

## WMC 2019 Junior Secondary Qualifying Round Solutions

1. **B** From 5:20 pm to 6:00 pm there are 40 minutes and from 6:00 pm to 6:05 pm there are 5 minutes. Altogether there are  $40 + 5 = 45$  minutes.
2. **B** The radius fo the circle is  $12 \div 2 = 6\text{cm}$  and so the area is  $\pi \times 6^2 = 36\pi\text{cm}^2$
3. **D** Consider a square with side length  $x$  with area  $x^2$ . After increasing its side length by 25% its side length is  $1,25x$  and so the area is  $1,5625x^2$ .
4. **B**  $0,2019 - 0,02019 = \frac{2019}{100000} \times (10 - 1) = 2019 \times 9 \div 100000 = 0,18171$
5. **D** There are 9 learners in front of Thabo and there are 11 learners behind him. We must also count Thabo himself. In total there are  $11 + 9 + 1 = 21$  learners.
6. **D** Approximate 7982413 to 8000000 and approximate 0,000246 to 0,00025. Then  $8000000 \times 0,00025 = 8 \times 25 \times 10 = 2000$ .
7. **D** One way to do this is to write out all the terms until the 83rd term. However a shorter way is to keep on adding the the numbers up to  $n$  until you go beyond 83 and then you stop.
8. **D**  $736 \times 32 + 726 \times 68 = 726 \times 100 = 72600$
9. **D** This is the only option that is smaller that  $\frac{3}{10}$ . Another way one may do this is two compare the first two options, and compare the smaller of these two with the third option and so on until the last option.
10. **E** For each handshake there are 14 choices for the first person and 13 choices for the second person. So there are  $14 \times 13$  choices. However since we can choose the same pair of people in two different ways, the number of handshakes is  $\frac{14 \times 13}{2} = 91$ .
11. **B**

$$\begin{aligned}
 S &= 9 + 99 + 999 + \dots + 99 \dots 99 \\
 &= (10^1 - 1) + (10^2 - 1) + \dots + (10^{2019} - 1) \\
 &= 10^1 + 10^2 + \dots + 10^{2019} - 2019 \\
 &= 1111 \dots 110 - 2019 \\
 &= 1111 \dots 11109091
 \end{aligned}$$

Where the last number has 2015 initial 1s. This gives a total digit sum of 2034.

12. **D** There are nine 1 by 1 squares, four 2 by 2 squares and one 3 by 3 square. So in total there are  $9 + 4 + 1 = 14$  squares.

13. **D** Begin by setting angle  $ABF = y$  and  $FDE = z$ .  $A = 180^\circ - 2y$  and  $E = 180^\circ - 2z$  and  $ACE$  is a triangle this gives  $y + z = 130^\circ$  as  $AFE$  is a straight line this makes  $x = 50^\circ$ .
14. **A** It's possible to get 60 (by getting everything). It's clearly not possible to get 58 or 59. 57, 56 and 55 can be achieved by getting all but one question correct. Finally 54 can be achieved by getting two questions from section A wrong and everything else correct.
15. **A** The trick is to realize that powers of go in cycles. Powers of 2 end in 2, 4, 8, 6 and then 2 again. A little calculation reveals that  $2^{2019}$  will end in an 8. Similarly powers of 3, end in 3, 9, 7 and 1 with  $3^{2019}$  ending in a 7. Lastly powers of 5 always end in 5 (a cycle of length one). Adding these together gives a final last digit of 0.