TAG/Pre-AP Algebra II - 11.6 (Binomial Theorem) Worksheet

Please show all work and solutions on **separate paper**. **NO WORK = NO CREDIT!!!**

Simplify each expression WITHOUT a calculator: *(if you've forgotten how to do these, refer to the examples on pages 795-797)*

1. $_7P_4$

2. $_{12}C_6$

3. $\dfrac{20!}{18!\,2!}$

4. $\dfrac{32!}{30!\,4!}$

5. $\dfrac{(n+2)!}{n!}$

6. $\dfrac{(n+1)!}{(n+4)!}$

7. $\dfrac{(n+3)!}{(n-2)!}$

Convert the following into _factorial form_:

8. $\dfrac{47\cdot46\cdot45}{10\cdot9\cdot8\cdot7}$

9. $\dfrac{100\cdot99\cdot98\cdot97}{21\cdot20\cdot19\cdot12\cdot11}$

10. $\dfrac{32\cdot31\cdot30\cdot18\cdot17\cdot16}{77\cdot76\cdot75\cdot74\cdot73}$

11. $451\cdot450\cdot449\cdot5\cdot4\cdot3$

For #12-18, you are expected to do each problem using the binomial theorem while __ONLY__ using a calculator for multiplication at the final step. You must show all work WITHOUT using the "nCr" function OR the factorial function on your calculator! The following is an example of the type of work that you are expected to show when using the Binomial Theorem:

EXAMPLE – Find the 5th term of $(2a-5b)^{11}$:

$\dbinom{11}{4}(2a)^7(-5b)^4$ *(use the Binomial Theorem for the set-up)*

$=\dfrac{11!}{4!\,7!}\cdot2^7\cdot a^7\cdot(-5)^4\cdot b^4$ *(expand nCr using factorials)*

$=\dfrac{11\cdot10\cdot9\cdot8}{4\cdot3\cdot2\cdot1}\cdot128\cdot a^7\cdot625\cdot b^4$ *(simplify the factorial by dividing out factors)*

$=\dfrac{9}{3}\cdot\dfrac{8}{4\cdot2}\cdot\dfrac{11\cdot10}{1}\cdot128\cdot a^7\cdot625\cdot b^4$ *(continue to simplify as much as possible __without__ using a calculator!)*

$=3\cdot11\cdot10\cdot128\cdot625\cdot a^7b^4$ *(a calculator is allowed __only__ for the multiplication in this final step – if it appears*

$=\boxed{26400000a^7b^4}$ *that you used a calculator to do the nCr's or the factorials, you will receive **ZERO** credit)*

Find the simplified term that contains the specified power in the expansion of the given binomial power.

12. $(c-d)^{19}$; d^{15} **13.** $(x^3+y^2)^{15}$; y^{12} **14.** $(x^3-y^2)^{13}$; x^{18} **15.** $(3x+2y)^8$; y^5

Find the specified term in the expansion of the given binomial power.

16. $(r-q)^{15}$; 12th term   **17.** $(a-b)^{17}$; 8th term   **18.** $(3x^2-2y^3)^7$; 4th term

Use the Binomial Theorem to expand each binomial power __WITHOUT USING A CALCULATOR__. Show __all__ work – evaluate all nCr's properly by using factorials. __Do NOT use Pascal's Triangle.__

19. $(y+5)^4$ **20.** $(2a-3c)^5$

21. Suppose that $(r+s)$ is raised to some positive integer power, and one term in the binomial series is $27132r^{13}s^6$.

     a) Which term is it?

     b) To what power was $(r+s)$ raised?

     c) What is the next term? (Simplify the coefficient – calculator-allowed)

     d) How many terms are there in this series?