



### Steps

There are 12 possibilities for the first choice. Put a 12 in the first slot.

### Work

12

12  
1<sup>st</sup> Object                    2<sup>nd</sup> Object                    3<sup>rd</sup> Object

There are 11 possibilities for the second objects. That is because we chose one of the 12 objects in the first step. Put an 11 in the second slot.

12

11

12      11  
1<sup>st</sup> Object      2<sup>nd</sup> Object                    3<sup>rd</sup> Object

Fill the remaining slots with decreasing numbers.

12

11

10

12      11      10  
1<sup>st</sup> Object      2<sup>nd</sup> Object      3<sup>rd</sup> Object

Steps  
Multiply the numbers.

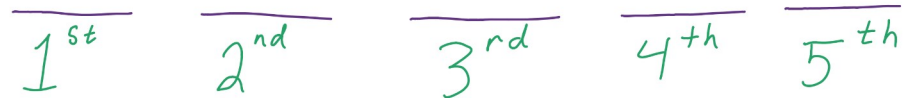
Work

$$\begin{array}{ccc} 12 & \times & 11 & \times & 10 \\ \hline 1^{\text{st}} \text{ Object} & & 2^{\text{nd}} \text{ Object} & & 3^{\text{rd}} \text{ Object} \\ & = & 1320 & & \end{array}$$

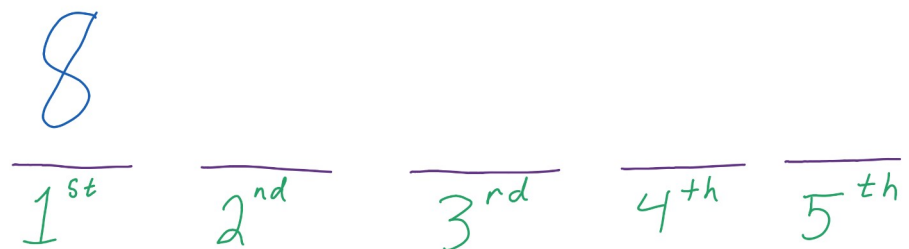
The number of permutations of 12 objects taken 3 at a time is 1,320. Our notation for this permutation is  ${}_{12}P_3$ .

Steps  
Start with a slot diagram.  
Because there are five objects, use five slots.

Work



There are 8 possibilities for the first choice. Put an 8 in the first slot.



### Steps

There are 7 possibilities for the second objects. That is because we chose one of the 8 objects in the first step. Put a 7 in the second slot.

### Work

$$\begin{array}{c} 8 \\ \hline 1^{\text{st}} \end{array} \quad \begin{array}{c} 7 \\ \hline 2^{\text{nd}} \end{array} \quad \begin{array}{c} \phantom{0} \\ \hline 3^{\text{rd}} \end{array} \quad \begin{array}{c} \phantom{0} \\ \hline 4^{\text{th}} \end{array} \quad \begin{array}{c} \phantom{0} \\ \hline 5^{\text{th}} \end{array}$$

Fill the remaining slots with decreasing numbers.

$$\begin{array}{c} 8 \\ \hline 1^{\text{st}} \end{array} \quad \begin{array}{c} 7 \\ \hline 2^{\text{nd}} \end{array} \quad \begin{array}{c} 6 \\ \hline 3^{\text{rd}} \end{array} \quad \begin{array}{c} 5 \\ \hline 4^{\text{th}} \end{array} \quad \begin{array}{c} 4 \\ \hline 5^{\text{th}} \end{array}$$

Multiply the numbers.

$$\begin{array}{c} 8 \\ \hline 1^{\text{st}} \end{array} \times \begin{array}{c} 7 \\ \hline 2^{\text{nd}} \end{array} \times \begin{array}{c} 6 \\ \hline 3^{\text{rd}} \end{array} \times \begin{array}{c} 5 \\ \hline 4^{\text{th}} \end{array} \times \begin{array}{c} 4 \\ \hline 5^{\text{th}} \end{array} \\ = 6,720$$

The number of permutations of 8 objects taken 5 at a time is 6,720. Our notation for this permutation is  ${}_8P_5$ .

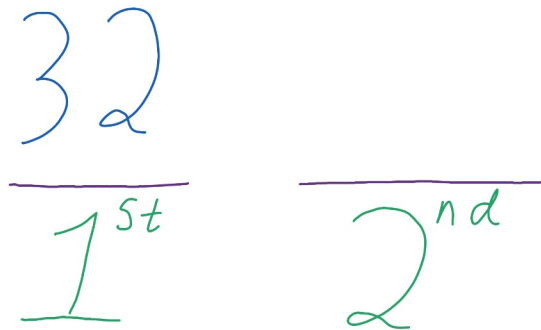
Steps

Start with a slot diagram.  
Because there are three  
objects, use three slots.

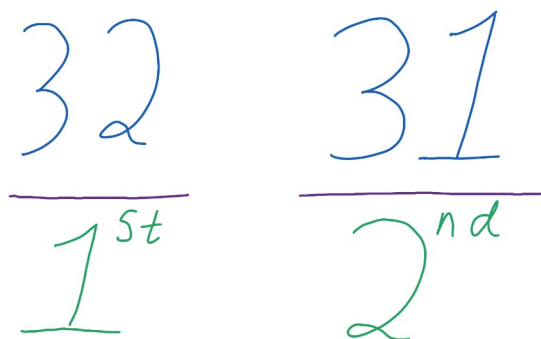
Work



There are 32 possibilities for  
the first choice. Put a 32 in  
the first slot.



There are 31 possibilities for  
the second objects. That is  
because we chose one of the  
32 objects in the first step.  
Put a 31 in the second slot.



Steps  
Multiply the numbers.

Work

$$\begin{array}{r} 32 \\ \hline 1^{st} \\ = \end{array} \times \begin{array}{r} 31 \\ \hline 2^{nd} \\ = \end{array} = 992$$

The number of permutations of 32 objects taken 2 at a time is 992. Our notation for this permutation is

${}_{32}P_2$ .