

Evaluate the expression.

1. $2!6!$

$$2 \cdot 720 = 1440$$

2. $7!0!$

$$5040 \cdot 1 = 5040$$

3. $\frac{8!}{5!}$

$$\frac{8 \cdot 7 \cdot 6 \cdot \cancel{5!}}{\cancel{5!}} = 336$$

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

$$= \frac{5!}{5! \cdot 0!} = 1$$

5. $\binom{7}{5}$

$$\frac{7!}{5! \cdot 2!} = \frac{7 \cdot 6 \cdot \cancel{5!}}{\cancel{5!} \cdot 2} = 21$$

6. $\binom{13}{4}$

$$\frac{13!}{4! \cdot 9!} = \frac{13 \cdot 12 \cdot 11 \cdot 10 \cdot \cancel{9!}}{4 \cdot 3 \cdot 2 \cdot \cancel{9!}} = 715$$

Rewrite as an expression that does not contain factorials.

7. $\frac{n!}{(n-2)!} = \frac{n(n-1)(\cancel{n-2}!)!}{(\cancel{n-2}!)!} = n(n-1)$

8. $\frac{(2n+2)!}{(2n)!} = \frac{(2n+2)(2n+1)(\cancel{2n}!)!}{(\cancel{2n}!)!} = (2n+2)(2n+1)$

9. $\frac{(3n+1)!}{(3n-1)!} = \frac{(3n+1)(3n)(\cancel{3n-1})!}{(\cancel{3n-1})!} = (3n+1)(3n)$

Use the binomial theorem to expand.

10. $(4x - y)^3 = \binom{3}{0}(4x)^3(-y)^0 + \binom{3}{1}(4x)^2(-y)^1 + \binom{3}{2}(4x)^1(-y)^2 + \binom{3}{3}(4x)^0(-y)^3$

$$= 1(64x^3)(1) - 3(16x^2)y + 3(4x)(y^2) - 1(1)y^3$$

$$= 64x^3 - 48x^2y + 12xy^2 - y^3$$

11. $(3x - 5y)^4 = \binom{4}{0}(3x)^4(-5y)^0 + \binom{4}{1}(3x)^3(-5y)^1 + \binom{4}{2}(3x)^2(-5y)^2 + \binom{4}{3}(3x)^1(-5y)^3 + \binom{4}{4}(3x)^0(-5y)^4$

$$= 1(81x^4)(1) + 4(27x^3)(-5y) + 6(9x^2)(25y^2) + 4(3x)(-125y^3) + 1(1)(625y^4)$$

$$= 81x^4 - 540x^3y + 1350x^2y^2 - 1500xy^3 + 625y^4$$

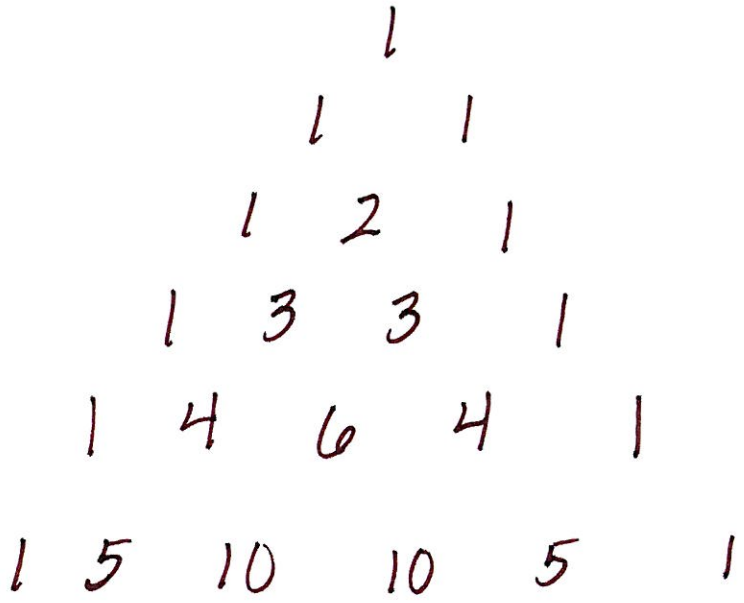
Use Pascal's Triangle to expand.

12. $(a + b)^6$

13. $(a - b)^7$

$$a^6 + 6a^5b + 15a^4b^2 + 20a^3b^3 + 15a^2b^4 + 6ab^5 + b^6$$

$$a^7 - 7a^6b + 21a^5b^2 - 35a^4b^3 + 35a^3b^4 - 21a^2b^5 + 7ab^6 - b^7$$



$(a+b)^6$ 1 6 15 20 15 6 1

$(a-b)^7$ 1 7 21 35 35 21 7 1