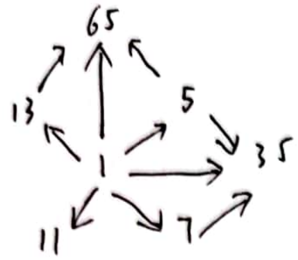
1.



2. lets make children as V and friends relations as E. to construct a graph. This an undirected graph. $2|E| = \sum_{v\in V} deg(v) = 7\times3 + 4\times9 + 4\times5 = 77$.
$2|E|$ is even, 77 is odd, impossible.

3. (1) G_1

	a	b	c	d
a	0	1	1	0
b	1	0	1	1
c	1	1	0	0
d	0	1	0	0

G_2.

	a	b
a	1	0
b	0	1

G_3

	a	b	c	d	e
a	0	1	0	0	0
b	0	0	1	0	0
c	0	0	0	0	0
d	0	0	1	0	1
e	1	0	0	0	0

G_4.

	a	b	c	d
a	0	1	1	0
b	0	0	1	0
c	0	0	0	0
d	1	0	1	0

(2)

K_5:

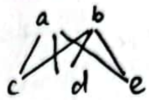
	a	b	c	d	e
a	0	1	1	1	1
b	1	0	1	1	1
c	1	1	0	1	1
d	1	1	1	0	1
e	1	1	1	1	0

C_6:

	a	b	c	d	e	f
a	0	1	0	0	0	1
b	1	0	1	0	0	0
c	0	1	0	1	0	0
d	0	0	1	0	1	0
e	0	0	0	1	0	1
f	1	0	0	0	1	0

$K_{2,3}$.

	a	b	c	d	e
a	0	0	1	1	1
b	0	0	1	1	1
c	1	1	0	0	0
d	1	1	0	0	0
e	1	1	0	0	0



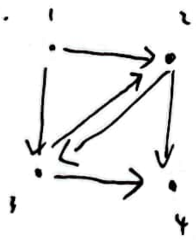
4.

(a)

M_1

M_2

(b).



6.(a) k_1 is not bipartite for there is only 1 point.
k_2 is bipartite for 1 in V_1, 1 in V_2

when $n \geq 3$.
choose any 3 vertices. they are pairwise connected.
Therefore we can not ~~put~~ deal with the edge c
when we put 1 in V_1 and 2, 3 in V_2.
any

$\Rightarrow n=2$ only

(b). when n is even, ~~we~~ we can mark they as $1, 2, \dots 2k-1, 2k$
and put ~~them into~~ $|\{1, 3, 5 \dots 2k-1\}| = k$ into V_1
~~into~~ and $|\{2, 4 \dots 2k\}| = k$ into V_2.
$\Rightarrow$. bipartite.
when n is odd, it fails since we canot arrange $2k+1$ into V_1 or V_2 for it ~~likes~~ links ~~both~~ 2 edge separately to $2k$ and $2k-1$

5.

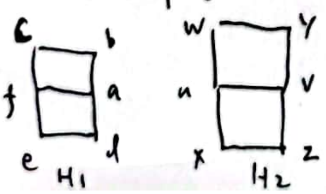
H_1

①

	a	b	c	d	e	f
a	0	1	0	1	0	1
b	1	0	1	0	0	0
c	0	1	0	0	0	1
d	1	0	0	0	1	0
e	0	0	0	1	0	1
f	1	0	1	0	1	0

H_2.

	u	v	x	y	z	w
u	0	1	1	0	0	1
v	1	0	0	1	0	0
x	1	0	0	0	1	0
y	0	1	0	0	0	1
z	0	0	1	0	0	0
w	1	0	0	1	0	0



bijection: $c \leftrightarrow w$, $b \leftrightarrow y$, $f \leftrightarrow u$, $a \leftrightarrow v$, $e \leftrightarrow x$, $d \leftrightarrow z$

$\{u, v\} \in E(H_1)$
$\Leftrightarrow \{6(u), 6(v)\} \in E(H_2)$
H_1, H_2 isomorphic

② H_1 vertex number = 6
H_3 vertex number = 5
$\Rightarrow H_1, H_3$ not isomorphic

③ H_4 has 1 vertex that has degree 3 : b
H_5 has 2 vertex that has degree 3 : v, X
$\Rightarrow H_4, H_5$ not isomorphic

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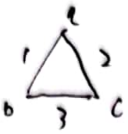
(c) W_n: never

when $n=1$, not exist

when $n=2$: not exist

when $n \geq 3$.

there always exist  structure

where we can only put 2 vertex in V_1/V_2

and 1 vertex in V_2/V_1

and can not deal with the third edge.

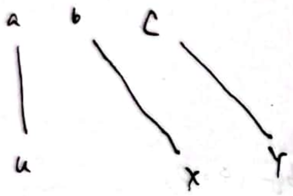
(d) any n.

let V_1 consist of all vertices ~~which~~ whose sum of cordinates is odd

an V_2 consist of all vertices whose sum of cordinates is even.

2 vertex in Q_n is connected (exist an edge) if only their sum of cordinates differs by 1. which make or neighbours in different set (V_1/V_2)

7. (a)



$|M|=3$.

$M=\{au, bx, cy\}$.

(b). Yes. $V_1=\{a,b,c,d,e\}$ $|V_1|=5$

$V_2=\{t,u,v,w,x,y,z\}$. $|V_2|=7$

1° not exists complete matching V_1 to V_2:

Since a, b, e (in V_1) both pointer only to u, x in V_2.

2° not exists complete matching V_2 to V_1:

since $|V_2|=7>|V_1|=5$.