

# RAMC 2022

## Elementary I Individual Solutions

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*Contest Problems/Solutions proposed by the Rochester Math Club problem writing committee:*

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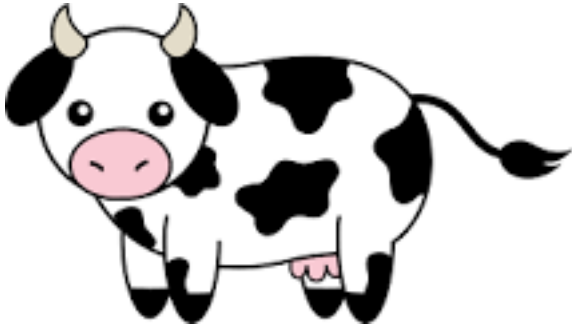
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*Graciously Reviewed By:*

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1. Farmer John is trying to sort his cows. He is sorting them from the youngest cow to the oldest cow. His cows are Annabelle, Bessie, Certie, Daisy, and Elsie. Bessie is 5, Elsie is 17, Daisy is 15, Certie is 14, and Annabelle is 8. How many cows are younger than Certie?



**Answer:**

**Solution:** We can go through all the cows and figure out if they are younger or older than Certie. As Certie is 14,

Name	Age	< 14?
Annabelle	8	Yes
Bessie	5	Yes
Daisy	15	No
Elsie	17	No

Therefore, there are 2 cows that are younger than Certie.

2. If a pencil and an eraser total two dollars, and a pencil and two erasers total three dollars, how many dollars does a pencil cost?

**Answer:**

**Solution:** Since one pencil and one eraser total 2 dollars, and one pencil and two erasers cost 3 dollars, adding one eraser adds one dollar, so one eraser costs one dollar. Then, we can remove one eraser from the one pencil and one eraser to get one pencil is  $2 - 1 = 1$  dollars.

3. James is building a staircase using bricks. If it takes him 1 brick to build 1 step, 3 bricks to build 2 steps, and 6 bricks to build 3 steps, How many blocks will it take him to build 7 steps?

**Answer:**

**Solution:** We know that it takes James 1 block to build 1 step, 3 blocks to build 2 steps, and 6 blocks to build 3 steps, so we can conclude it would take him  $6 + 4 = 10$  blocks to build 4 steps. Then, we can say that the amount of blocks that it takes him to build 7 steps would be  $1 + 2 + 3 + 4 + 5 + 6 + 7 = 28$  blocks.

4. A full cooler of drinks and ice weighs 10 pounds in total. The empty cooler weighs 2 pounds, and the ice inside weighs  $2\frac{1}{2}$  pounds. If the weights of the drinks inside can be expressed as  $a\frac{b}{c}$  pounds, what is  $a + b + c$ ?

**Answer:**

**Solution:** The empty cooler and ice together weigh  $4\frac{1}{2}$  pounds. This means that the drinks weigh  $10 - 4\frac{1}{2} = 5\frac{1}{2}$  pounds. This means that  $a = 5$ ,  $b = 1$ , and  $c = 2$ , so  $a + b + c = 8$ .

5. A conservation effort is planting trees in a recently developed area. They want to plant more than 2000 trees. On day 1, they successfully planted 100 trees. Each day after that, the number of planted trees doubled from the amount of the previous day. On which day do they reach their goal?

**Answer:**

**Solution:** On the first day, they planted 100 trees. On the second, they would plant 200, then 400, then 800, then 1600. Since they want to plant 2000 trees, we add the numbers until we reach at least 2000. We know  $100 + 200 + 400 + 800 = 1500$ , so we are just short,  $1500 + 1600 = 3100$ , which is at least 2000, which means that it will take them 5 days to plant at least 2000 trees. Therefore, the goal will be hit on day 6.

6. Jimmy has some pizzas. He divides his pizzas into four equal stacks. He then splits each stack into 2 smaller stacks. After that, he removes 2 pizzas from each stack. Each of the stacks now has 4 pizzas. How many pizzas did Jimmy start with?

**Answer:**

**Solution:** The 4 stacks are each divided into 2 stacks, which gives us a total of 8 stacks. Each stack has 2 pizzas removed, for a total of  $2 \cdot 8 = 16$  pizzas removed. There are 4 pizzas left in each stack for a total of  $4 \cdot 8 = 32$  pizzas. Therefore, the total amount of pizzas is  $16 + 32 = 48$  pizzas.

7. Andrew has 20 watermelons. He gives half of the watermelons to his friend Felix, and gives half of his remaining watermelons to Golden. After that, he cuts each of his remaining watermelons into 8 slices. How many slices of watermelon does Andrew have?

**Answer:**

**Solution:** Half of 20 is 10, and half of 10 is 5. Each of the 5 watermelons is cut up into 8 equal slices, so the total amount of slices is  $5 \cdot 8 = 40$  slices.

8. Nathan was born on December 8th, 2021. How many days old was Nathan on July 31<sup>st</sup>, 2022?

**Answer:**

**Solution:** There are 31 days in December, meaning there are  $31 - 8 = 23$  days left in 2022. There are 31 days in January, March, May and July, 28 in February, and 30 in April and June. Adding all of these up makes  $23 + 31 + 28 + 31 + 30 + 31 + 30 + 31 = 235$  days.

9. Kurt is fishing in crystal clear waters. He is going to sell the different types of fish. He catches 4 red fish, 2 blue fish, 13 green fish, and 1 eel. He can get \$2 for red fish, \$5 for blue fish, \$0.50 for green fish, and \$20 for an eel. How much money would Kurt make, if he sold all of the fish, in dollars?

**Answer:**

**Solution:** The total of Kurt's red fish is  $2 \cdot 4 = \$8$ , the total of his blue fish is \$10, the total amount for green fish is \$6.50, and the total for the eel is \$20. Adding all these up yields  $\$8 + \$10 + \$6.50 + \$20 = \$44.50$ .

10. Jeff has 6 medium sized piles of cars. He takes those piles and splits them into 3 smaller piles. Then he splits the small piles into 4 tiny piles. Finally he gives each friend 2 cars from each tiny pile. He is left with 3 cars in each tiny pile. How many cars did he have at the start, if any two piles of the same size have the same number of cars?

**Answer:**

**Solution:** Jeff gave away two cars and is left with 3 in each tiny pile. This means each tiny pile had  $3 + 2 = 5$  cars. He had 4 tiny piles in each small pile so each small pile has  $5 \cdot 4 = 20$  cars. There are 3 small piles in each medium pile which have  $20 \cdot 3 = 60$  cars each. Finally the 6 medium piles in total have  $60 \cdot 6 = 360$  cars total.

11. Frank has purchased a metal detector and is trying to find trinkets. He counts every single trinket he finds, but if the trinket is broken, Frank will count the broken one as  $\frac{1}{2}$  a trinket. Frank finds a total of  $10\frac{1}{2}$  trinkets in a week. If Frank finds the same amount of trinkets every day, then what is the total amount of trinkets Frank has found by the third day of the week?

**Answer:**

**Solution:** If Frank finds a total of 10.5 trinkets in a week, then he finds  $\frac{10.5}{7} = 1.5$  in a day. If we are trying to find how many he has by the third day, we multiply 1.5 (amount of trinkets per day) and 3 (the amount of days) to get  $1.5 \cdot 3 = 4.5$ .

12. A river cruise company has 2 boats. Six people want to ride the boat today. If each boat must contain at least 1 person, how many different combinations of people can be put on the boats?

**Answer:**  $\boxed{62}$

**Solution:** Each person has 2 choices, to go on the first or the second boat; there are  $2^6$  ways to put the people on the boats. However, there are 2 cases that all people go to the first boat and that all people go to the second boat. Therefore, there are  $2^6 - 2 = 62$  total combinations.

13. A banana and an orange cost 25 dollars total. Three bananas and two oranges total 65 dollars. How much does the orange cost?

**Answer:**  $\boxed{5}$

**Solution:** The group of fruit that has 3 bananas and 2 oranges has 2 more bananas than the other group. Therefore, the difference between the two groups is 2 bananas and  $\$65 - \$25 = \$40$ . This means that one banana equals \$20. If one banana and one orange cost \$25, and we know that the banana costs \$20, the orange must be \$5.

14. Garfield eats one plate of lasagna on the first day, 2 plate of lasagna on the second, 3 plates on the third, and so on. After 24 days, how many plates of lasagna did Garfield eat in total?

**Answer:**  $\boxed{300}$

**Solution:** The number of plates of lasagna that Garfield eats increases by 1 each day. Since he eats 24 plates on the 24th day, the total lasagnas eaten are  $1 + 2 + 3 + \dots + 24$ . By the sequence addition formula, Garfield ate  $\frac{24 \cdot 25}{2} = 300$  dishes.

15. Billy is carrying a lunch basket, which has 2 sandwiches, 8 pickles, 5 crackers, and 7 carrots. If Billy reaches into his basket and blindly takes two items at the same time, what is the chance that he will get a carrot and a sandwich? Assume all items are different from each other.

**Answer:**  $\boxed{\frac{2}{33}}$

**Solution:** There are 22 items in the basket. Billy will take 2 items out of the 22. There are  $\frac{22!}{2!(22-2)!} = 231$  ways of doing this, by the combination formula.

However, we only want 1 combination: carrot and sandwich; of which there are 14 different ways to do so: 2 sandwiches  $\cdot$  7 carrots. As there are 14 successful ways and 231 total possible combinations, this gives us  $\frac{14}{231}$  or  $\frac{2}{33}$ .