

In class 7

1. Write the first 8 levels of Pascal's triangle.
2. Use the 6th level to expand  $(a + b)^6$
3. Find the coefficient of the term  $x^8$  in the expansion of  $(x - 3)^{11}$
4. Verify Pascal's identity

$$\binom{n}{k} = \binom{n-1}{k-1} + \binom{n-1}{k}$$

for  $n = 7, k = 5$

5. Verify Vandermonde's identity

$$\binom{m+n}{r} = \sum_{k=0}^r \binom{m}{r-k} \binom{n}{k}$$

for  $m = 5, n = 4, r = 3$

6. Rewrite Vandermonde's identity with  $n = m = r$  to create a new identity.
7. Rewrite

$$(x + y)^n = \sum_{k=0}^n \binom{n}{k} x^{n-k} y^k$$

with  $x = 1, y = 2$

8. Verify the "hockey stick" identity

$$\binom{n+1}{r+1} = \sum_{i=r}^n \binom{i}{r}$$

for  $n = 7, r = 2$

9. Find the hockey stick in Pascal's triangle by circling the left and right hand sides of the above identity