

Final Exam

Date/Time: 2023.06.13 08:10 – 09:00

(程式檔命名學號_final.py，上傳至 Moodle FinalExam 上傳區)

Problem: Pascal's Triangles

[上機寫程式部分]

Write a Python program to generate and print out the Pascal's triangle using *recursion*. You must read the [Wikipedia page](#) for information about Pascal's triangle, paying special attention to how the triangle is constructed, as seen [here](#). Please directly refer to the following sample input/output to find what should be specified by the user, and what should be printed out accordingly.

We allow you to utilize ChatGPT, and the key to using ChatGPT effectively lies in providing precise prompts to generate accurate code that meets the problem requirements. You must have tried feeding the problem statements of quits directly into ChatGPT before, letting it generate code for you! Hence, for this task, we will not provide an exact problem statement. Instead, we directly provide you the sample input/output to let you practice creating proper prompt text for ChatGPT. This problem is not difficult and you should be able to accomplish it without relying on ChatGPT; however, if you do succeed in solving it with ChatGPT, make sure you understand how to write the code by yourself today.

Sample Input/Output

(以下是你程式執行後須印出的結果)

```
c:\workspace>python final.py
Height of Pascal's triangle: 1
Direction of triangle ('normal', 'reversed', 'left' or 'right'): normal
1

c:\workspace>python final.py
Height of Pascal's triangle: 5
Direction of triangle ('normal', 'reversed', 'left' or 'right'): normal
1
1 1
1 2 1
1 3 3 1
1 4 6 4 1

c:\workspace>python final.py
Height of Pascal's triangle: -1
Invalid input. Please enter an integer greater than or equal to 1.
Height of Pascal's triangle: 0
Invalid input. Please enter an integer greater than or equal to 1.
Height of Pascal's triangle: 8
Direction of triangle ('normal', 'reversed', 'left' or 'right'): xdx
Invalid input for direction. Please enter 'normal', 'reversed', 'left' or 'right'.
Direction of triangle ('normal', 'reversed', 'left' or 'right'): reversed
1 7 21 35 35 21 7 1
1 6 15 20 15 6 1
1 5 10 10 5 1
1 4 6 4 1
1 3 3 1
1 2 1
1 1
1
```

```

c:\workspace>python final.py
Height of Pascal's triangle: 15
Direction of triangle ('normal', 'reversed', 'left' or 'right'): normal
      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
1 11 55 165 330 462 462 330 165 55 11 1
1 12 66 220 495 792 924 792 495 220 66 12 1
1 13 78 286 715 1287 1716 1716 1287 715 286 78 13 1
1 14 91 364 1001 2002 3003 3432 3003 2002 1001 364 91 14 1

c:\workspace>python final.py
Height of Pascal's triangle: 15
Direction of triangle ('normal', 'reversed', 'left' or 'right'): reversed
1 14 91 364 1001 2002 3003 3432 3003 2002 1001 364 91 14 1
 1 13 78 286 715 1287 1716 1716 1287 715 286 78 13 1
 1 12 66 220 495 792 924 792 495 220 66 12 1
 1 11 55 165 330 462 462 330 165 55 11 1
 1 10 45 120 210 252 210 120 45 10 1
 1 9 36 84 126 126 84 36 9 1
 1 8 28 56 70 56 28 8 1
 1 7 21 35 35 21 7 1
 1 6 15 20 15 6 1
 1 5 10 10 5 1
 1 4 6 4 1
 1 3 3 1
 1 2 1
 1 1
 1

c:\workspace>python final.py
Height of Pascal's triangle: 15
Direction of triangle ('normal', 'reversed', 'left' or 'right'): left
      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
1 11 55 165 330 462 462 330 165 55 11 1
1 12 66 220 495 792 924 792 495 220 66 12 1
1 13 78 286 715 1287 1716 1716 1287 715 286 78 13 1
1 14 91 364 1001 2002 3003 3432 3003 2002 1001 364 91 14 1

c:\workspace>python final.py
Height of Pascal's triangle: 15
Direction of triangle ('normal', 'reversed', 'left' or 'right'): right
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
1 11 55 165 330 462 462 330 165 55 11 1
1 12 66 220 495 792 924 792 495 220 66 12 1
1 13 78 286 715 1287 1716 1716 1287 715 286 78 13 1
1 14 91 364 1001 2002 3003 3432 3003 2002 1001 364 91 14 1

c:\workspace>

```

(繳交是交 final.py 檔，不是交截圖)

Need to write comments in your code.