Math 30 Counting Problems

November 25, 2024

1. How many arrangements could be made of the word:
   - FATHER if F is first?
   - UNCLE if C is first and L is last?
   - DAUGHTER if UG is last?
   - MOTHER if the vowels are first and last?
2. Determine the number of different arrangements of the 6 letter word ANSWER
   - Without restrictions
   - That begin with an S
   - That begin with a vowel and end with a consonant.
   - That have the three letters ANS adjacent and in that order.
   - That have the three letters ANS adjacent and in any order.

3. Eric, James, Lucas, Jayant, and Jovan foo to watch a movie and sit in 5 adjacent seats. In how how many ways can this be done if

   - Eric sits next to Lucas?

   - Scott refuses to sit next to Jovan?

4. In how many ways can four adults and five children be arranged in a single line

   - Without restriction?

   - If the children and adults alternate positions?

   - If the adults are all together and the children are all together?

   - If the adults are all together?

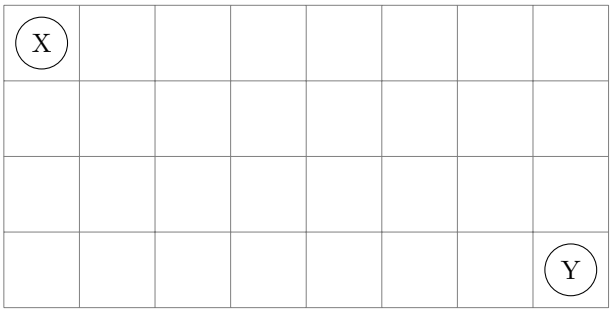
5. How many different arrangements can be made using all the letters of each word?

   - RENERT

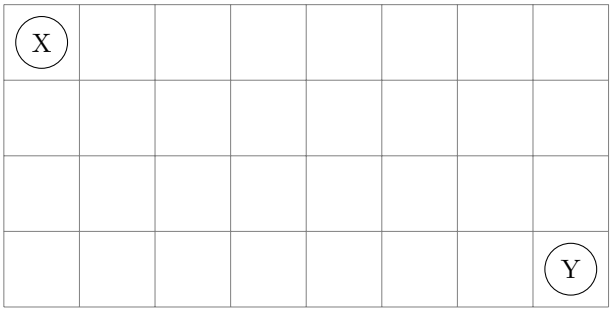
   - ELLIANA

   - XOXXXXOOOXXXX

6. How many ways can you travel from X to Y if you may only travel to adjacent squares right or down?



7. How many ways can you travel from X to Y if you may travel one or two units and only to squares right or down?



8. • How many 5 card poker hands are possible?

   • How many hands will there be all diamonds?

   • How many hands will there be 4 black cards and 1 red card?

   • How many hands will have 3 kings?

9. Jovan's pizza store has 9 choices of toppings available.

   • How many different 2-topping pizzas can be made?

   • How many different 3-topping pizzas can be made?

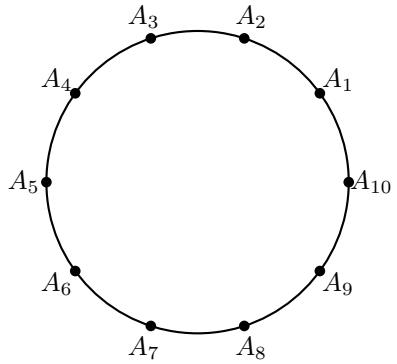
10. How many different rectangles can be formed by eight horizontal lines and three vertical lines?

11. A basketball coach has five guards and seven forwards on his basketball team.

    - In how many different ways can he select a starting team of two guards and three forwards?

    - How many different starting teams are there if the star player, who plays guard, must be included?

12. How many chords can be formed between the points $A_1, A_2, \ldots, A_{10}$?



13. How many different 4 card hands have

- At least one black card?

- At least 2 kings?

- Two pairs?

- At most 2 clubs?

14. Show that the number of diagonals in a p-sided polygon is $\frac{p(p-3)}{2}$

15. After everyone had shaken hands once with everyone else in a room, there was a total of 66 handshakes. How many people were in the room?

16. Collinear points are points which share the same straight line. Find the number of triangles which can be formed from 10 points if no three of the points are collinear.

17. There are 5 different English books, 2 different Science books, and 2 different mathematics books.

    - How many ways can three of these books be arranged on the shelf?

    - How many ways can two english, two science, and a math book be arranged?

18. A coach must have 5 starters for a basketball team from 6 males and 5 females. If there must be at least two of each gender in the starting line-up, how many different groups of players can be chosen?