MATHCOUNTS®

2013
■ 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

02-C13SPR

1. ____ : ____ p.m.   Marti lives in New York and wishes to call her friend Kathy who lives in Honolulu. The chart below shows the times in several cities when it is 12:00 noon in New York. If Marti calls Kathy when the time is 6:30 p.m. in New York, what time is it in Honolulu?

City	Time when it is 12:00 noon in New York
Chicago, IL	11:00 AM
Denver, CO	10:00 AM
Los Angeles, CA	9:00 AM
Honolulu, HI	7:00 AM

2. _____   What is the value of $1 - 2 + 4 - 8 + 16 - 32 + 64 - 128 + 256 - 512 + 1024$?

3. _____ minutes   At a university's graduation ceremony, 690 names are to be read at a pace of one name every 10 seconds. How many minutes will it take to read all of the names?

4. _____ red apples

Apples Collected
by Ms. Pinski's Class
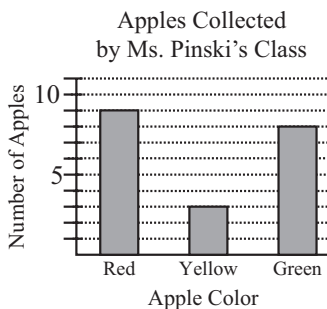
The apples collected by Ms. Pinski's class are represented in the bar graph shown. How many more red apples than yellow apples were collected?

5. _____ cm   The perimeter of a particular rectangle is 18 cm, and the length of the rectangle is one-third its perimeter. What is the width of the rectangle?

6. _____   One-half of the sum of n and 8 is equal to 7. What is the value of n?

7. _____   When $(37 \times 45) - 15$ is simplified, what is the units digit?

8. _____   One witness to a crime said that the suspect was 25 years old and 69 inches tall. A second witness claimed that the suspect was 35 years old and 74 inches tall. The third witness reported that the suspect was 65 inches tall and 35 years old. Each witness correctly identified either the suspect's height or age, but not both. If a is the suspect's age in years, and b is the suspect's height in inches, what is the value of the sum $a + b$?

9. _____ times   Zeno's pet rabbit always jumps halfway to a carrot no matter how far away he is from the carrot. He will eat the carrot if he lands within 6 inches of it. How many times must Zeno's rabbit jump to eat a carrot that is initially 12 feet away?
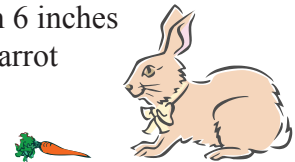
10. _____ outfits   Mellie has 6 pairs of pants and 10 shirts. She then buys 2 more pairs of pants. If an outfit consists of a pair of pants and a shirt, how many more outfits can Mellie make now compared to the number that she could make before this purchase?

11. _____ degrees   Two equilateral triangles are drawn in a square, as shown. In degrees, what is the measure of each obtuse angle in the rhombus formed by the intersection of the two triangles?
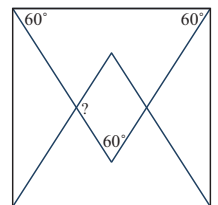
12. $ _____   Seven pounds of Mystery Meat and four pounds of Tastes Like Chicken cost $78.00. Tastes Like Chicken costs $3.00 more per pound than Mystery Meat. In dollars, how much does a pound of Mystery Meat cost?

13. _____ cm   The perimeter of a rectangle is 22 cm and its area is 24 cm². What is the smaller of the two integer dimensions of the rectangle?

14. _____ blocks   On Tuesdays, Mr. Cansetti walks from his home, located at one end of Main Street, to the grocery store at the other end of Main Street. On his way down Main Street, he passes the post office and the police station, in that order. Mr. Cansetti's home is 7.5 blocks from to the police station. The post office is 6 blocks from the grocery store and 3.5 blocks from the police station. How many blocks does Mr. Cansetti walk from his home to the grocery store?

15. _____ pigs   Farmer Hank has fewer than 100 pigs on his farm. If he groups the pigs five to a pen, there are always three pigs left over. If he groups the pigs seven to a pen, there is always one pig left over. However, if he groups the pigs three to a pen, there are no pigs left over. What is the greatest number of pigs that Farmer Hank could have on his farm?
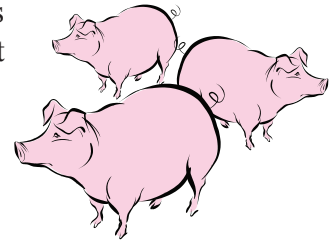
16. _____ days   Three people can paint 5 rooms in 2 days. Working at this same rate, how many days will it take 6 people to paint 15 rooms?

17. _____   At the school's carnival, one game featured this unique square dartboard with five smaller, shaded squares, shown here. The length of a side of the square dartboard is 4 times the length of a side of any of the five congruent, shaded squares. To win a prize, a player's dart has to land in a shaded region. If a player's dart randomly hits the dartboard, what is the probability of her winning a prize? Express your answer as a common fraction.
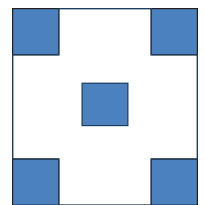
18. _____   A line passes through the points $(-2, 8)$ and $(5, -13)$. When the equation of the line is written in the form $y = mx + b$, what is the product of m and b?

19. _____ ft² Mr. Mayfeld is designing a sign for his ice cream shop. The sign will be a shape consisting of a semicircle and an isosceles triangle that he will paint to look like a cone with a scoop of ice cream. He will cut the figure out of a rectangular piece of plywood measuring 2 ft by 4 ft, as shown. The shaded regions will be cut away. If BE = 3BG and $\overline{AB}$ is parallel to $\overline{CE}$, what is the total area of the resulting figure? Express your answer as a decimal to the nearest tenth.
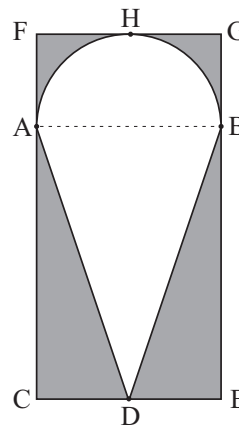
20. _____ license plates A state license plate contains the state logo in the center, preceded by three letters and followed by three digits. If the first two letters must both be consonants, excluding Y, how many different license plates are possible?

21. _____ cm³ A right square pyramid has a base with a perimeter of 36 cm and a height of 12 cm. At one-third of the distance up from the base to the apex, the pyramid is cut by a plane parallel to its base. What is the volume of the top pyramid?
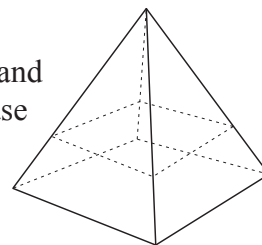
22. _____ Four integers are chosen from 1 to 10, inclusive, with repetition allowed. What is the greatest possible difference between the mean and the median of the four integers? Express your answer as a common fraction.

23. _____ books Jay and Mike were walking home with heavy books in their backpacks. When Mike complained about the weight in his backpack, Jay remarked, "If I take one of your books, I will be carrying twice as many books as you will be carrying, but if you take one of my books, we'll be carrying the same number of books." How many books is Mike carrying in his backpack?

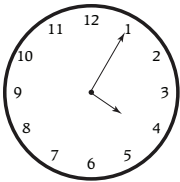**24.** _____ cm A right rectangular prism has a volume of 720 cm³. Its surface area is 484 cm². If all edge lengths are integers, what is the length of the longest segment that can be drawn that connects two vertices? Express your answer in simplest radical form.

25. _____ Avi and Hari agree to meet at their favorite restaurant between 5:00 p.m. and 6:00 p.m. They have agreed that the person who arrives first will wait for the other only 15 minutes before leaving. What is the probability that the two of them will actually meet at the restaurant, assuming that the arrival times are random within the hour? Express your answer as a common fraction.

26. _____ When the local convenience store was bought by a new owner, the old sodas were replaced by new ones that were 20% larger. In addition, the price of the new, larger sodas was 20% less than the price of the old, smaller sodas. What is the ratio of the cost per ounce for the old soda to the cost per ounce for the new soda? Express your answer as a common fraction.

27. _____ hours Working in pairs, Alana and Bob can complete a job in 2 hours, Bob and Cody can do the job in 3 hours, and Alana and Cody can do the same job in 4 hours. How many hours will it take for Alana, Bob and Cody working together to complete this job? Express your answer as a common fraction.

28. _____ What fraction of the first 100 triangular numbers are evenly divisible by 7? Express your answer as a common fraction.

29. _____ The analog clock shown has a minute hand with an arrow tip that is exactly twice as far from the clock's center as the hour hand's arrow tip. If point A is at the tip of the minute hand, and point B is at the tip of the hour hand, what is the ratio of the distance that point B travels in 3 hours to the distance that point A travels in 9 hours? Express your answer as a common fraction.

30. _____ percent What percent of the interval with endpoints -5 and 5 consists of real numbers x satisfying the inequality $x + 1 > \dfrac{8}{x-1}$?

Forms of Answers

The following list explains acceptable forms for answers. Coaches should ensure that Mathletes are familiar with these rules prior to participating at any level of competition. Judges will score competition answers in compliance with these rules for forms of answers.

All answers must be expressed in simplest form. A "common fraction" is to be considered a fraction in the form $\pm\frac{a}{b}$, where a and b are natural numbers and GCF(a, b) = 1. In some cases the term "common fraction" is to be considered a fraction in the form $\frac{A}{B}$, where A and B are algebraic expressions and A and B do not share a common factor. A simplified "mixed number" ("mixed numeral," "mixed fraction") is to be considered a fraction in the form $\pm N\frac{a}{b}$, where N, a and b are natural numbers, $a < b$ and GCF(a, b) = 1. Examples:

Problem: Express 8 divided by 12 as a common fraction. *Answer:* $\frac{2}{3}$ *Unacceptable:* $\frac{4}{6}$

Problem: Express 12 divided by 8 as a common fraction. *Answer:* $\frac{3}{2}$ *Unacceptable:* $\frac{12}{8}$, $1\frac{1}{2}$

Problem: Express the sum of the lengths of the radius and the circumference of a circle with a diameter of $\frac{1}{4}$ as a common fraction in terms of π. *Answer:* $\frac{1+2\pi}{8}$

Problem: Express 20 divided by 12 as a mixed number. *Answer:* $1\frac{2}{3}$ *Unacceptable:* $1\frac{8}{12}$, $\frac{5}{3}$

Ratios should be expressed as simplified common fractions unless otherwise specified. Examples:
Simplified, Acceptable Forms: $\frac{7}{2}$, $\frac{3}{\pi}$, $\frac{4-\pi}{6}$ *Unacceptable:* $3\frac{1}{2}$, $\frac{\frac{1}{4}}{3}$, 3.5, 2:1

Radicals must be simplified. A simplified radical must satisfy: 1) no radicands have a factor which possesses the root indicated by the index; 2) no radicands contain fractions; and 3) no radicals appear in the denominator of a fraction. Numbers with fractional exponents are *not* in radical form. Examples:
Problem: Evaluate $\sqrt{15}\times\sqrt{5}$. *Answer:* $5\sqrt{3}$ *Unacceptable:* $\sqrt{75}$

Answers to problems asking for a response in the form of a dollar amount or an unspecified monetary unit (e.g., "How many dollars...," "How much will it cost...," "What is the amount of interest...") should be expressed in the form ($) *a.bc*, where *a* is an integer and *b* and *c* are digits. The *only* exceptions to this rule are when *a* is zero, in which case it may be omitted, or when *b* and *c* are both zero, in which case they may both be omitted. Examples:
Acceptable: 2.35, 0.38, .38, 5.00, 5   *Unacceptable:* 4.9, 8.0

Units of measurement are not required in answers, but they must be correct if given. When a problem asks for an answer expressed in a specific unit of measure or when a unit of measure is provided in the answer blank, equivalent answers expressed in other units are not acceptable. For example, if a problem asks for the number of ounces and 36 oz is the correct answer, 2 lbs 4 oz will not be accepted. If a problem asks for the number of cents and 25 cents is the correct answer, $0.25 will not be accepted.

Do not make approximations for numbers (e.g., π, $\frac{2}{3}$, $5\sqrt{3}$) in the data given or in solutions unless the problem says to do so.

Do not do any intermediate rounding (other than the "rounding" a calculator performs) when calculating solutions. All rounding should be done at the end of the calculation process.

Scientific notation should be expressed in the form $a \times 10^n$ where a is a decimal, $1 \le |a| < 10$, and n is an integer. Examples:
Problem: Write 6895 in scientific notation.   *Answer:* 6.895×10^3
Problem: Write 40,000 in scientific notation.   *Answer:* 4×10^4 *or* 4.0×10^4

An answer expressed to a greater or lesser degree of accuracy than called for in the problem will not be accepted. Whole number answers should be expressed in their whole number form.
Thus, 25.0 will not be accepted for 25, and 25 will not be accepted for 25.0.

The plural form of the units will always be provided in the answer blank, even if the answer appears to require the singular form of the units.