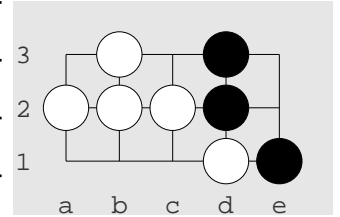1. (a) What is the score of this go position P?   Black _____ White _____
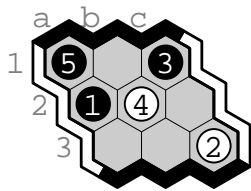
   (b) Repeat (a) if the komi is 3.5.   Black _____ White _____

   (c) From P, give all black moves that capture an opponent block. _____

   (d) Repeat (c) for white.   _____

2. From `hexgo/hex.py`, here is `parent[x]` for this hex position. Next a white stone is placed at `b3` , causing two union operations. Show the changes to `parent[x]`.

```
                x        -4 -3 -2 -1  0  1  2  3  4  5  6  7  8  9
  current parent[x]      -4 -3 -2 -1  3  1 -4 -4  4  5  6  7 -3  9
     after union 4 7     __ __ __ __ __ __ __ __ __ __ __ __ __ __
  then after union 8 7   __ __ __ __ __ __ __ __ __ __ __ __ __ __
```

3. (a) Unscramble and indent this code (a while loop) from the function that computes the go score. Indent properly and write the line number for each line: we have written the first number line for you.

```
                                        WRITE YOUR ANSWER BELOW HERE
(0) b_nbr |= (self.brd[x] == BLACK)            .(6)
(1) empty_points.append(x)                     .
(2) empty_seen.add(x)                          .
(3) if self.brd[x] == EMPTY and x not in empty_seen:  .
(4) for j in self.nbr_offsets:                 .
(5) w_nbr |= (self.brd[x] == WHITE)            .
(6) while (len(empty_points) > 0):             .
(7) territory += 1                             .
(8) q = empty_points.pop()                     .
(9) x = j + q                                  .
```
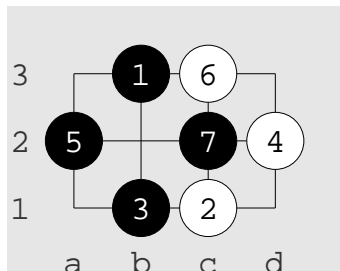
   (b) Explain carefully: what does this line do ? `b_nbr |= (self.brd[x] == BLACK)`

   _____

   _____

4. For both of the following continuations of the go game, give the first illegal move, and explain why it is illegal (occupied point, liberty violation, superko violation) or answer **all moves legal** if all moves are legal. (a) Assume self-capture is illegal. (b) Assume self-capture is legal.

(a) ... 8.W[b2] 9.B[c2] 10.W[a1] _____

(b) ...   (same as above) _____

(a) ... 8.W[d3] 9.B[pass] 10.W[d1] 11.B[b2] _____

(b) ...   (same as above) _____

5. This line is from the go board initialization in `hexgo/stone_board.py`:

```
self.nbr_offset = ((-1,0), (0,1), (1,0), (0,-1))
```

(a) Give the corresponding line for hex board initialization:

```
self.nbr_offset =
```
_____

(b) Carefully explain the purpose of line 92 below:

_____

_____


```
for r in range(self.r):
  for c in range(self.c):
    for (y,x) in self.nbr_offset:
      if r+y in r_range and c+x in c_range:  # line 92
```

6. AlphaGo-Lee Sedol challenge match, Game 1, who made move move 7 (AG/LS)? _____
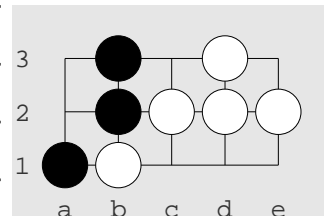
(b) why was this move unexpected? (at most 20 words) _____

_____

(c) did this move turn out to be strong or weak move? Explain (at most 30 words)

_____

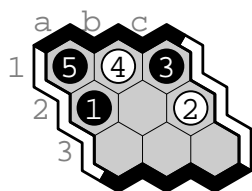_____

1. (a) What is the score of this go position P?   Black _____ White _____

   (b) Repeat (a) if the komi is 3.5.   Black _____ White _____

   (c) From P, give all black moves that capture an opponent block. _____

   (d) Repeat (c) for white.   _____

2. From `hexgo/hex.py`, here is `parent[x]` for this hex position. Next a white stone is placed at `b2` , causing two union operations. Show the changes to `parent[x]`.

x	-4	-3	-2	-1	0	1	2	3	4	5	6	7	8	9
current parent[x]	-4	-3	-2	-1	3	1	-4	-4	4	-3	6	7	8	9
after union 1 4	--	--	--	--	--	--	--	--	--	--	--	--	--	--
then after union 5 4	--	--	--	--	--	--	--	--	--	--	--	--	--	--

3. (a) Unscramble and indent this code (a while loop) from the function that computes the go score. Indent properly and write the line number for each line: we have written the first number line for you.

   WRITE YOUR ANSWER BELOW HERE

   ```
   (0) for j in self.nbr_offsets:
   (1) w_nbr |= (self.brd[x] == WHITE)
   (2) while (len(empty_points) > 0):
   (3) territory += 1
   (4) q = empty_points.pop()
   (5) x = j + q
   (7) b_nbr |= (self.brd[x] == BLACK)
   (6) empty_points.append(x)
   (8) empty_seen.add(x)
   (9) if self.brd[x] == EMPTY and x not in empty_seen:
   ```
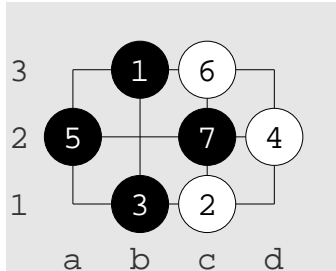
   .(2)

   .

   .

   .

   .

   .

   .

   .

   .

   (b) Explain carefully: what does this line do ? `b_nbr |= (self.brd[x] == BLACK)`

   _____

   _____

4. For both of the following continuations of the go game, give the first illegal move, and explain why it is illegal (occupied point, liberty violation, superko violation) or answer **all moves legal** if all moves are legal. (a) Assume self-capture is illegal. (b) Assume self-capture is legal.

(a) ... 8.W[b2] 9.B[c2] 10.W[a1]　　————————————

(b) ...　(same as above)　　　　————————————

(a) ... 8.W[d3] 9.B[pass] 10.W[d1] 11.B[b2] ————————————

(b) ...　(same as above)　　　　————————————

5. This line is from the go board initialization in `hexgo/stone_board.py`:

```
self.nbr_offset = ((-1,0), (0,1), (1,0), (0,-1))
```

(a) Give the corresponding line for hex board initialization:

```
self.nbr_offset =
```
　————————————————————————

(b) Carefully explain the purpose of line 92 below:

————————————————————————————————

————————————————————————————————

```
for r in range(self.r):
  for c in range(self.c):
    for (y,x) in self.nbr_offset:
      if r+y in r_range and c+x in c_range:  # line 92
```

6. AlphaGo-Lee Sedol challenge match, Game 3, who made move move 37 (AG/LS)? ————————

(b) why was this move unexpected? (at most 20 words)　————————————————

————————————————————————————————

(c) did this move turn out to be strong or weak move? Explain (at most 30 words)

————————————————————————————————

————————————————————————————————
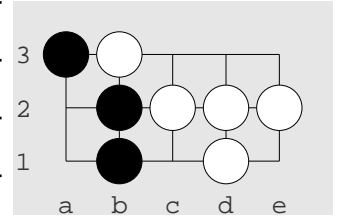
1. (a) What is the score of this go position P?   Black _____ White _____

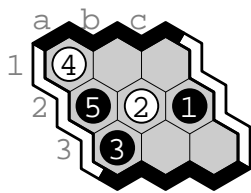   (b) Repeat (a) if the komi is 3.5.   Black _____ White _____

   (c) From P, give all black moves that capture an opponent block. _____

   (d) Repeat (c) for white.   _____

2. From `hexgo/hex.py`, here is `parent[x]` for this hex position. Next a white stone is placed at `b1` , causing two union operations. Show the changes to `parent[x]`.


```
        x            -4 -3 -2 -1  0  1  2  3  4  5  6  7  8  9

current parent[x]    -4 -3 -2 -1 -1  1  2 -2  4  5 -2  7  8  9

  after union 0 1    -- -- -- -- -- -- -- -- -- -- -- -- -- --

then after union 4 1 -- -- -- -- -- -- -- -- -- -- -- -- -- --
```

3. (a) Unscramble and indent this code (a while loop) from the function that computes the go score. Indent properly and write the line number for each line: we have written the first number line for you.

WRITE YOUR ANSWER BELOW HERE

```
(0) territory += 1                                  (9)
(1) q = empty_points.pop()
(2) x = j + q
(3) b_nbr |= (self.brd[x] == BLACK)
(4) empty_points.append(x)
(5) empty_seen.add(x)
(6) if self.brd[x] == EMPTY and x not in empty_seen:
(7) for j in self.nbr_offsets:
(8) w_nbr |= (self.brd[x] == WHITE)
(9) while (len(empty_points) > 0):
```
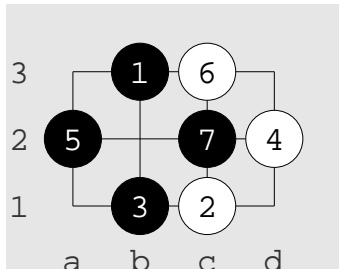
   (b) Explain carefully: what does this line do ? `b_nbr |= (self.brd[x] == BLACK)`

   _____

   _____

4. For both of the following continuations of the go game, give the first illegal move, and explain why it is illegal (occupied point, liberty violation, superko violation) or answer **all moves legal** if all moves are legal. (a) Assume self-capture is illegal. (b) Assume self-capture is legal.

(a) ... 8.W[b2] 9.B[c2] 10.W[a1]   _____

(b) ...   (same as above)   _____

(a) ... 8.W[d3] 9.B[pass] 10.W[d1] 11.B[b2] _____

(b) ...   (same as above)   _____

5. This line is from the go board initialization in `hexgo/stone_board.py`:

```
self.nbr_offset = ((-1,0), (0,1), (1,0), (0,-1))
```

(a) Give the corresponding line for hex board initialization:

```
self.nbr_offset =
```
_____

(b) Carefully explain the purpose of line 92 below:

_____

_____


```
for r in range(self.r):
  for c in range(self.c):
    for (y,x) in self.nbr_offset:
      if r+y in r_range and c+x in c_range:  # line 92
```

6. AlphaGo-Lee Sedol challenge match, Game 4, who made move move 78 (AG/LS)? _____

(b) why was this move unexpected? (at most 20 words) _____

_____

(c) did this move turn out to be strong or weak move? Explain (at most 30 words)

_____

_____