Project 2

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Contents

1 Python Code

```
from math import factorial

def Pascal(numRows):
    triangle=""
    for i in range(numRows+1):
        for j in range(numRows-i+1):
            triangle+="  "
        # loop to get elements of row i
        for j in range(i+1):
            # nCr = n!/((n-r)!*r!)
            num=factorial(i)
            den=factorial(j)*factorial(i-j)
            triangle+=( str(num//den) + "   " )

        triangle+="\n"

    return triangle
```

2 Print Pascal's Triangle

2.1 $(s-t)^{10}$

```
Pascal(10)
```

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

Binomial Expansion: $s^{10}-10s^9t+45s^8t^2-120s^7t^3+210s^6t^4-252s^5t^5+210s^4t^6-120s^3t^7+45s^2t^8-10st^9+t^{10}$

2.2 $(2x+y)^5$

```
Pascal(5)
```

```
          1
        1   1
      1   2   1
    1   3   3   1
  1   4   6   4   1
1   5   10   10   5   1
```

Binomial Expansion: $2x^5+5(2x)^4y+10(2x)^3y^2+10(2x)^2y^3+5(2x)y^4+y^5$

3 List elements of a power set

3.1 Python Code

```
from itertools import chain, combinations

def powerset(given):
    s=list(given)
    result=chain.from_iterable(combinations(s,r) for r in
    ↪  range(len(s)+1))
    return list(result)
```

3.2 (a,b,c,d,e)

```
my_set={'a','b','c','d','e'}
seta=powerset(my_set)
seta
```

```
[(), ('b',), ('a',), ('d',), ('e',), ('c',), ('b', 'a'), ('b',
↪  'd'), ('b', 'e'), ('b', 'c'), ('a', 'd'), ('a', 'e'),
↪  ('a', 'c'), ('d', 'e'), ('d', 'c'), ('e', 'c'), ('b', 'a',
↪  'd'), ('b', 'a', 'e'), ('b', 'a', 'c'), ('b', 'd', 'e'),
↪  ('b', 'd', 'c'), ('b', 'e', 'c'), ('a', 'd', 'e'), ('a',
↪  'd', 'c'), ('a', 'e', 'c'), ('d', 'e', 'c'), ('b', 'a',
↪  'd', 'e'), ('b', 'a', 'd', 'c'), ('b', 'a', 'e', 'c'),
↪  ('b', 'd', 'e', 'c'), ('a', 'd', 'e', 'c'), ('b', 'a',
↪  'd', 'e', 'c')]
```

```
len(seta)
```

```
32
```

3.3 $(2, 4, 6, 8, 10, one)$

```
my_set={2,4,6,8,10,'one'}
setb=powerset(my_set)
setb
```

```
[(), (2,), (4,), (6,), (8,), (10,), ('one',), (2, 4), (2, 6),
↪  (2, 8), (2, 10), (2, 'one'), (4, 6), (4, 8), (4, 10), (4,
↪  'one'), (6, 8), (6, 10), (6, 'one'), (8, 10), (8, 'one'),
↪  (10, 'one'), (2, 4, 6), (2, 4, 8), (2, 4, 10), (2, 4,
↪  'one'), (2, 6, 8), (2, 6, 10), (2, 6, 'one'), (2, 8, 10),
↪  (2, 8, 'one'), (2, 10, 'one'), (4, 6, 8), (4, 6, 10), (4,
↪  6, 'one'), (4, 8, 10), (4, 8, 'one'), (4, 10, 'one'), (6,
↪  8, 10), (6, 8, 'one'), (6, 10, 'one'), (8, 10, 'one'), (2,
↪  4, 6, 8), (2, 4, 6, 10), (2, 4, 6, 'one'), (2, 4, 8, 10),
↪  (2, 4, 8, 'one'), (2, 4, 10, 'one'), (2, 6, 8, 10), (2, 6,
↪  8, 'one'), (2, 6, 10, 'one'), (2, 8, 10, 'one'), (4, 6, 8,
↪  10), (4, 6, 8, 'one'), (4, 6, 10, 'one'), (4, 8, 10,
↪  'one'), (6, 8, 10, 'one'), (2, 4, 6, 8, 10), (2, 4, 6, 8,
↪  'one'), (2, 4, 6, 10, 'one'), (2, 4, 8, 10, 'one'), (2, 6,
↪  8, 10, 'one'), (4, 6, 8, 10, 'one'), (2, 4, 6, 8, 10,
↪  'one')]
```

```
len(setb)
```

```
64
```

3.4 $(a, 1, b, 2, c, 3, 6, 9, 12, 15, 4, 8, 16)$

```
my_set={'a', 1, 'b', 2, 'c', 3, 6, 9, 12, 15, 4, 8, 16}
setc=powerset(my_set)
len(setc)
```

```
8192
```

3.5 $(3, 1, 24, 5, 9, 10, 11, 16, 29, 37, 54, 42, 18)$

```
my_set={3, 1, 24, 5, 9, 10, 11, 16, 29, 37, 54, 42, 18}
setd=powerset(my_set)
len(setd)
```

```
8192
```

3.6 Function to find powerset length

In general, the length of a powerset will be 2^n, where n is the number of elements in a set.