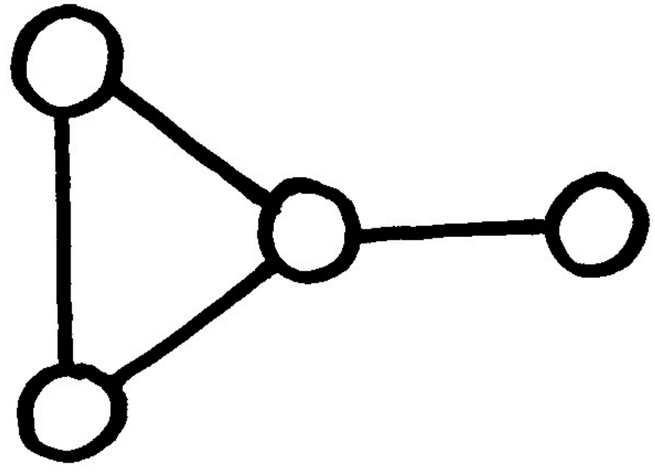
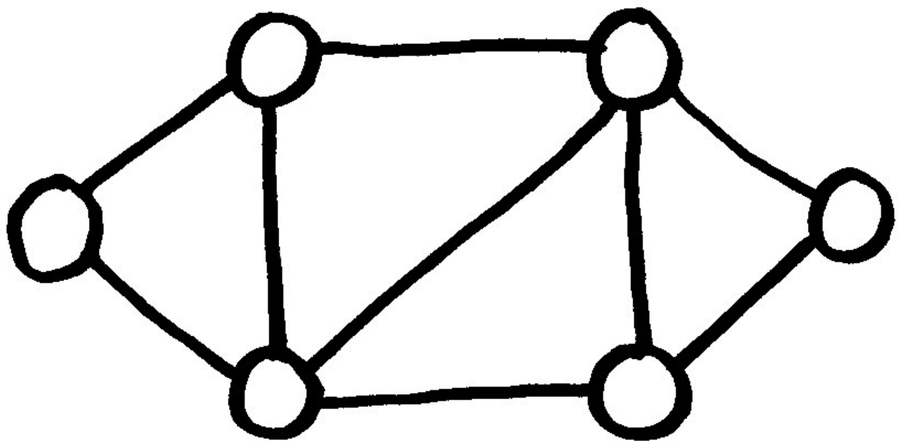
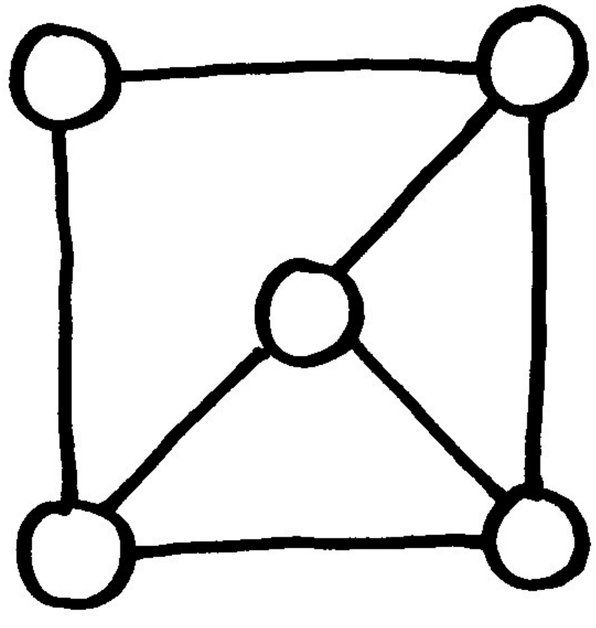
GRAPH COLORING & CHROMATIC NUMBERS

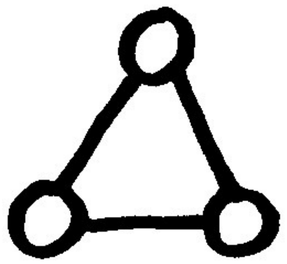


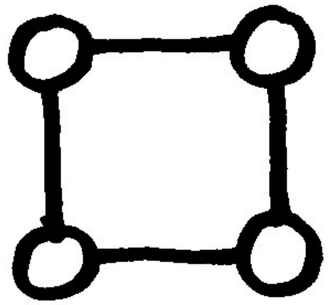
CONTACT J. HAMKINS
JHAMKINS@GC.CUNY.EDU
WITH QUESTIONS.

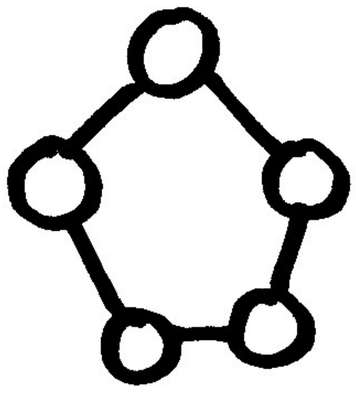


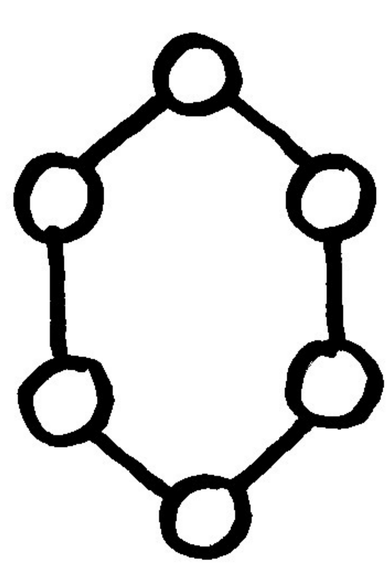


COLOR EACH VERTEX SO THAT CONNECTED VERTICES HAVE DIFFERENT COLORS.



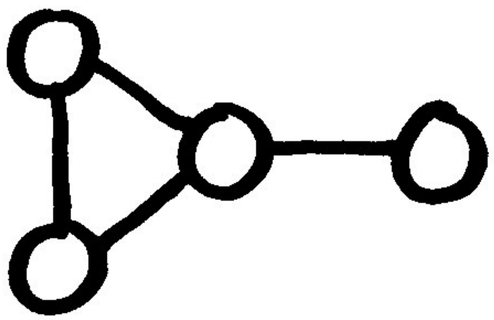


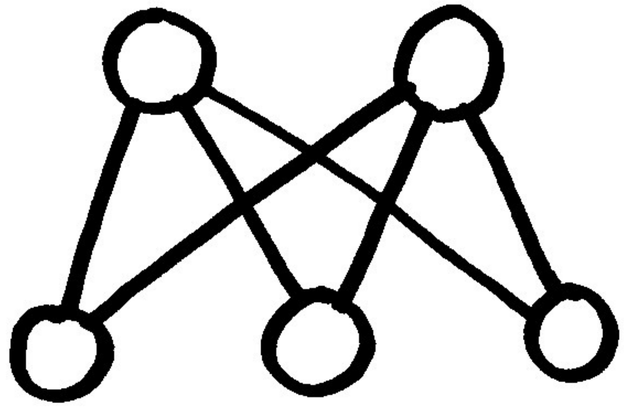


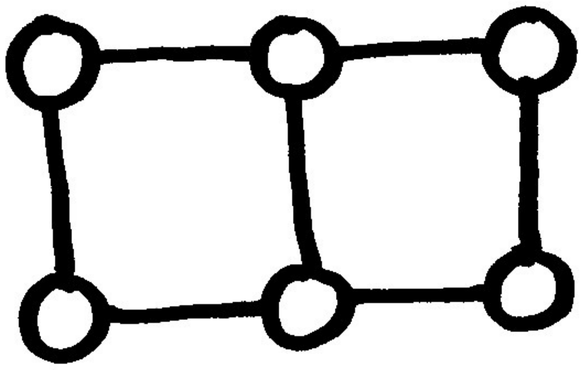


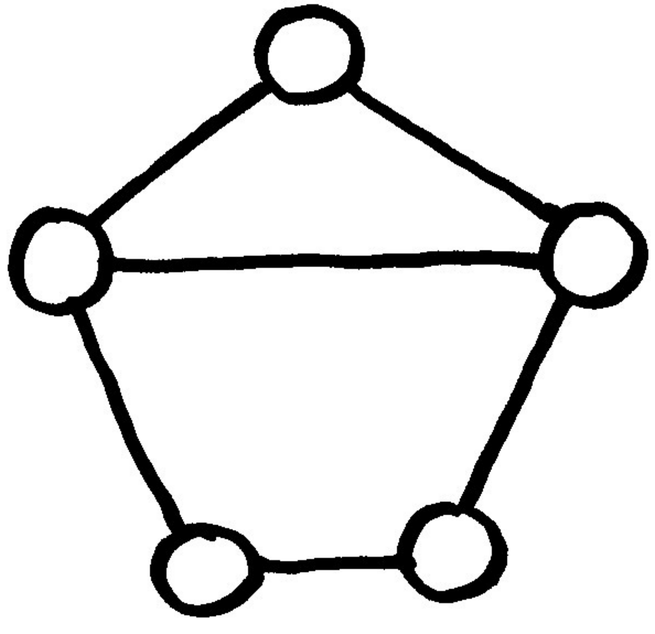
TRY TO USE THE FEWEST NUMBER OF COLORS — THIS IS THE CHROMATIC NUMBER.

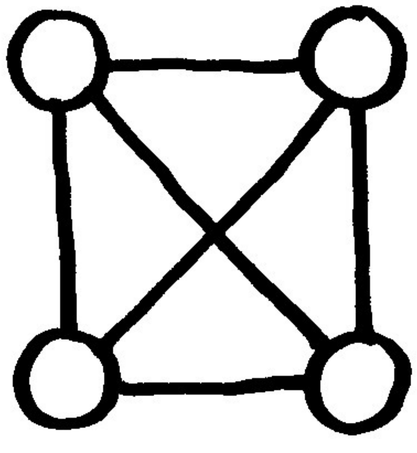
WHAT IS MY CHROMATIC NUMBER?



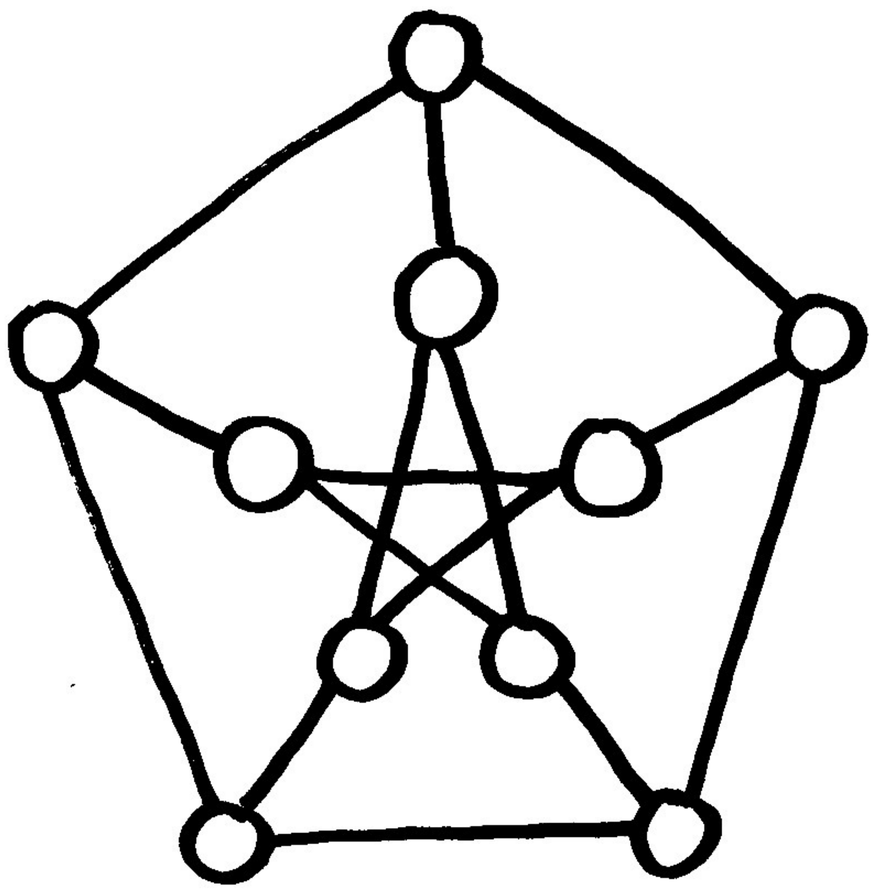


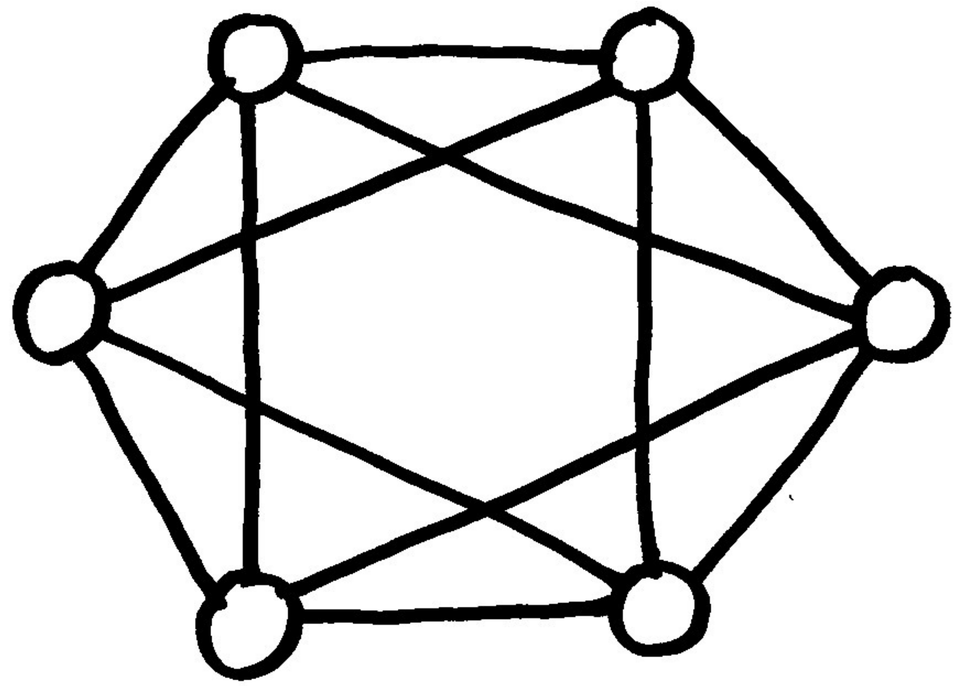






HOW MANY COLORS DID YOU USE?





MY GRAPH:

GRAPH BY _____:

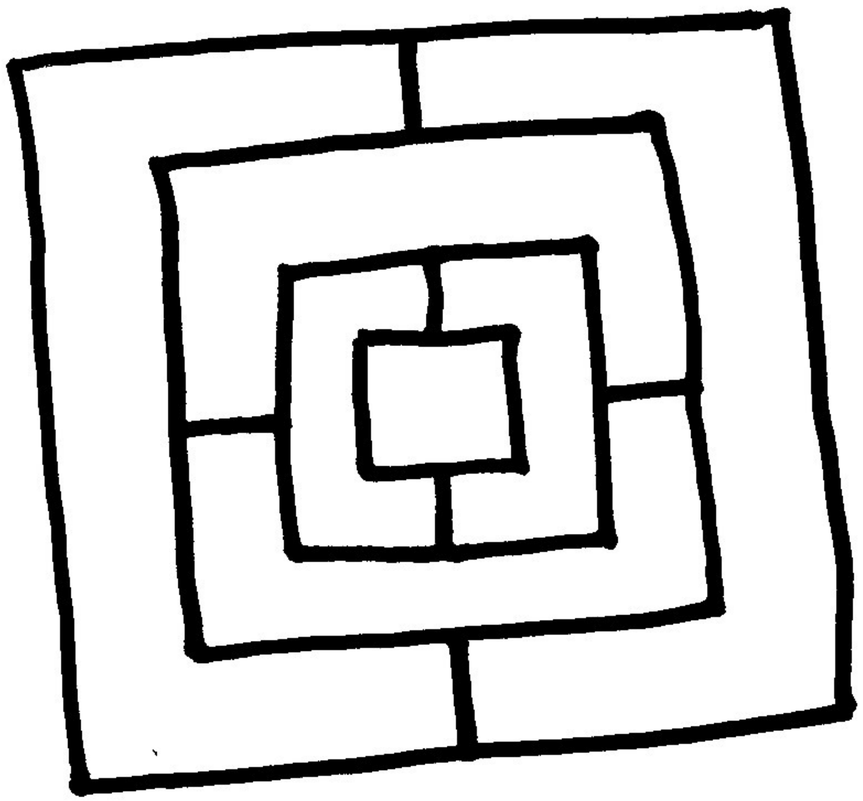
COLORED BY _____,

USING _____ COLORS.

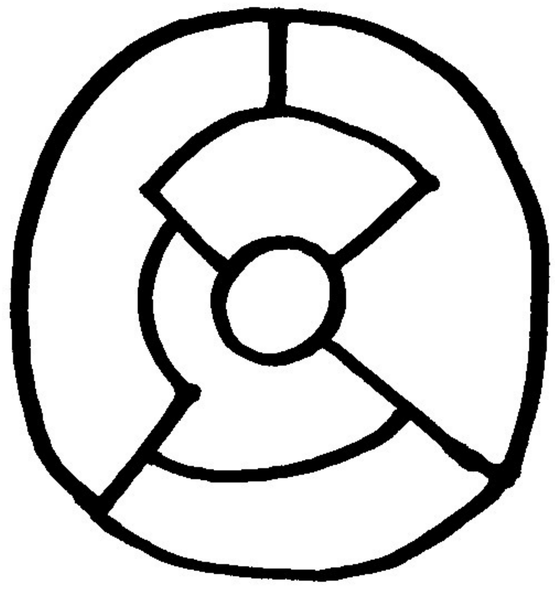
COLORED BY ME

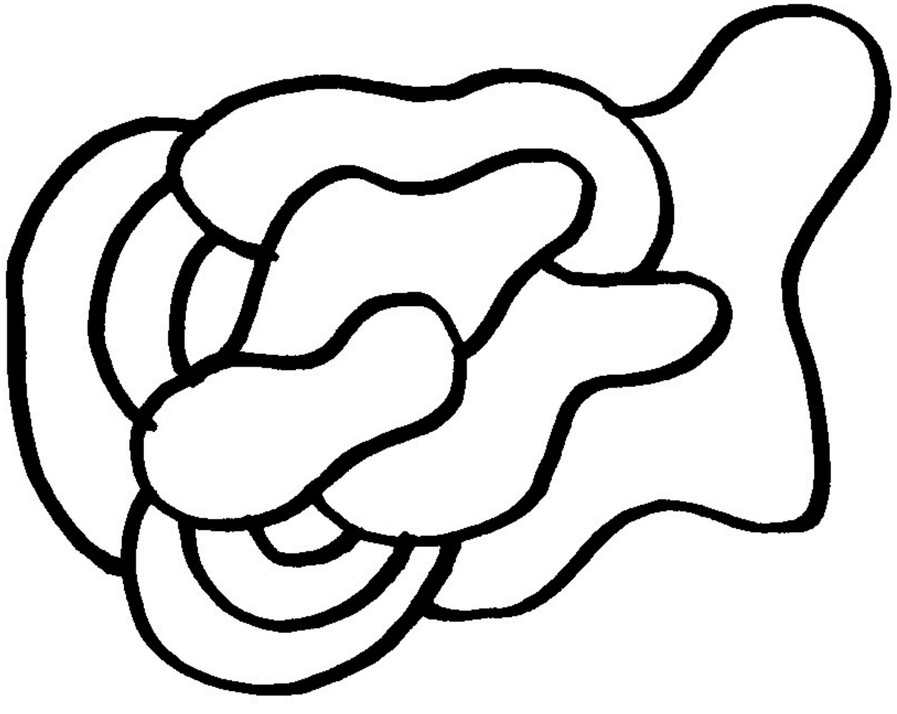
USING _____ COLORS.

MAP COLORING



COLOR THE COUNTRIES ON THIS MAP SO THAT ADJACENT COUNTRIES HAVE DIFFERENT COLORS.





TRY TO USE THE FEWEST NUMBER OF COLORS. REMARKABLY, FOUR COLORS ALWAYS SUFFICE!

MY MAP:

MAP BY _____.

COLORED BY _____

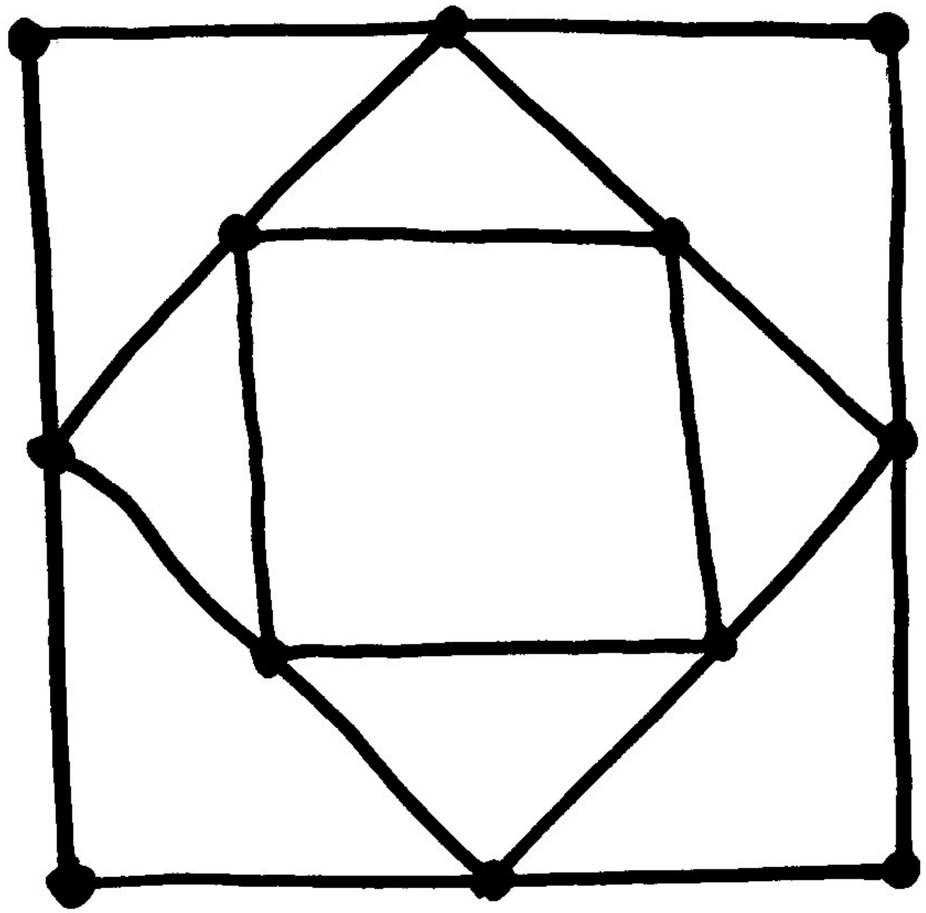
USING _____ COLORS.

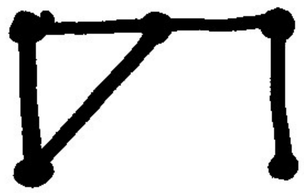
COLORED BY ME

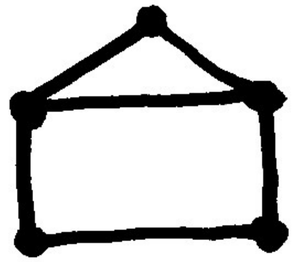
USING _____ COLORS.

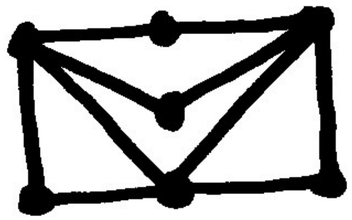
EULERIAN PATHS & CIRCUITS

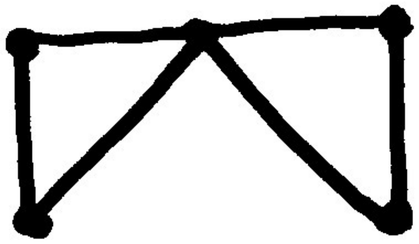
DRAW THESE SHAPES WITHOUT LIFTING YOUR PENCIL AND WITHOUT RETRACING ANY LINE.



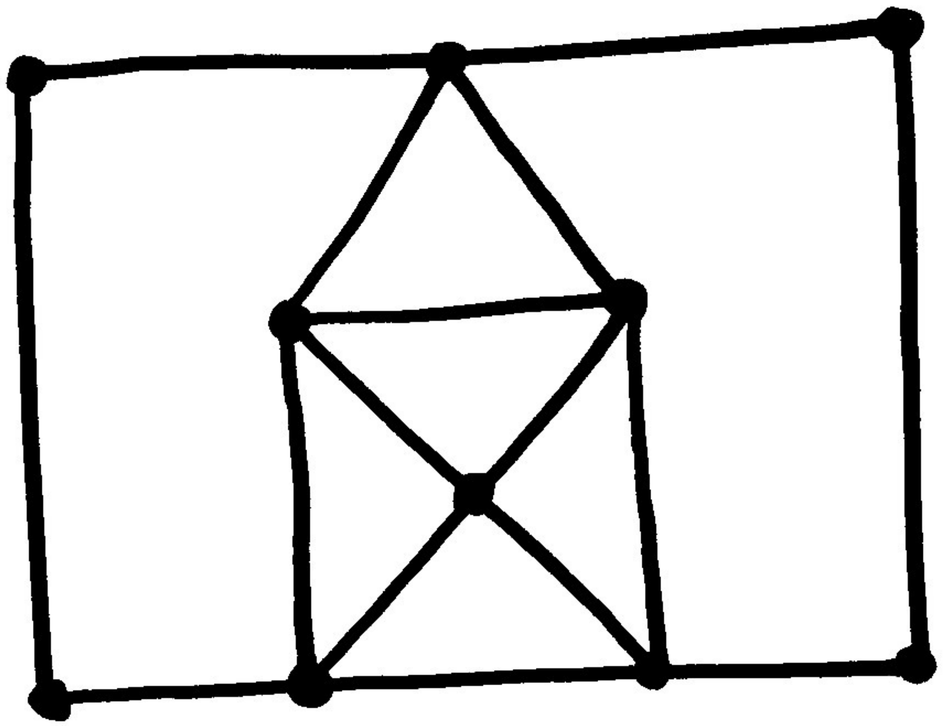


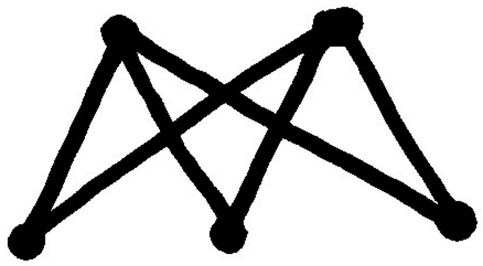


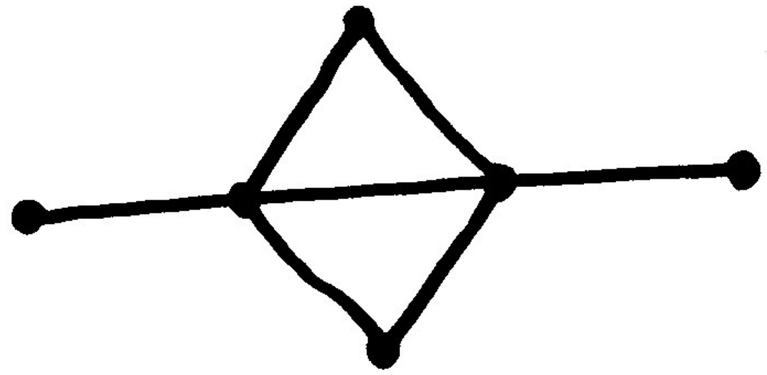




A CIRCUIT STARTS AND ENDS IN THE SAME PLACE.



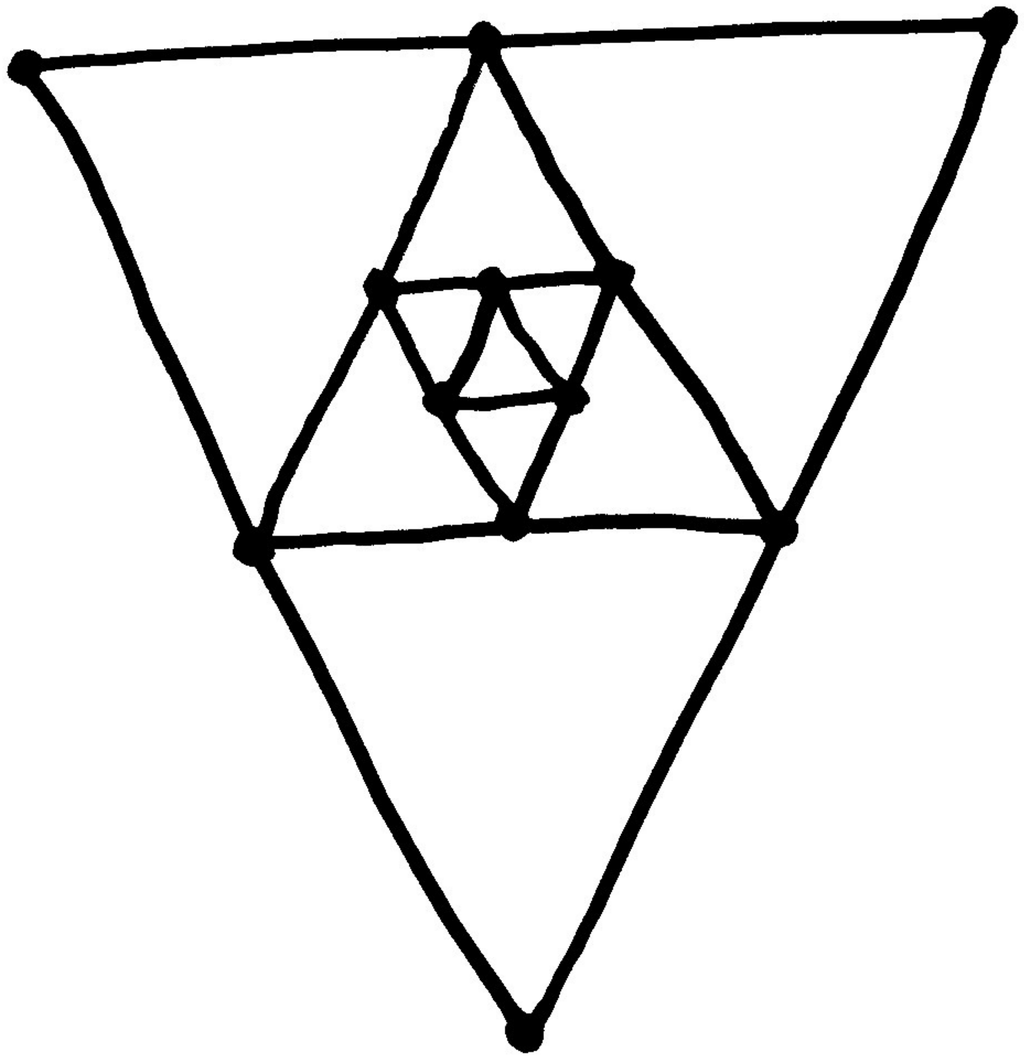


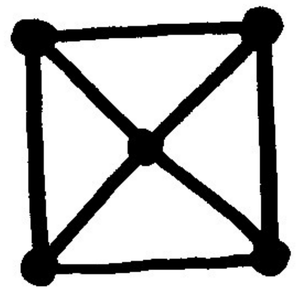


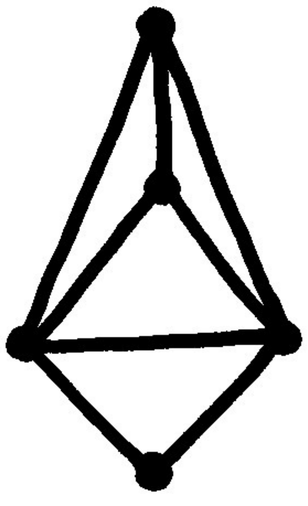
A PATH CAN START AND END IN DIFFERENT PLACES.

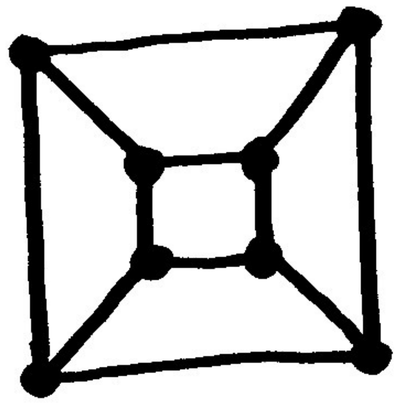
ONLY SOME OF THESE GRAPHS HAVE AN EULERIAN PATH OR CIRCUIT.

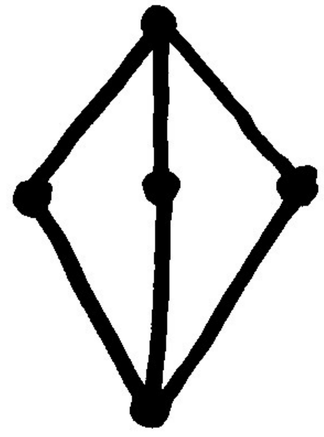
CIRCLE THE IMPOSSIBLE GRAPHS.











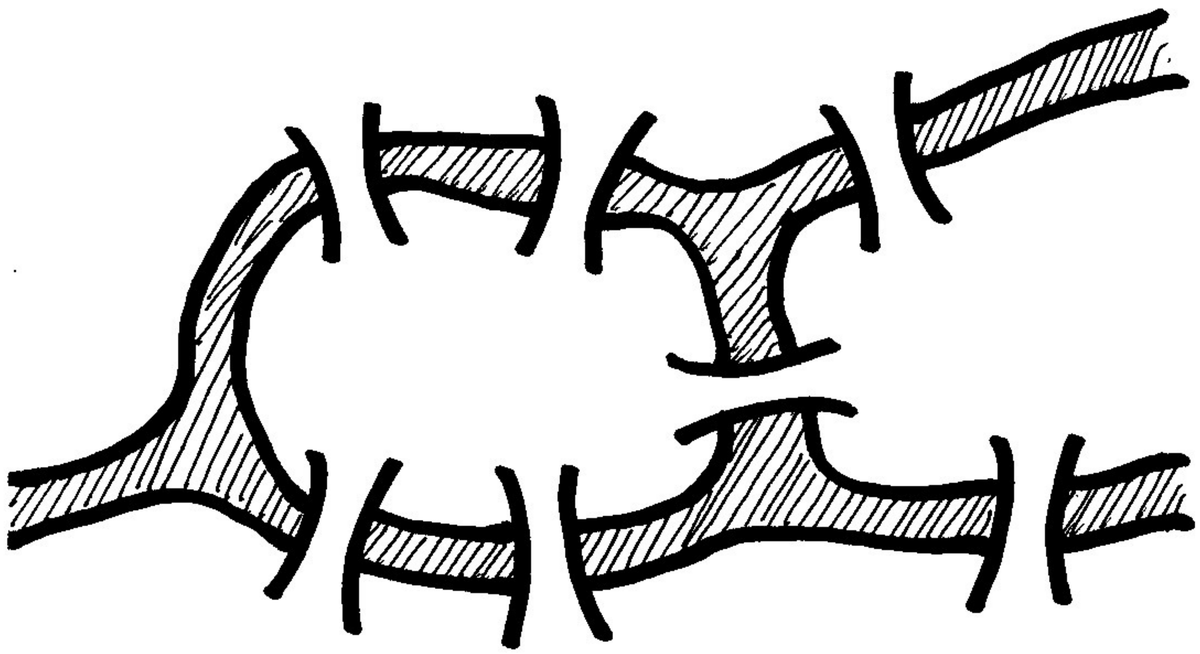
EVERY TIME YOU ENTER A NODE, YOU LEAVE ON A FRESH LINE. SO:

CIRCUIT: EVERY NODE HAS EVEN DEGREE

PATH: EVERY NODE EXCEPT START/END

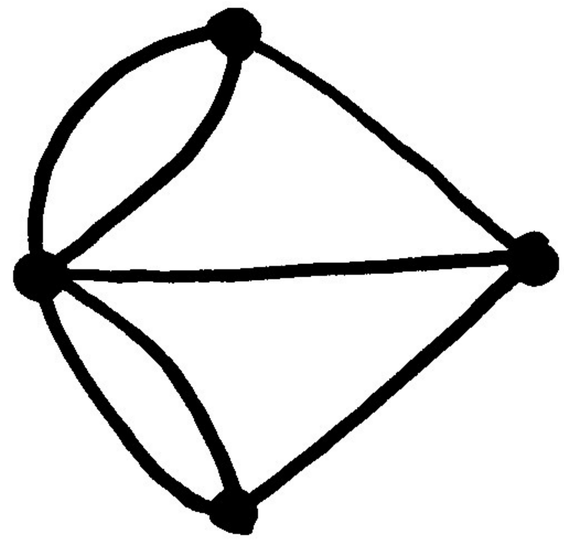
THE SEVEN BRIDGES OF

· KÖNIGSBERG



IS IT POSSIBLE TO TOUR THE CITY, CROSSING EACH BRIDGE EXACTLY ONCE?

MATHEMATICIANS REPRESENT THE KÖNIGSBERG BRIDGE PROBLEM WITH AN ABSTRACT GRAPH:



IS THERE AN EULERIAN PATH? EVERY NODE HAS ODD DEGREE.