EXTRA PRACTICE 38
The Binomial Theorem
Use after Section 14.6

Name_____

_____

Examples:

a) $5! = 5 \cdot 4 \cdot 3 \cdot 2 \cdot 1 = 120$

b) $\binom{7}{3} = \frac{7!}{(7-3)!\,3!} = \frac{7 \cdot 6 \cdot 5 \cdot 4 \cdot 3 \cdot 2 \cdot 1}{4 \cdot 3 \cdot 2 \cdot 1 \cdot 3 \cdot 2 \cdot 1} = 35$

c) Expand: $(2x - 5y)^4$.

Using the binomial theorem $(a+b)^n = \binom{n}{0}a^n + \binom{n}{1}a^{n-1}b + \binom{n}{2}a^{n-2}b^2 + \cdots + \binom{n}{n}b$.

$a = 2x,\ b = -5y,\ n = 4$

$$= \binom{4}{0}(2x)^4 + \binom{4}{1}(2x)^3(-5y) + \binom{4}{2}(2x)^2(-5y)^2 + \binom{4}{3}(2x)(-5y)^3 + \binom{4}{4}(-5y)^4$$

$$= 1(16x^4) + 4(8x^3)(-5y) + 6(4x^2)(25y^2) + 4(2x)(-125y^3) + 1(625y^4)$$

$$= 16x^4 - 160x^3y + 600x^2y^2 - 1000xy^3 + 625y^4$$

Simplify.

1. $7!$ _____

2. $9!$ _____

3. $8!$ _____

4. $\frac{5!}{3!}$ _____

5. $\binom{4}{3}$ _____

6. $\binom{9}{6}$ _____

7. $\binom{12}{8}$ _____

8. $\binom{25}{25}$ _____

9. $\binom{12}{2}$ _____

10. $\binom{18}{1}$ _____

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Expand each of the following.

11. $(x+y)^5$ _____

12. $(x-y)^6$ _____

13. $(2x+y)^3$ _____

14. $(3x-2y)^3$ _____

15. $(x-3y)^5$ _____

16. $(2x+y)^6$ _____

17. $(x+y)^8$ _____

18. $(3x-2y)^4$ _____

19. $(-x+y)^3$ _____

20. $(2x-y)^5$ _____

21. $\left(x+\frac{1}{y}\right)^5$ _____

22. $\left(2x-\frac{5}{y}\right)^3$ _____

Find the indicated term of the binomial expansion.

23. 5th, $(x+y)^7$ _____

24. 6th, $(2x-3y)^9$ _____

25. 8th, $(2x+3y^2)^{10}$ _____

26. 7th, $(3x+2y)^8$ _____