

2022-2023 Junior Mathematical Olympiad

Round One Solutions (Grade 4) - 10:00am

1. **Soln:** (A) $2 \times 0 + 2 \times 3 = 0 + 6 = 6$
2. **Soln:** (E) Since $\frac{1}{2} = \frac{2}{4} = \frac{4}{8} = \frac{8}{16}$, the sum is $\frac{1}{2} + \frac{1}{2} + \frac{1}{2} + \frac{1}{2} = 2$
3. **Soln:** (C) The first is 3 and the last is 20. The total is $20 - 3 + 1 = 18$
4. **Soln:** (C) The next 4 terms of the sequence are 39, 28, 17, 6.
5. **Soln:** (B) The total number of cow legs is $30 \times 4 = 120$. Therefore the total number of chickens is 60 and the total number of animals on the farm is $30 + 60 = 90$.
6. **Soln:** (C) For her 6th birthday, Mary got 6 toys. After her 6th birthday, the total number of toys obtained is $6 + 5 + 4 + 3 + 2 + 1 = 21$.
7. **Soln:** (C) Because $4 \times 15 = 60$, John walks at rate $\frac{52}{4} = 13$ steps per 15 seconds. Since John walks 52 steps in 60 seconds and 13 steps in 15 seconds, he walks $52 + 13 = 65$ steps in $60 + 15 = 75$ seconds.
8. **Soln:** (E) The combined amount is $\$150 + \$200 + \$250 + \$400 = \$1000$. They each end up with $\$ \frac{1000}{4} = \250
9. **Soln:** (D) The number of 10 cents coins is $\frac{100}{10} = 10$ and the number of 25 cents coins is $\frac{100}{25} = 4$. The total number of coins is therefore $10 + 4 = 14$.
10. **Soln:** (C) The total age of the six siblings is $2 + 4 + 5 + 6 + 8 + 10 = 35$. The total age of the remaining two children is therefore $35 - 22 = 13$ years old. $5 + 8 = 13$.
11. **Soln:** (B) The area of the walkway is the area of the outer rectangle minus the area of the inner rectangle. This is $22 \times 10 - 20 \times 8 = 60$
12. **Soln:** (E) 1 cup of lemon juice requires 2 cups of sugar and 8 cups of water. 3 cups of lemon juice requires $3 \times 8 = 24$ cups of water.
13. **Soln:** (A) The number of dots is $6 \times 6 - 2 \times 2 = 36 - 4 = 32$.
14. **Soln:** (D) The size of the garden is $6 \times 8 = 48$ square metres. The total number of tomato plants is therefore $48 \times 4 = 192$. Since each plant on average yields 10 tomatoes, the total expected yield is 1920 tomatoes.

2022-2023 JMO (Solutions)

15. **Soln: (A)** When $n = 4$, $1 + 3 \times n \times (n - 1) = 1 + 3 \times 4 \times (4 - 1) = 1 + 12 \times 3 = 37$
16. **Soln: (D)** $\frac{1}{4} + \frac{1}{4} = \frac{1}{2}$ of the bridge is over land. Therefore $\frac{1}{2}$ the bridge is over water. This represents 120 m. The length of the bridge is therefore 2×120 m which is 240 m
17. **Soln: (C)** The fraction is $\frac{1}{5} \times \frac{3}{4} = 3/20$
18. **Soln: (D)** The factors of 42 are 1, 2, 3, 6, 7, 14, 21, 42. There are 8 of them.
19. **Soln: (C)** With exactly one 7, there are

17, 27, 37, 47, 57, 67, 70, 71, 72, 73, 74, 75, 76, 78, 79, 87, 97.

Also 77 has exactly two sevens. The total number is 18.

20. **Soln: (C)** Since \$7.50 buys 250 grams of salt, \$1 buys $\frac{250}{7.50}$ grams of salt and \$1.80 buys $1.80 \times \frac{250}{7.50} = 60$ grams of salt.
21. **Soln: (D)** Each team plays two games. 1 is possible (one loss and one draw). 2 is possible (two draws). 4 is possible (one win and one draw). 6 is possible (two wins). 5 is not possible (no two points add to 5)
22. **Soln: (B)** If the length of one side of square is x m, then the area of the rectangle is $3x^2$ and the perimeter is $8x = 56$. This gives $x = 7$. The area of the rectangle is $3x^2 = 3 \times 7^2 = 147$
23. **Soln: (B)** Since the first Wednesday can be on the 1st, 2nd, 3rd, 4th, 5th, 6th or 7th, adding 14, the third Wednesday must be on the 15th, 16th, 17th, 18th, 19th, 20th or 21st.
24. **Soln: (C)** Without the 40 minutes break, the total time for the journey is $(11 - 7) \times 60 - 40 = 200$ minutes. This is $\frac{200}{60} = \frac{10}{3}$ hours. The average speed is

$$\text{Average speed} = \frac{\text{Total distance}}{\text{Time taken}} = \frac{300 \text{ km}}{10/3 \text{ hours}} = 300 \times \frac{3}{10} = 90 \text{ km/h}$$

25. **Soln: (E)** With a week starting on a Sunday, the number of pages Chip reads per week is $25 + 6 \times 4 = 49$. After noting that $\frac{290}{49} = 5.9$, in 5 weeks, Chip reads $5 \times 49 = 245$ pages. In the sixth week he has 45 pages left. He reads 25 pages on the Sunday and completes the book in another 5 days. The total number of days to complete the book is now $5 \times 7 + 1 + 5 = 41$ days.