



MCAMC  
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## MCAMC: Individual Round

*Do not turn the page until you are told to do so.*

This section of the competition is to be completed **individually** within **1 hour**, and this section consists of **20 questions**. No aids such as calculators, notes, compasses, smartphones, smartwatches, etc. are allowed. All answers must be recorded on this page in order to receive credit. Answers must be exact (do not approximate  $\pi$ ) and in simplest form, with all fractions expressed as improper fractions. Examples of unacceptable answers include:  $\frac{4}{6}$ ,  $1\frac{1}{3}$ ,  $3 + 2$ . Examples of acceptable answers include  $\frac{2}{3}$ ,  $\frac{4}{3}$ ,  $5$ . There is no need to include units for any answer, and the units are always assumed to be the units in the question. Either exact decimal answers or improper fractions will be accepted (i.e.  $0.25$  and  $\frac{1}{4}$  are both acceptable).

Name: \_\_\_\_\_

Team Name: \_\_\_\_\_ Team/Student ID: \_\_\_\_\_

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|----------|-----------|-----------|-----------|
| 1. _____ | 6. _____  | 11. _____ | 16. _____ |
| 2. _____ | 7. _____  | 12. _____ | 17. _____ |
| 3. _____ | 8. _____  | 13. _____ | 18. _____ |
| 4. _____ | 9. _____  | 14. _____ | 19. _____ |
| 5. _____ | 10. _____ | 15. _____ | 20. _____ |

# 1 Individual Round

Do your best! ☺

1. Kadabra challenges Abra to a battle of brainpower. He tells Abra to compute

$$\frac{1}{1 + \frac{1}{1+1}}$$

What should Abra answer?

2. Dawn is cooking Poffins for Pachirisu. She knows that Pachirisu likes Poffins which contain 3 Persim Berries for every 1 Oran Berry. If Dawn uses 12 Persim Berries, how many Oran Berries should she use?
3. Eevee escapes from the Bokémon Day-Care. She heads 6 miles north on Route 210 and 8 miles east on Route 215 until she reaches Veilstone City, where she is captured. The Day-Care Man flies in a straight path from the Day-Care to Veilstone City to pick her up, then flies back to the Day-Care in the same way. How much more distance, in miles, did the Day-Care Man travel in total than Eevee?
4. The pool at Cerulean Gym is 15 feet long and 12 feet wide. If Misty fills the pool with enough water so that the water level is 7 feet high, in cubic feet, how much water is in the pool?
5. If Ash has 3 Boké Balls, 5 Great Balls, 2 Ultra Balls, and 1 Master Ball, what is the probability that upon drawing a ball without looking, he will draw the Master Ball from his pouch?
6. If  $X \odot Y$  is defined as  $X^2 + Y^2 + 2XY$ , what is the value of  $8 \odot (1 \odot 2)$ ?
7. Snorlax is counting sheep in his sleep. It takes him 1 hour to count 4 sheep. However, after every hour, 2 more sheep appear. If he wakes up after he has finished counting every single sheep that he sees, and there are 12 sheep when he first falls asleep, how long, in hours, does Snorlax sleep for?
8. Serena is battling Diantha with 3 different Fire-type Bokémon, 1 Grass-type Bokémon, and 1 Water-type Bokémon. In how many different orders can she send out all her Bokémon, if she wants to send out a Fire-type Bokémon first?
9. In rectangle  $AXEW$ ,  $AX = 9$ ,  $AW = 15$ , and point  $M$  lies on side  $EX$  such that  $MW = 15$ . What is the ratio of the area of  $\triangle MEW$  to the total area of  $AXEW$ ?
10. Ash has decided that he wants to capture all the Bokémon in the world. As of 2019, he has captured 80 different Bokémon. If Ash began his quest in 1999 at the age of 10 and he continues to capture Bokémon at the same rate, how old will Ash be when he has captured all 812 currently-known Bokémon? (Note: Assume he began his quest on his birthday, give your answer as a whole number, and yes, Ash does age.)
11. Jigglypuff is battling Fox McCloud, but instead of a Bokébattle, they are fighting in Super Smash Sisters Ultimate. Jigglypuff has an attack called Rest that does massive damage and can be modeled by the equation

$$f(t) = -t^2 + 30t - 200$$

where  $f(t)$  is the amount of damage Rest does and  $t$  is the amount of time in seconds that has elapsed in the match. How many seconds after the match begins should Jigglypuff use Rest to maximize the amount of damage dealt to Fox?

12. Each day, Oshawott steals 20% of the Rare Candies from Ash's Candy Jar. If after the second day, there are 16 Rare Candies left, how many were in the jar to begin with?
13. Psyduck uses Hypnosis on Snivy, who falls asleep. However, Snivy can wake up if she can concentrate enough to think of the correct solution to the following problem: If  $a$  and  $b$  are the solutions to  $4x^2 - 9 = 0$ , find the value of  $a \times b$ . What should Snivy answer to wake up?

14. If Electrode's body is a sphere of diameter 1 foot and a Boké Ball is a sphere with a radius of 2 inches, how many times larger is Electrode's body than a Boké Ball?
15. Boké Puffs costing \$20 per pound is mixed with Boké Beans costing \$5 per pound to make a mixture costing \$6 per pound. What fraction of the mixture's weight consists of Boké Puffs? Express your answer as a common fraction.
16. Snorlax is sleeping again, but this time, he wakes up from his nap whenever the angle between the minute hand and the hour hand on the clock is 10 degrees. If it is currently 4:00, in how many minutes will Snorlax wake up?
17. Piplup is battling Chimchar, who has 50 Health Points, or HP. He knows Bubble, which does 20 damage to Chimchar's HP (reduces his HP by 20). Bubble also has a 20% chance of critically striking, which will deal 30 damage instead of 20. What is the probability that Piplup will defeat Chimchar (reduce his HP to 0) within two uses of Bubble? Give your answer as a fraction.
18. Vaporeon, Jolteon, Flareon, Umbreon, Glaceon, Leafeon, Espeon, and Sylveon are all going to the Bokémon Ball. How many ways are there to split them into two groups so that there are at least two of them per group?
19. The Bokéstop is located 1 mile north and 1 mile west of the Bokémon Gym. The area within 5 miles of the Bokémon Gym that is located north and east of the Bokéstop can be expressed in the form  $\frac{a}{b}\pi - c$ , where  $a$ ,  $b$ ,  $c$  are positive integers and  $a$  and  $b$  are relatively prime. Find  $a + b + c$ .
20. Klefki is trying to rob a bank but there is a safe with a code on it blocking her from the money. Klefki knows that the code to this safe is a 1 digit number and is the remainder of  $10^9 + 23^9$  when divided by 11. She only has 1 try at opening the safe, what digit should she input?