The University of the West Indies, Mona

presents

2025/2026 Senior Mathematical Olympiad

Qualifying Round Examination Grades 9-11 (Solution)

1. **Soln**: **(A)** The conditions will be met if B_4 flies to the cell in the fourth row and second column.

2. **Soln**: **(C)** Consider the vertex due east of A. The distance travelled to that vertex is equivalent to $1+1+1=3$ edge lengths. The ant then travels another $1+1=2$ edge lengths for a total of 5 edge lengths or $5\times 12=60$ cm.

3. **Soln**: **(A)** The squares are of two different sizes with total $y=6+1=7$. The triangles are of four different sizes with total $x=4+3+2+1=10$. From this $x+y=17$.

4. **Soln**: **(C)** Since 0 to any non-zero power is 0 and $2^0=1$ and 1 to any power is 1, the sum is $2^0+1^{10}=1+1=2$.

5. **Soln**: **(E)** The area may be thought of as the area of a big rectangle minus the area of two smaller rectangles. The area of the big rectangle is $(a+b)\times 3a$ and the areas of the small rectangles are $a\times a$ and $a\times 2a$. The area of the room is therefore $3a\,(a+b)-3a^2=3a^2+3ab-3a^2=3ab$.

6. **Soln**: **(C)** Let the number of poles be p and the number of birds be b. We have $b=p+1$ and $b=2\,(p-1)=2p-2$. Subtracting the first from the second $0=p-3$. It follows that $p=3$.

7. **Soln**: **(B)** The number of white cubes on the units $1,3$ and 5 are $2+3+2+3+2=12$ and the number of black cubes on these faces is $25-12=13$. These numbers are reversed on units 2 and 4. The total number of white cubes is therefore $3\,(12)+2\,(13)=62$.

8. **Soln**: **(A)** The fraction of blue, red or green marbles is $\frac{6}{15}+\frac{3}{15}+\frac{1}{15}=\frac{2}{3}$. The fraction of the other colours is $\frac{1}{3}$ and the number of marbles is $\frac{1}{3}\times 2025=675$.

9. **Soln**: **(C)** The diagonal of the rectangle shown is 5 cm which is the same as the radius (the missing diagonal of the same rectangle). The diameter is therefore 5 cm + 5 cm = 10 cm.

10. **Soln**: **(D)** Let the amount for the travel expenses be $\$T$ and the number of friends be f. We have $1400f = T - 400$ and $1600f = T + 600$. Subtracting the first equation from the second equation, we have $200f = 1000$ and so $f = 5$. From this, we get $T = 1400f + 400 = 1400 \times 5 + 400 = 7400$. The amount each should contribute is therefore $\$\frac{7400}{5} = \$1480$.

11. **Soln**: **(B)** In one hour, the number of 3 minutes is $\frac{60}{3} = 20$ and the number of 3 minutes interval in two hours is 40. The total number of balloons inflated (including those that popped) is therefore $40 \times 8 = 320 = 32 \times 10$. For every 10 inflated only 9 survived and so the number that survived is $32 \times 9 = 288$.

12. **Soln**: **(E)** The increase in volume due to the error is 12 cm $\times$14 cm $\times$16 cm **minus** 10 cm $\times$12 cm $\times$14 cm which is $12 \times 14 \times (16 - 10) = 12 \times 14 \times 6$. This represents a percentage of $\frac{12\times14\times6}{12\times14\times10} \times 100 = \frac{6}{10} \times 100 = 60\%$.

13. **Soln**: **(B)** After filling in the 3 in the top row and the 8 in the left column, the table can be filled in as

$\times$	3	9	2	7
8	24	72	16	56
4	12	36	8	28
3	9	27	6	P
6	18	54	12	42

We used the fact that the only (non unit) common factor to 8 and 6 is 2 and the only (non unit) common factor to 6 and 27 is 3. So $M = S = 12$.

14. **Soln**: **(C)** The size of one of the angles of the pentagon is $\frac{(5-2)}{5} \times 180 = 108°$. In the base triangle adjacent to the angle marked x, the angles are $60°$, $180° - 108° = 72°$ and $180° - (60° + 72°) = 48°$ (complementary to the angle marked x). The value of x is therefore $180° - 48° = 132°$.

15. **Soln**: **(A)** The length of time of travel is 4:00 p.m. minus 9:00 a.m. which is 7 hours. With R for right, D for down, U for up and L for left, the following motion will result in a distance of 0 m: RDRDRUL

16. **Soln**: **(D)** Let Buella be the younger of the two and let her present age be b so that Avril's present age is $b+m$. From the information given, $(b + m - 1) = 5(b - 1)$ and $b+m = b^2$. So $4b = 4+m$ or $m = 4b-4$. Since $b+m = b^2$, we have $b+(4b - 4) = b^2$ giving $b^2 - 5b + 4 = 0$. That is, $(b - 1)(b - 4) = 0$. So $b = 1$ or $b = 4$. $b = 1$ is not

feasible (as this would result in $m = 0$) and so $b = 4$. This result in $m = 4 \times 4 - 4 = 12$.

17. **Soln**: **(E)** Let the sum of the marked angles in the five triangles be a, b, c, d, e. The missing angles are $180° - a, 180° - b$, etc. Summing all the angles at the common vertex, we get $2\,(180° - a) + 2\,(180° - b) +$ etc $+2\,(180° - e) = 360°$. From this we get $1440° - 2\,(a + b + c + d + e) = 0$, giving $a + b + c + d + e = \frac{1440}{2} = 720°$.

18. **Soln**: **(D)** Let the number of red, blue and white marbles be r, b and w respectively so that $r + b + w = 60$. Also, $b + r = 2w$ and $b + w = 3r$. This gives $2w + w = 60$ resulting in $w = 20$ and $r + 3r = 60$ resulting in $r = 15$. The number of blue marbles is therefore $60 - 20 - 15 = 25$.

19. **Soln**: **(B)** Based on the information given, all three triangles are similar. Let $AC = a$ and $BC = b$. The area of ABC is $\frac{1}{2}$(base)(height) where the base is $6+2 = 8$ cm. The height is $h = AF = BE$. From similarity, $\frac{AF}{6} = \frac{2}{BE}$. That is, $h^2 = 12$ and so $h = \sqrt{12} = 2\sqrt{3}$. The area of the required triangle is now $\frac{1}{2}(8)(2\sqrt{3}) = 8\sqrt{3}$ cm^2.

20. **Soln**: **(C)** Let the volume of the two jugs be V. The amounts of water are $\frac{2}{3}V$ and $\frac{4}{5}V$. The question now is, what is this sum a fraction of the new volume $2V$? The amount of water in the combined bottles $\frac{2}{3}V + \frac{4}{5}V = \frac{22}{15}V$ and the fraction is $\frac{22}{15}V \div 2V = \frac{11}{15}$. The fraction of juice is therefore $\frac{4}{15}$ giving the desired ratio of $11 : 4$.

21. **Soln**: **(D)** Let $\angle CBD = \angle DBA = \alpha$. From the information given, ΔCAB is isosceles and $\angle BAC = 2\alpha$. Since the sum of the angles in the triangle is $180°$, $20° + 4\alpha = 180°$, giving $\alpha = 40°$. Because $\angle BAC = \angle BDC$, the quadrilateral $ABCD$ is cyclic and since the angle at C is $\alpha = 20° + 40° = 60°$, The angle at A is $180° - 60° = 120°$.

22. **Soln**: **(D)** Let the elapsed time be $a0$ minutes where $a0$ is less than 60. The time shown would be 21:$a0$ and the distance travelled recorder would show $116+90 \times \frac{a0}{60} = 116 + \frac{3}{2}a0 = 116 + \frac{3}{2} \times 10a = 116 + 15a$. We now want to determine the value of a such that $21a = 116 + 15a$. No such a exist. Let the elapsed time be $b0$ minutes where $b0$ is greater than 60. The time shown would be 22:$(b - 6)\,0$ and the distance travelled recorder would show $116 + 90 \times \frac{b0}{60} = 116 + \frac{3}{2}b0 = 116 + \frac{3}{2} \times 10b = 116 + 15b$. We now want to determine the value of b such that $22\,(b - 6) = 116 + 15b$. When $b = 7$, both sides equate to 221.

23. **Soln**: **(A)** Let the consecutive numbers be $a, a - 1, a - 2, a + 1$ and $a + 2$. The sum is $5a$ which is a number that is exactly divisible by 5. Of the numbers given,

only 2025 is divisible by 5 and since $\frac{2025}{5} = 405$, the five consecutive numbers are $403, 404, 405, 406$ and 407.

24. **Soln**: **(B)** Let D be the distance to the beach from home and let the planned speed be x km/h. The time T, for the trip will be $\frac{D}{x}$. With the information given,

$$\frac{D}{x+5} = T - 5 \text{ and } \frac{D}{x+10} = T - 8$$

So $D = Tx + 5T - 5x - 25$ and $D = Tx + 10T - 8x - 80$. That is (because $Tx = D$), $0 = 5T - 5x - 25$ and $0 = 10T - 8x - 80$. The last two equations give $5T - 5x = 25$ and $5T - 4x = 40$. Subtracting, $x = 15$ and so the planned speed was 15 km/h.

25. **Soln**: **(A)** A guess is that the last three digits is 0. This is actually true because both 20! and 15! end with 000. The reason is that 20! as factors 5 and 2 more than 3 times and so does 15!