Creating Pascal's Triangle

Name ______________________

Date ______________ Period ______

Given r and n are integers and $0 \le r \le n$, then the symbol $\binom{n}{r}$ is defined as

$$\binom{n}{r} = \frac{n!}{r!(n-r)!}$$

the symbol $\binom{n}{r}$ is spoken "n taken r at a time."

Pascal's Triangle

using $\binom{n}{r}$

	$r=0$	$r=1$	$r=2$	$r=3$	$r=4$	$r=5$
$n=0$	$\binom{0}{0}$					
$n=1$	$\binom{1}{0}$	$\binom{1}{1}$				
$n=2$	$\binom{2}{0}$	$\binom{2}{1}$	$\binom{2}{2}$			
$n=3$	$\binom{3}{0}$	$\binom{3}{1}$	$\binom{3}{2}$	$\binom{3}{3}$		
$n=4$	$\binom{4}{0}$	$\binom{4}{1}$	$\binom{4}{2}$	$\binom{4}{3}$	$\binom{4}{4}$	
$n=5$	$\binom{5}{0}$	$\binom{5}{1}$	$\binom{5}{2}$	$\binom{5}{3}$	$\binom{5}{4}$	$\binom{5}{5}$

Pascal's Triangle

using $\binom{n}{r}$

$r = 0$

$n = 0$ $\quad \binom{0}{0}$ $\quad r = 1$ $\qquad$ ( )

$n = 1$ $\quad \binom{1}{0} \; \binom{1}{1}$ $\quad r = 2$ $\qquad$ ( ) ( )

$n = 2$ $\quad \binom{2}{0} \; \binom{2}{1} \; \binom{2}{2}$ $\quad r = 3$ $\qquad$ ( ) ( ) ( )

$n = 3$ $\quad \binom{3}{0} \; \binom{3}{1} \; \binom{3}{2} \; \binom{3}{3}$ $\quad r = 4$ $\qquad$ ( ) ( ) ( ) ( )

$n = 4$ $\quad \binom{4}{0} \; \binom{4}{1} \; \binom{4}{2} \; \binom{4}{3} \; \binom{4}{4}$ $\quad r = 5$ $\qquad$ ( ) ( ) ( ) ( ) ( )

$n = 5$ $\quad \binom{5}{0} \; \binom{5}{1} \; \binom{5}{2} \; \binom{5}{3} \; \binom{5}{4} \; \binom{5}{5}$ $\qquad$ ( ) ( ) ( ) ( ) ( ) ( )

Pascal's Triangle

$n = 0$ $\quad$ ( ) $r = 0$

$n = 1$ $\quad$ ( ) ( ) $r = 1$

$n = 2$ $\quad$ ( ) ( ) ( ) $r = 2$

$n = 3$ $\quad$ ( ) ( ) ( ) ( ) $r = 3$

$n = 4$ $\quad$ ( ) ( ) ( ) ( ) ( ) $r = 4$

$n = 5$ $\quad$ ( ) ( ) ( ) ( ) ( ) ( ) $r = 5$

$n = 6$ $\quad$ ( ) ( ) ( ) ( ) ( ) ( ) ( ) $r = 6$

$n = 7$ $\quad$ ( ) ( ) ( ) ( ) ( ) ( ) ( ) ( ) $r = 7$

$n = 8$ $\quad$ ( ) ( ) ( ) ( ) ( ) ( ) ( ) ( ) ( ) $r = 8$

$n = 9$ $\quad$ ( ) ( ) ( ) ( ) ( ) ( ) ( ) ( ) ( ) ( ) $r = 9$

Pascal's Triangle

$$\binom{n}{r} \qquad \binom{n}{r} = \frac{n!}{r!(n-r)!}$$

$$\begin{array}{c}
\binom{0}{0} \\
\binom{1}{0} \quad \binom{1}{1} \\
\binom{2}{0} \quad \binom{2}{1} \quad \binom{2}{2} \\
\binom{3}{0} \quad \binom{3}{1} \quad \binom{3}{2} \quad \binom{3}{3} \\
\binom{4}{0} \quad \binom{4}{1} \quad \binom{4}{2} \quad \binom{4}{3} \quad \binom{4}{4} \\
\binom{5}{0} \quad \binom{5}{1} \quad \binom{5}{2} \quad \binom{5}{3} \quad \binom{5}{4} \quad \binom{5}{5}
\end{array}
=
\begin{array}{c}
1 \\
1 \quad 1 \\
1 \quad 2 \quad 1 \\
1 \quad 3 \quad 3 \quad 1 \\
1 \quad 4 \quad 6 \quad 4 \quad 1 \\
1 \quad 5 \quad 10 \quad 10 \quad 5 \quad 1
\end{array}$$

Numerical Values

Pascal's Triangle

$$\binom{n}{r} = \frac{n!}{r!(n-r)!}$$

$$\begin{array}{c}
1 \\
1 \quad 1 \\
1 \quad 2 \quad 1 \\
1 \quad 3 \quad 3 \quad 1 \\
1 \quad 4 \quad 6 \quad 4 \quad 1 \\
1 \quad 5 \quad 10 \quad 10 \quad 5 \quad 1
\end{array}
\qquad
\begin{array}{c}
1 \\
1 \quad 1 \\
1 \qquad\quad 1 \\
1 \qquad\qquad\quad 1 \\
1 \qquad\qquad\qquad\quad 1 \\
1 \qquad\qquad\qquad\qquad\qquad 1
\end{array}$$

Pascal's Triangle

$$
\begin{array}{ccccccccccccccccccc}
 & & & & & & & & & 1 & & & & & & & & & \\
 & & & & & & & & 1 & & 1 & & & & & & & & \\
 & & & & & & & 1 & & & & 1 & & & & & & & \\
 & & & & & & 1 & & & & & & 1 & & & & & & \\
 & & & & & 1 & & & & & & & & 1 & & & & & \\
 & & & & 1 & & & & & & & & & & 1 & & & & \\
 & & & 1 & & & & & & & & & & & & 1 & & & \\
 & & 1 & & & & & & & & & & & & & & 1 & & \\
 & 1 & & & & & & & & & & & & & & & & 1 & \\
1 & & & & & & & & & & & & & & & & & & 1
\end{array}
$$

Pascal's Triangle

$\binom{n}{r}$

$$\binom{n}{r} = \frac{n!}{r!(n-r)!}$$

Numerical Values

$$
\begin{array}{cccccc}
\binom{0}{0} \\
\binom{1}{0} & \binom{1}{1} \\
\binom{2}{0} & \binom{2}{1} & \binom{2}{2} \\
\binom{3}{0} & \binom{3}{1} & \binom{3}{2} & \binom{3}{3} \\
\binom{4}{0} & \binom{4}{1} & \binom{4}{2} & \binom{4}{3} & \binom{4}{4} \\
\binom{5}{0} & \binom{5}{1} & \binom{5}{2} & \binom{5}{3} & \binom{5}{4} & \binom{5}{5}
\end{array}
=
\begin{array}{cccccc}
1 \\
1 & 1 \\
1 & 2 & 1 \\
1 & 3 & 3 & 1 \\
1 & 4 & 6 & 4 & 1 \\
1 & 5 & 10 & 10 & 5 & 1
\end{array}
$$