2025-2026 Junior Mathematical Olympiad

Round One Grades 5/6 SOLUTIONS - 1:00pm

1. **Soln**: **(E)** The value of $2^2 + 0^2 + 2^2 + 6^2$ is $4 + 0 + 4 + 36 = 44$.

2. **Soln**: **(A)** The product is $27a = 8b$. Since 27 is a factor of 81, $b = 1$ and this gives $a = 3$. The value of $a + b = 4$.

3. **Soln**: **(D)** Consider colouring the triangle and then the rectangle. There are two ways for the semi-circle and three ways for the rectangle. The multiplication rule says the total number of ways of coloring the figure is $2 \times 3 = 6$. The six pairs of colours are $(y, b), (y, g), (y, p), (r, b), (r, g), (r, p)$.

4. **Soln**: **(B)** $\frac{1}{3} \times 20\% \times 60 = \frac{1}{3} \times \frac{20}{100} \times 60 = \frac{1}{3} \times \frac{1}{5} \times 60 = \frac{1}{15} \times 60 = 4$.

5. **Soln**: **(E)** Since $6 = 2 \times 3$, the factors of 6 are $1, 2, 3, 6$ and their sum is 12.

6. **Soln**: **(A)** For any 5 parts of the drink, there is 1 part concentrate. The fraction is $\frac{1}{5}$ and the percentage is $\frac{1}{5} \times 100 = 20\%$.

7. **Soln**: **(B)** Since $2 + 2 = 4$ which is not prime, and $3 + 2 = 5$ which is prime, the value of p is 3.

8. **Soln**: **(B)** The number 2 appears twice in every occurrence of $2, 0, 2, 6$. If the list was 32 numbers then $2, 0, 2, 6$ appears 8 times ending with a 6. The number 2 appears $8 \times 2 = 16$ times. The next (33rd) is a 2 which means that the new list contains 17 twos.

9. **Soln**: **(B)** $36 = 6^2$ and the next square is $7^2 = 49$. The difference in ages will be $49 - 36 = 13$. Adding 13 to 2026 gives the year 2039. Hence Jerry will be 49 in 2039.

10. **Soln**: **(A)** Since $\frac{12}{15} + \frac{3}{15} = \frac{15}{15} = 1$ and so $\frac{1}{\square} = \frac{3}{15} = \frac{1}{5}$, giving $\square = 5$.

11. **Soln**: **(D)** The diagram shows $t = w = z = 50^\circ$ and $s = u = x = y = 130^\circ$. It is now clear that $t + y = 50^\circ + 130^\circ = 180^\circ$.

12. **Soln**: **(C)** $1\frac{1}{2} = \frac{3}{2} = 1 \times \frac{3}{2}$. The amount of water to be used will be $1\frac{1}{2} \times \frac{3}{2} = \frac{3}{2} \times \frac{3}{2} = \frac{9}{4} = 2\frac{1}{4}$.

13. **Soln**: **(C)** The area of a square with side length ℓ is $\ell^2 = \ell \times \ell$.

14. **Soln**: **(C)** In 75 minutes he took his second pill and in $3 \times 75 = 225$ minutes he took his 4th pill. Now $225 = 3 \times 60 + 45$ and so he took his 4th pill after 3 hours and 45 minutes. Adding this time to 11:05, we get 14:50.

15. **Soln**: **(A)** 40% of 60 is $\frac{40}{100} \times 60 = 24$ and 50% of 24 is $\frac{50}{100} \times 24 = 12$.

16. **Soln**: **(C)** With the obvious notation, $i = 2s, a = 2s$.The required fraction is $\frac{s}{s+i+a} = \frac{s}{s+2s+2s} = \frac{s}{5s} = \frac{1}{5}$.

17. **Soln**: **(E)** Using the ruler labelled E, he can measure 10 and 40 cm. Since $40 - 10 = 30$, he can also measure 30 cm. Since $60 - 40 = 20$, he can also measure 20 cm. Finally, since $60 - 10 = 50$, he can also measure 50 cm. The 60 cm measure is done edge to edge.

18. **Soln**: **(D)** If the number of cars carrying 2 people is x and the number carrying 3 people is y then $x + y = 8$ and $2x + 3y = 19$. From this, $3x + 3y = 24$ and if we subtract the last two equations, we get $x = 24 - 19 = 5$. The answer can also be obtained by trying the options given.

19. **Soln**: **(A)** The question is 50 plus which two numbers is equal to 60 plus one of the numbers. Since the difference between 60 and 50 is 10, the sum of the two remaining weights must differ from the third by a surplus of 10. Of 10 kg, 20 kg, 30 kg, 40 kg. Only 20 kg, 30 kg, 40 kg works, since $20 + 30 = 40 + 10$. So the 10 kg weight was not used in the balancing.

20. **Soln**: **(A)** The train stops according to the cycle $XEXWXEXWXE\ldots$.with every 4th stop at W. Since $40 = 4 \times 10$, it 40th stop will be at W.

21. **Soln**: **(B)** 7.7 mm $\times 100 = 770$ mm and 7.7 mm $\times 30 = 231$ mm. Of the options, 130 is the best.

22. **Soln**: **(C)** Since $1/4 + 3/4 = 1$, the 120 cm represents 3/4 of her height. Hence 1/4 of her height is 40 cm. Therefore Rea is $4 \times 40 = 160$ cm tall.

23. **Soln**: **(D)** First the first digit cannot be a 0. If the first digit is a 2, there are 3 choices for the second digit, 2 choices for the third digit and 1 for the fourth digit, giving $1 \times 3 \times 2 \times 1 = 6$ ways. If the first digit is a 6, there are 2 choices for the second digit. If the second digit is a 2 then there are 2 choices for the third digit and 1 choice for the last digit. The number of ways here is $1 \times 1 \times 2 \times 1 = 2$ ways. If the second digit is a 0 then there is 1 choice for the third digit and 1 choice for the last digit. The number of ways here is $1 \times 1 \times 1 \times 1 = 1$ way. The total is therefore $6 + 2 + 1 = 9$ ways.

24. **Soln**: **(A)** $2\otimes = \square + \blacksquare$ and $2\otimes + \square + \blacksquare = \square + 4\blacksquare$. This means that $\square + \blacksquare + \square + \blacksquare = \square + 4\blacksquare$ or $\square = 2\blacksquare$. This means that $\blacksquare < \square$. Also, $2\otimes = \square + \blacksquare = \square + \frac{1}{2}\square = \frac{3}{2}\square$ and so $\otimes = \frac{3}{4}\square$. This means that $\otimes < \square$. Also, $2\otimes = \square + \blacksquare$ implies $2\otimes = 2\blacksquare + \blacksquare = 3\blacksquare$ and so $\otimes = \frac{3}{2}\blacksquare$. So $\otimes > \blacksquare$. The order is $\blacksquare < \otimes < \square$. The list is $\blacksquare\ \otimes\ \square$.

25. **Soln**: **(C)** The number of votes for the candidates finishing second and third total $36 - (12 + 4) = 20$. If s is the number of votes received by the candidate placing second, t is the number of votes received by the candidate finishing third, and f is the number of votes received by the candidate placing fourth, then $s + t + f = 20$ where $f \geq 5$ and $s \leq 11$. Suppose $s = 11$ then $t + f = 9$ which is not possible as $f \geq 5$ and $t > f$. Suppose $s = 10$, then $t + f = 10$. Again this is not possible for the same reason. Suppose $s = 9$, then $t + f = 11$. $f = 5$ and $t = 6$ works. Suppose $s = 8$, then $t + f = 12$. $f = 5$ and $t = 7$ works. So $s = 8$ or $s = 9$.