right turn (R), or make a left turn (L). The instructions always indicate movement relative to the direction she is facing as she physically walks through the grid of rooms. She keeps going until she reaches the room with the ♠. Including the room into which she enters, and the room with the ♠, how many total rooms does Annie visit during this walk?



7. _____

The sum of the integer n and eighteen is equal to the product of four and five. What is the value of n?

8. _____ students

More than 100 students signed up to participate in the Geography Bowl competition. If teams of 2 could be made with no students left out, and teams of 3 could also be made with no students left out, what is the fewest number of students who could have signed up for the Geography Bowl?

9. _____ colors

Manuel wishes to paint each face of his rectangular prism such that no two adjacent faces of his prism are the same color. What is the minimum number of unique paint colors he needs to achieve this?

10. _____ feet

The width of a rectangle is 1 foot longer than its length, and the area of the rectangle is 72 ft^2. In feet, what is the rectangle's perimeter?

11. _____ chickens

A nonzero number of goats, each with four legs, and a nonzero number of chickens, each with two legs, are living on a farm. Between all the animals, there are $\frac{3}{8}$ as many heads as there are legs. Assuming that all animals have all of their limbs, what is the fewest possible number of chickens on the farm?

12. _____ points

In Olympic diving, there are seven judges who rate the performance of each dive on a scale from 0 to 10, using half-point increments, where 0 is a failed attempt and 10 is excellent. After each of the seven judges has scored the dive, the two highest scores and the two lowest scores are discarded. The remaining three scores are then added together and the sum is multiplied by the degree of difficulty of the dive. This degree of difficulty is a number between 1.2 and 3.6. A famous Olympian diver completed a dive with degree of difficulty 3.5 and received the following seven performance scores from the judges: 8.0, 7.0, 8.5, 7.5, 7.5, 8.0, 7.0. What was the final number of points that the Olympian received on this dive? Express your answer as a decimal to the nearest tenth.

13. _____ cups

Michael is baking cookies. His cookie recipe calls for $1\frac{3}{4}$ cups sugar and makes 24 cookies. If he wants to scale the recipe to make exactly 18 cookies, how many cups of sugar will he need? Express your answer as a mixed number.

14. _____ meters

Fyodor and his three sons, Ivan, Dmitri and Alyosha, are standing exactly on the corners of a rectangular room. Fyodor is 3 meters from Dmitri and 5 meters from Ivan. What is the minimum possible distance that Fyodor could be from Alyosha?

15. _____ calculators

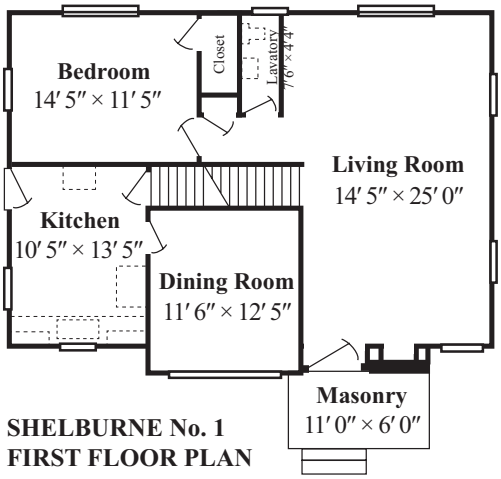
The Ten Finger calculator company periodically checks random calculators before shipping crates out to customers. On Wednesday, 12 calculators from each of 64 crates of 144 calculators were tested. Two of the tested calculators were found to be defective. Based on this rate of defect, how many total calculators are expected to be defective?

16. $\_\_\_\_\_$

At a concert for the band Algal Rhythms, 75% of the tickets were sold at the full price of \$30. The remaining 25% of tickets were sold at a discounted price of \$10. What was the average selling price of a ticket at the Algal Rhythms concert? Express your answer in dollars, rounded to the nearest cent.

17. $\_\_\_\_\_$ ft^2

From 1908 to 1940, a house could be mail-ordered from the Sears catalog. Shown here is a floor plan for the Shelburne No. 1 model which was sold during the 1920s. The dimensions of each room are given in feet and inches, and adjacent walls meet at right angles. In square feet, what is the area of the dining room of the Shelburne No. 1 model? Express your answer to the nearest square foot.



SHELBURNE No. 1
FIRST FLOOR PLAN

18. $\_\_\_\_\_$ ft^2

A gardener uses exactly 500 feet of fencing to completely enclose a rectangular area in her backyard. If the width of her garden is 50 feet less than the length, what will be the area of her garden?

19. $\_\_\_\_\_$: $\_\_\_\_\_$ a.m.

Joe left home traveling to Agora. At 10:32 a.m., Joe's speedometer showed that he was going 75 mi/h, and Joe knew that he had 60 miles left to travel. Assuming Joe maintains an average speed of 75 mi/h, what time will it be when he arrives in Agora? Express your answer in the form HH:MM, where HH represents the two-digit hour and MM represents the two-digit minute.

20. $\_\_\_\_\_$

The 5th power of a positive number is equal to the product of $\frac{2}{3}$ and the 4th power of the number. What is the ratio of this number's 10th power to its 8th power? Express your answer as a common fraction.

21. _____ sandwiches

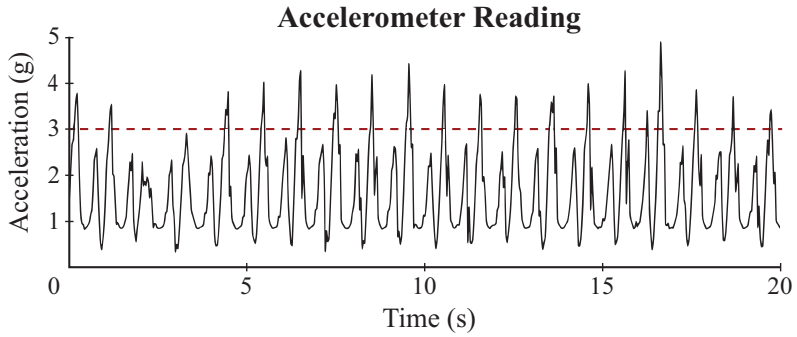
James is making a sandwich with two slices of bread chosen from rye, wheat and white, and filled with either ham or cheese, or both. If his sandwich can have one or two types of bread and the order of the ingredients doesn't matter, how many different sandwiches can James make?

22. _____ students

On Wednesday, $\frac{1}{3}$ of the students in Mr. Short's homeroom had drama practice, and $\frac{1}{4}$ of his other homeroom students had band practice. If 6 students had band practice, how many students are in Mr. Short's homeroom?

23. _____ m/s

Jen's phone uses a simple algorithm to count the number of strides she takes. The algorithm looks at the phone's accelerometer measurements, and counts a stride each time the acceleration goes from below to above 3 g. Based on the number of strides counted in the 20-second window shown here, and assuming that Jen travels 140 cm per stride, what was Jen's average walking speed, in meters per second, over the 20-second window? Express your answer as a decimal to the nearest hundredth.



24. _____

A triangle has integer side lengths 2, 5 and x. What is the median of all possible values of x?

25. _____ movies per month

Pixflix online video charges \$5.95 to view a movie. Movie Prime video service charges \$150 per year membership and \$3.95 per movie. Assuming Minda views the same number of movies each month, what is the fewest number of movies per month Minda must view to make Movie Prime the better deal?

26. _____ The number 345,600 can be expressed as $6^a5^b4^c$ for integers a, b and c. What is the value of the product abc?

27. _____ groups Kurt is creating a bouquet of flowers for his mother. He has a selection of roses, lilies, orchids and violets from which to create a bouquet of a dozen flowers. Kurt's mother loves orchids, so his bouquet will have at least six orchids. How many different groups of a dozen flowers can Kurt use to make a bouquet?

28. _____ If $\frac{3}{x+2} = \frac{y+3}{2}$ and x and y are integers, what is the sum of all possible values of x?

29. _____ The sequence a_n has the property that $a_n = a_{n-1} + 2a_{n-2}$ for $n \geq 2$. It is also true that $a_0 = 4$ and $a_4 = 26$. What is the value of a_5? Express your answer as a common fraction.

30. _____ Jaylin has a wooden cube which is painted blue on the outside. She cuts the cube into 1000 identical cubes, some of which have some sides painted blue, then rolls the resulting cubes like dice. The probability that no blue faces land up after Jaylin rolls the 1000 cubes can be expressed as $2^a \times 3^b \times 5^c$ where a, b and c are integers. What is the value of $a + b + c$?