Binomial Expansion

$$(X+1)^1 = X+1$$
$$(X+1)^2 = 1X^2+2X+1$$
$$(X+1)^3 = 1X^3+3X^2+3X+1$$
$$(X+1)^4 = 1X^4+4X^3+6X^2+4X+1$$
$$(X+1)^5 = 1X^5+5X^4+10X^3+10X^2+5X+1$$
$$(X+1)^6 = 1X^6+6X^5+15X^4+20X^3+15X^2+6X+1$$

We did all of the painful multiplication and gathering of like terms in order to show you a nice pattern.

1. What do you notice?

2. Without actually doing the work of expanding the binomial, can you write out what $(X+1)^7$ would become?

3. What expression would get us this simplified product?

$$1X^9+9X^8+36X^7+84X^6+126X^5+126X^4+84X^3+36X^2+9X^1+1$$

4. Can you figure out what $(X+1)^{10}$ would become if you did all of the multiplication and simplification?

5. Explain in words how you would get the next row of expansions.