WMC 2019 Upper Primary Qualifying Round Solutions

1. **D** This is ordinary multiplication but one way to do is to write $20 \times 19 = 20 \times 20 - 20 = 400 - 20 = 380$.

2. **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.

3. **C** $\frac{30}{100} \times \frac{20}{100} \times \frac{50}{100} \times 7000 = 210$

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** 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.

7. **D** Approximate 7982413 to 8000000 and approximate $0,000246$ to $0,00025$. Then $8000000 \times 0,00025 = 8 \times 25 \times 10 = 2000$.

8. **D** The side length of the square is equal to $12 \div 4 = 3cm$. So the are of the square is $3 \times 3 = 9cm^2$.

9. **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.

Alternative
We break the terms of the sequence into groups where the first group has only the term, 1. The second group has the terms $2, 2$. The third group has the terms $3, 3, 3$ and so on. Note that, this means the nth group contains the number n(and copies of only n). We see that by counting all the terms up to the nth group, we would have counted exactly $n(n + 1)/2$ terms (The sum of the first n positive integers is $n(n + 1)/2$). A simple check reveals that at the 12th group, we would have counted $12(13)/2 = 78$ terms. Note then that the 13th group must therefore contain 13 terms which are the 79th, 80th, $\cdots$ 83rd, all the way up to the 91st term and the fact that all the elements in the 13th group are all 13 means the 83rd term must be 13.

10. **D** $726 \times 32 + 726 \times 68 = 726 \times 100 = 72600$

11. **B** 15% of the boys did not come, and so $\frac{15}{100} \times 60 = 9$ boys were absent. 20% of the girls did not come, so $\frac{20}{100} \times 90 = 18$ girls did not come to school. In total $9 + 18 = 27$ children did not come to school.

12. **E** For each handshake there are 14 choices for the first person and 13 choices for the second person. So there are 14×13 choices. However since we can choose the same pair of people in two different ways, the number of handshakes is $\frac{14 \times 13}{2} = 91$.

Alternative
The number of handshakes is the number of ways in which we can choose 2 objects from 14. This is $\binom{14}{2} = 91$ ways.

Alternative

If we label the people at the party from $1, 2 \cdots 14$, then the first person can shake 13 hands, the second person can shake 12 hands (note that the second person cannot shake the first person as this will be a repetition), the third person can shake 11 hands. This goes on until we get to the 13th person who can shake only 1 hand the the 14th then has no hand to shake. The total number of hand shakes is then the sum of the first 13 positive integers which is $13(14)/2 = 91$.

13. **D** Note that we count digits after the decimal point. There is repeating pattern of $0, 2, 4, 3, 9$. This consists of 5 digits.So we need to find how many multiples of 5 are in 2019. There are 403 multiples with a remainder of 4. So the 2019 th digit must be the 4 th number in the list $0, 2, 4, 3, 9$. So the $2019th$ digits is 3

14. **B** The number who passed both parts is 20. We also have that 25 passed only the first part. 15 passed neither part. So the number who passed only the second part is $80 - (20 + 15 + 25) = 20$

15. **D** It is easier to count the numbers that do not have a 5 then subtract from the total number of four digit numbers. For the first digit there are 8 options, it can only be one of $1, 2, 3, 4, 6, 7, 8, 9$. For the second, third and last digit there are 9 options for each, it can only be one of $0, 1, 2, 3, 4, 6, 7, 8, 9$. So there are $8 \times 9 \times 9 \times 9 = 5832$ numbers that do not have a 5. There are $9999 - 999 = 9000$ four digit numbers and so $9000 - 5832 = 3168$ contain at least one 5.