

abc acb bac bca cab cba : 3! = 6

ac ca  
bc cb  
ab ba

$P(3,2) = 6$

a: 1  
b: 2  
c: 3

$P(3,1) = 3$

abc

$P(n, r) = \frac{n!}{(n-r)!}$

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$2+6=8$   
 Anzahl der Möglichkeiten die man hat, 8 Personen zu wählen:  $\binom{8}{2}$

$21=12$   
 Anzahl der Möglichkeiten die man hat, 12 Personen zu wählen:  $\binom{12}{2}$

alle Möglichkeiten  
 $\binom{12}{2}$

Anzahl der Möglichkeiten die man hat, 2 Personen zu wählen:  $\binom{12}{2}$   
 $C(m, r) = \frac{m!}{r!(m-r)!}$

$C(3,3) = 1$	3	3	{a,b,c}
$C(3,2) = 3$	2	3	
$C(3,1) = 3$	1	3	

Anzahl der Möglichkeiten die man hat, 3 Personen zu wählen:  $\binom{3}{3} = 1$

Anzahl der Möglichkeiten die man hat, 2 Personen zu wählen:  $\binom{3}{2} = 3$

Anzahl der Möglichkeiten die man hat, 1 Person zu wählen:  $\binom{3}{1} = 3$

Anzahl der Möglichkeiten die man hat, 0 Personen zu wählen:  $\binom{3}{0} = 1$

Anzahl der Möglichkeiten die man hat, 3 Personen zu wählen:  $\binom{3}{3} = 1$

... les ... de ...

- 6.3 { ... + ...
- 10.3 { ... + ...
- 6.10 { ... + ...

... : ...

de ...

(1/12)

... pour ...

... [ ... ]

... m ...

Ex: 1: 1000

1000: 1000 1000 | 1000 1000  
1000: 1000 1000

1000 1000 1000 1000

$$P(n, m) = \frac{(n-m)!}{m!} = \frac{n!}{m!}$$

1000 : 1000 = 1

$$P(n, 2) = \frac{(n-2)!}{2!}$$

1000: 1000 = 1000

$$P(n, 2) = n(n-1)(n-2) \dots (n-2+1)$$

1000: 1000 = 1000

1000: 1000 = 1000

1000: 1000

1000: 1000 = 1000

...  $\frac{1}{m} \sum_{i=1}^m \dots$

...  $\frac{1}{m} \sum_{i=1}^m \dots$

...  $\frac{1}{m} \sum_{i=1}^m \dots$

...  $\frac{1}{m} \sum_{i=1}^m \dots$

...  $\frac{1}{m} \sum_{i=1}^m \dots$

$$\binom{m}{k} = C(m, k) = \frac{m!}{k!(m-k)!}$$

...  $\frac{1}{m} \sum_{i=1}^m \dots$

...  $\frac{1}{m} \sum_{i=1}^m \dots$

...  $\frac{1}{m} \sum_{i=1}^m \dots$

...  $\frac{1}{m} \sum_{i=1}^m \dots$

...  $\frac{1}{m} \sum_{i=1}^m \dots$

$$C(m, k) = \frac{P(m, k)}{P(k, k)} = \frac{m!}{k!(m-k)!}$$

$$P(m, k) = C(m, k) \cdot P(k, k)$$

...  $\frac{1}{m} \sum_{i=1}^m \dots$

...  $\frac{1}{m} \sum_{i=1}^m \dots$

...  $\frac{1}{m} \sum_{i=1}^m \dots$

...  $\frac{1}{m} \sum_{i=1}^m \dots$

...  $\frac{1}{m} \sum_{i=1}^m \dots$

$$8i \cdot 8i = (8i)^2$$

8i 8i de 160 e. 160 160 de 160

8i 8i de 160 e. 160 160 de 160

(2) 8i 8i de 160 e. 160 160 de 160

8i 8i de 160 e. 160 160 de 160

8i 8i de 160 e. 160 160 de 160

8i 8i de 160 e. 160 160 de 160

(1) 8i 8i de 160 e. 160 160 de 160

8i 8i de 160 e. 160 160 de 160

8i 8i de 160 e. 160 160 de 160

8i 8i de 160 e. 160 160 de 160

8i 8i de 160 e. 160 160 de 160

8i 8i de 160 e. 160 160 de 160

$$8i \cdot 8i = 64i^2$$

8i 8i de 160 e. 160 160 de 160







Let  $x > w$

Let  $x > w$  and  $x < w$  are the two cases to be considered. In the first case,  $x > w$  and in the second case,  $x < w$ .

Let us now consider the case  $x > w$ . In this case, the binomial coefficient  $\binom{x}{w}$  is defined as  $\frac{x!}{w!(x-w)!}$ . We can write this as  $\frac{x!}{w!} \cdot \frac{1}{(x-w)!}$ .

(3) 
$$\binom{x}{w} = \binom{x}{x-w} + \binom{x}{w}$$

Let us now consider the case  $x < w$ . In this case, the binomial coefficient  $\binom{x}{w}$  is zero. This is because the number of ways to choose  $w$  objects from  $x$  objects is zero when  $w > x$ .

implies that:

$$\frac{i(x-w)!}{w!} = \frac{i(x-w)!((x-w)-w)!}{w!} = \binom{x-w}{w}$$

$$\frac{i(x-w)!}{w!} = \binom{x}{w}$$

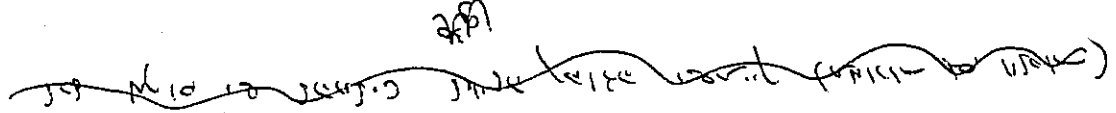
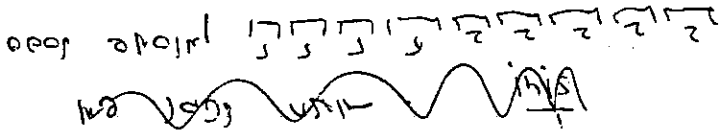
(4) 
$$\binom{x-w}{w} = \binom{x}{w}$$

(5)

... ..

... ..

(5)  $\frac{(5i)^4 (2i)^5 (5i)^4}{20i}$



... ..

(11)  $\frac{1}{15} \binom{5}{2} \binom{5}{2} \binom{5}{2} \binom{5}{2} \binom{5}{2} \binom{5}{2}$

... ..

(5) 2 2 2 2 2 2 2 2

... ..

... ..

... ..

(1)  $\frac{1}{3i} \binom{30}{10} \binom{20}{10}$  : 10, 10, 10

... ..

... ..

(3)  $\frac{1}{3i} \binom{30}{10} \binom{20}{5}$  : 20, 5, 5

(2)  $\binom{30}{10} \binom{20}{6}$  : 4, 6, 20

(1)  $\binom{30}{20}$  : 10 - 1 20

... ..

