

1. **A**. The number of diagonals on a  $n$ -gon is  $\frac{n(n-3)}{2} = \frac{100 \times 97}{2} = \boxed{4850}$ .
2. **D**. The number of handshakes among  $n$  people is  $\frac{n(n-1)}{2} = 28$  which means  $n = \boxed{8}$ .
3. **B**. We count the possible outcomes in different cases.  
If only one weight is used, we have only 3 cases.  
If two weights is used, we have 6 cases. There are 3 ways to select 2 weights from the 3 available while the order of selection is not important. For each pair of selections, for example, 1 and 3, there are two possibilities: weights on the same side and weights on the opposite sides. So, we have  $3 \times 2 = 6$  cases.  
If all three weights are selected, we have 4 cases: all 3 weights on the same side or one weight on one side and 3 weights on the other side.  
Therefore, the total selection is  $3 + 6 + 4 = 13$ .
4. **C**. We can construct the division and try to find a pattern by listing few examples: one line divides the plane in 2, 2 lines in 4, 3 lines in 7, and so on. So the pattern is to add consecutive whole numbers starting from two. We then have the first 6 number of this sequence: 2, 4, 7, 11, 16, 22. So the answer is 22.
5. **C**. If the first digit is 2 more than the last digit, we have  $8 \times 8 \times 7 \times 1$  cases. If the first digit is 2 less than the last digit, we have  $7 \times 8 \times 7 \times 1$  cases. Thus, the total case is 840.
6. **B**. If the  $N$  people is seated in a way such that there are two empty chairs between any two people sit next to each other, we can group 1 person with two chairs into group of 3s. Then  $60 \div 3 = 20$ .
7. **B**. There is only one selection for the last digit, but  $\binom{25}{2}$  selections for the other two.
8. **C**. For increasing order, the eligible digits are 1 - 9. If we select any 3 digits, there is only one way to order them. Thus, there are  $\binom{9}{3}$  ways. For decreasing order, the eligible digits are 0 - 9 for  $\binom{10}{3}$  ways. Thus, the total is 204.
9. **B**. The line through the two points is  $y = \frac{88}{15}(x - 3) + 17$ . For  $y$  to be an integer,  $x - 3$  must be a multiple of 15. Thus, we have 4 solutions: 3, 18, 33, and 48.
10. **C**. Each tourist has 2 selections for a total of  $2^6$  selections. However the restriction is that each guide must take at least one tourist. There are two cases a guide may have 0 tourist. Thus, we have  $2^6 - 2 = 62$ .