



RAMC 2022

Elementary I Team Solutions

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

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1. Hans goes on a workout. He runs for 20 minutes from his house directly to the park. At the park, he finds a bike, and rides directly back home in 5 minutes. The distance from his house to the park is 2 miles. What is his average speed for his workout, in miles per hour? Express your answer as a decimal.

Answer: $\boxed{9.6}$

Solution: Hansel travels a total 4 miles in 25 minutes or $\frac{5}{12}$ of an hour. As speed = $\frac{\text{distance}}{\text{time}}$, he travels at $\frac{4}{\frac{5}{12}} = \frac{48}{5} = 9.6$ mph.

2. Nick has a 483 jellybeans. He buys 87 more, then eats 12 of them and gives away 293 to his friends. How many jellybeans are left?

Answer: $\boxed{275}$

Solution: First, Nick has 483 jellybeans. After he buys 87 more, he has $483 + 87 = 580$ jellybeans. Then, he eats 12 of them, so he has $580 - 12 = 568$ jellybeans. He then gives away 293 jellybeans to his friends, so at the end he has $568 - 293 = 275$ jellybeans.

3. The CEO of a swim club must choose 3 members to fill some leadership roles. He is looking for a team of 3, with one president, one vice-president, and one captain. How many ways can he assemble this team, if there are 7 members in the club?

Answer: $\boxed{210}$

Solution: There's 3 spots that the CEO has to fill. For president, he can choose any of the 7 people. For the vice-president spot, he can choose from 6 people, since one person is already the president. For the captain, he can choose from the 5 remaining people. This gives us $7 \cdot 6 \cdot 5 = 210$ choices.

4. Jerry adds up the first 100 positive integers and asks his friends if the result is even or odd. Sarah says the result is even, Tom says the result is odd, Mary says the result is divisible by 5, and Jane says the result is divisible by 101. The following statements may be true or false.

- A. Sarah is correct.
- B. Joe is correct.
- C. Mary is correct.
- D. Jane is correct.

Which of the choices below are accurate? Answer as a number.

- 1. A is true; B, C, D are false
- 2. B is true; A, C, D are false
- 3. B, C are false; A, D are true
- 4. A, C, D are true; B is false
- 5. B, C, D are true; A is false

Answer:

Solution: We can calculate the sum of the first 100 positive integers as $\frac{(100)(101)}{2} = 5050 = 2 \cdot 5 \cdot 5 \cdot 101$. Therefore, Tom is the only one not correct. Therefore, A is true, and B, C, and D are false, which is answer choice 1.

5. Jim and Joe both start jogging from the same point. Jim jogs 8 miles east, 1 mile west, and 4 miles south. Joe jogs 6 miles south, 2 miles north, and 7 miles west. What is the final distance between Jim and Joe?

Answer:

Solution: Both Jim and Joe end up 4 miles south of the point that they started on. Jim ends up 7 miles east, and Joe ends up 7 miles west. This means that the distance between the two is $7 + 7 = 14$.

6. Eva and John are driving towards each other on a straight road. They start 46 miles apart. Eva is going 10 mph and John is going 13 mph. If $2A$ represents the amount of time it take for them to meet up, what is A ?

Answer:

Solution: Since John is driving at 10 mph and Eva is driving at 13 mph, the total speed they go towards each other is 23 mph. They are 46 miles apart, so it will take them $46/23 = 2$ hours to meet each other, and since that is $2A$, A is 1 hour.

7. A rectangular prism has a length of 5 inches, a width of 3, and a height of 6. What is the surface area of the rectangular prism?

Answer:

Solution: The surface area of a rectangular prism must include all 6 surfaces. Since the opposite sides of a prism are congruent, we only have to calculate 3 sides. Taking the length and width side gets us $5 \cdot 3 = 15$ inches with a total of 30 inches for both sides. The width and height side has an area of 18 or 36 total for both sides. The length and width side has an area of 30 for a total of 60 inches for both sides. For all six sides, the total surface area is $30 + 36 + 60 = 126$ square inches.

8. Poly has to perform at 4 concerts in London this week, but there are not enough seats. Poly doesn't want to let her fans down so she decides to put on another concert. To put on a fifth concert, Poly needs to figure out how many seats she needs. All of the concerts had enough seats to hold 500 people. The first concert had 637, the second had 548, the third had 724 and the fourth had 517. How many seats does Poly need to put on the fifth concert?

Answer:

Solution: We need to calculate the number of people who were unable to see the first four concerts. The first one had an additional $637 - 500 = 137$, second had $548 - 500 = 48$, the third had $724 - 500 = 224$, and the final one had $517 - 500 = 17$. Therefore, there were $137 + 48 + 224 + 17 = 426$ people that still wanted to see Poly, so that is the amount of seats she needs to have.

9. A local school is forming a math team. The team has 3 spots, and there are 6 different people who want to join. How many ways can they make a team?

Answer:

Solution: For the first of the three spots, there are 6 ways to fill the spot with a person, since there are 6 people. For the second spot, there's 5 ways, since someone's already on the team, so there's 5 available people. For the third spot, there's 4 ways someone could join the team. This gives $6 \cdot 5 \cdot 4 = 120$ ways, but this actually is too big. As each team can be ordered in 6 ways in the interior, we have to divide 120 by 6, to get $\frac{120}{6} = 20$.

10. Jack has two cubes of side length 3, and a rectangular prism with length 6, height 3, and width 3, made of two cubes put together. What is the maximum surface area of a shape he can create with these 3 objects?

Answer:

Solution: Jack should put the cubes on opposite sides of the prism so that they cover up less faces. This way only 1 face of each cube is covered, which also covers up an equal area on the prism. The surface area of each cube is 54, but one face is covered up, so the surface area exposed is 45. For two cubes the total area is 90. For the rectangular prism, the total surface area of the prism is $90 - 9 - 9 = 72$. Therefore, the total is $72 + 90 = 162$.