

DATA605 - Discussion 6

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Discussion 6

4 Using the relation Equation 3.1 write a program to compute Pascal's triangle, putting the results in a matrix. Have your program print the triangle for $n = 10$ (Chapter 3, Pg. 113)

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

```
pascals_triangle <- function(height){  
  #define a matrix to hold our results with height + 1 rows and columns  
  m <- matrix(nrow=height+1,ncol = height+1)  
  #starting at row 1 loop until you reach the height +1  
  for (n in 1:(height+1)) {  
    row <- "" #define empty string as row  
    for(j in 1:n){#loop across columns until you reach row number  
      if(j == 1 || j == n){#if first column or last column set value to 1  
        m[n,j] <- 1  
        row <- paste(row, m[n,j], sep = ' ')  
      }  
      else{ #else apply formula 3.1 by looking up previous values from matrix and doing simple addition  
        m[n,j] <- m[n-1, j] + m[n-1,j-1]  
        row <- paste(row,m[n,j], sep = ' ')  
      }  
    }  
    print(row)  
  }  
}  
pascals_triangle(10)
```

```
## [1] " 1"  
## [1] " 1 1"  
## [1] " 1 2 1"  
## [1] " 1 3 3 1"  
## [1] " 1 4 6 4 1"  
## [1] " 1 5 10 10 5 1"  
## [1] " 1 6 15 20 15 6 1"  
## [1] " 1 7 21 35 35 21 7 1"  
## [1] " 1 8 28 56 70 56 28 8 1"  
## [1] " 1 9 36 84 126 126 84 36 9 1"  
## [1] " 1 10 45 120 210 252 210 120 45 10 1"
```

```
pascalTriangle <- function(h) {
  lapply(0:h, function(i) choose(i, 0:i))
}
pascalTriangle(10)
```

```
## [[1]]
## [1] 1
##
## [[2]]
## [1] 1 1
##
## [[3]]
## [1] 1 2 1
##
## [[4]]
## [1] 1 3 3 1
##
## [[5]]
## [1] 1 4 6 4 1
##
## [[6]]
## [1] 1 5 10 10 5 1
##
## [[7]]
## [1] 1 6 15 20 15 6 1
##
## [[8]]
## [1] 1 7 21 35 35 21 7 1
##
## [[9]]
## [1] 1 8 28 56 70 56 28 8 1
##
## [[10]]
## [1] 1 9 36 84 126 126 84 36 9 1
##
## [[11]]
## [1] 1 10 45 120 210 252 210 120 45 10 1
```