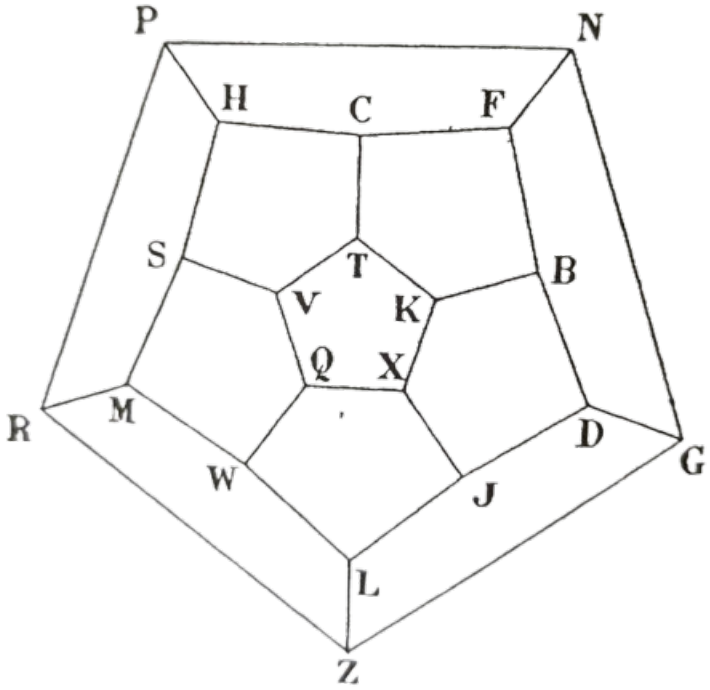


```
b 0  [d f k] = [3 4 8]
c 1  [f h t] = [4 6 16]
d 2  [b g j] = [1 5 7]
f 3  [b c n] = [1 2 11]
g 4  [d n z] = [3 11 20]
h 5  [c p s] = [2 12 15]
j 6  [d l x] = [3 9 19]
k 7  [b j t] = [1 7 16]
l 8  [j w z] = [7 18 20]
m 9  [r s w] = [14 15 18]
n 10 [f g p] = [4 5 12]
p 11 [h n r] = [6 11 14]
q 12 [v w x] = [17 18 19]
r 13 [m p z] = [10 12 20]
s 14 [h m v] = [6 10 17]
t 15 [c k v] = [2 8 17]
v 16 [q s t] = [13 15 16]
w 17 [l m q] = [9 10 13]
x 18 [j k q] = [7 8 13]
z 19 [g l r] = [5 9 14]
```

```
     1  2  3  4  5  6  7  8  9 10 11 12 13 14 15 16 17 18 19 20
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 2 [ 0, 0, 0, 1, 0, 1, 0, 0, 0, 0, 0, 0, 0, 0, 0, 1, 0, 0, 0, 0]
 3 [ 1, 0, 0, 0, 1, 0, 1, 0, 0, 0, 0, 0, 0, 0, 0, 0, 0, 0, 0, 0]
 4 [ 1, 1, 0, 0, 0, 0, 0, 0, 0, 0, 1, 0, 0, 0, 0, 0, 0, 0, 0, 0]
 5 [ 0, 0, 1, 0, 0, 0, 0, 0, 0, 0, 1, 0, 0, 0, 0, 0, 0, 0, 0, 1]
 6 [ 0, 1, 0, 0, 0, 0, 0, 0, 0, 0, 0, 1, 0, 0, 1, 0, 0, 0, 0, 0]
 7 [ 0, 0, 1, 0, 0, 0, 0, 0, 1, 0, 0, 0, 0, 0, 0, 0, 0, 0, 1, 0]
 8 [ 1, 0, 0, 0, 0, 0, 1, 0, 0, 0, 0, 0, 0, 0, 0, 1, 0, 0, 0, 0]
 9 [ 0, 0, 0, 0, 0, 0, 1, 0, 0, 0, 0, 0, 0, 0, 0, 0, 0, 1, 0, 1]
10 [ 0, 0, 0, 0, 0, 0, 0, 0, 0, 0, 0, 0, 0, 1, 1, 0, 0, 1, 0, 0]
11 [ 0, 0, 0, 1, 1, 0, 0, 0, 0, 0, 0, 1, 0, 0, 0, 0, 0, 0, 0, 0]
12 [ 0, 0, 0, 0, 0, 1, 0, 0, 0, 0, 1, 0, 0, 1, 0, 0, 0, 0, 0, 0]
13 [ 0, 0, 0, 0, 0, 0, 0, 0, 0, 0, 0, 0, 0, 0, 0, 0, 1, 1, 1, 0]
14 [ 0, 0, 0, 0, 0, 0, 0, 0, 0, 1, 0, 1, 0, 0, 0, 0, 0, 0, 0, 1]
15 [ 0, 0, 0, 0, 0, 1, 0, 0, 0, 1, 0, 0, 0, 0, 0, 0, 1, 0, 0, 0]
```

```
16 [ 0, 1, 0, 0, 0, 0, 0, 1, 0, 0, 0, 0, 0, 0, 0, 0, 1, 0, 0, 0]
17 [ 0, 0, 0, 0, 0, 0, 0, 0, 0, 0, 0, 0, 1, 0, 1, 1, 0, 0, 0, 0]
18 [ 0, 0, 0, 0, 0, 0, 0, 0, 1, 1, 0, 0, 1, 0, 0, 0, 0, 0, 0, 0]
19 [ 0, 0, 0, 0, 0, 0, 1, 1, 0, 0, 0, 0, 1, 0, 0, 0, 0, 0, 0, 0]
20 [ 0, 0, 0, 0, 1, 0, 0, 0, 1, 0, 0, 0, 0, 1, 0, 0, 0, 0, 0, 0]



# This code is contributed by divyesh072019.

import time

def isSafe(v, graph, path, pos):
    if graph[path[pos - 1]][v] == 0:
        return False
    for i in range(pos):
        if path[i] == v:
            return False
    return True

hasCycle = False

def hamCycle(graph):
    global hasCycle
    hasCycle = False
    path = []
    path.append(0)
    visited = [False]*(len(graph))
    for i in range(len(visited)):
        visited[i] = False
    visited[0] = True
    FindHamCycle(graph, 1, path, visited)
    if hasCycle:
        print("No Hamiltonian Cycle" + "possible ")
        return

def FindHamCycle(graph, pos, path, visited):
    if pos == len(graph):
        if graph[path[-1]][path[0]] != 0:
            path.append(0)
            for i in range(len(path)):
                print(path[i], end = " ")
            print()
            path.pop()
            hasCycle = True
        return
    for v in range(len(graph)):
        if isSafe(v, graph, path, pos) and not visited[v]:
            path.append(v)
            visited[v] = True
            FindHamCycle(graph, pos + 1, path, visited)
            visited[v] = False
            path.pop()

tic = time.time()
graph = [[ 0, 0, 1, 1, 0, 0, 0, 1, 0, 0, 0, 0, 0, 0, 0, 0, 0, 0, 0, 0],
         [ 0, 0, 0, 1, 0, 1, 0, 0, 0, 0, 0, 0, 0, 0, 0, 1, 0, 0, 0, 0],
         [ 1, 0, 0, 0, 1, 0, 1, 0, 0, 0, 0, 0, 0, 0, 0, 0, 0, 0, 0, 0],
         [ 1, 1, 0, 0, 0, 0, 0, 0, 0, 0, 1, 0, 0, 0, 0, 0, 0, 0, 0, 0],
         [ 0, 0, 1, 0, 0, 0, 0, 0, 0, 0, 1, 0, 0, 0, 0, 0, 0, 0, 0, 1],
         [ 0, 1, 0, 0, 0, 0, 0, 0, 0, 0, 0, 1, 0, 0, 1, 0, 0, 0, 0, 0],
         [ 0, 0, 1, 0, 0, 0, 0, 0, 1, 0, 0, 0, 0, 0, 0, 0, 0, 0, 1, 0],
         [ 1, 0, 0, 0, 0, 0, 1, 0, 0, 0, 0, 0, 0, 0, 0, 1, 0, 0, 0, 0],
         [ 0, 0, 0, 0, 0, 0, 1, 0, 0, 0, 0, 0, 0, 0, 0, 0, 0, 1, 0, 1],
```

```
          [ 0, 0, 0, 0, 0, 0, 0, 0, 0, 0, 0, 0, 1, 1, 0, 0, 1, 0, 0],
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          [ 0, 0, 0, 0, 0, 0, 0, 0, 0, 0, 0, 0, 0, 0, 0, 0, 1, 1, 1],
          [ 0, 0, 0, 0, 0, 0, 0, 0, 0, 1, 0, 1, 0, 0, 0, 0, 0, 0, 1],
          [ 0, 0, 0, 0, 0, 1, 0, 0, 0, 1, 0, 0, 0, 0, 0, 0, 1, 0, 0],
          [ 0, 1, 0, 0, 0, 0, 0, 1, 0, 0, 0, 0, 0, 0, 0, 0, 1, 0, 0],
          [ 0, 0, 0, 0, 0, 0, 0, 0, 0, 0, 0, 0, 1, 0, 1, 1, 0, 0, 0],
          [ 0, 0, 0, 0, 0, 0, 0, 0, 1, 1, 0, 0, 1, 0, 0, 0, 0, 0, 0],
          [ 0, 0, 0, 0, 0, 0, 1, 1, 0, 0, 0, 0, 1, 0, 0, 0, 0, 0, 0],
          [ 0, 0, 0, 0, 1, 0, 0, 0, 1, 0, 0, 0, 0, 1, 0, 0, 0, 0, 0]]
hamCycle(graph)
tac = time.time()
print('\n',tac-tic,' s.')
```

```
0  2  4  10  3  1  5  11  13  19  8  6  18  12  17  9  14  16  15  7  0
0  2  4  10  3  1  15  16  12  17  9  14  5  11  13  19  8  6  18  7  0
0  2  4  10  11  5  14  16  12  17  9  13  19  8  6  18  7  15  1  3  0
0  2  4  10  11  13  19  8  6  18  7  15  16  12  17  9  14  5  1  3  0
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0  7  15  16  14  9  17  12  18  6  8  19  13  11  5  1  3  10  4  2  0

0.0317387580871582  s.
```
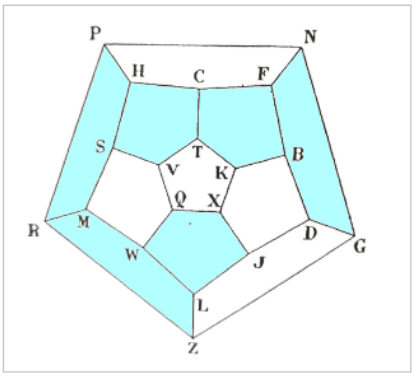

Après conversion nombres en lettres, voici les 40 solutions trouvées par le programme de l’internaute divyesh072019. On dessine les 6 premières.

1) B D G N F C H P R Z L J X Q W M S V T K B
2) B D G N F C T V Q W M S H P R Z L J X K B
3) B D G N P H S V Q W M R Z L J X K T C F B

4) B D G N P R Z L J X K T V Q W M S H C F B
5) B D G Z L J X K T C H S V Q W M R P N F B
6) B D G Z L J X Q W M R P N F C H S V T K B
7) B D G Z R M S H P N F C T V Q W L J X K B
8) B D G Z R M S V Q W L J X K T C H P N F B
9) B D G Z R M W L J X Q V S H P N F C T K B
10) B D G Z R P N F C H S M W L J X Q V T K B
11) B D J L W M R Z G N P H S V Q X K T C F B
12) B D J L W M S H P R Z G N F C T V Q X K B
13) B D J L W M S V Q X K T C H P R Z G N F B
14) B D J L W Q X K T V S M R Z G N P H C F B
15) B D J L Z G N F C T V S H P R M W Q X K B
16) B D J L Z G N P R M W Q X K T V S H C F B
17) B D J X K T C H P R M S V Q W L Z G N F B
18) B D J X K T V Q W L Z G N P R M S H C F B
19) B D J X Q V S H P R M W L Z G N F C T K B
20) B D J X Q W L Z G N F C H P R M S V T K B
21) B F C H P N G D J X Q W L Z R M S V T K B
22) B F C H S M W L Z R P N G D J X Q V T K B
23) B F C T V Q W L Z R M S H P N G D J X K B
24) B F C T V S H P N G D J L Z R M W Q X K B
25) B F N G D J L Z R P H C T V S M W Q X K B
26) B F N G D J X Q V S M W L Z R P H C T K B
27) B F N P H C T V S M R Z G D J L W Q X K B
28) B F N P R M S H C T V Q W L Z G D J X K B
29) B F N P R M W L Z G D J X Q V S H C T K B
30) B F N P R Z G D J L W M S H C T V Q X K B
31) B K T C F N G Z L W M R P H S V Q X J D B
32) B K T C F N P H S V Q X J L W M R Z G D B
33) B K T C H P R Z L W M S V Q X J D G N F B
34) B K T C H S V Q X J D G Z L W M R P N F B
35) B K T V Q X J D G N P R Z L W M S H C F B
36) B K T V Q X J L W M S H C F N P R Z G D B
37) B K T V S H C F N P R M W Q X J L Z G D B
38) B K T V S M R P H C F N G Z L W Q X J D B
39) B K T V S M R Z L W Q X J D G N P H C F B
40) B K T V S M W Q X J L Z R P H C F N G D B

Pourquoi le programme de calcul des cycles hamiltoniens trouve-t-il 40 solutions ?
Il faut penser à la façon dont Hermary coupe le dodécaèdre en deux demi-dodécaèdre et imaginer qu’on colorie l’un des deux demi-dodécaèdres en noir. Alors ce demi-dodécaèdre contient ou pas le pentagone central, ce qui fait deux possibilités combinatoires, on voit que dans la couronne centrale des pentagones de taille moyenne, le demi-dodécaèdre contient parfois 1, parfois 2, parfois 3 mais jamais 4 pentagones centraux, et une fois ça fixé, il ne lui reste pas de choix pour le nombre de pentagones à colorier sur la couronne externe, puisque ce nombre est déterminé (il est égal au complémentaire à 6 du nombre de pentagones coloriés jusque-là). On a donc 2x3 = 6 possibilités. Je n’arrive pas à retomber sur mes pattes car j’en trouve 8.
C’est sans compter que le programme a considéré comme différentes des cycles égaux à rotation d’un cinquième de tour près. D’où les 40 possibilités.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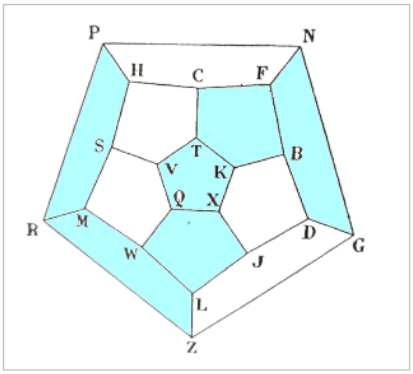
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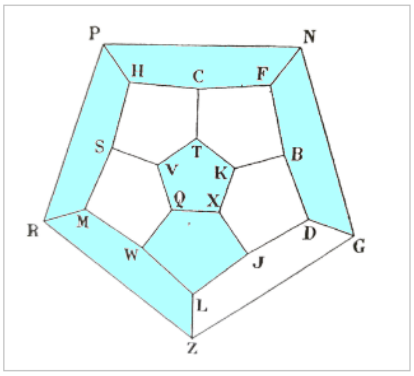
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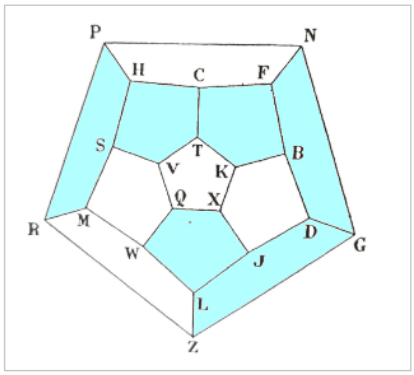
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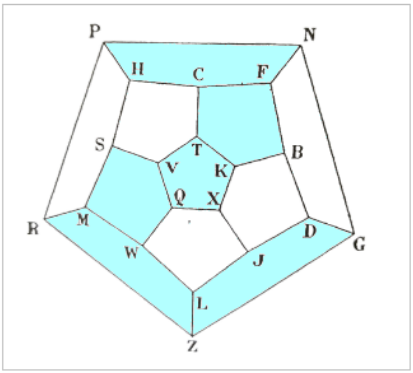
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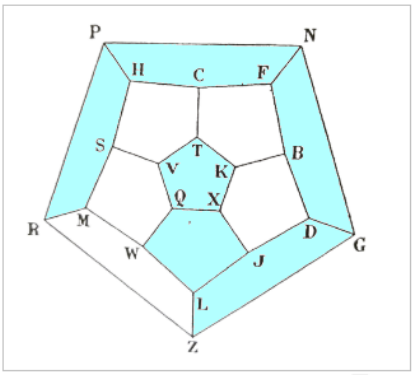
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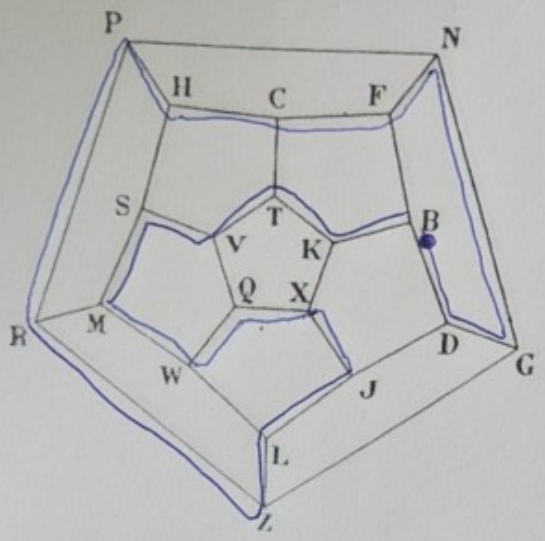
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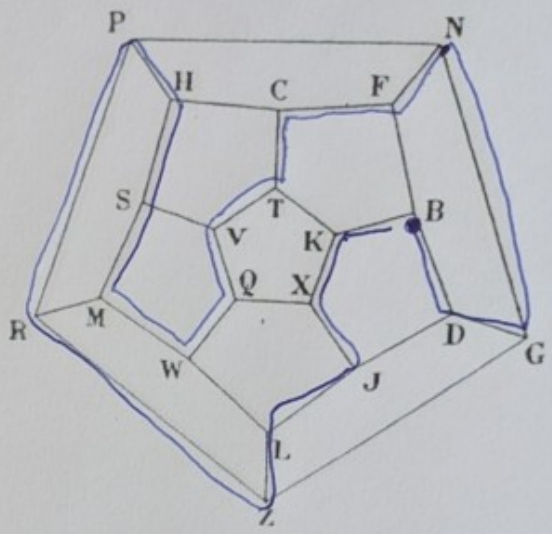
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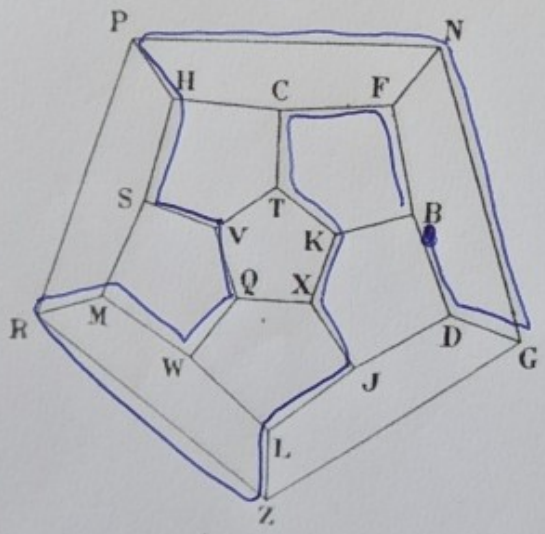
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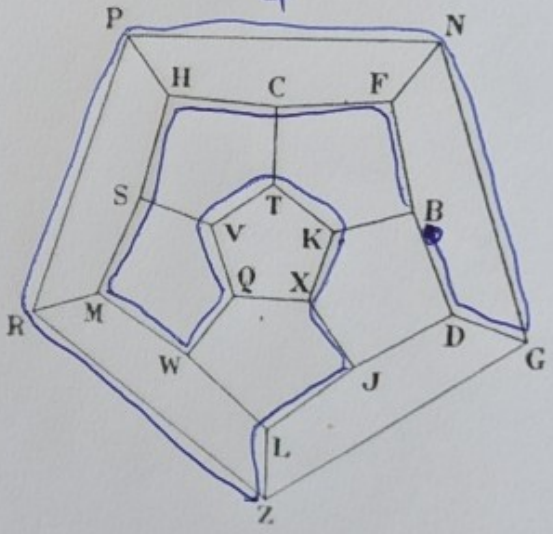
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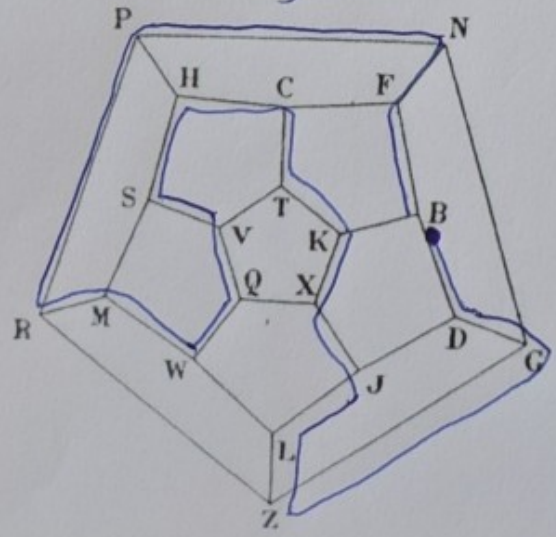
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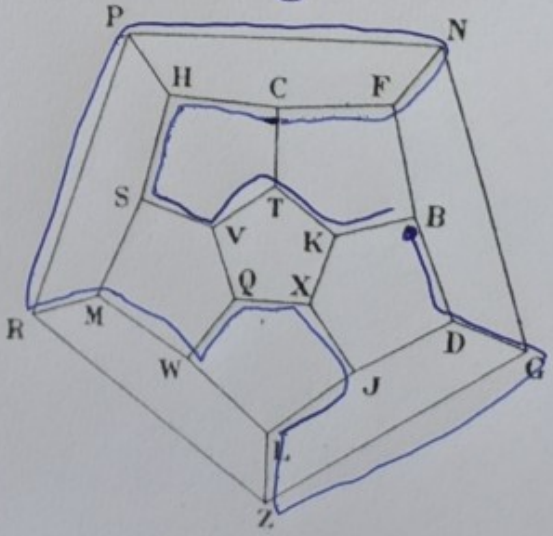
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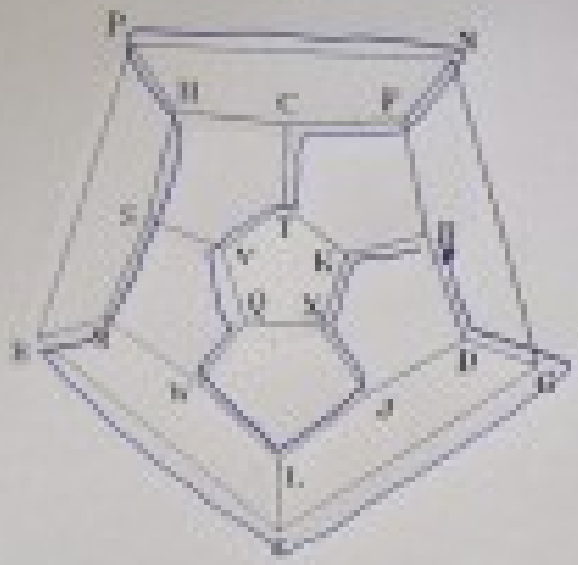
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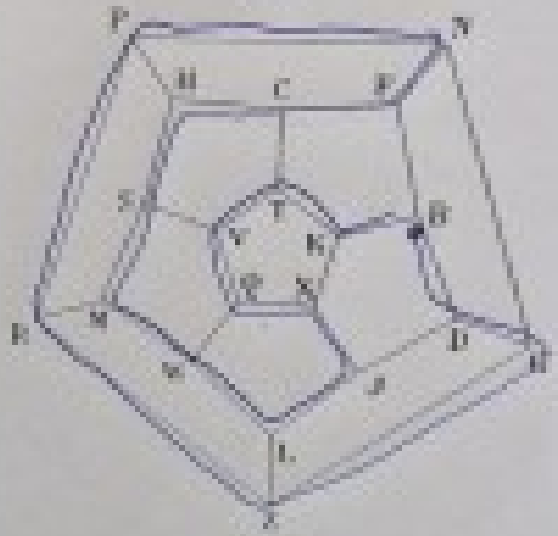
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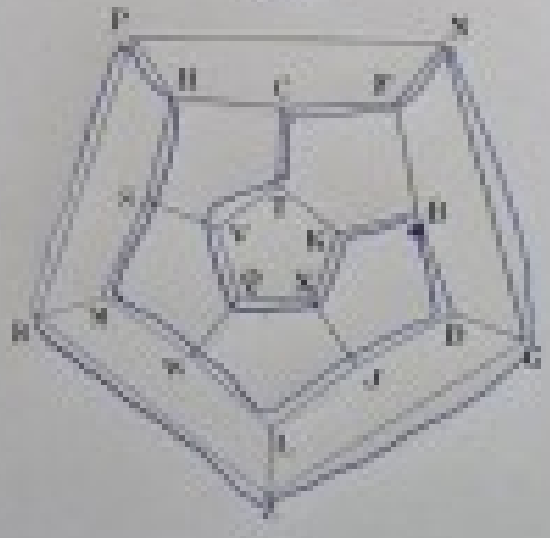
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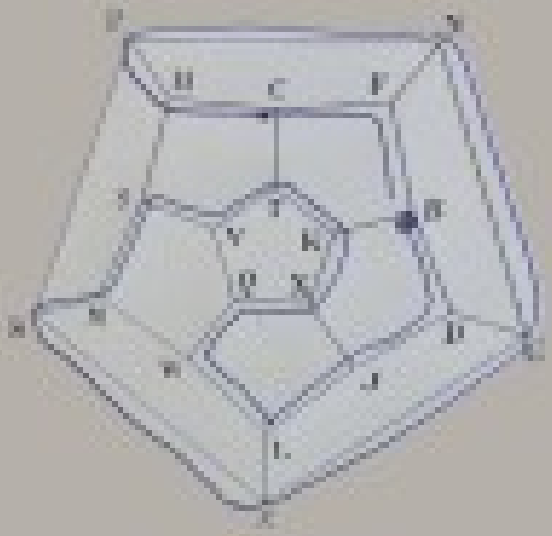

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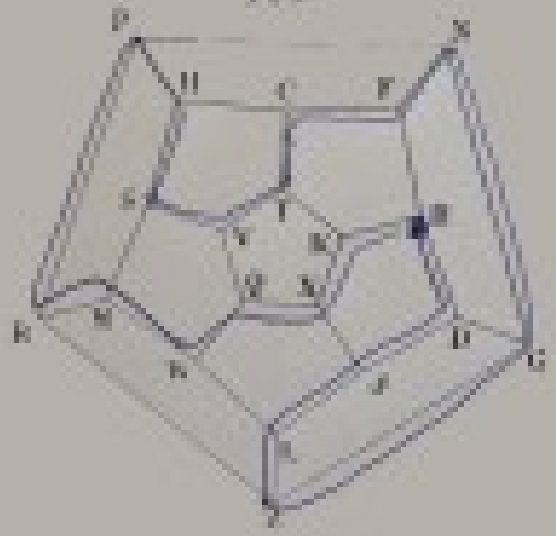

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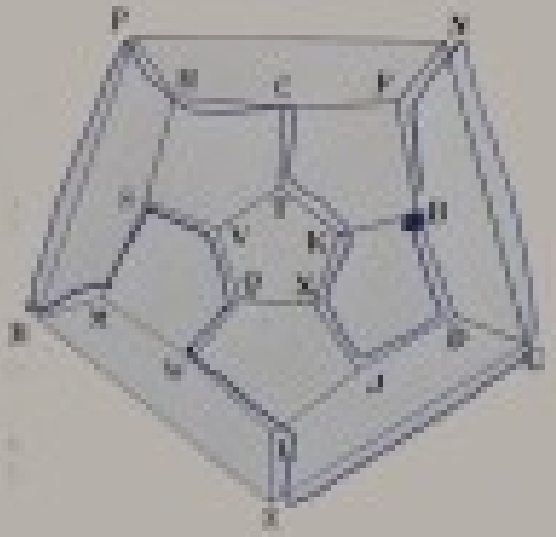

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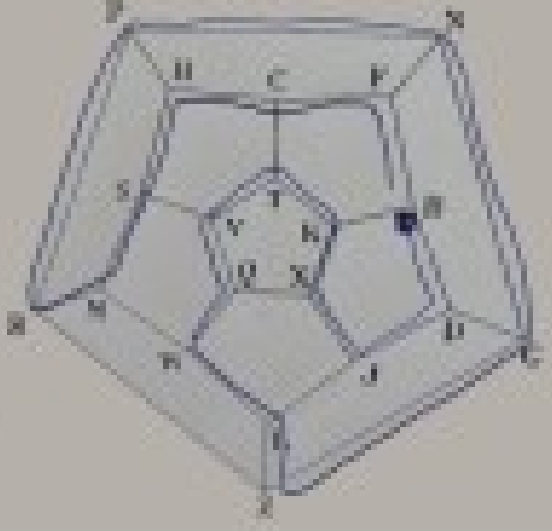

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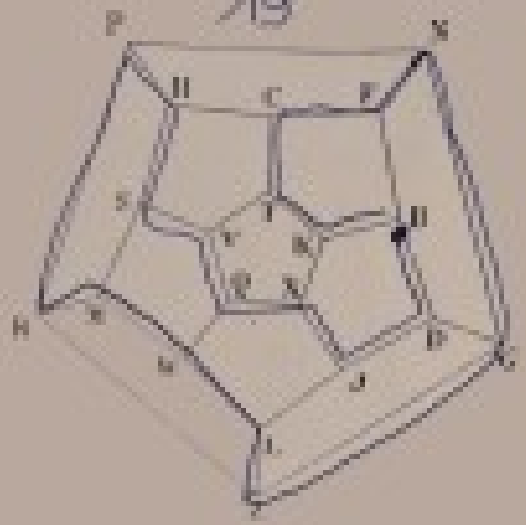

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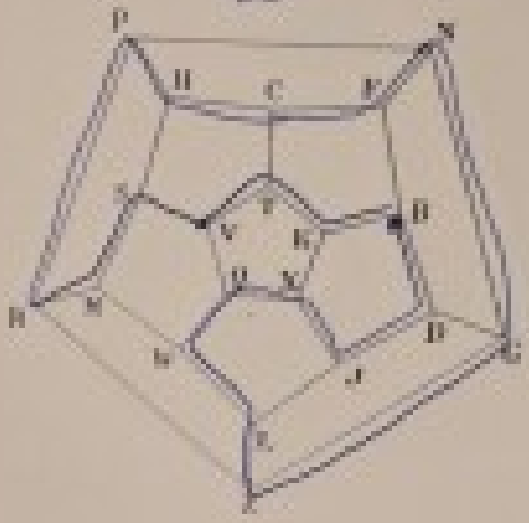

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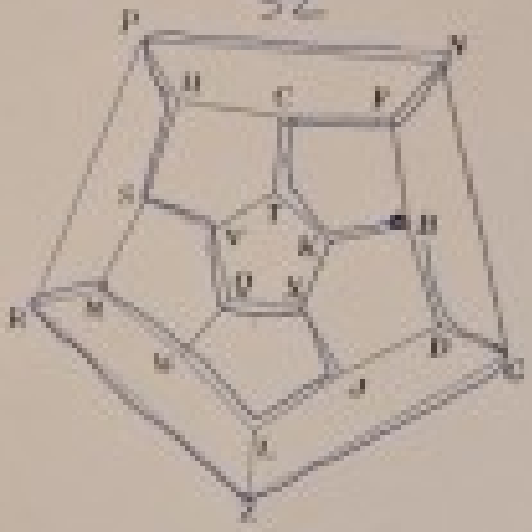

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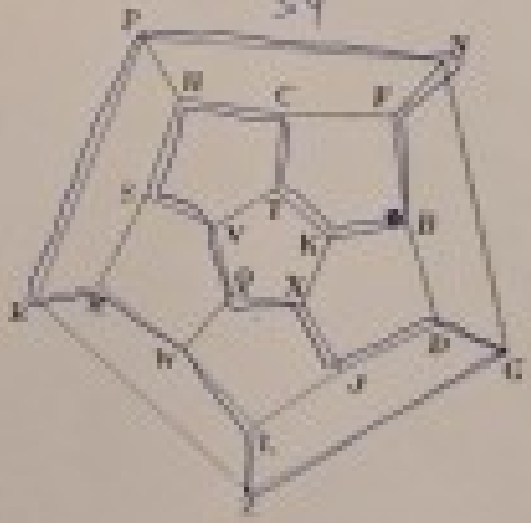

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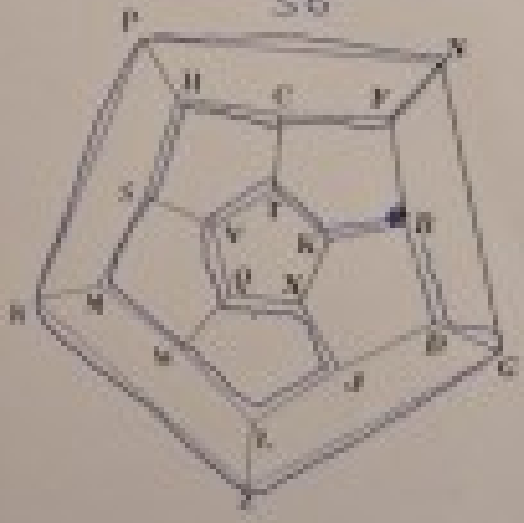

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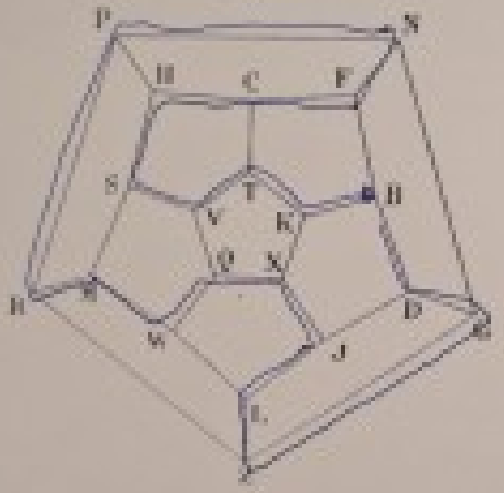
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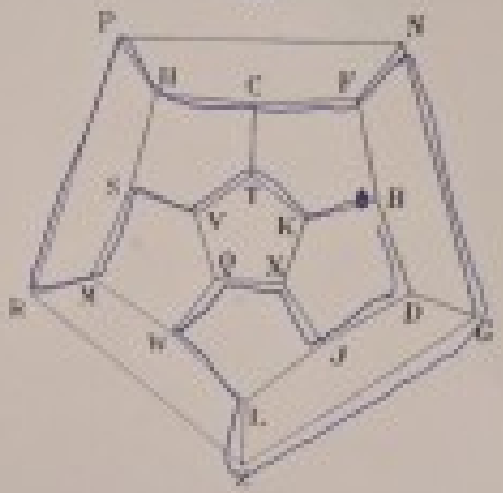
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