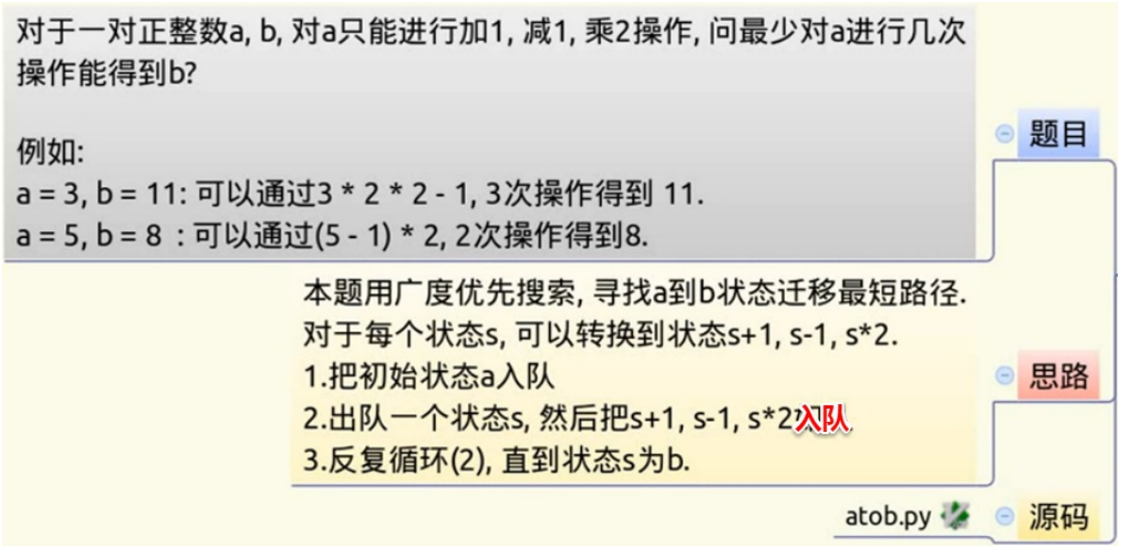
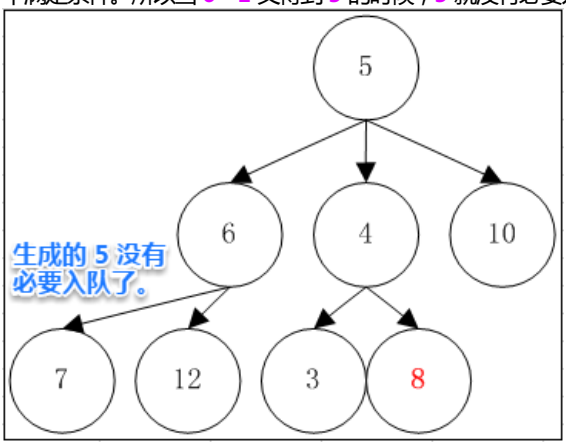
队列-3

a_to_b.py

- **案例**
  - **案例-3**：数字变换
    - **概述**



    - **思路**
      - **如何记录计算次数？**通过 **(数字, 计算次数)** 元组这种数据结构实现。
      - **为什么要设置集合（老师实现）？**下图是一个 **5 to 8** 的过程，**5** 之所以要 **+1、-1、*2** 就是说明 **5** 不等于 **8**，不满足条件。所以当 **6 - 1** 又得到 **5** 的时候，**5** 就没有必要入队再次进行与 **8** 的比较了。



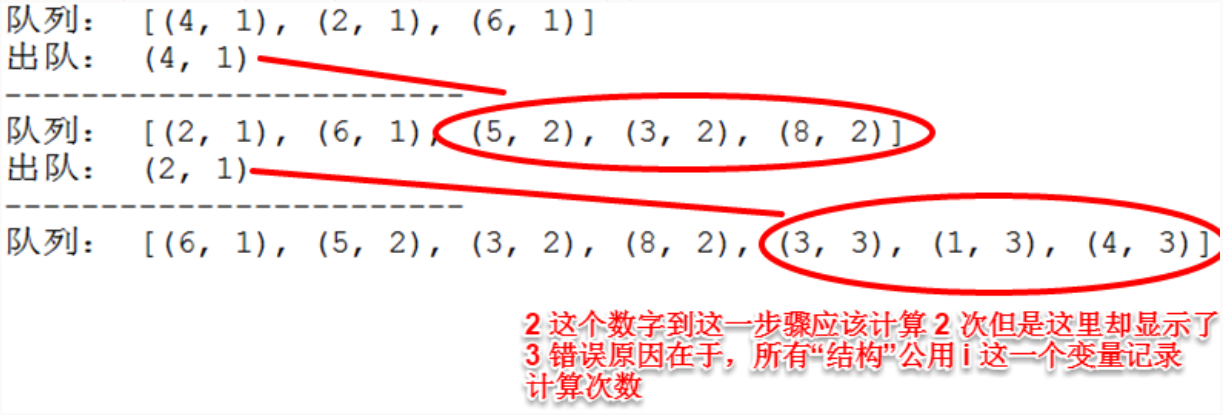
    - **代码-0**：自己实现（有问题）

```
# coding:utf-8

from collections import deque

def a_to_b(a, b):
    i = 0
    q = deque()
    cur = (a, i)

    while not cur[0] == b:
        q.append((cur[0] + 1, i + 1))
        q.append((cur[0] - 1, i + 1))
        q.append((cur[0] * 2, i + 1))
        cur = q.popleft()
    return cur[1]

if __name__ == "__main__":
    print a_to_b(3, 11)
```

1 # 输出结果永远是 1 。问题出在高亮处，i 的初值永远是 0 所以不管多少次循环 + 1 后永远是 1


```
# coding:utf-8

from collections import deque

def a_to_b(a, b):
    i = 0
    q = deque()
    cur = (a, i)

    while not cur[0] == b:
        i = i + 1
        q.append((cur[0] + 1, i))
        q.append((cur[0] - 1, i))
        q.append((cur[0] * 2, i))
        cur = q.popleft()
    return cur[1]

if __name__ == "__main__":
    print a_to_b(3, 11)
```

13 # 从 3 计算到 11 只需要 3 次计算这里却是 13 。问题出在高亮处



- **代码-1**：自己实现

```
# coding:utf-8

from collections import deque

def a_to_b(a, b):
    # 用元组这种数据结构表示 (计算结果, 层数)
    # 通过层数得知通过几次计算由 a 得到 b
    q = deque()
    cur = (a, 0)

    # 如果计算结果不等于 b , 再次计算 计算结果的+1、-1、*2 入队
    while not cur[0] == b:
        # 使用各自的变量存储计算次数
        q.append((cur[0] + 1, cur[1] + 1))
        q.append((cur[0] - 1, cur[1] + 1))
        q.append((cur[0] * 2, cur[1] + 1))
        cur = q.popleft()
    return cur[1]

if __name__ == "__main__":
    print u'通过', a_to_b(3, 11), u'次计算实现！'
```

- **代码-2**：老师实现

```
# coding:utf-8
```

```
from collections import deque

def a_to_b(a, b):

    q = deque([(a, 0)])
    # 通过集合 check 判断，如果通过 +1、-1、*2 生成的元素之前入队过
    # （经过与 b 的判断，入队过现在还在生成新数，说明该数不等于 b）
    # 就不要再次入队
    check = {a}

    # 队列出队元素是元组，将元组拆包
    # num   获得元组第一元素
    # count 获得元组第二个元素
    num, count = q.popleft()

    while not num == b:
        # 新生成的数不在集合中，才添加到队列
        if not num + 1 in check:
            q.append((num + 1, count + 1))
            check.add(num + 1)
        # 新生成的数不在集合中，才添加到队列
        if not num - 1 in check:
            q.append((num - 1, count + 1))
            check.add(num - 1)
        # 新生成的数不在集合中，才添加到队列
        if not num * 2 in check:
            q.append((num * 2, count + 1))
            check.add(num * 2)
        num, count = q.popleft()

    return count

if __name__ == "__main__":
    print a_to_b(3, 11)

# 没有集合判断
deque([(11, 3), (24, 3), (7, 4), (5, 4), (12, 4), (5, 4), (3, 4), (8, 4), (11, 4), (9, 4), (20, 4), (5, 4), (3, 4), (8, 4), (3, 4), (1, 4), (4, 4), (7, 4), (5, 4), (12, 4), (10, 4), (8, 4), (18, 4), (8, 4), (6, 4), (14, 4), (17, 4), (15, 4), (32, 4), (5, 4), (3, 4), (8, 4), (3, 4), (1, 4), (4, 4), (7, 4), (5, 4), (12, 4), (3, 4), (1, 4), (4, 4), (1, 4), (-1, 4), (0, 4), (3, 4), (1, 4), (4, 4), (6, 4), (4, 4), (10, 4), (4, 4), (2, 4), (6, 4), (9, 4), (7, 4), (16, 4), (9, 4), (7, 4), (16, 4), (7, 4), (5, 4), (12, 4), (15, 4), (13, 4), (28, 4), (7, 4), (5, 4), (12, 4), (5, 4), (3, 4), (8, 4), (11, 4), (9, 4), (20, 4), (14, 4), (12, 4), (26, 4)])
# 有集合判断 ，可以看出队列中元素显著的少
deque([(11, 3), (24, 3), (20, 4), (18, 4), (17, 4), (15, 4), (32, 4), (-1, 4), (28, 4), (26, 4)])
```

- **And So On**