

NOTE: In this sample, only 4 sets of questions (of 3 questions each) are provided. The real competition will include 8 sets of questions. The provided questions are indicative of the style and difficulty of the questions that will be on the real competition. Just for fun, a story is told in this sample. A story may or may not be told in the real competition.

One copy of the following answer sheet will be provided:



MCAMC
2019

Live Round Set 1 Answer Sheet

Team ID: _____

1. _____ 2. _____ 3. _____

Six copies of the following questions will be provided:

1. Every day, Pablo the sailor eats a $\frac{1}{3}$ cup of spinach. In how many days will he eat $\frac{2}{3}$ of a quart? (There are 4 cups in 1 quart.)
2. One day, Pablo is trying to find treasure on the coordinate plane, but he's stuck at point $(3, 4)$. The treasure is located at $(0, 0)$. How many units away is the treasure?
3. Luckily, Pablo did find his treasure. However, the treasure is being protected by an angry octopus! He takes his sword out and cuts off one of the octopus's legs, but 3 more legs regenerate back. How many legs will the octopus have if he cuts off another 3 legs?

One copy of the following answer sheet will be provided:



MCAMC
2019

Live Round Set 3 Answer Sheet

Team ID: _____

7. _____ 8. _____ 9. _____

Six copies of the following questions will be provided:

7. The octopus is now angry, but the sea fairy promises to tell Pablo a trick if he can guess the number she's thinking of. She gives Pablo three hints: (1) the number has 5 factors, (2) the number has 2 digits, and (3) the number divides 48. What number should Pablo guess?
8. Pablo guessed the number correctly, and the hint was to slash the octopus on the forehead that many times. The octopus is defeated and the treasure is finally Pablo's. The treasure chest (a rectangular prism) has height 5, length $10 - x$, and width $-7 + x$. What is the sum of all edge lengths on the box?
9. The treasure chest has a combination lock on it, consisting of 3 dials, each with the numbers 1 to 6. The lock opens if the sum of the numbers selected is exactly 10. Pablo randomly spins each dial. What is the probability that Pablo can open the treasure chest on the first try?

One copy of the following answer sheet will be provided:



MCAMC
2019

Live Round Set 5 Answer Sheet

Team ID: _____

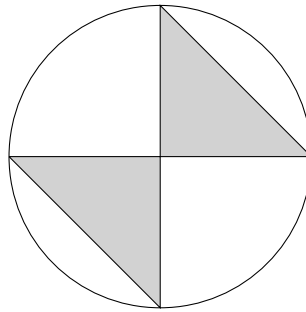
13. _____

14. _____

15. _____

Six copies of the following questions will be provided:

13. Pablo opens the treasure chest, and finds a bunch of gold coins! The gold coins have the below pattern inscribed on them. The figure is drawn to scale. What is the ratio of the shaded area to the unshaded area? Express your answer as a fraction in lowest terms.



14. With Pablo's newfound wealth, he decides to quit his dangerous lifestyle and open a business selling fruits and vegetables. Today, Andy bought 2 apples and 1 potato for \$2.25, Becky bought 2 potatoes and 1 banana for \$3.25, and Charlie bought 2 bananas and 1 apple for \$2.00. Now, Diana walks in and buys 1 apple, 1 potato, and 1 banana. How much does Diana pay?
15. After a successful career, Pablo dies a peaceful death, and at his funeral, it is revealed that he placed his most prized possession in a room with 1000 lockers numbered 000 to 999. The number on the locker has four special properties: (1) its units digit is equal to its hundreds digit, and (2) if you add 1 to it, the number is divisible by 9, (3) it is divisible by the number of possible numbers considering only properties (1) and (2), and (4) the sum of its digits is at least 10. Which number locker is the special locker?

One copy of the following answer sheet will be provided:



MCAMC
2019

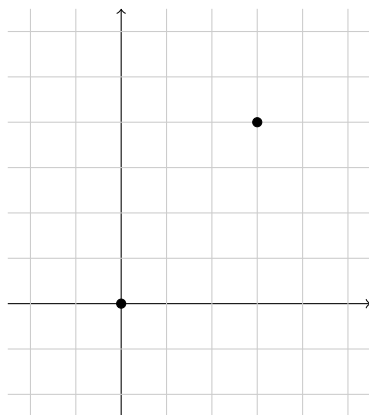
Live Round Set 8 Answer Sheet

Team ID: _____

22. _____ 23. _____ 24. _____

Six copies of the following questions will be provided:

22. Pablo is reincarnated! Now, Pablo not only likes to eat spinach every day, he also likes to drink milk. He likes to split the milk into two cups as follows. He first starts with one cup (call it cup 1) filled to the brim with milk and another cup (cup 2) empty. Then, he pours $\frac{1}{2}$ of the milk from cup 1 into cup 2, then pours $\frac{1}{3}$ of the milk from cup 2 into cup 1, then pours $\frac{1}{4}$ of the milk from cup 1 into cup 2, repeating until Pablo pours $\frac{1}{101}$ of cup 2 into 1. At the end of this process, how much milk is in cup 1?
23. Pablo is sailing on the coordinate plane again, and once again he is stuck at the point $(3, 4)$. The treasure he's looking for is at $(0, 0)$ again. If Pablo's ship has enough fuel to travel 10 units, and Pablo can only travel along the gridlines in the coordinate plane below, how many different paths can Pablo take to his treasure? Note that any path that starts at $(3, 4)$ and ends at $(0, 0)$ is a valid path, even if it sometimes overlaps with itself.



24. Pablo again finds his treasure, only to notice that it is being protected by an angry octopus! This time, the octopus not only regenerates 3 legs when 1 is cut off, but also has a $\frac{1}{2}$ probability of launching a counterattack when hit. This counterattack lowers Pablo's accuracy by a factor of $\frac{1}{2}$. Pablo's starting accuracy is 100%. After Pablo attempts to attack 3 times, what is the probability that the octopus now has 14 legs?