

1.1

只包含样本1和4，样本空间变为

- 1 青绿 蜷缩 浊响 是
- 2 乌黑 稍蜷 沉闷 否

- 1. 青绿 蜷缩 浊响
- 2. * 蜷缩 浊响
- 3. ** 浊响
- 4. * 蜷缩 *
- 5. 青绿 * 浊响
- 6. 青绿 蜷缩 *
- 7. 青绿 **

1.2

```
1 #include <stdio.h>
2 int State[50], cnt, Sum[20];
3 bool vis[1 << 18];
4
5
6 void dfs(int k, int start, int now, int S) {
7     if (now == k) {
8         if (vis[S]) return ;
9         vis[S] = true;
10        ++Sum[k];
11        return ;
12    }
13    for (int i = start; i < cnt; ++i)
14        dfs(k, i + 1, now + 1, S | State[i]);
15 }
16
17 int main(){
18     int s1, s2, s3, i, j, k, i1, j1, k1;
19     for (i = 0; i <= 3; ++i)
20         for (j = 0; j <= 3; ++j)
21             for (k = 0; k <= 2; ++k) {
22                 s1 = (!i) ? 7 : 1 << (i - 1);
23                 s2 = (!j) ? 7 : 1 << (j - 1);
24                 s3 = (!k) ? 3 : 1 << (k - 1);
25                 for (i1 = 0; i1 <= 2; ++i1)
26                     if (s1 >> i1 & 1)
27                         for (j1 = 0; j1 <= 2; ++j1)
28                             if (s2 >> j1 & 1)
29                                 for (k1 = 0; k1 <= 1; ++k1)
30                                     if (s3 >> k1 & 1)
31                                         State[cnt] |= 1 << (i1 * 6 + j1 * 2
32 + k1);
33                                     ++ cnt;
34             }
35     Sum[0] = 1;
36     for (i = 1; i <= 18; ++i) {
```

```

36     dfs(i, 0, 0, 0);
37     Sum[i] += Sum[i - 1];
38     printf("%d %d\n", i, Sum[i]);
39     if (Sum[i] == 1 << 18)
40         break;
41 }
42 ++i;
43 for (; i <= 18; ++i)
44     Sum[i] += Sum[i - 1];
45 for (i = 0; i <= 18; ++i)
46     printf("%d %d\n", i, Sum[i]);
47 return 0;
48 }

```

答案如下

```

1  0 1
2  1 49
3  2 898
4  3 8386
5  4 41743
6  5 115822
7  6 201304
8  7 248854
9  8 260788
10 9 262144
11 10 262144
12 11 262144
13 12 262144
14 13 262144
15 14 262144
16 15 262144
17 16 262144
18 17 262144
19 18 262144

```

1.3

以训练错误为第一关键字, 训练结果简单程度为第二关键字进行归纳

1.4

因为 $l(0, 0) = l(1, 1), l(1, 0) = l(0, 1)$

所以, $l(0, 0) + l(0, 1) = l(1, 0) + l(1, 1)$

令 $l(0, 0) + l(0, 1) = A$

所以 $l(f(x) == h(x)) + l(f(x) == h(x)) = A$

$\sum_f l(h(x), f(x)) = \frac{1}{2} 2^{|\mathcal{X}|} (l(f(x) == h(x)) + l(f(x) \neq g(x)))$

$= \frac{1}{2} 2^{|\mathcal{X}|} A$

原式 $= \frac{1}{2} 2^{|\mathcal{X}|} A \sum_{x \in \mathcal{X} - X} P(x) \sum_h P(h|X, \mathcal{L}_\alpha)$

所以仍然成立