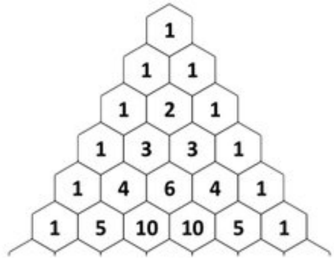
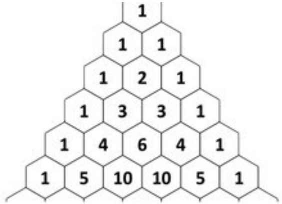
TASK CARD #1



1. FIND THE POWERS OF 2.
2. FIND THE POWERS OF 11.
3. FIND ALL PERPECT SQUARE NUMBERS (They are hidden well!).
4. FIND FIBONACCI SEQUENCE.
5. FIND THE SIERPINSKI TRIANGLE (Coloring according a pattern can be needed!).



TASK CARD #2

BELOW RELATION EXISTS BETWEEN THE BINOMIAL EXPANSIONS AND THE PASCAL TRIANGLE.

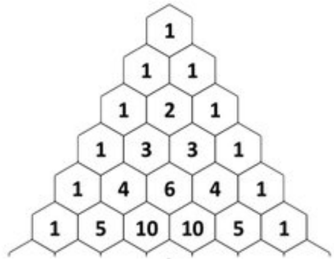
$$
\begin{array}{ll}
(x+y)^0 & 1 \\
(x+y)^1 & 1x + 1y \\
(x+y)^2 & 1x^2 + 2xy + 1y^2 \\
(x+y)^3 & 1x^3 + 3x^2y + 3xy^2 + 1y^3 \\
(x+y)^4 & 1x^4 + 4x^3y + 6x^2y^2 + 4xy^3 + 1y^4 \\
(x+y)^5 & 1x^5 + 5x^4y + 10x^3y^2 + 10x^2y^3 + 5xy^4 + 1y^5
\end{array}
$$

ACCORDING TO THIS, WRITE

$(x + y)^8 =$

TASK CARD #3

THE **BINOMIAL DISTRIBUTION** DESCRIBES A PROBABILITY DISTRIBUTION BASED ON EXPERIMENTS THAT HAVE TWO POSSIBLE OUTCOMES. THE MOST CLASSIC EXAMPLE OF THIS IS TOSSING A COIN.



Consider flipping a fair coin 3 times. WRITE ITS SAMPLE SPACE.

- Find the probability of getting 3 heads?
- Find the probability of getting 2 heads and a tail?
- Find the probability of getting 2 tails and a head?
- Find the probability of getting 3 tails?

Anything you realize? ☺

Now flip it 4 times.

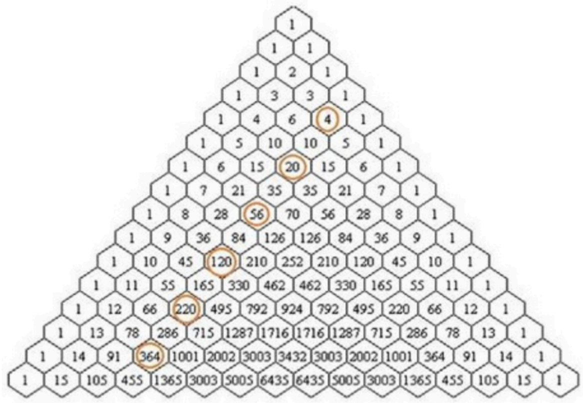
- P (4 HEADS) =
- P (3Hs and 1T) =
- P (2Hs and 2Ts) =
- P (3Ts and 1H) =
- P (4 TAILS) =

ARE YOU READY TO FLIP IT ONE MORE TIME? !!

TASK CARD #4

EVEN YOU CAN FIND π IN PASCAL TRIANGLE

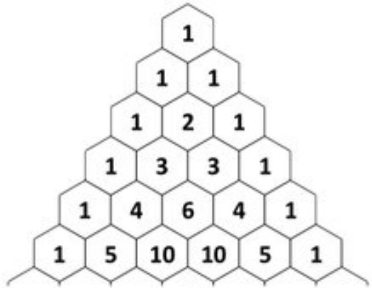
$$\pi = 3 + \frac{2}{3}\left(\frac{1}{C_3^4} - \frac{1}{C_3^6} + \frac{1}{C_3^8} - \cdot\right).$$



BY USING A CALCULATOR, PROVE THAT PI EXISTS IN THE PASCAL TRIANGLE.

TASK CARD #5

HOW CAN YOU FIND ZERO IN EACH ROW?



TASK CARD #6

How many ways are there to choose 2 objects from a set of 4? It doesn't take too long to list w/ these numbers {A, B, C, D}. So this is the answer;

AB, AC, AD, BC, BD, CD.

Say, 3 objects from a set of 5. The set is {A, B, C, D, E} and here are the 10 possible groups of objects (listed in alphabetical order):

ABC, ABD, ABE, ACD, ACE, ADE, BCD, BCE, BDE, CDE

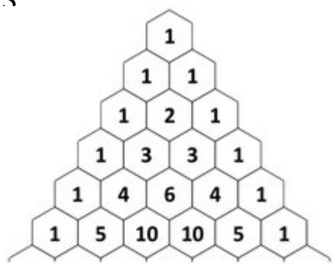
So the mathematical term for "the number of ways to choose k objects from a set of n objects", we will simply say "n choose k".

is called COMBINATION.

And can easily be calculated as $C(n,k) = \binom{n}{k} = \frac{n!}{k!\,(n-k)!}$

BELIEVE IT OR NOT, PASCAL TRIANGLE CAN ALSO HELP YOU TO CALCULATE THE NUMBER OF COMBINATIONS OF CHOOSING K OBJECTS FROM N OBJECTS

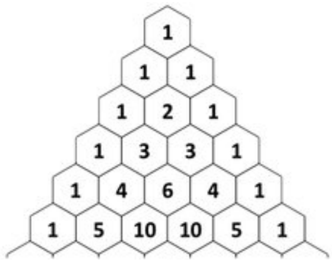
TRY TO FIND OUT HOW!?



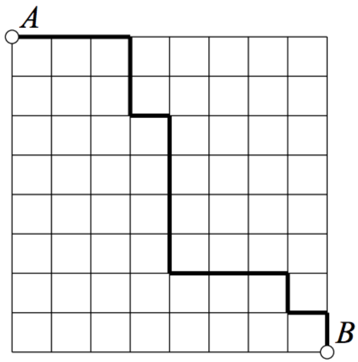
TASK CARD #7

PASCAL TRIANGLE CAN EVEN GUESS YOUR EXAM SCORE. EVEN ALL YOUR CLASSMATES'.

Let's draw a diagram for *binomial distribution if each question is answered right (R) or (W)*

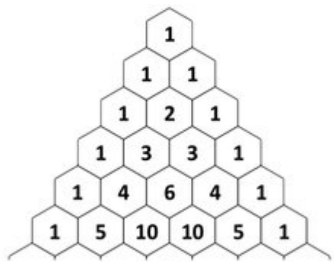


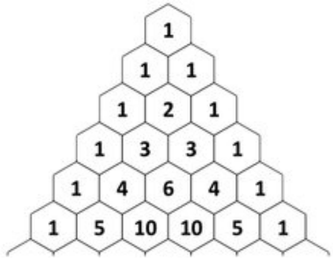
TASK CARD #8



FIND THE NUMBER OF PATHS FROM ONE CORNER TO THE OPPOSITE CORNER (A to B IN THE FIGURE) THAT ARE THE SHORTEST POSSIBLE DISTANCE, IN OTHER WORDS, WITH NO BACKTRACKING.

* A TYPICAL SHORTEST ROUTE IS SHOWN AS A BOLD PATH ON THE GRID IN THE FIGURE





TASK CARD #9

STILL NOT IMPRESSED?

OK NOW IS THE REAL MAGIC! PASCAL TRIANGLE CAN HELP YOU TO FIND THE N[TH] TERM OF ANY SEQUENCE. LET'S SEE HOW

5, 7, 21, 53, 109, 195, 317, 481, . . .,

5 7 21 53 109 195 317 481 . . .

2 14 32 56 86 122 164 . . .

12 18 24 30 36 42 . . .

6 6 6 6 6 . . .

0 0 0 0 . . .

First list the numbers in a line, get their differences in each row, until you get a full row of zeros ! then get the starters of each row! And here you go …

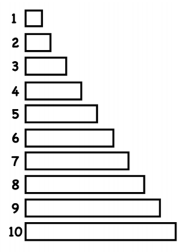
$$
\begin{aligned}
f(n) &= 5\binom{n}{0} + 2\binom{n}{1} + 12\binom{n}{2} + 6\binom{n}{3} \\
f(n) &= 5\cdot 1 + 2\cdot n + 12\cdot\frac{n(n-1)}{2} + 6\cdot\frac{n(n-1)(n-2)}{6} \\
f(n) &= 5 + 2n + 6(n^2 - n) + (n^3 - 3n^2 + 2n) \\
f(n) &= n^3 + 3n^2 - 2n + 5.
\end{aligned}
$$

NOW

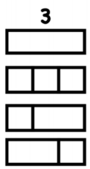
FIND THE GENERAL RULE FOR CUBE NUMBERS?

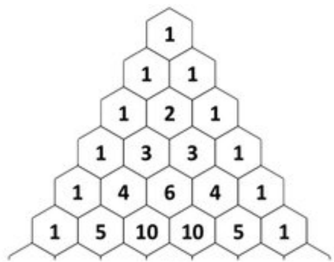
TASK CARD #10

IMAGINE YOU HAVE RODS OF UNIT LENGTHS AS IN THE FOLLOWING DIAGRAM.



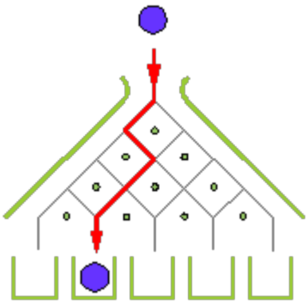
FIND OUT HOW MANY DIFFERENT ROD TRAINS CAN BE MADE FROM ANY LENGTH OF ROD. FOR EXAMPLE, YOU CAN MAKE THESE 4 TRAINS FOR THE 3 ROD.





TASK CARD #11

The pinball will be deflected either left or right with equal probability by the first nail. The result is that the pinball follows a random path, deflecting off one pin in each of the four rows of pins, and ending up in one of the cups at the bottom.



HOW MANY DIFFERENT PATHS ARE THERE THROUGH THE PINBALL MACHINE AND WHAT ARE THEY?

HOW MANY PATHS ARE THERE THAT END UP IN ANY GIVEN BIN?

WHAT IS THE PROBABILITY THAT THE PINBALL WILL END UP IN ANY GIVEN BIN?