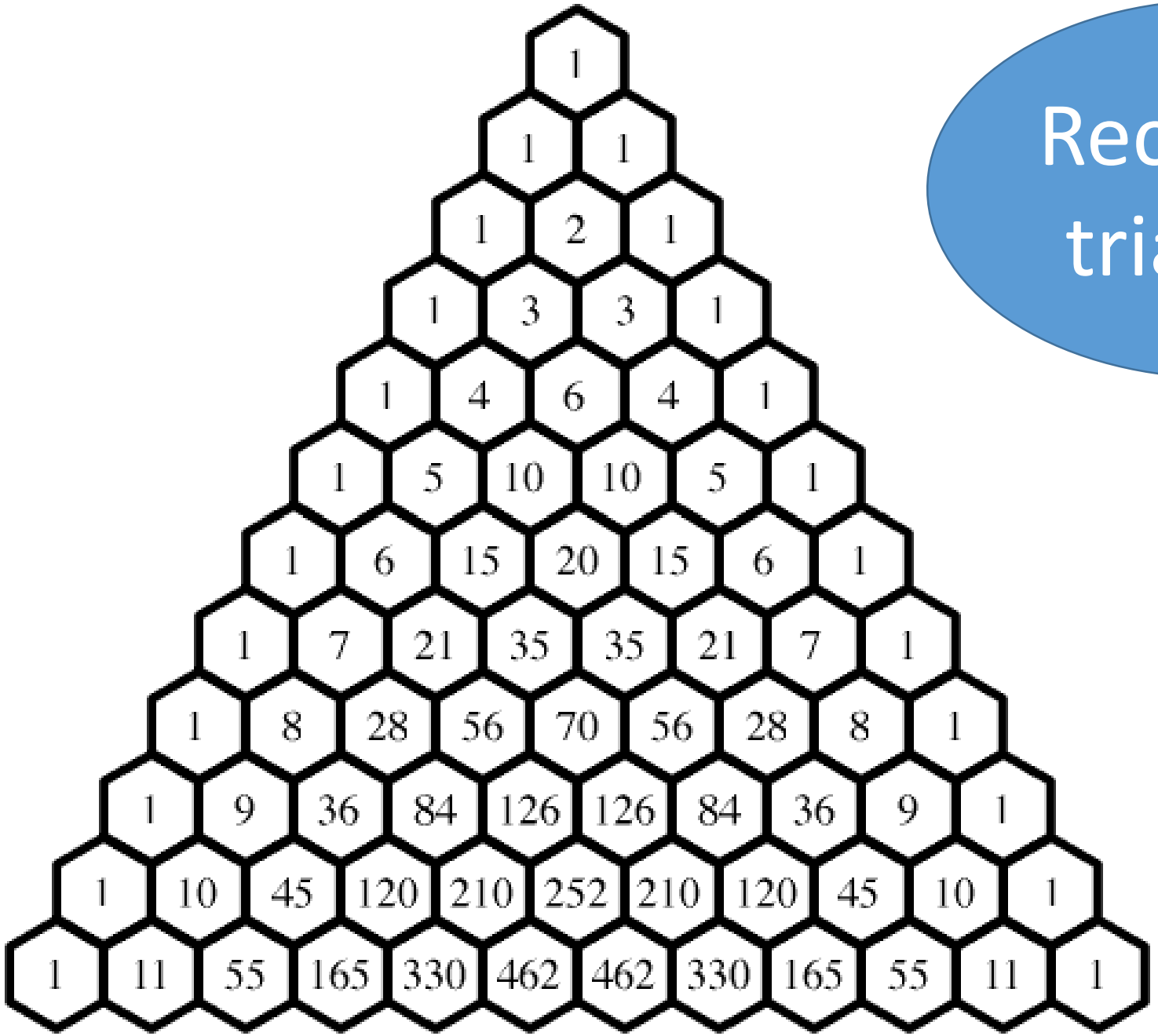
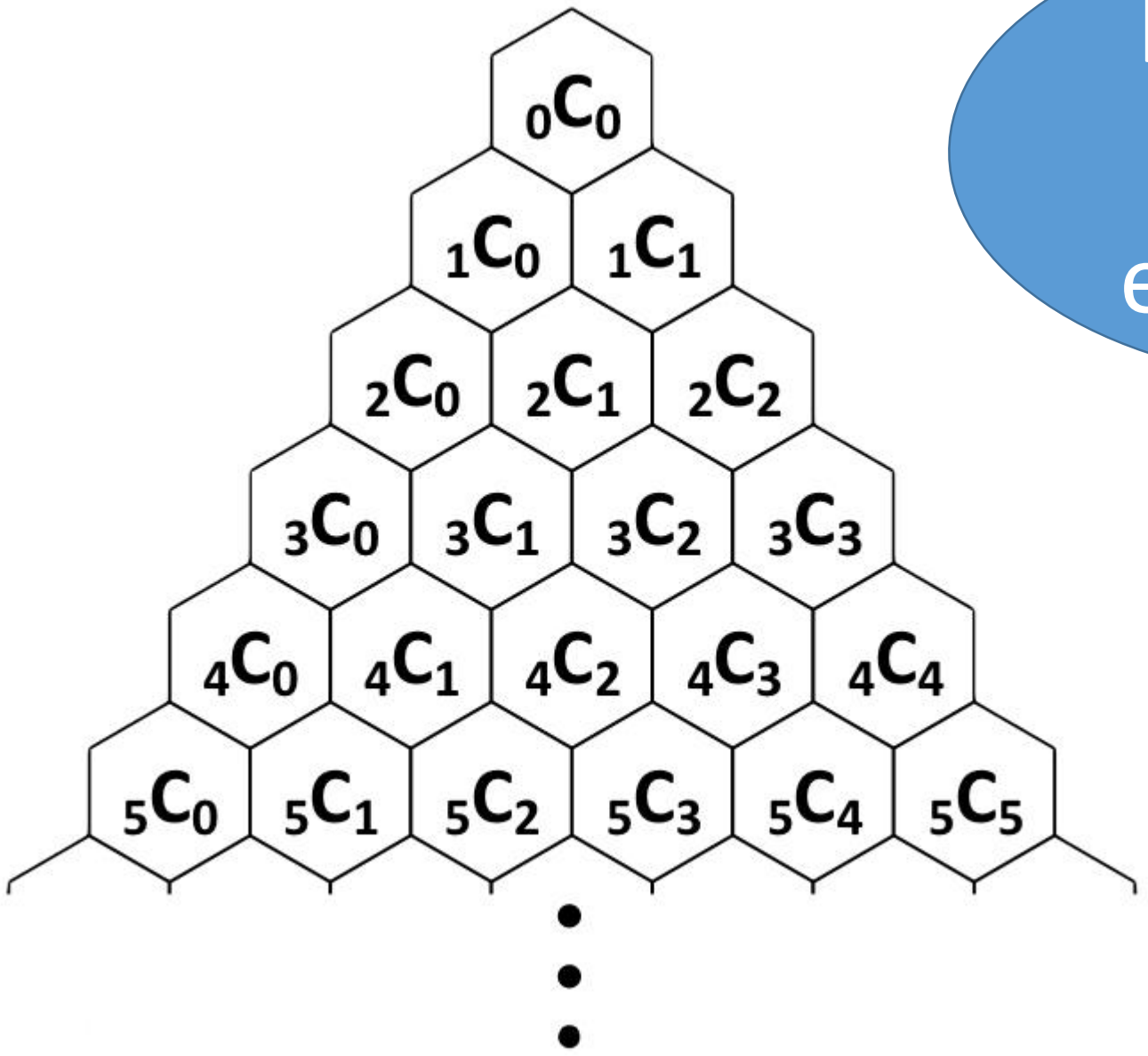
Applying Pascal’s Method



Recall the triangle.

Recall the triangle equations.

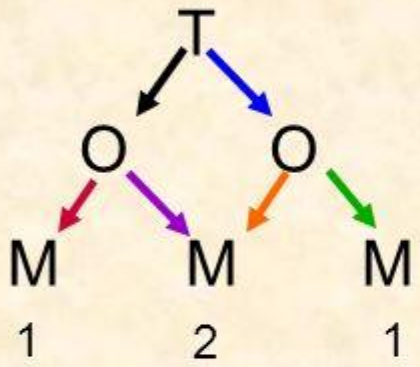


Fun with Pascal's Triangle

Suppose your name is Tom

Arrange your name in Pascal's Triangle form with one letter per line.

Find how many different paths you can take to spell your name.



1 path ends with the M on the left

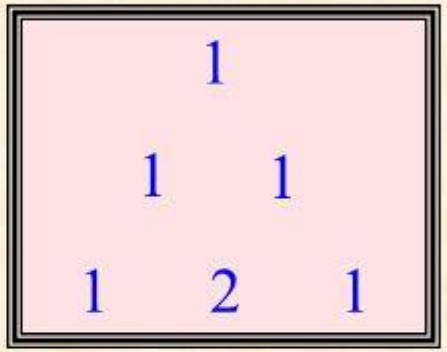
2 paths end with the M in the middle

1 path ends with the M on the right.

There are 4 paths:

black, red; black purple;

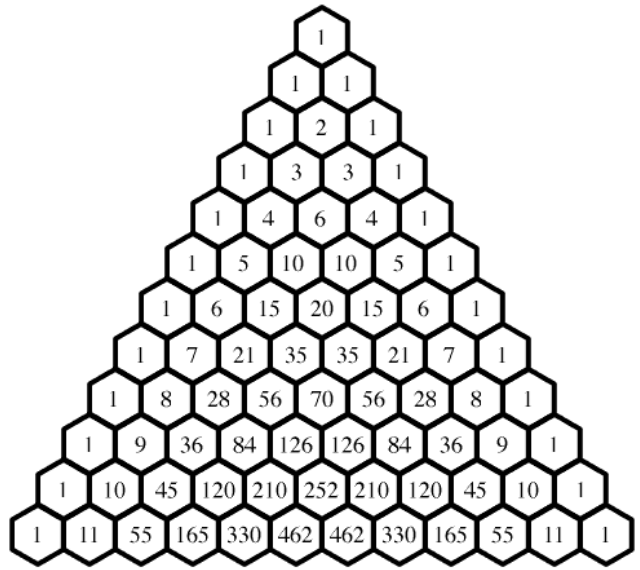
blue orange; blue, green



The name arrangement is like Pascal's Triangle.

The number of letters in your name determines how many rows you use.

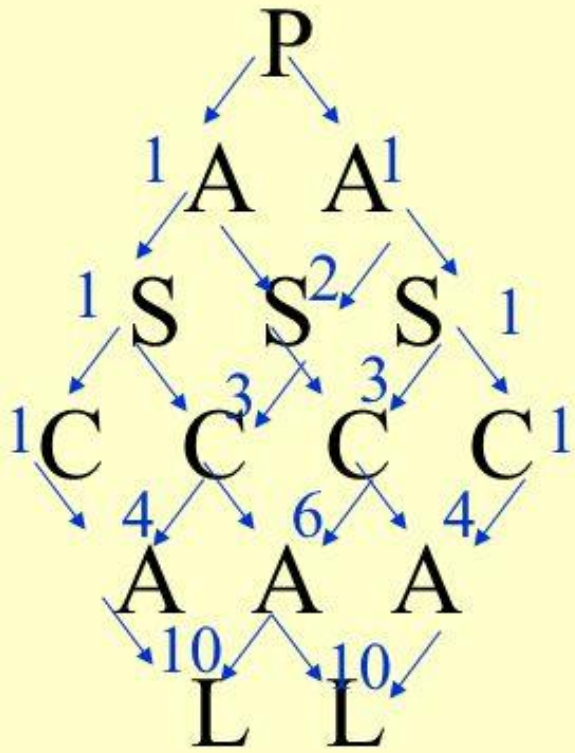
The sum of the numbers in the last row tells you how many paths will spell your name.



Example 1

Determine how many different paths will spell PASCAL if you start at the top and proceed to the next row by moving diagonally left or right.

Write the triangle coefficients



There are 10+10 = 20 paths that will spell PASCAL.

F

U U

N N N

D D D D

A A A A A

M M M M M M

E E E E E E E

N N N N N N

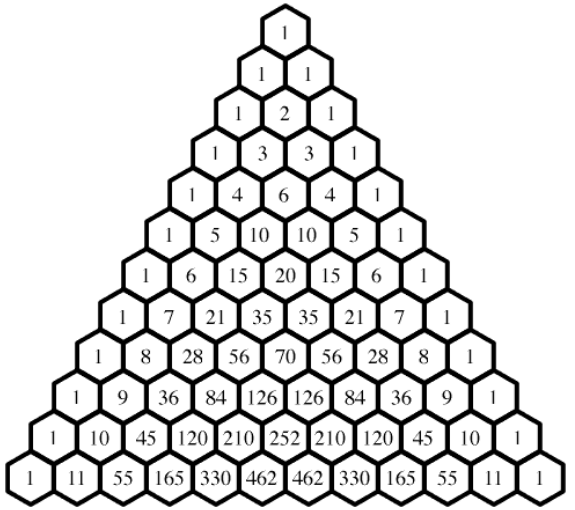
T T T T T

A A A A

L L L

S S

How many ways can you spell fundamental?



Shamrock Paths:

- How many different ways can you spell Shamrock?
- Explain how you know your answer is correct.

S

H H

A A A

M M M M

R R R R R

O O O O O O

C C C C C C C

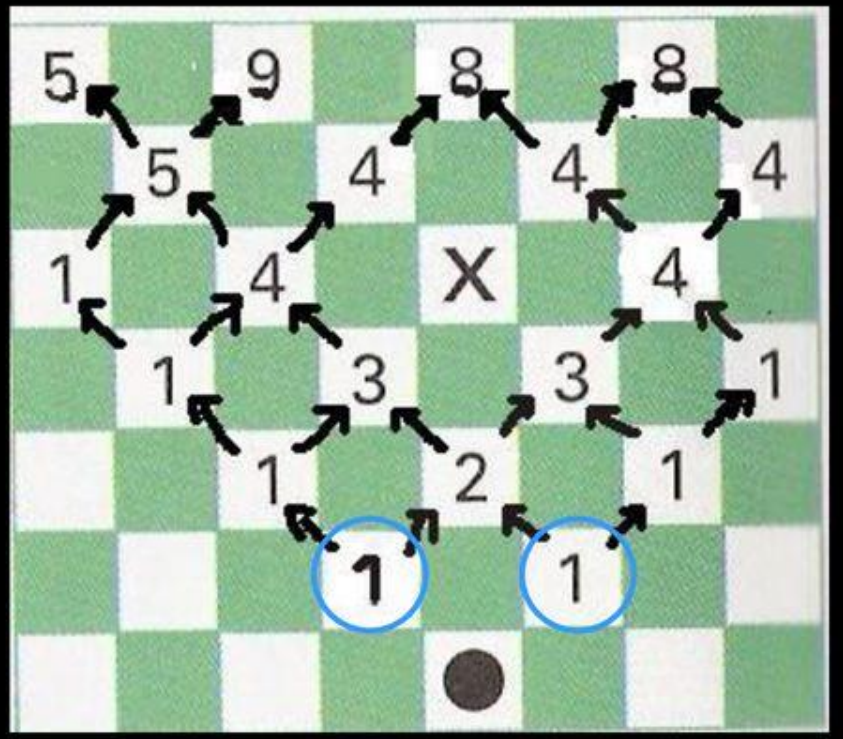
K K K K K K K K

2

Checkers Problems

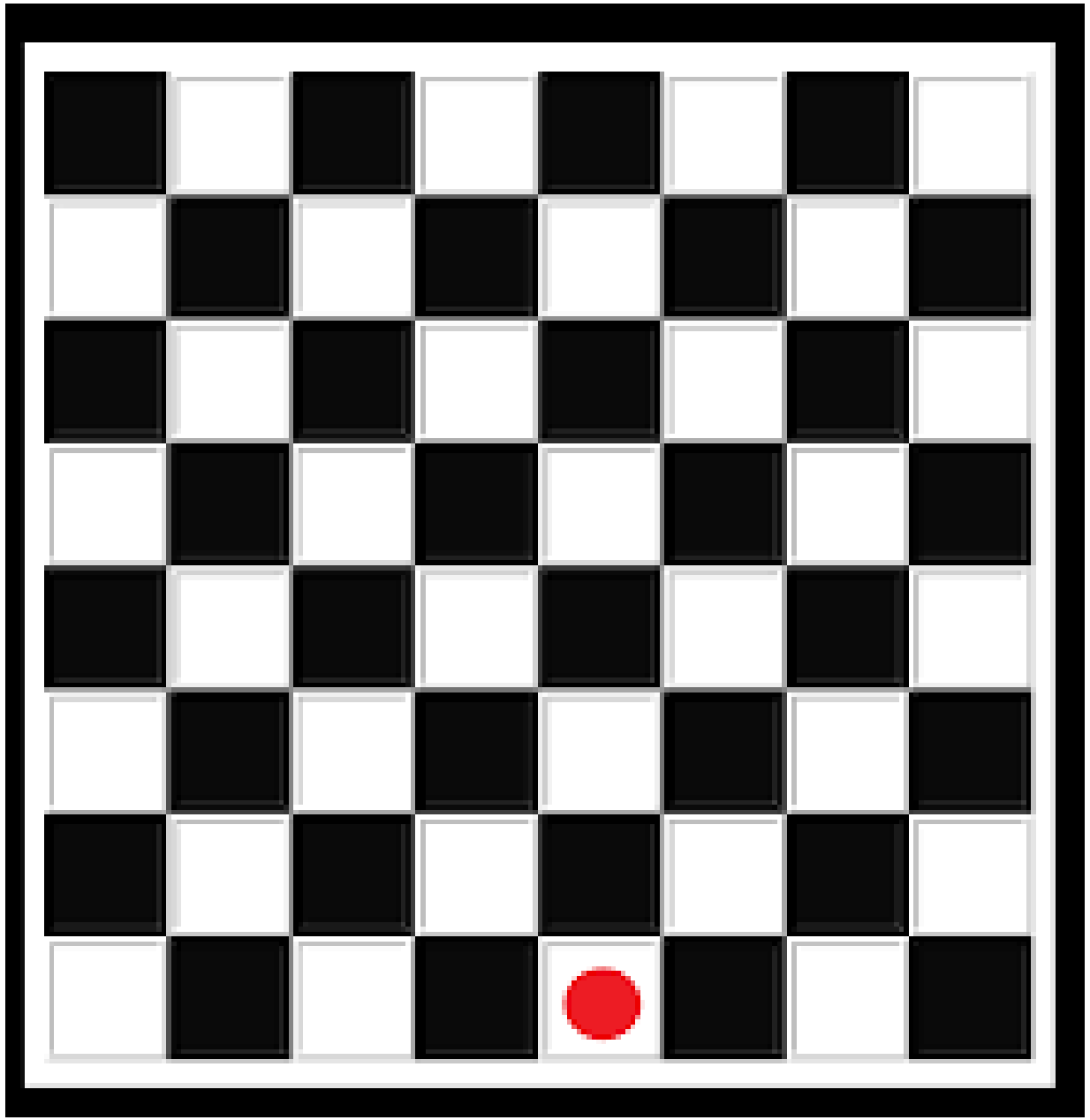
Example 2: Counting paths on a Checkerboard.

On the checkerboard shown, the checker can travel only diagonally upward. It cannot move through a square containing an X. Determine the number of paths the checker's current position to the top of the board?

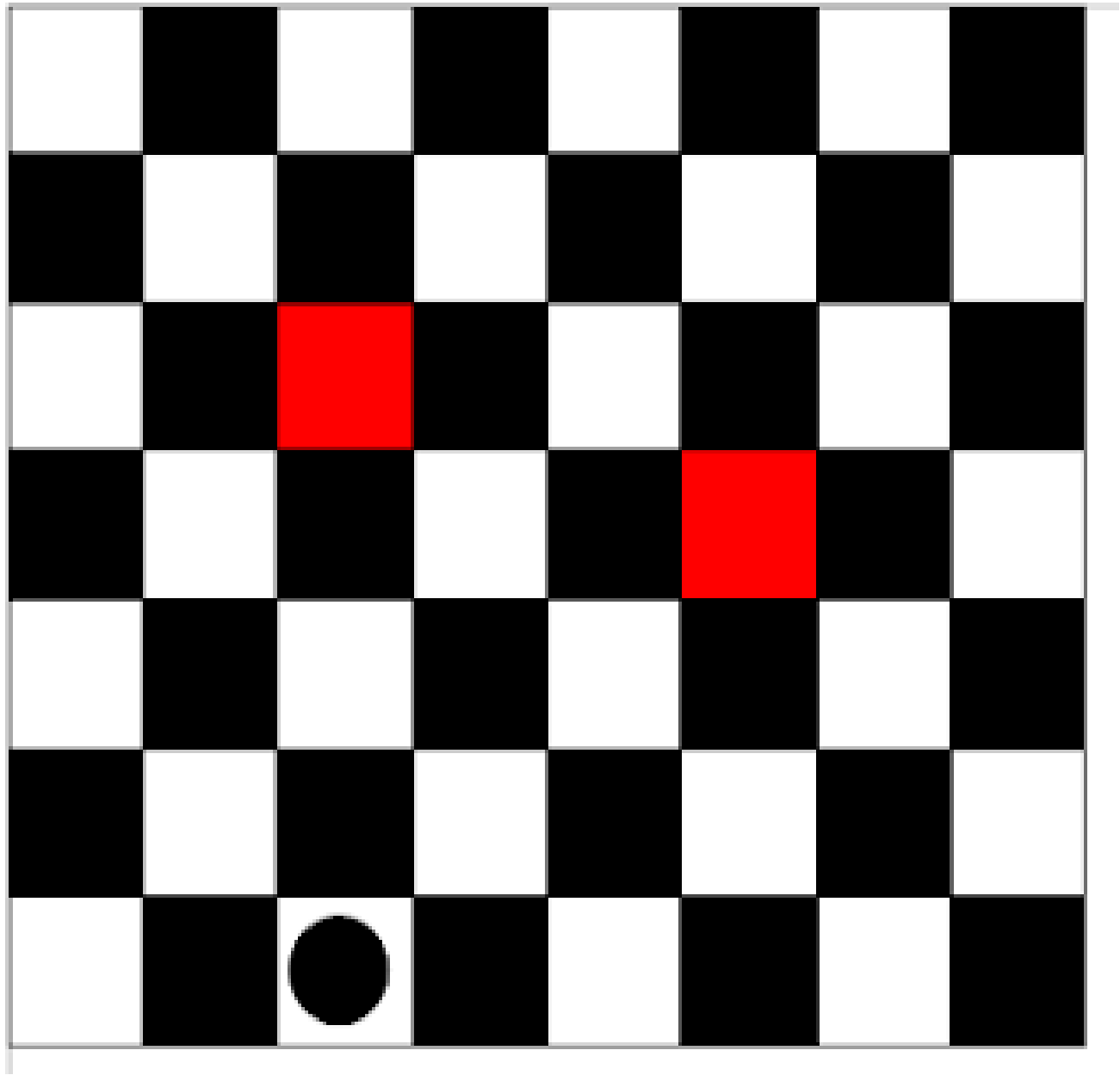


1. There is one path possible into each of the squares diagonally adjacent to the checker's starting position.
2. From the second row, there are 4 paths to the third row: one path to the 3rd square from the left, two to the 5th square and one to the 7th square.
3. The square containing an X gets a zero or no number since there are no paths through this blocked square.

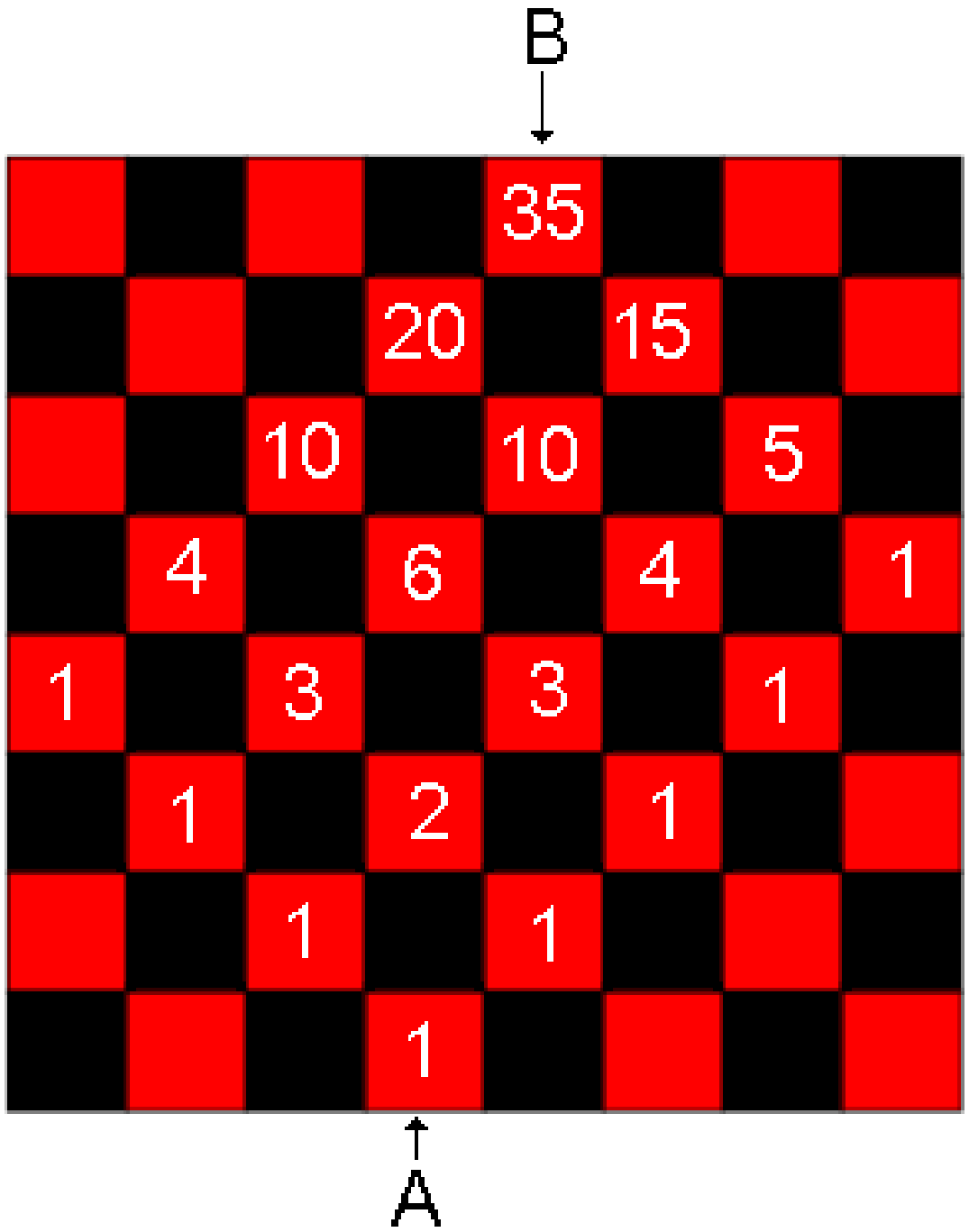
Therefore the answer is 5 + 9 + 8 + 8 = 30



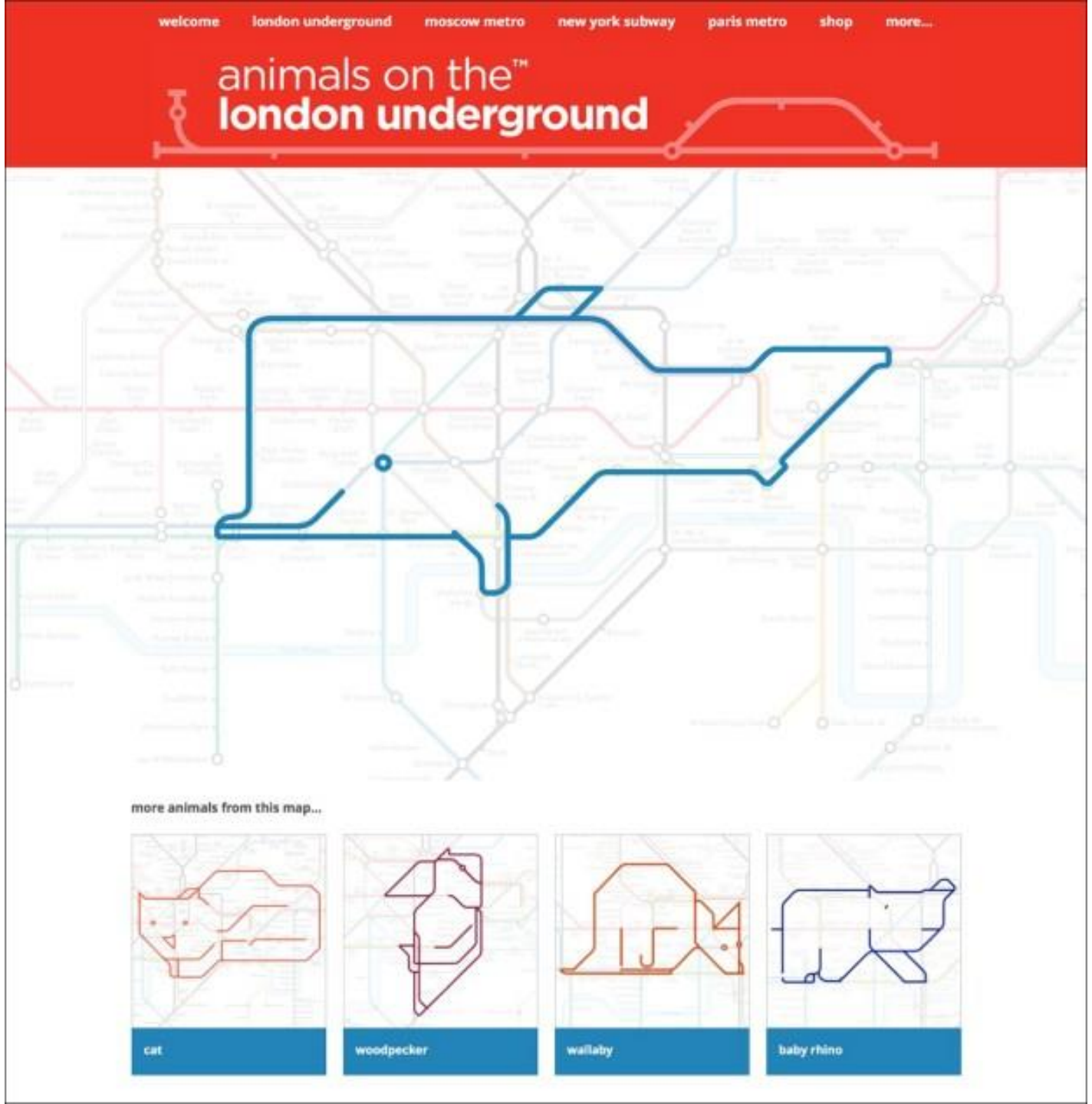
A checker is placed on a checkerboard as shown. The checker may move diagonally upward. How many paths are there to the top of the board?



A checker is placed on a checkerboard as shown. The checker may move diagonally upward. Although it cannot move into a square with a red square, the checker may jump over the X into the diagonally opposite square. How many paths are there to the top of the board?



What question goes with this solution?



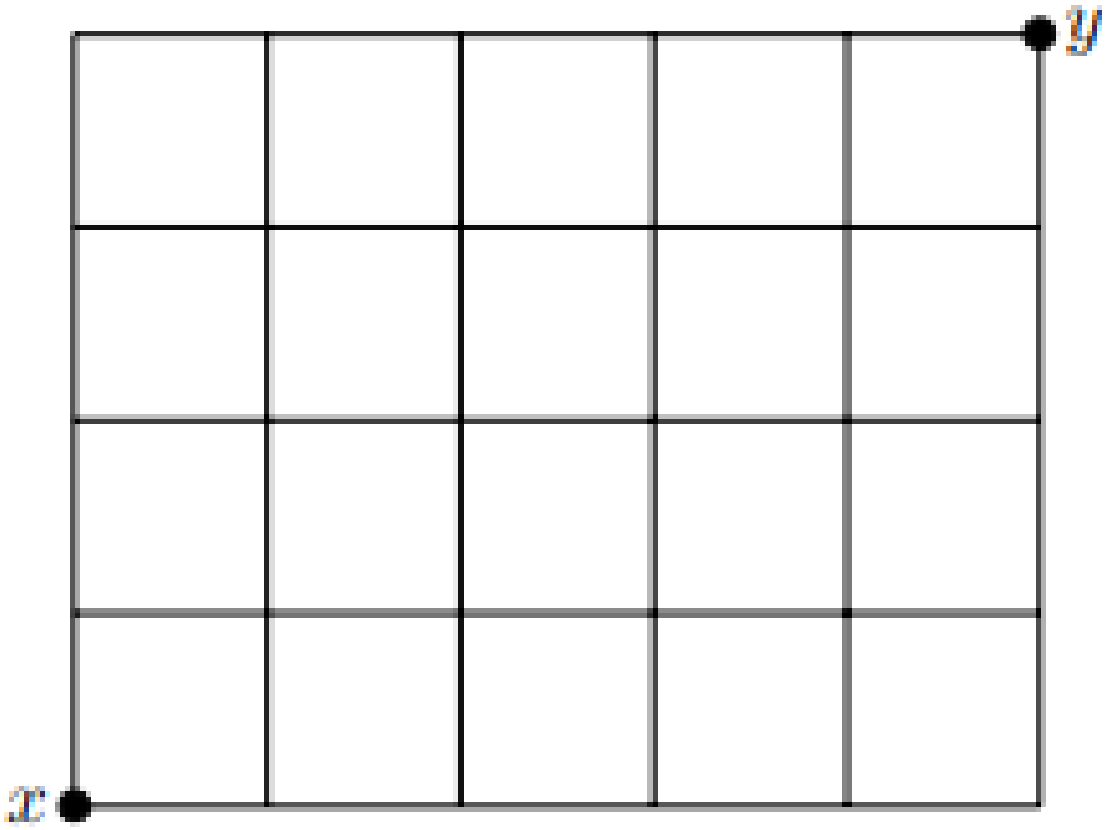
3

Routes Problems

1	1	1	1	1	1
1	2	3	4	5	6
1	3	6	10	15	21
1	4	10	20	35	56
1	5	15	35	70	126
1	6	21	56	126	252

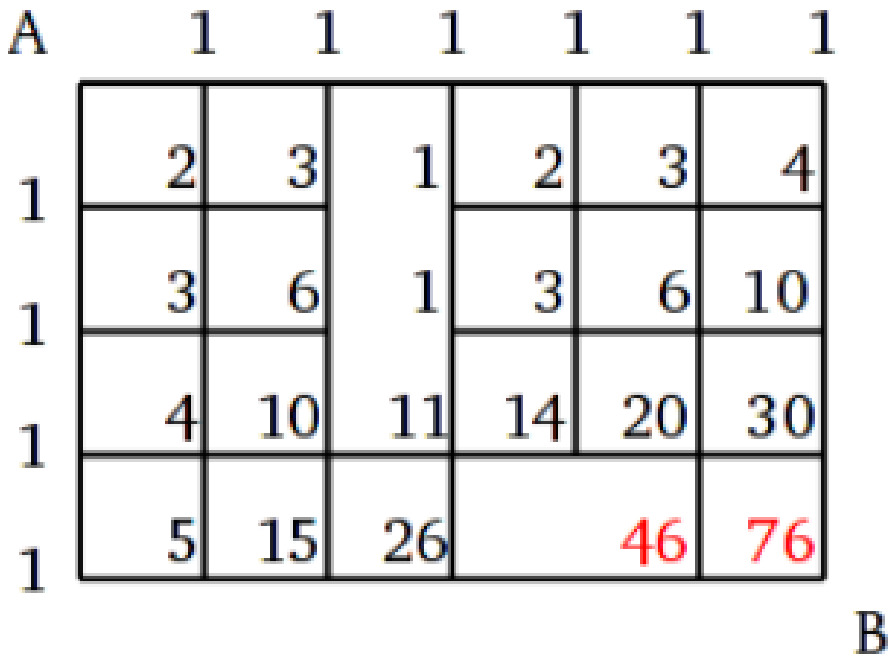
How many routes (moving to the right and down) can the cyclist take to get to school?

How many routes from x to y moving only to the right and up?



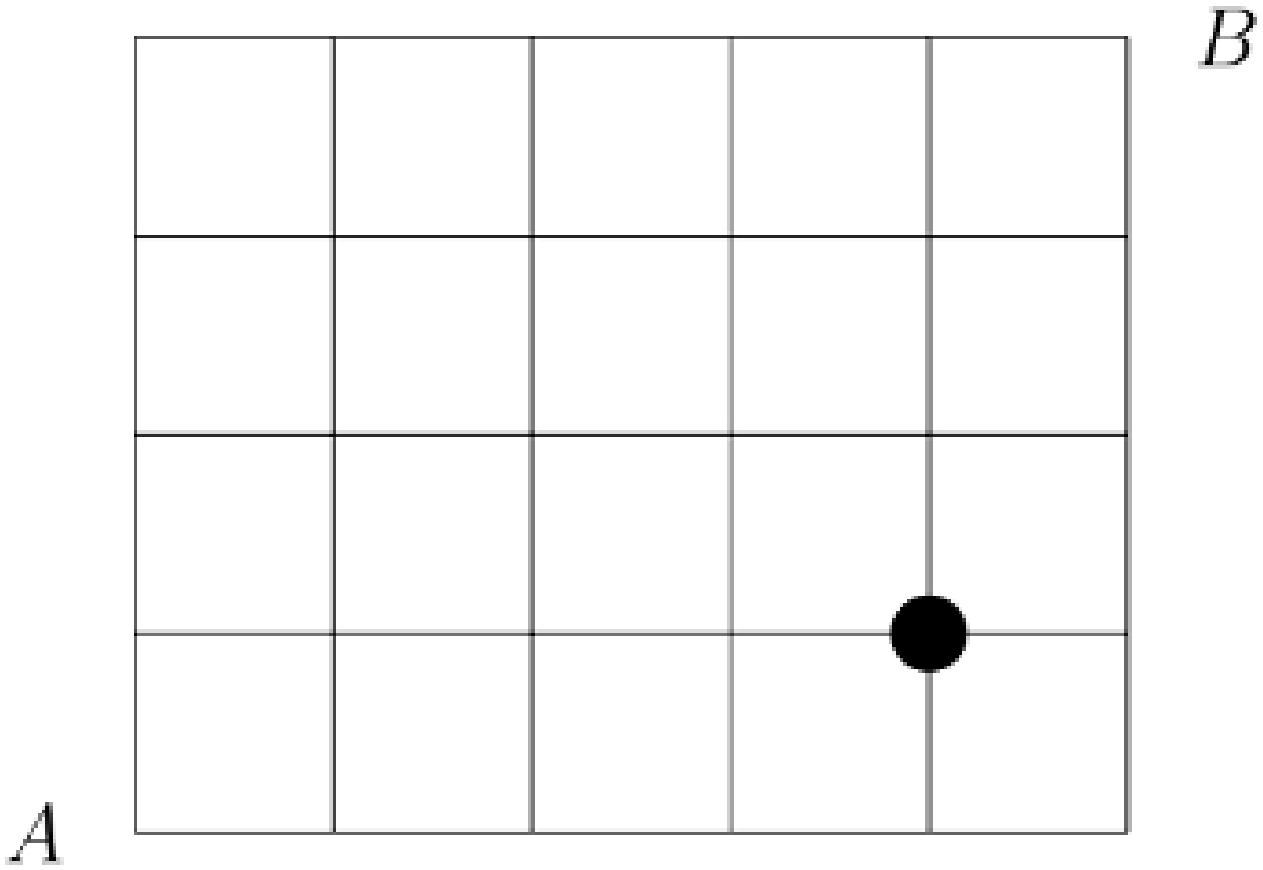
Example

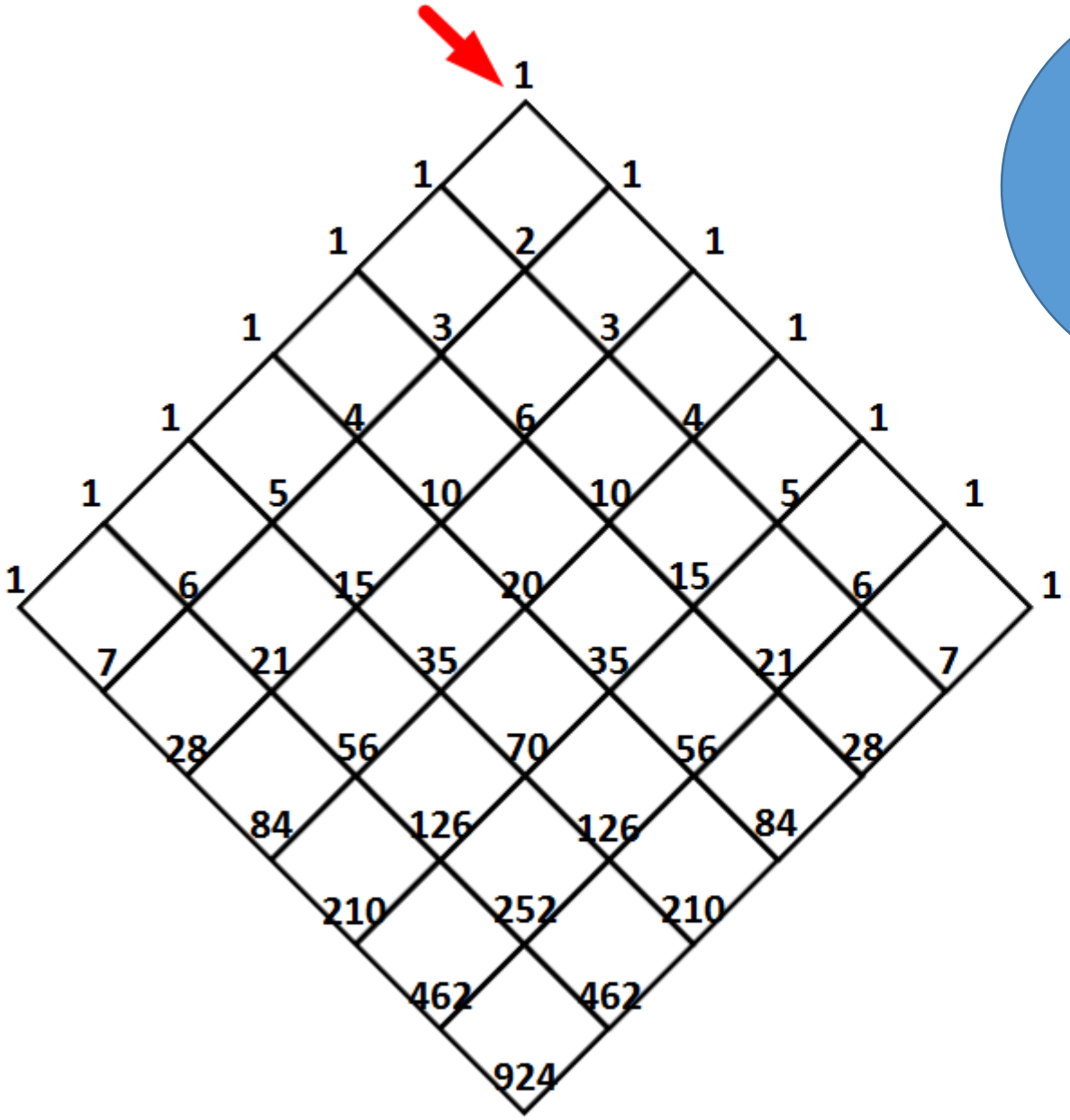
How many paths lead from A to B, moving only east and south?



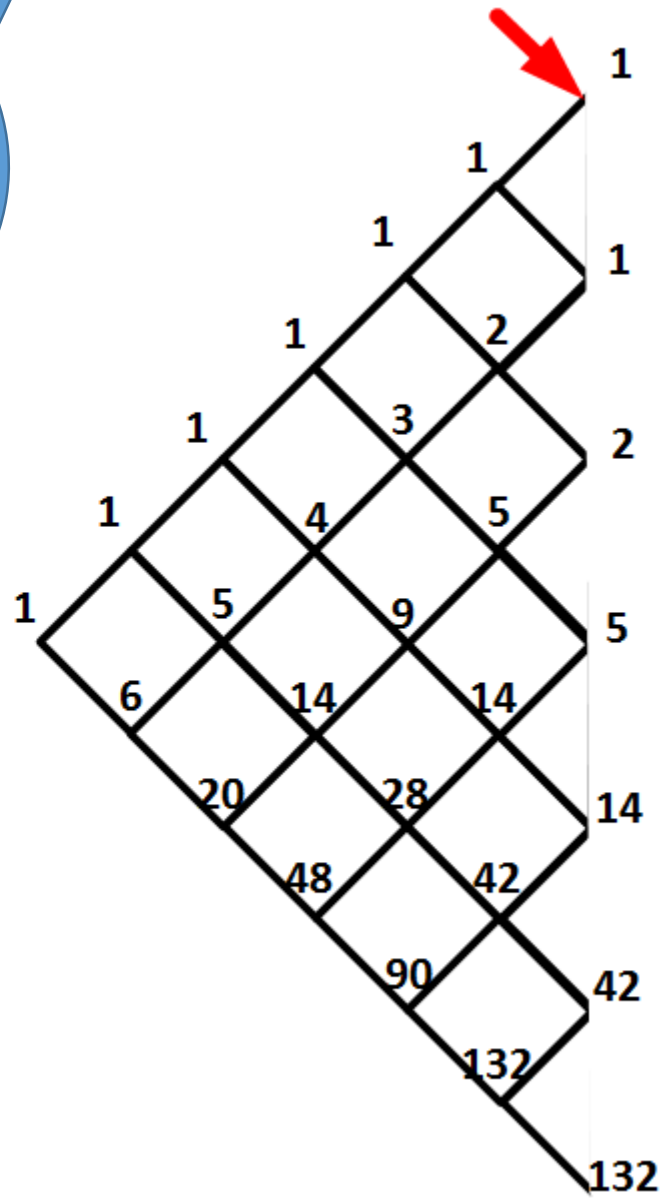
There are 76 paths from A to B.

How many routes that move right and up start at A (your home) and go to B (the school) stopping by your favourite coffee shop (the dot)?





How triangles work:



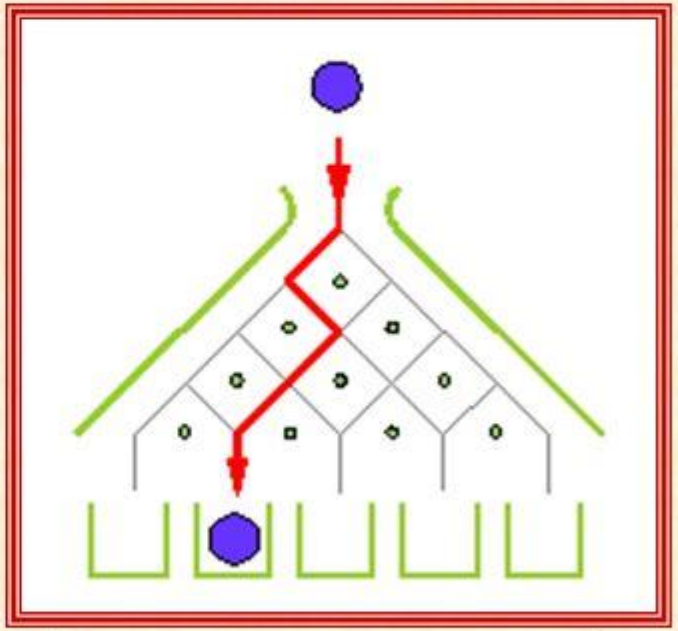

4
PLINKO
100
500
1000
0
10000
0
1000
500
100

The Pinball Game

What is the probability that the ball will end up in any given bin?

The gray lines indicate the paths. There are 5 bins where the marble can finish.

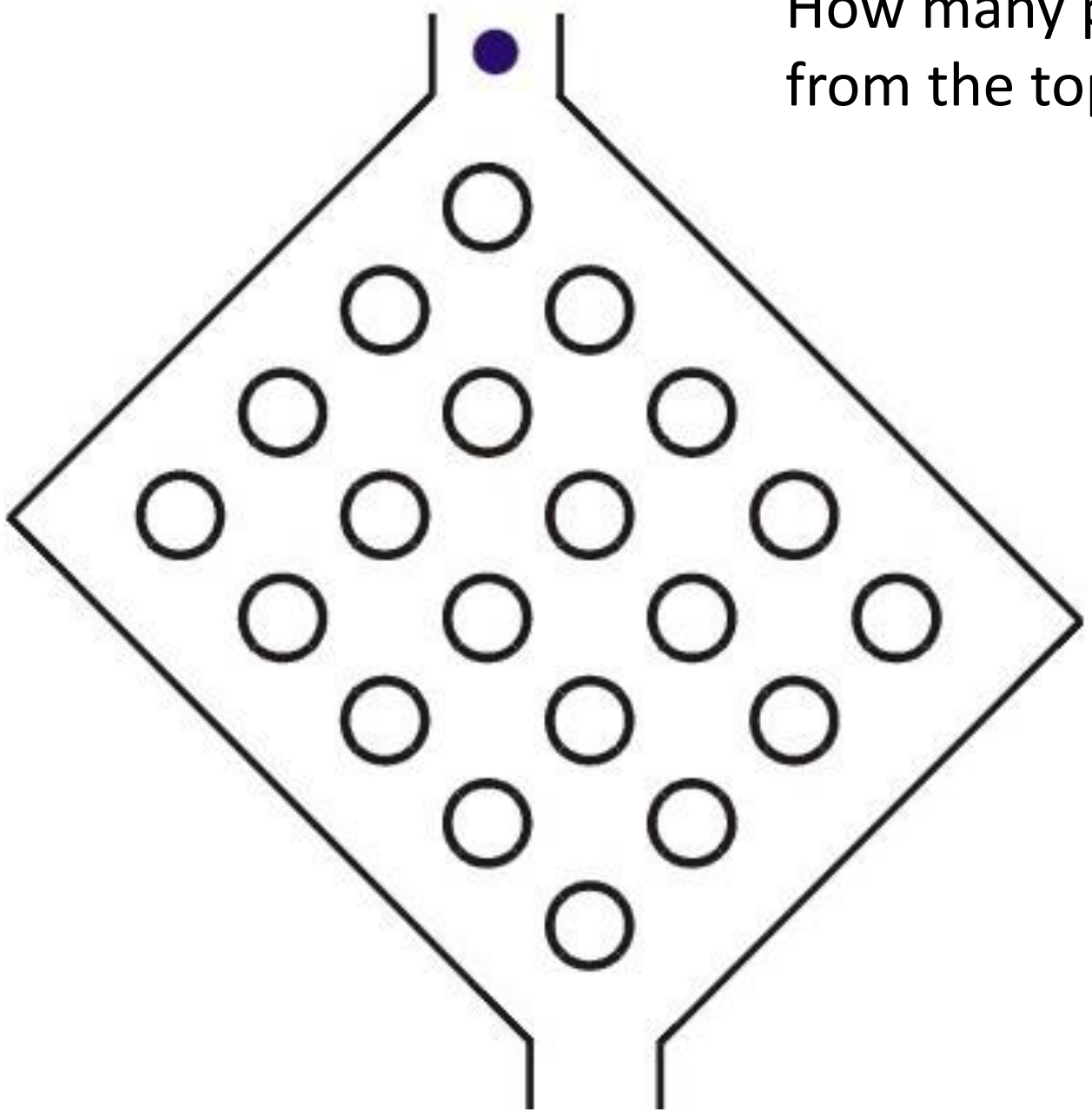
There are 16 paths (sum of the number of paths to each bin) and the ball is equally likely to follow any of the paths.



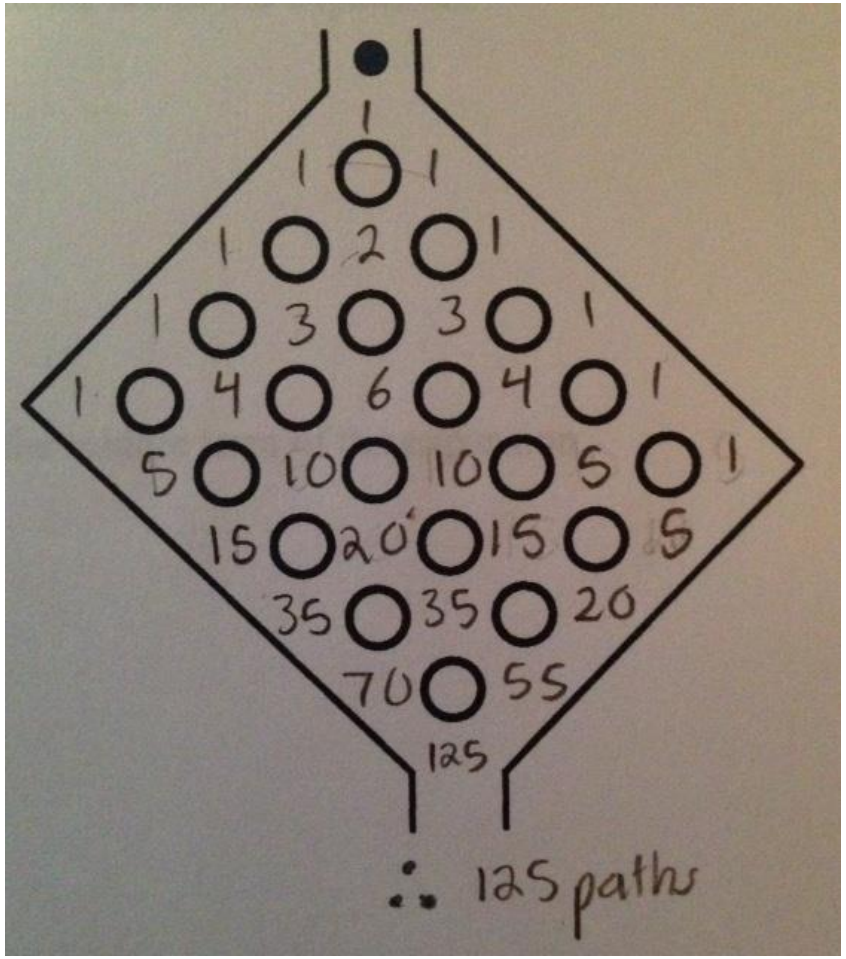
- Probability = 1/16 to end in the 1st (leftmost) bin.
- Probability = 4/16 to end in the 2nd bin.
- Probability = 6/16 to end in 3rd bin.
- Probability = 4/16 to end in 4th bin.
- Probability = 1/16 to end in the 5th bin.

1 4 6 4 1

Number of path ending in each bin. The 5th row of Pascal's Triangle because there are 5 bins.



How many paths can the ball take as it falls from the top to the bottom?



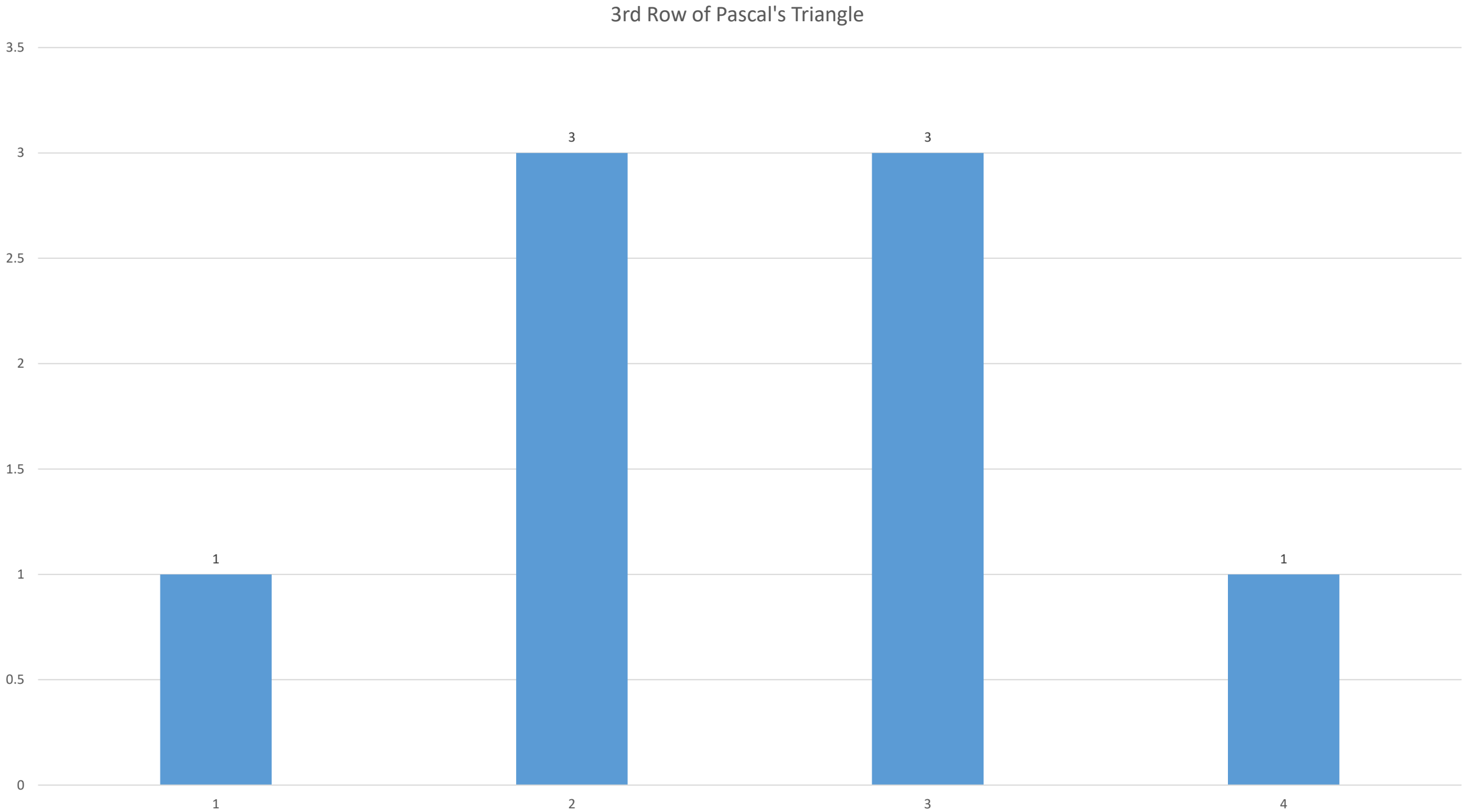
How many routes exist for the marble?

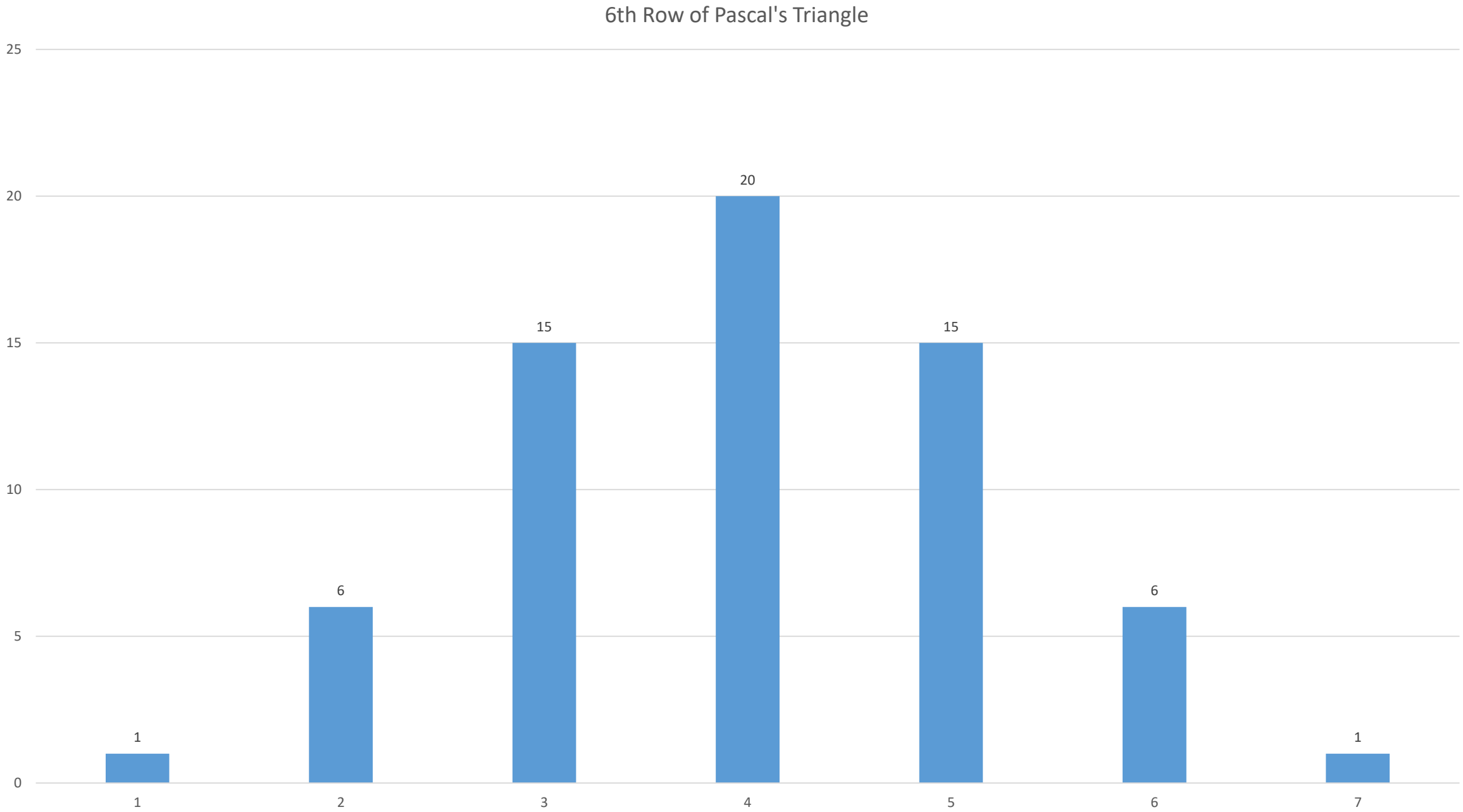

How many routes exist for the marble?

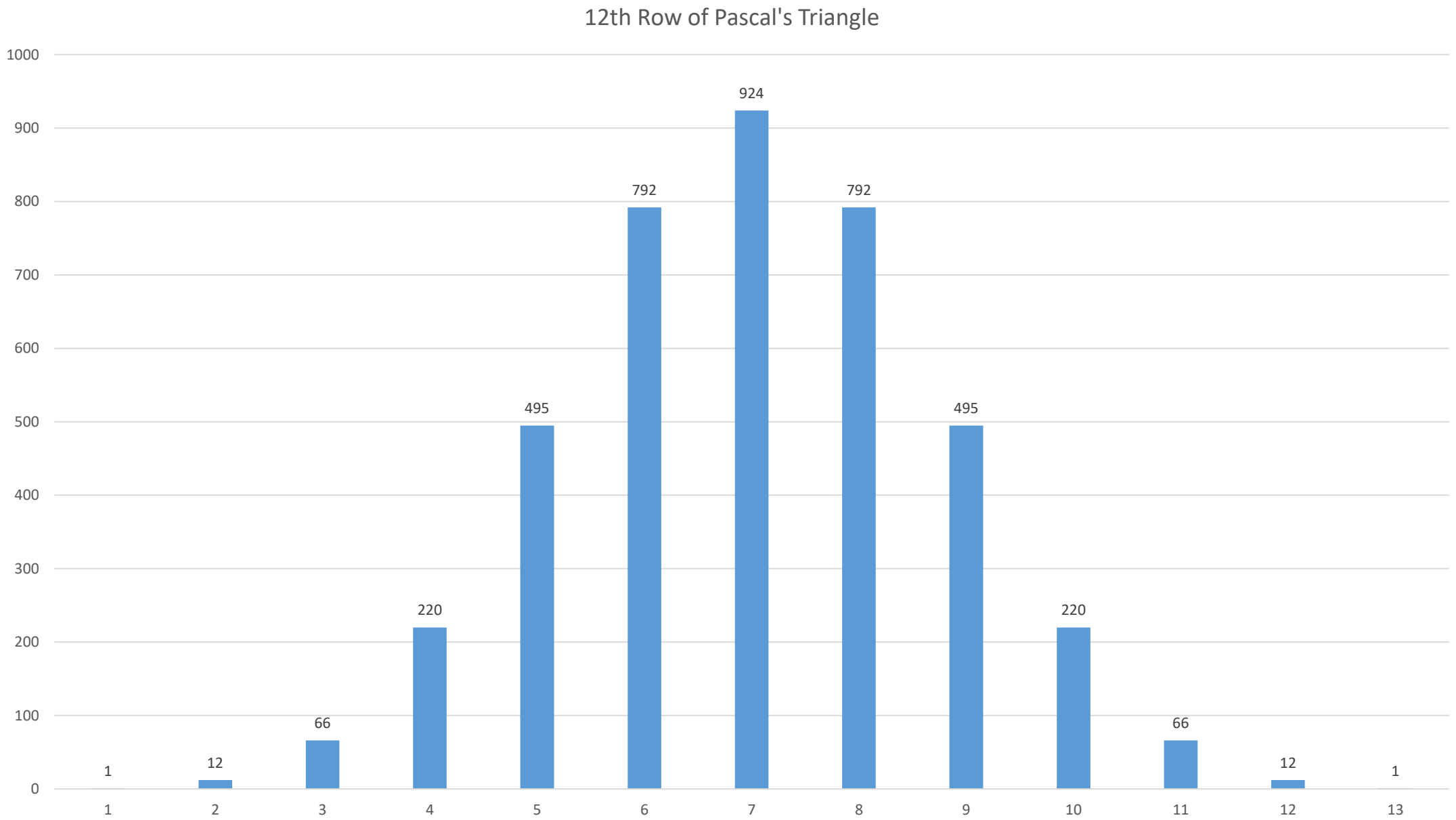
How many routes exist for the plinko disk?

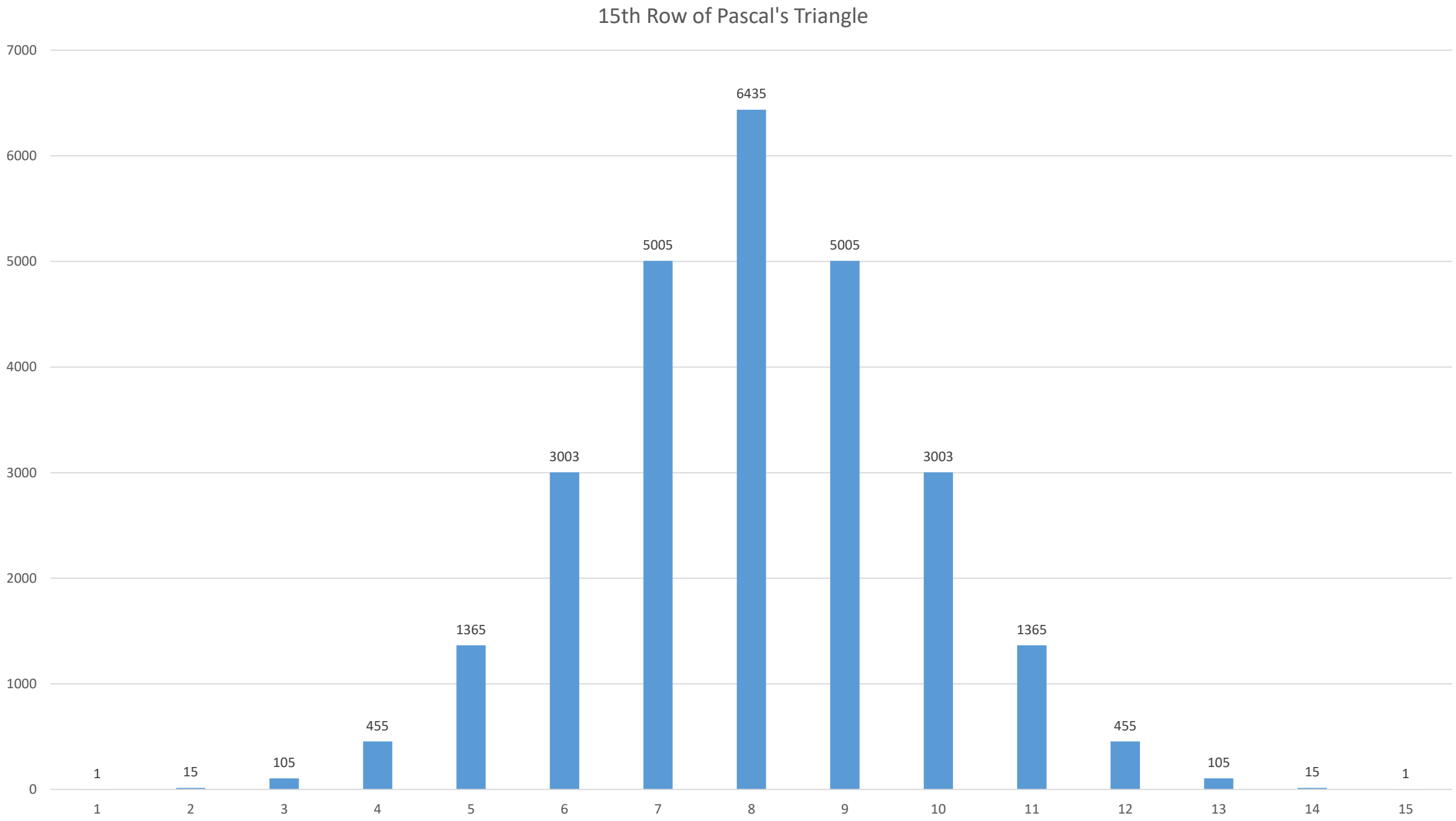
How does Pascal's triangle relate to anything real and/or useful?

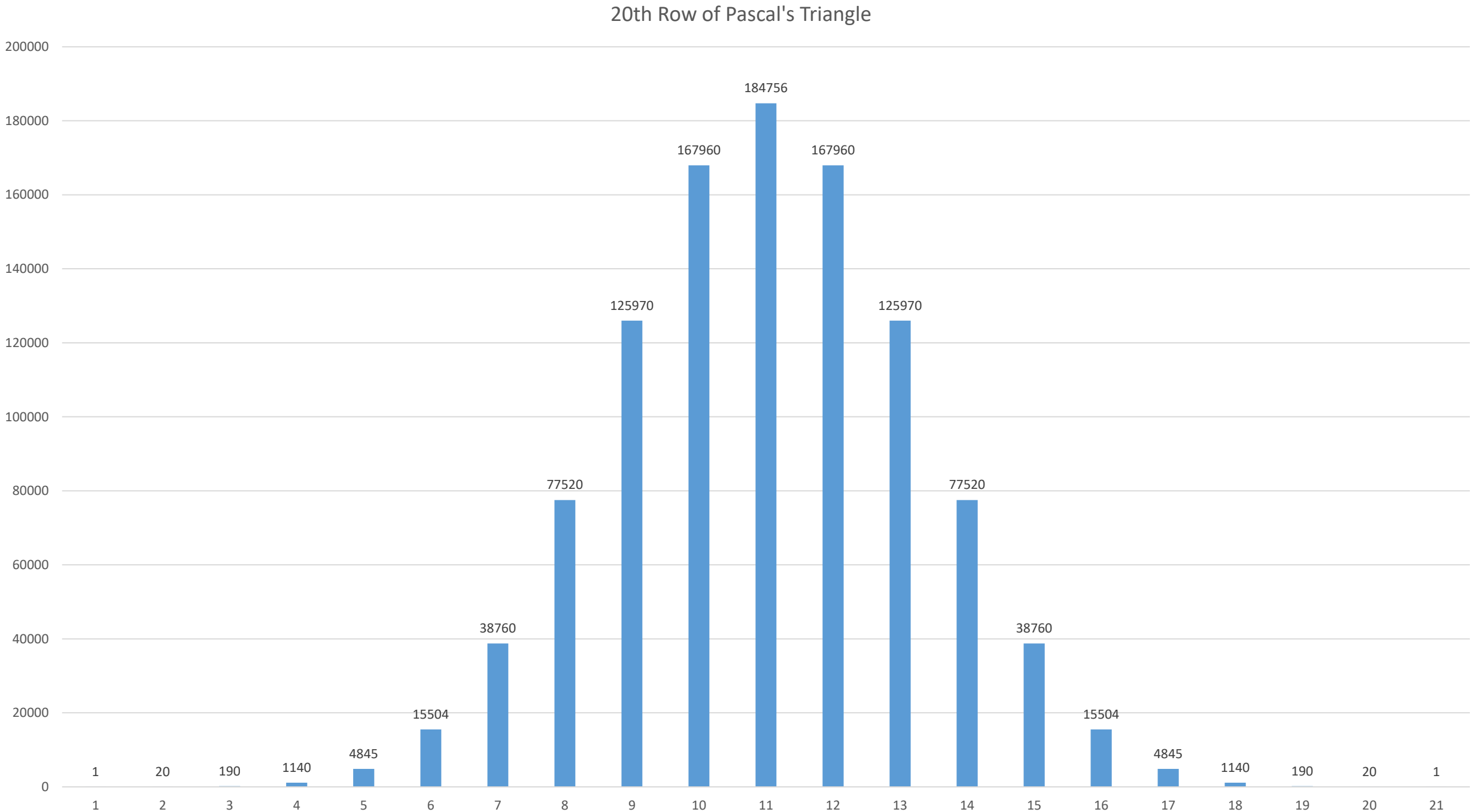
Look at the following graphs…


3rd Row of Pascal's Triangle
3.5
3
2.5
2
1.5
1
0.5
0
1
3
3
1
1
2
3
4


6th Row of Pascal's Triangle
25
20
15
10
5
0
1
6
15
20
15
6
1
1
2
3
4
5
6
7


12th Row of Pascal's Triangle
1000
900
800
700
600
500
400
300
200
100
0
1
12
66
220
495
792
924
792
495
220
66
12
1
1
2
3
4
5
6
7
8
9
10
11
12
13


15th Row of Pascal's Triangle
7000
6000
5000
4000
3000
2000
1000
0
1
15
105
455
1365
3003
5005
6435
5005
3003
1365
455
105
15
1
1
2
3
4
5
6
7
8
9
10
11
12
13
14
15


20th Row of Pascal's Triangle
200000
180000
160000
140000
120000
100000
80000
60000
40000
20000
0
1
20
190
1140
4845
15504
38760
77520
125970
167960
184756
167960
125970
77520
38760
15504
4845
1140
190
20
1
1
2
3
4
5
6
7
8
9
10
11
12
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14
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16
17
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19
20
21