

# 2025-2026 Junior Mathematical Olympiad

## Round One Grades 5/6 SOLUTIONS - 10:00am

1. **Soln:** (B)  $0 \times 2 = 0$  and the result is  $2 + 0 + 6 = 8$ .
2. **Soln:** (E) From the units column we see that  $3x$  has units digit 7. Since  $x$  is a single digit, we deduce that  $x = 9$ . This gives  $3x = 27$ . Hence there is a carry of 2. We can now see from the tens column that  $y = 2 + 1 + 2 + 3 = 8$ . It follows that  $x + y = 9 + 8 = 17$ .
3. **Soln:** (B)  $5 - 1 = 4$  and so the distance between the two displayed numbers is 4. Only 2 and 10 are separated by a distance of 4. 10 to 12 is 2 units and 12 to 2 is 2 units.
4. **Soln:** (A)  $\frac{1}{2} \times 10\% \times 20 = \frac{1}{2} \times \frac{10}{100} \times 20 = \frac{1}{2} \times \frac{1}{10} \times 20 = \frac{1}{20} \times 20 = 1$ .
5. **Soln:** (D) Consider colouring the semi-circle and then the square. There are two ways for the semi-circle and three ways for the square. The multiplication rule says the total number of ways of coloring the figure is  $2 \times 3 = 6$ . The six pairs of colours are  $(y, b), (y, g), (y, p), (r, b), (r, g), (r, p)$ .
6. **Soln:** (C) There are 4 factors. Namely 1, 2, 1013, 2026.
7. **Soln:** (A) Jogging at the same rate, she travels 3 km in 40 minutes and 9 km in 120 minutes or in 2 hours. This means that she can jog 18 km in 4 hours.
8. **Soln:** (E)  $7 = 2 \times 3 + 1$  and  $7 = 1 \times 4 + 3$ .  $11 = 3 \times 3 + 2$  and  $11 = 2 \times 4 + 3$ .  $17 = 3 \times 5 + 2$  and  $17 = 4 \times 4 + 1$ .  $19 = 3 \times 6 + 1$  and  $19 = 4 \times 4 + 3$ .  $25 = 3 \times 8 + 1$  and  $25 = 6 \times 4 + 1$ . The correct answer is 25 giving a remainder of 1 in both cases.
9. **Soln:** (B) Of the options given, only 12 satisfy the condition of the problem. The sum of the digits of 12 is  $1 + 2 = 3$  and  $12 = 4 \times 3$  and so 12 is divisible by 3.
10. **Soln:** (C)  $1^2 + 2^2 = 5$  which is prime.  $2^2 + 3^2 = 13$ , which is prime.  $3^2 + 4^2 = 25 = 5 \times 5$  which is not prime.  $4^2 + 5^2 = 41$ , which is prime and  $5^2 + 6^2 = 61$  which is also prime.
11. **Soln:** (C) The number of items in the list is  $1 + 2 + 3 + 4 + 5 + 6 + 7 + 8 + 9 = 45$ . Since  $45 = 22 + 1 + 22$ , the middle number is the 23rd number in the list. Now,  $1 + 2 + 3 + 4 + 5 + 6 = 21$  and  $1 + 2 + 3 + 4 + 5 + 6 + 7 = 28$  and so the 23rd number in the list is a 7.
12. **Soln:** (D) The diagram shows  $t = w = z = 50^\circ$  and  $s = u = x = y = 130^\circ$ . It is now clear that  $t + y = 50^\circ + 130^\circ = 180^\circ$ .
13. **Soln:** (C) The area of a square with side length  $\ell$  is  $\ell^2 = \ell \times \ell$ .

14. **Soln:** (D) In 80 minutes he took his second pill and in  $3 \times 80 = 240$  minutes he took his 4th pill. Now  $240 = 4 \times 60$  and so he took his 4th pill after 4 hours. Adding this time to 9:15, we get 1:15.
15. **Soln:** (D) The number of 3-laps in 36 laps is  $\frac{36}{3} = 12$ . This is the number of 4-laps. The total number of laps Shayne would have completed is  $12 \times 4 = 48$ . The distance covered is  $48 \times 25 = 1200$  m.
16. **Soln:** (B) The digits under consideration for  $a$  and  $b$  are 0, 1, 2, 3. Since the numbers cannot start with 0, the leading digits of  $a$  and  $b$  are 1 and 2. This produces a sum of  $3 \times 10 = 30$ . The other digits are 0 and 3 producing a sum of  $0 + 3 = 3$ . The smallest sum is  $30 + 3 = 33$ .
17. **Soln:** (C) The sum of the five numbers is  $9 + 2 + 8 + 7 + 5 = 31$ . Subtracting 9, 2, 8 or 5 will result in a number that is not a multiple of 4. However  $31 - 7 = 24$  which is  $4 \times 6$ , a multiple of 4.
18. **Soln:** (E) If currently Tim is  $a$  years old, then the sum of the ages will be  $a - 1 + a + a + 1 = 3a$ . So  $3a = 27$ . This means that  $a = 9$  and the oldest of the boys is Ted which is 10 years old. He will be 11 on his next birthday.
19. **Soln:** (E)  $J = 2M = 3O$  and so  $J$  is even and is a multiple of 3. Since the digits are different,  $J = 6$ . This makes  $M = 3$  and  $O = 2$ . It follows that  $M \times O \times J \times O = 3 \times 2 \times 6 \times 2 = 72$ .
20. **Soln:** (C) The eight smallest prime numbers are 2, 3, 5, 7, 11, 13, 17, 19. We want to use the smallest possible denominator. Since the only even prime number is 2, the denominator cannot be 2 because the sum of 7 odd numbers will be odd. When the denominator is 3, the result is  $R = \frac{1}{3}(2 + 5 + 7 + 11 + 13 + 17 + 19) = \frac{1}{3}(74)$ . This is not a whole number. Next we divide by 5. Here  $R = \frac{1}{5}(2 + 3 + 7 + 11 + 13 + 17 + 19) = \frac{1}{5}(72)$ . This is not a whole number. Next we divide by 7. Here  $R = \frac{1}{7}(2 + 3 + 5 + 11 + 13 + 17 + 19) = 10$ .
21. **Soln:** (E) Subtracting 1 gives the various distances. In order the distances are  $\frac{1}{6}, \frac{1}{7}, \frac{1}{8}, \frac{1}{9}$  and  $\frac{1}{10}$ . The smallest is  $\frac{1}{10}$ , corresponding to (E).
22. **Soln:** (A) Let  $x$  be the number of fish caught we have  $3x = x + 24$  and so  $2x = 24$  giving  $x = 12$ .
23. **Soln:** (E) Let the pairs be  $(x, y)$  where  $x < y$  and are such that  $x + y = 100$  where  $10 \leq x \leq 50$  and  $50 \leq y \leq 90$ . There is a pair for each  $x$  satisfying  $10 \leq x \leq 50$ . The total is  $50 - 10 + 1 = 41$ .

24. **Soln:** (B) Let the number of 3, 4 and 5 piece packets be the ordered set  $(a, b, c)$ . We want  $3a + 4b + 5c = 23$ . For  $c = 4$ ,  $b$  must be zero and  $a = 1$ . So one way is  $(1, 0, 4)$ . For  $c = 3$ ,  $3a + 4b = 8$ . This means that  $a$  must be zero and  $b = 2$ . Another way is  $(0, 2, 3)$ . For  $c = 2$ ,  $3a + 4b = 13$ . This means that  $a$  must be 3 and  $b = 1$ . Another way is  $(3, 1, 2)$ . For  $c = 1$ ,  $3a + 4b = 18$ . This means that  $a$  can be 6 and  $b = 0$  or  $a = 2$  and  $b = 3$ . Two other ways are  $(6, 0, 1)$  and  $(2, 3, 1)$ . For  $c = 0$ ,  $3a + 4b = 23$ . This means that  $a$  can be 1 and  $b = 5$  or  $a = 5$  and  $b = 2$ . Two other ways are  $(1, 5, 0)$  and  $(5, 2, 0)$ . The total number of ways is  $1 + 1 + 1 + 2 + 2 = 7$ .
25. **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  $\blacksquare \otimes \square$ .