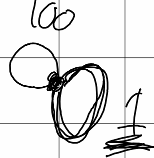
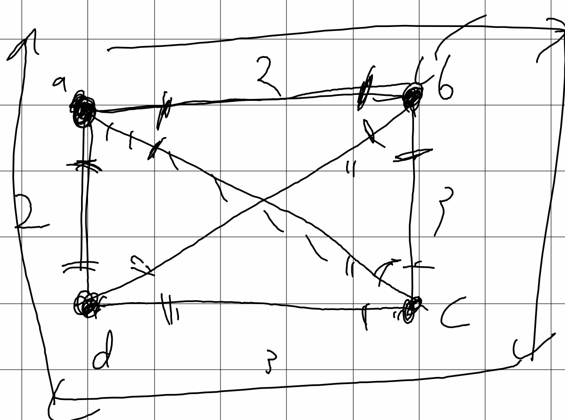


Brute force

1 edge in

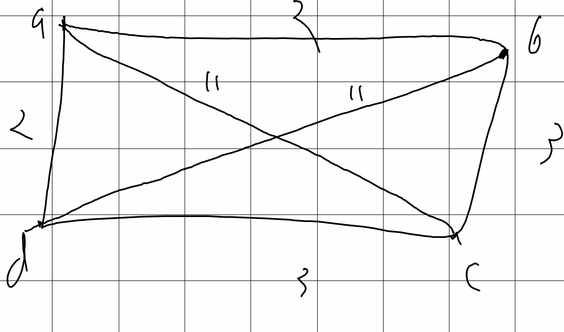
1 edge out



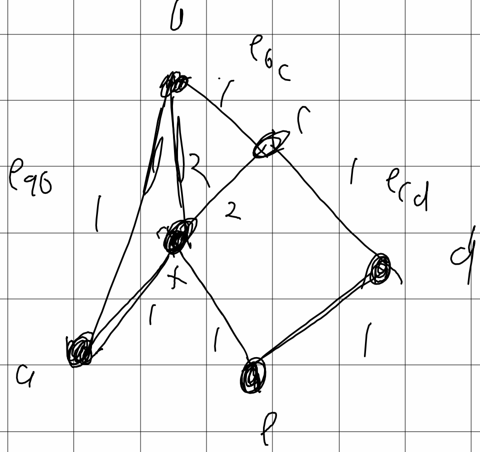
$C = (a, b, c, d, a)$ Hamiltonian

replace an edge in C
w/ another edge, it gets ~~worse~~

increases length



$2+2+3+3 = 10$



e_{ab} e_{ab} e_{bc}

(a, b, c, d, e, a)

e_{fa} e_{bc} e_{cd}

e_{cb} e_{bc} 2

e_{cb} e_{bf} 3 b

e_{bf} e_{bc} 3

f

choices

6

sum over all edges in this path weights of

per vertex, associate 2 edges

sum of weights of these edges = 2, (c)

12

$\sum_{v \in V}$ weight of both chosen edges min'e

b

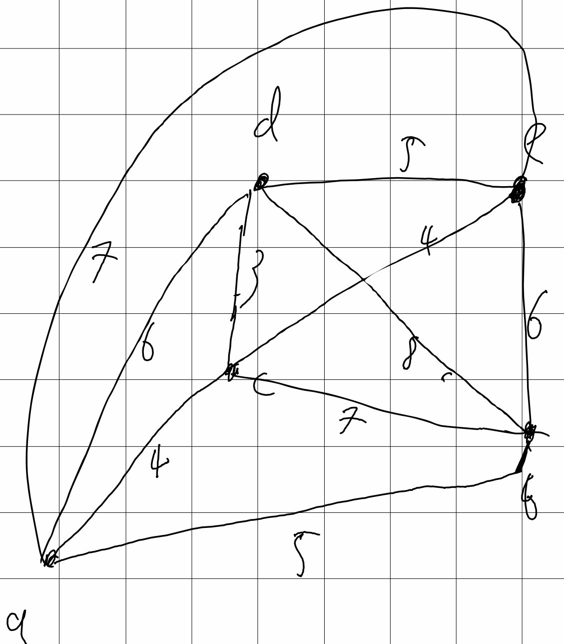
C, D Hamiltonian cycles

$$\left[\sum_{v\in V} \text{weight of both edges for a cycle } C\right]$$

$$\left[\sum_{v\in V} \text{weight of both edges for a cycle } D\right]$$

Per vertex, weight of edge going in + edge going out

is smaller than in D



5.3.16

in 5 6 5 4 3 5

e → b → a → c → d → e   min'l length

out 6 5 4 3 5 6

a

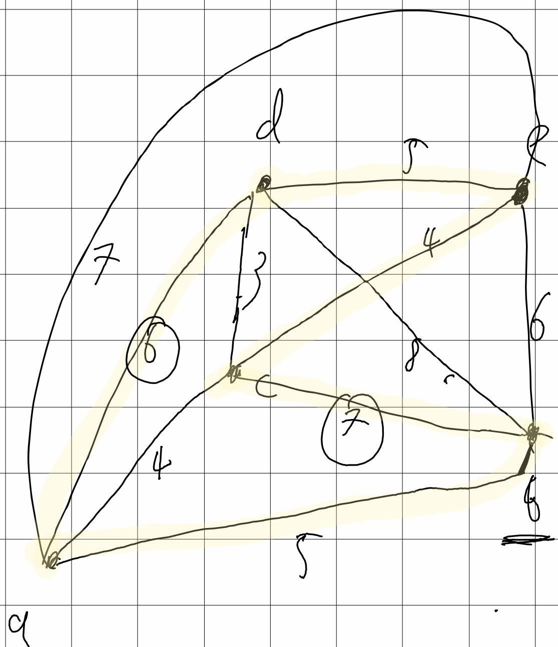
5	6	5	4	5
e	b	a	c	d
4	5	4	3	5

not!

theoretically

min'l already

only 1 possible way to improve

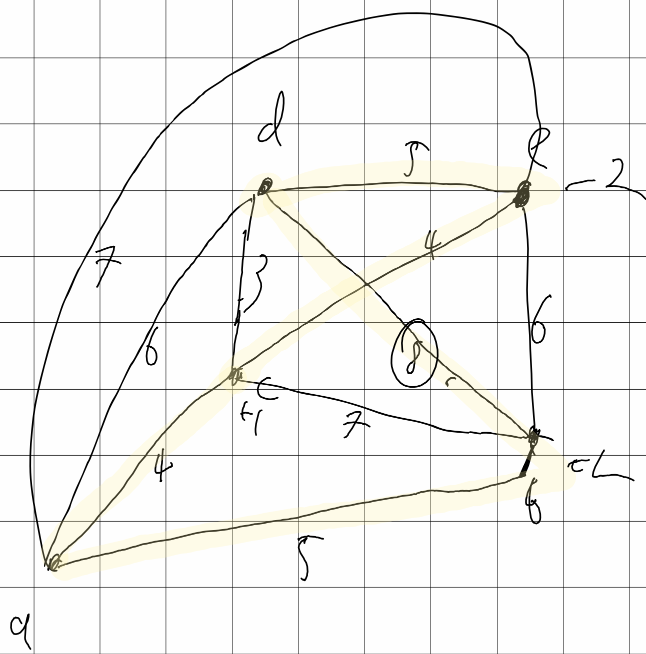


Suppose we chose

d, e, c in our cycle

From c, what next?
if we choose b, we must have
b, a, d

d e c b a d
+3 −2 +4 +2 +2 +3 ← comparing to original

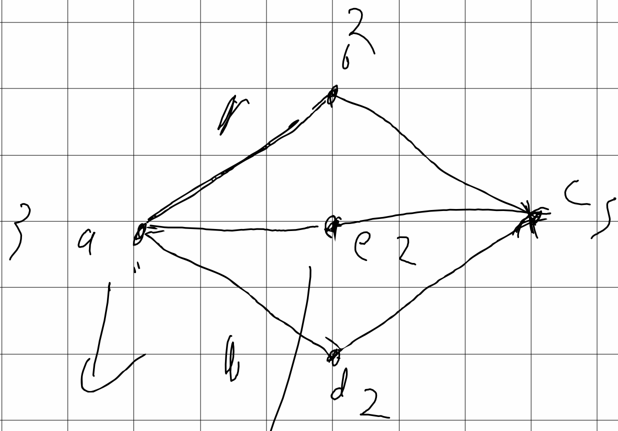


6
6
5

8
8 ←2
5

4
dd C
3

4
new c ←1
a



no Hamiltonian cycle

deg 1

∴ no cycle

5 vertices

5 edges in Hamiltonian cycle

Hamiltonian cycle

$\Downarrow$

each vertex has degree 2

Claim. No Hamiltonian cycle

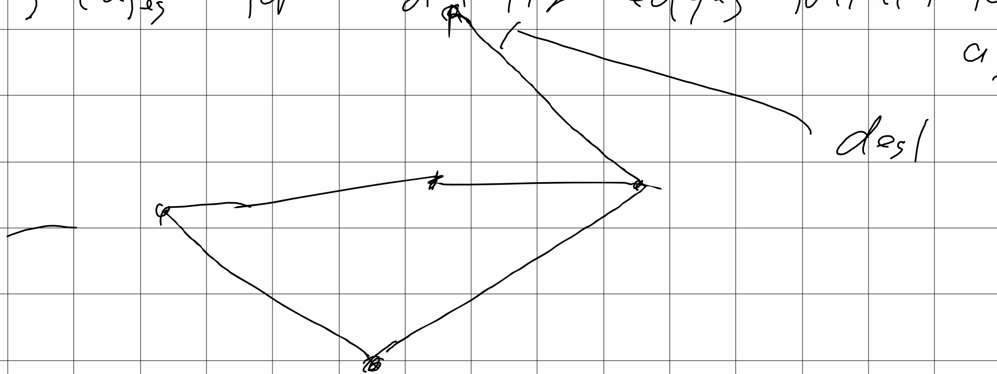
Suppose so, then we can delete edges until we reach the cycle

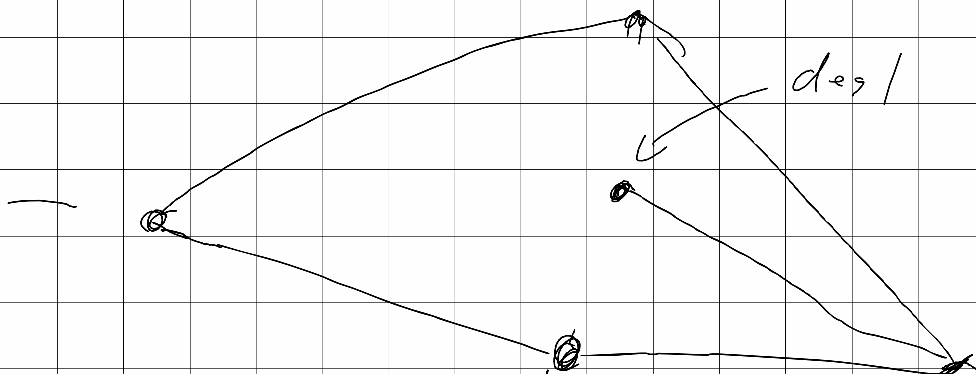
cycle must have 5 edges, 5 vertices

each vertex has degree 2

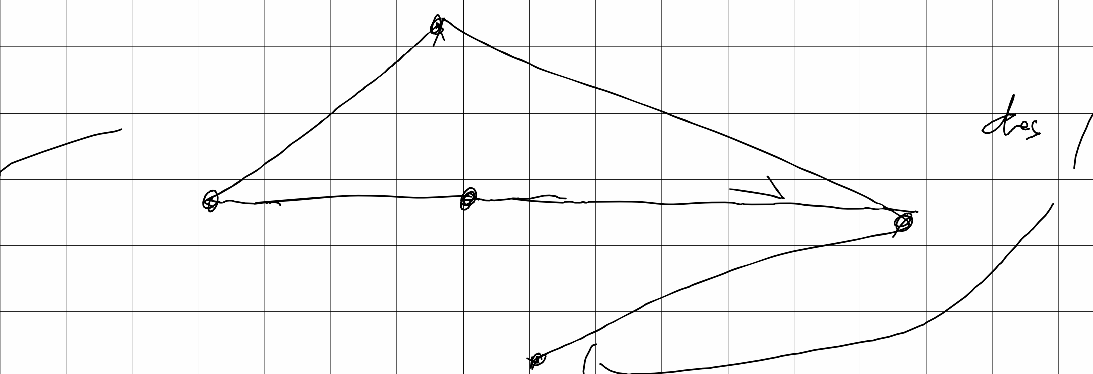
deg(a) = 3, so to get a Hamiltonian cycle, we must delete an edge from a

3 cases for deleting edges incident to a

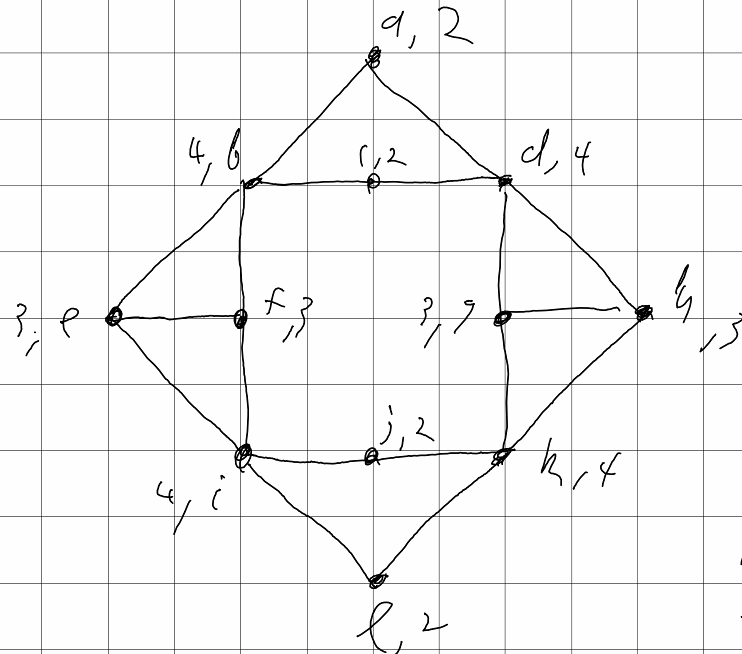




deg 1 => cannot delete to get to deg 2 ∴ no HC

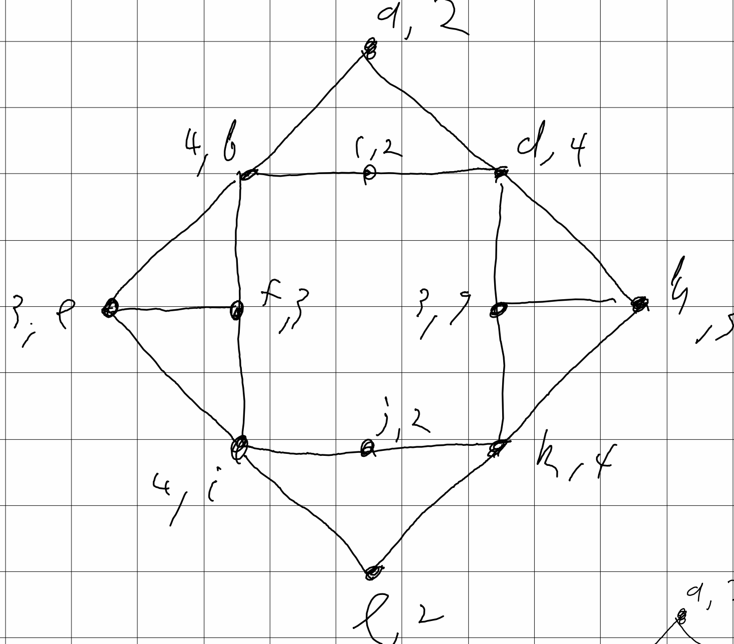


all have 5 edges ∴ cannot delete anymore ∴ no cycle possible



12 degrees to go out

12 vertices
18 edges → delete 6



delete 1 edge on c