Pre Calc Name: \_\_\_\_\_\_\_\_\_\_\_\_\_\_

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 WS Assessment

Target 10

Binomial theorem

Combinations & permutation

* Binomial coefficients and theorem
* Combinations
* Permutation and
* Probability

HW 10 Permutation Combination www.deltamath.com

THE BINOMIAL THEOREM shows how to calculate a power of a binomial (a +b)n without actually multiplying out. (a +b)4 = (a + b)(a + b)(a +b)(a +b) = a4+ 4a3b + 6a2b2+ 4ab3+ b4 ...

Base on the degree rule, the problem now in only remain on finding the value of coefficient. For example to "expand" (a +b)5, degree 5, we would write

(a +b)5= ? a5 + ? a4b + ? a3b2 +? a2b3 + ? ab4+? b5

The coefficients are called the binomial coefficients, and it comes from binomial theorem.

The symbol for a binomial coefficient is $\left(\begin{matrix}n\\k\end{matrix}\right)$ The upper index *n* is the exponent of the expansion; the lower index k indicates which term.

For example, when n = 5, each term in the expansion of (a + b)5 will look like this:

 $\left(\begin{matrix}5\\k\end{matrix}\right)a^{5-k}b^{k} $where k will successively take on the values 0 through 5.

(a +b)5 = $\left(\begin{matrix}5\\0\end{matrix}\right)a^{5-0}b^{0}$ + $\left(\begin{matrix}5\\1\end{matrix}\right)a^{5-1}b^{1}$ +

+ $\left(\begin{matrix}5\\5\end{matrix}\right)a^{5-5}b^{5}$ You fill in 3 terms in between above

With $\left(\begin{matrix}n\\k\end{matrix}\right)$ = nCk = ,$\left(\frac{n!}{k!(n-k)!}\right)$ you find the value of coefficient of (a + b)5 as follow

$\left(\begin{matrix}5\\0\end{matrix}\right)=\left(\frac{5!}{0!(5-0)!}\right)=?$ $\left(\begin{matrix}5\\1\end{matrix}\right)=\left(\frac{5!}{1!(5-1)!}\right)=?$ $\left(\begin{matrix}5\\2\end{matrix}\right)=\left(\frac{5!}{2!(5-2)!}\right)=?$

$\left(\begin{matrix}5\\3\end{matrix}\right)=\left(\frac{5!}{3!(5-3)!}\right)=?$ $\left(\begin{matrix}5\\4\end{matrix}\right)=\left(\frac{5!}{4!(5-4)!}\right)=?$ $\left(\begin{matrix}5\\5\end{matrix}\right)=\left(\frac{5!}{5!(5-5)!}\right)=?$

Finally we will have

(a + b)5 = ?

Using sigma notation, and factorials for the combinatorial numbers, the binomial theorem is as

![(n over k) = nCk = n!/[(n-k)!k!]]()![(a + b)^n = sum[k=0,n][(n over k)a^(n-k)b^k]]()

Now you write the expansion of

(a – b)5 = ?

How about (x – 2)5 = ?

Use the binomial theorem to expand (a + b)8 = ?

Write the fifth term in the expansion of

(a + b)10 (a – b)9 (a + b)13

The term a8b4 occurs in the expansion of what binomial? In that expansion, what is the coefficient of a8b4?

In the expansion of (x−y)15, calculate the coefficients of x3y12 and x2y13

Use the binomial theorem to expand (a + b)8

Write the fifth term in the expansion of (2x + 3)10

Pascale Triangle

Use Pascale Triangle to expand (x + 2)6

Remind notation again With $\left(\begin{matrix}n\\k\end{matrix}\right)$ = nCk = ,$\left(\frac{n!}{k!(n-k)!}\right)$

Prove

$\left(\begin{matrix}n+1\\2\end{matrix}\right)-\left(\begin{matrix}n\\2\end{matrix}\right)=n $ for all n >2 $\left(\begin{matrix}n+1\\2\end{matrix}\right)+\left(\begin{matrix}n\\2\end{matrix}\right)=n^{2} $ for all n >2

Use binomial theorem

$\left(\begin{matrix}n-1\\k\end{matrix}\right)+\left(\begin{matrix}n-1\\k-1\end{matrix}\right)=\left(\begin{matrix}n\\k\end{matrix}\right) $ for all n >2 $\left(\begin{matrix}n\\0\end{matrix}\right)+2\left(\begin{matrix}n\\1\end{matrix}\right)+4\left(\begin{matrix}n\\2\end{matrix}\right)+…+2^{n}\left(\begin{matrix}n\\n\end{matrix}\right)=3^{n} $

Fundamental Principle of Counting

 If something can be chosen, or can happen, or be done, in ***m*** different ways, and, after that has happened, something else can be chosen in **n** different ways, then the number of ways of choosing both them is $m∙n$

Mr. Tran has the following clothes: Wool and Rayon Suits; Each type of suit is in the following colors – gray, blue, black, or tan. He also has floral, strip, geometric, and solid ties.

How many different selections are available for him to choose?

How many ways can a seven-digit phone number begin with 503?

How many ways to scramble to make a password from your name?

**Permutation**: The number of ways to arrange objects when the order of their arrangement is important.

The number of permutations of n different things taken k at a time is written as nPk = $\frac{n!}{\left(n-k\right)!}$

Write down all the permutation of ABC (Hint: 6 of them)

How many permutation of 3 letter arrangement are there form four letter MNPQ ?

**Combination**: The number of ways to arrange objects when the order of their arrangement is NOT important.

The number of combinations of n different things taken k at a time is written as nCk = $\frac{n!}{\left(n-k\right)!k!}$

 How many ways to pick a President, VP and Secretary from your class?

How many ways to pick a team of 3 people to represent your class?

How many ways to choose 3 desserts from a menu of 10?

How many ways to list 3 favorite dessert in order from a menu of 10?

How many different types of 3 topping pizza can be order?

How many different types of 4 flavor baskin-robbins ice cream can be order on a dish? on a cone?

**Probability**

A 4 digit PIN is selected. What is the probability that there are no repeated digits?

Compute the probability of randomly drawing five cards from a deck and getting exactly one Ace.

**Target 10 Assessment**

1. Complete the following expansion. (2 + ax)4 = 16 + 32ax + …

2. Consider the expansion of (x2 – 2)5 The first four terms of the expansion in descending powers of x are x10 – 10x8 + 40x6 + Ax4 + ... Find the value of A.

3. Expand by binomial theorem $\left(a-\frac{1}{a}\right)^{6}$

4. There are 5 men and 4 women to be seated in a row. How many arrangements are possible if two men must sit at the beginning of the row and two men must sit at the end of the row?

5. Compute the probability of randomly drawing five cards from a deck and getting exactly one

Face Spade Black Odd number