

Expand $(2x - 5y)^5$ using Pascal's triangle.

$$1 \cdot (2x)^5 + 5 \cdot (2x)^4 \cdot (-5y) + 10 \cdot (2x)^3 \cdot (-5y)^2 + 10 \cdot (2x)^2 \cdot (-5y)^3 + 5 \cdot (2x) \cdot (-5y)^4 + 1 \cdot (-5y)^5$$

$$32x^5 + (5 \cdot 16 \cdot (-5))x^4y + 10 \cdot 8 \cdot (-5)x^3y^2 + 10 \cdot 4 \cdot (-5)x^2y^3 + 5 \cdot 2 \cdot (-5)x^4y^4 + (-5)^5y^5$$

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Use the binomial theorem to find a particular term.

E.g. Find the 10th term of $(x + 2y)^{16}$ w/o fully expanding?

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

First term: $\binom{5}{0}x^5$

Second term: $\binom{5}{1}x^4y$

3rd term: $\binom{5}{2}x^3y^2$

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In general; $(x+y)^n$.

The $(n+1)$ term in this expansion:

$$\binom{n}{r} x^{n-r} y^r$$

The 10th term in $(x+2y)^{16}$

$n+1=10 \Rightarrow n=9$ $\binom{16}{9} x^7 \cdot (2y)^9$

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