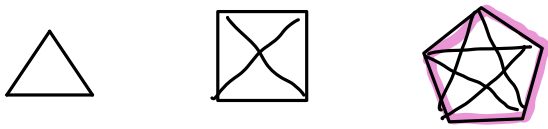


Triangular Numbers: The return

① How many lines can you draw between the vertices of an equilateral triangle, square, regular pentagon?

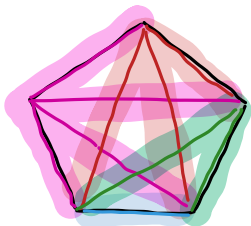


Be sure to count the edges we already have.

② Do these numbers look familiar? Quick refresher of triangular numbers if no.

③ Now, our hidden goal is to find the sum $1+2+3$ in and $1+2+3+4$ hidden in .

Color the lines in your picture of in a way that represents $1+2+3+4$.

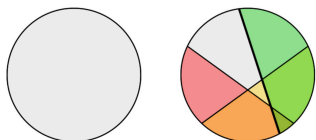


$$4+3+2+1$$

④ Predict the number of edges for a regular hexagon. Check using your coloring method!

⑤ What about a regular 50-gon?

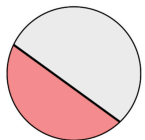
For the students that are very fast:



$n=0, p=1$



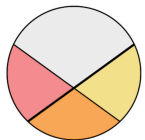
$n=3, p=7$



$n=1, p=2$



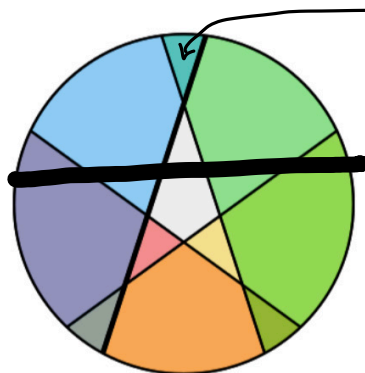
$n=4, p=11$



$n=2, p=4$



$n=5, p=16$



$n=4, p=11$

adding this line cuts five regions in two.

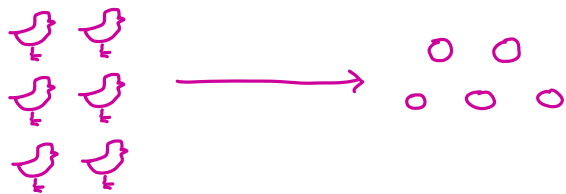
anything it doesn't cut was already there

@Wikipedia

triangular #s + 1

Pigeonhole Principle

① I have 6 pigeons that I need to stick into 5 holes. How do I do it?



② In your groups discuss the following:

"I have 7 pigeons and 2 holes. Must there be a hole with at least 4 pigeons?"

"I have 7 pigeons and 3 holes. Must there be a hole with at least 3 pigeons?"

③ Without actually drawing all of the pigeons, how can we know there must be a hole with at least 6 pigeons if I have 101 pigeons and 20 holes total?

④ A classroom holds 30 people. How do I know at least 3 share a birth month?

⑤ A stadium holds 1000 people. How do I know at least 3 people share a birthday?

(Hint: $365 \times 2 = 730$)

⑥ (Can definitely skip for the fast kids) There are at most 100,000 hairs on a human head.

The city of Buffalo, NY has 250,000 people. How do I know at least 3 have exactly the same number of hairs on their head?

⑦ Come up with your own scenario that can be solved with this technique!