



# RAMC 2022

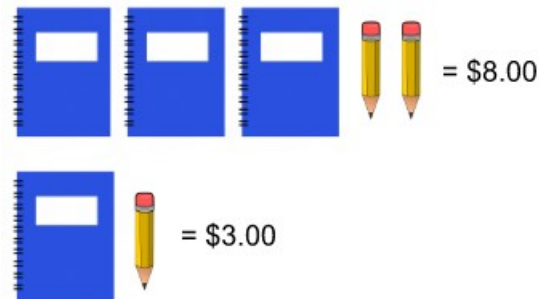
## Elementary II Individual Round

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- **SCORING:** The first 10 questions are worth 1 point each, and the last 5 questions are worth 2 points each.
- This round contains 15 questions to be solved in 45 minutes. Problems towards the end tend to be more difficult than problems toward the beginning.
- No computational aids are permitted other than scratch paper, graph paper, and a pen/pencil. No calculators of any kind are allowed.
- All answers must be in a reasonably simplified form.
- Fill out your information, and sign/initial the honor code on the answer sheet provided.
- If you believe there is an error on the test, submit a challenge to the proctors. Please include your name, level (Elem I/II, MS, HS), and explanation of the problem and your solution.

Do not flip the page until the proctor begins the round!

1. Elise is playing on her phone. Its battery charge is currently at 50, out of a maximum of 100. While the phone is charging, its battery charge increases by 2 every minute, but since Elise is playing, its charge goes down by 1 every 2 minutes. How long does it take for Elise's phone to fully charge? Express your answer in the form minutes:seconds.
2. A target-shaped figure has 3 concentric circles, as shown in the diagram. The inner and outer-most circles are colored red, while the smaller inside ring is colored gray, like shown in the diagram below. The distance between each circle is 5 units. If the radius of the inner circle is also 5 units, find the area of the red sections, in units<sup>2</sup>.
3. Brady went to the local grocery store and bought a bag of colored candies. Inside of the bag, he finds 15 blue, 12 red, 6 green, and 12 purple candies. He blindly grabs 2 out of the bag, one after the other, without replacement. Find the probability that both the candies Brady grabbed were blue.
4. Use the diagram below to find the cost of one notebook, in dollars.



5. Evaluate the expression  $2022 \div ((3 \times 0 + 6 - 2) \times 7 + 2 - 7 \times 3 - 6)$ .
6. Susie is swimming a 2 kilometer race, where 1 kilometer = 1000 meters. She swims the first 200 meters in 3 minutes. For every 200 meters following the initial one, her pace continuously slows as she has to swim 2 more seconds than the previous 200. After completing 1 kilometer, Susie's goggles fall off, and she has to stop for 7 seconds to fix them. How long does it take for Susie to swim the whole 2 kilometers? Express your answer in seconds.
7. Timothy and Colin love dice games. They design a game where each person rolls 2 dice and whoever has the higher sum of the 2 numbers shown on the dice wins. Timothy rolls a 3 and 4. Find the probability that Colin wins over Timothy.

8. John wants to draw the smallest square around a circle of radius length 5, such that the circle is completely within the square. What is the area of the square that he should draw?
9. Christine has a normal pack of 54 cards, but the sizes of each card varies. Like a normal deck, there are 2 jokers, 12 face cards (including 4 jacks, 4 queens, and 4 kings), and the rest are numbered cards. A numbered card in this deck is a 4 units by 5 units rectangle. A face card is in a triangular shape with a base of 3 units and height 8. Finally, a joker is a square with a side length of 15 units. If all the cards are laid out on an infinite table, what is the maximum area the cards can cover? Express your answer in units<sup>2</sup>.
10. Leo is trying to improve his basketball skills by continuously shooting hoops. At the start, he can only hit one after missing 39 in a row. However, after each set of 120 shots, he can make a basket in 10 less tries. For example, after 120 shots, he can make the basket on his 30<sup>th</sup> shot, and after 240 shots, he can make the bucket on the 20<sup>th</sup>. After exactly 450 shots, how many free throws has he made?
11. Given that a mile is equal to 5280 feet, how many inches are in  $\frac{1}{8}$  of a mile?
12. A snail is climbing up a pipe that is 11 meters long. Each day, the snail can climb up 3 meters during the day, and slides down 1 meter during the night when the snail is sleeping. How many days does it take for the snail to reach the top the pipe?
13. Japanese Beetles are an invasive species. With every passing day in a forest, the beetles will increase to 3 times the current population. However, if the beetles exceed a population of 150 on any given day, the next day, half the beetles will die, and they will not reproduce until the day after that. If there are currently 64 beetles in the field, how many beetles will be in the field after a week passes?
14. Two painting companies are hired to paint lines on a 7 mile road. Company A paints the road at the speed of 528 inches per minute. Company B paints the road at 352 yards per hour. The two companies start painting at opposite sides of the road. Using the conversions 3 feet = 1 yard and 5280 feet = 1 mile, how many minutes does it take them to complete the job?
15. Forrest indulges in a box of chocolates for 5 days. The box includes 20 Cocoa Truffles, 20 Chocolate Caramels, and 10 Dark Chocolate pieces. Each day, he eats either 3 Cocoa Truffles, 2 Chocolate Caramels, or 1 Dark Chocolate piece. At the end of the 5 days, he gives the remaining 36 pieces to a friend. When Forrest gives the leftovers to his friend, there are  $t$  Cocoa Truffles,  $c$  Chocolate Caramels, and  $d$  Dark Chocolates left. Find  $t + cd$ .