

2022-2023 Junior Mathematical Olympiad

Round One Solutions (Grade 4)

1:00pm

- Soln: (D)** $202 \times 3 = 606$ which is even. All the others are odd.
- Soln: (A)** Since $2 \times 3 = 6$, the value of $20 + 2 \times 3$ is $20 + 6 = 26$
- Soln: (B)** To get to the ★, go three units (C) down and three units (3) across, C3
- Soln: (E)** To move from **A** to **Z** requires 3 moves to the right and 3 moves down.
- Soln: (E)** It is evident that each row has $3+3 = 6$ seats. The number of rows is therefore $\frac{150}{6} = 25$.
- Soln: (E)** There are 4 edges at the top, 4 edges at the bottom, and 4 edges at the sides. The total is 12.
- Soln: (B)** Based on the information given, the orders the cars are driving are

12345 to 12534 to 13254 to 21354

- Soln: (B)** The largest is 54,321 and the smallest is 12,345 and the difference is $54,321 - 12,345 = 41,976$.
- Soln: (E)** The largest triangle is made up of 4 smaller triangles and each are made up of 4 smallest triangles (16 in total). $4 + 2 = 6$ are shaded and so the fraction is $6/16 = 3/8$.
- Soln: (E)** After placing the 1's in their only two possible positions, the completed grid is

| | | | |
|---|---|---|---|
| 1 | 2 | 4 | 3 |
| 3 | 4 | 2 | 1 |
| 2 | 1 | 3 | 4 |
| 4 | 3 | 1 | 2 |

The total is $1 + 2 + 3 + 4 = 10$

- Soln: (C)** First, there are $6 \times 8 = 48$ square pieces of chocolate. After eating the outside pieces, the lengths and widths are going to be reduced by 2 (one from top/bottom and left/right). The new dimension will be $4 \times 6 = 24$ and the fraction will be $24/48 = 1/2$

2022-2023 JMO (Solutions)

12. **Soln: (A)** Let us undo Harry's moves so we will add 10, half the result and then subtract 5. The result is $\frac{1}{2}(30 + 10) - 5 = 15$.
13. **Soln: (C)** The length of a small square is $\frac{20}{5} = 4$ cm. The length of a vertical wire is therefore $3 \times 4 = 12$ cm. Adding the 6 vertical wires and the 4 horizontal wires, we get $6 \times 12 + 4 \times 20 = 152$ cm.
14. **Soln: (E)** Since each boy has least one brother, the number of boys in the family must be at least 2. Since each girl has at least two sisters, the number of girls in the family must be at least 3. The least number of children in the family is $2 + 3 = 5$.
15. **Soln: (D)** Including the advertisement break, the total run time in minutes is $90 + 8 + 5 = 103$ minutes. This is 1 hour and 43 minutes.
 $17 : 10 + 1 : 43 = 18 : 53$.
16. **Soln: (E)** The area of the white portion is $8 \times 10 - 37 = 43$. The area of the grey portion is therefore $9 \times 12 - 43 = 65$.
17. **Soln: (E)** Since 2 children are to the left of Bobby and 3 children are to the right of him, each row has $2 + 1 + 3 = 6$ children. Similarly, the number of rows in the classroom is $2 + 1 + 1 = 4$. The number of children in the class is therefore $6 \times 4 = 24$.
18. **Soln: (B)** Let the distance between two trees be "1 gap". 16 trees will produce 15 gaps. The length of 4 gaps is 80 metres and therefore the length of a gap is 20 metres and the length of 15 gaps is 15×20 metres = 300 metres.
19. **Soln: (B)** The present row totals are 15, 16, 15 and the column totals are 16, 15, 15. The discrepancies are in row 2 and column 1. This correspond to "3". If it is changed to 2 then all rows and columns would add to 15.
20. **Soln: (B)** Since one number is odd and one is even, the smaller of the two numbers is $\frac{1}{2}(317 - 1) = 158$ which is even. Since $158 + 159 = 317$. The odd page number is 159 and the next page number is 160.
21. **Soln: (D)** After 8 additional weeks the number of boys is $39 + 6 \times 8$ and the number of girls is $23 + 8 \times 8$. The number of boys in the group is now $39 + 6 \times 8 = 87$. The total (boys and girls) is $2 \times 87 = 174$.
22. **Soln: (C)** The cost of $16 - 6 = 10$ icecream is $\$1200 - \$700 = \$500$ and so the price of one icecream is $\frac{\$500}{10} = \50 . The cost for 16 icecream is therefore $16 \times \$50 = \800 . The amount of money in the drawer at the start is therefore $\$1200 - \$800 = \$400$.

2022-2023 JMO (Solutions)

23. **Soln: (A)** We have $j = \frac{6}{5}y$ and $b = \frac{4}{5}j$. Therefore $b = \frac{4}{5} \times \left(\frac{6}{5}y\right) = \frac{24}{25}y$. So Bobbi has $\frac{1}{25}$ less than Yola.

24. **Soln: (D)** Using four stamps,

$$(4, 2, 2, 2), (2, 4, 2, 2), (2, 2, 4, 2), (2, 2, 2, 4) \\ (3, 3, 2, 2), (3, 2, 3, 2), (3, 2, 2, 3), (2, 3, 3, 2), (2, 2, 3, 3), (2, 3, 2, 3),$$

The total is 10.

25. **Soln: (E)** We have $L = 2 + S, B = L - 3, C = B + 1, C = A - 3$ and so

$$C = B + 1 = L - 3 + 1 = 2 + S - 3 + 1 = S$$