



RAMC 2023

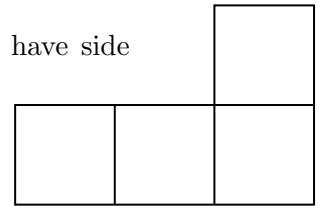
Elementary I Individual Round

- **SCORING:** The first 10 questions are worth 1 point each, and the last 5 questions are worth 2 points each, for a total of 20 possible points.
- This round contains 15 questions to be solved in 45 minutes. All answers are integers.
- No computational aids are permitted other than scratch paper, graph paper, and a pen/pencil. No calculators of any kind are allowed.
- 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. James has 15 chickens, and they each lay 2 eggs a day. How many eggs will the chickens lay over the course of 3 days?

2. Ethan draws a shape using 4 squares, as shown to the right. The squares have side lengths of 4 inches. What is the perimeter of the shape, in inches?



3. Jack is driving through a city. He traveled 5 kilometers in 2 and a half minutes. The speed limit on the highway he was driving on was 110 kilometers per hour. By how many kilometers per hour was Jack speeding?

4. Lily is stacking alternating blocks into a tower according to the following pattern: she starts with a short block, then she stacks a tall block on top, and repeats. Short blocks add 4 inches to her tower, and tall blocks add 6 inches. If Lily stacked a total of 25 blocks, how many inches tall is her tower?

5. Alex has 12 marbles in a bag, of which 3 are red, 7 are green, and 2 are white. He randomly pulls one marble out of the bag. The probability that the marble is red can be written as a fraction in simplest form, $\frac{a}{b}$. What is $a + b$?

6. Richard hosts a species of aliens called voidoids in his basement. Every afternoon, half of the voidoids leave, but on the third evening 4 more voidoids appear. If Richard starts with 64 voidoids, how many voidoids are left after 5 days?

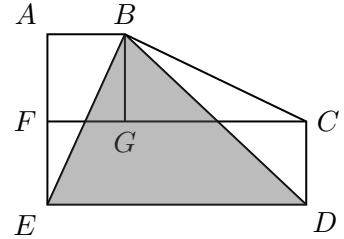
7. Red bags contain 15 red balls, blue bags contain 12 blue balls, and yellow bag contain 9 yellow balls. Andrew has 1 red bag, 2 blue bags, and 3 yellow bags. What is the smallest number of balls that Andrew can take out of his bags to guarantee that he has taken out at least one ball of each color?

8. Stephen and Gary are building a sidewalk that is 150 pieces of pavement. Stephen is able to put down 6 pieces of pavement in an hour and Gary is able to put down 9 pieces. If they work together, how many hours does it take them to build the sidewalk?

9. Joan is building a Super Space Jet to go to the moon, but she has a competitor Chris. Joan's Jet travels at approximately 1,250 mph and she starts in LA which is 23,750 miles away from the moon. Chris's Jet travels at 2,150 mph and is launching from Sydney which is 30,100 miles away. If both Jets leave at the same time, how much longer, in hours, does it take Joan's Jet to get to the moon?

10. Francis has a cauldron of magic stew containing 8 newt's tails, 15 frog legs, and 3 unicorn horns. Charles scoops out one newt's tail and eats it. Francis now randomly scoops out one of the remaining ingredients to serve to his guests. The probability he will scoop out a unicorn horn can be expressed as $X\%$. What is X ?
11. The ratio of the internal angles of a triangle is $2 : 4 : 3$. What is the degree measure of the smallest angle?

12. Rectangles $ABGF$ and $CDEF$ are joined with right triangle BGC , as shown. Point B is joined to points E and D . Segments AB , DE , and EF have lengths 1, 5, and 2, respectively. Given that triangle BGC has an area of 8, what is the area of the shaded region?



13. The expression

$$\left(1 - \frac{1}{2}\right) \left(1 - \frac{1}{3}\right) \left(1 - \frac{1}{4}\right) \cdots \left(1 - \frac{1}{10}\right)$$

can be simplified to a fraction in simplest form, $\frac{a}{b}$. Find $a + b$.

14. The difference between two primes is 41. What is their product?
15. How many ways are there to arrange 3 different red and 2 different blue books on a shelf if the blue books must be next to each other?