清华算法营-5B

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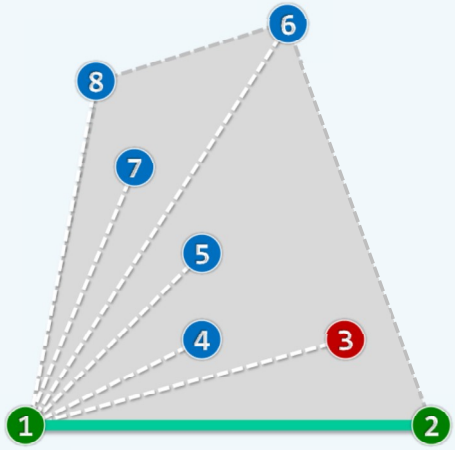
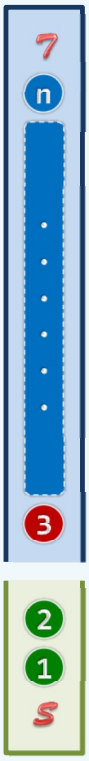
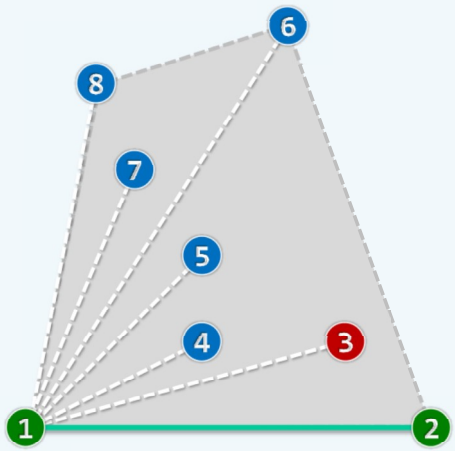
CH: Graham Scan: Presorting



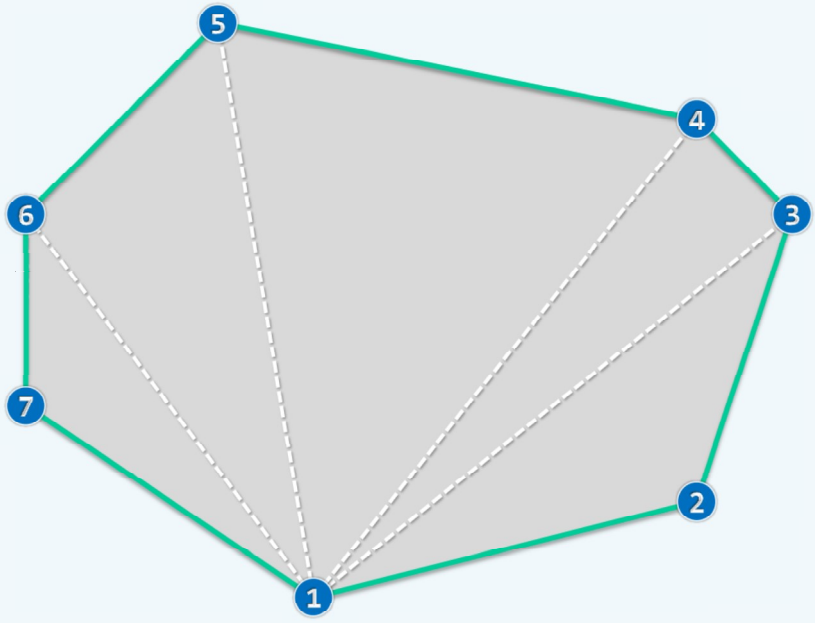


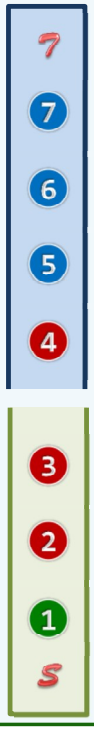
CH: Graham Scan: Scan

```
while( ! T.empty() )
   // test type of current turn
   toLeft( U, V, W ) ?
      // step forward at a left turn
      S.push( T.pop() ) :
      // otherwise, backtrack
      S.pop(); //what if S "empty"
```

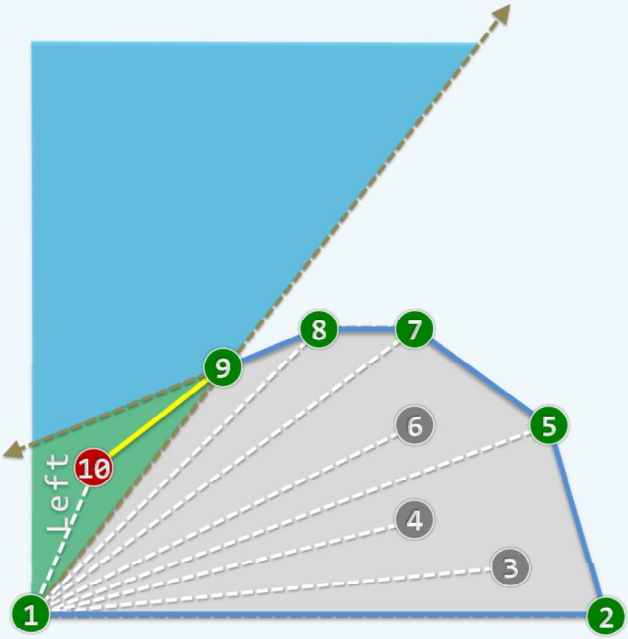


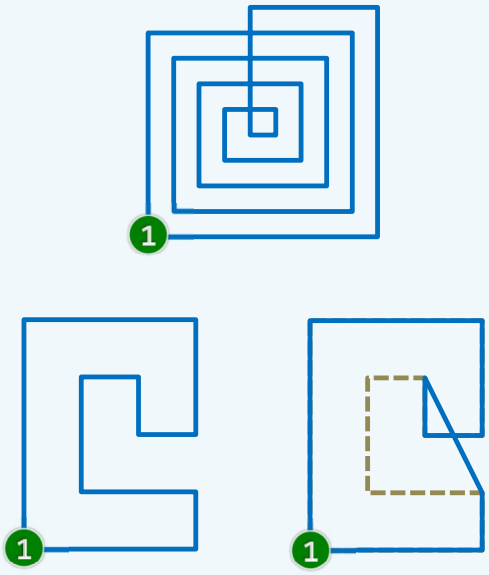
CH: Graham Scan: A Simple Example



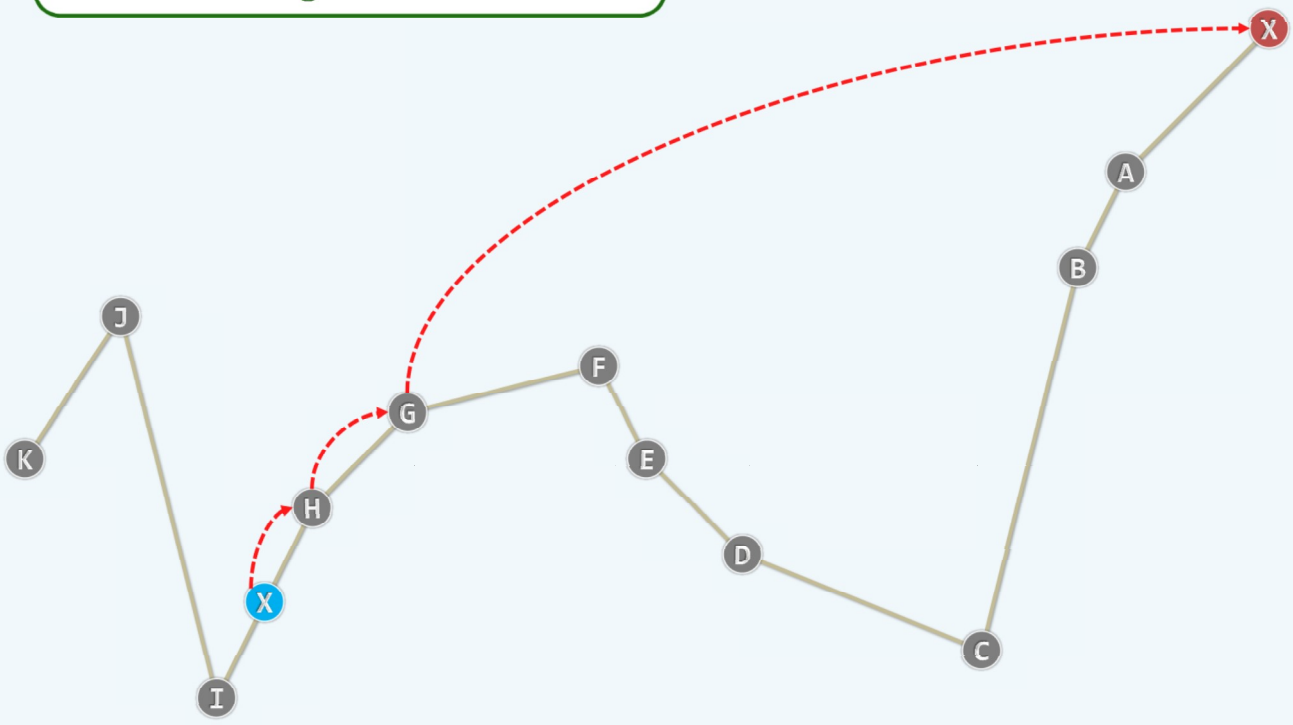


CH: Graham Scan: Correctness

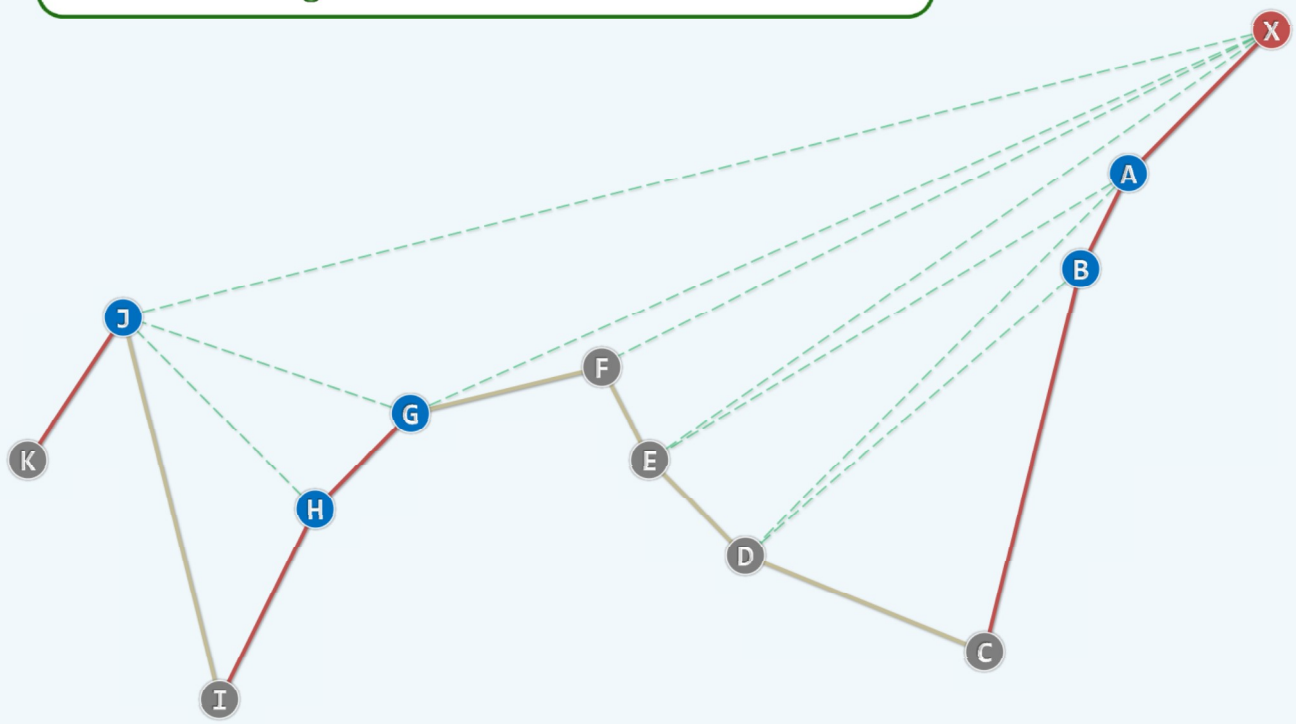




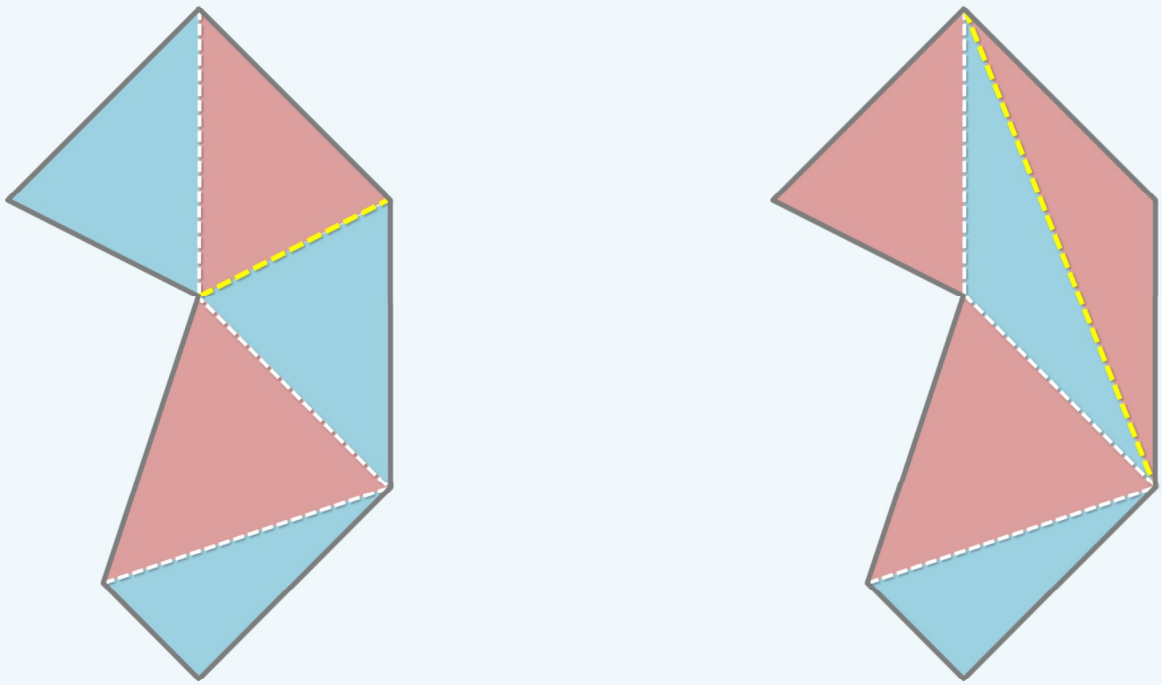
CH: Guarding the Great Wall



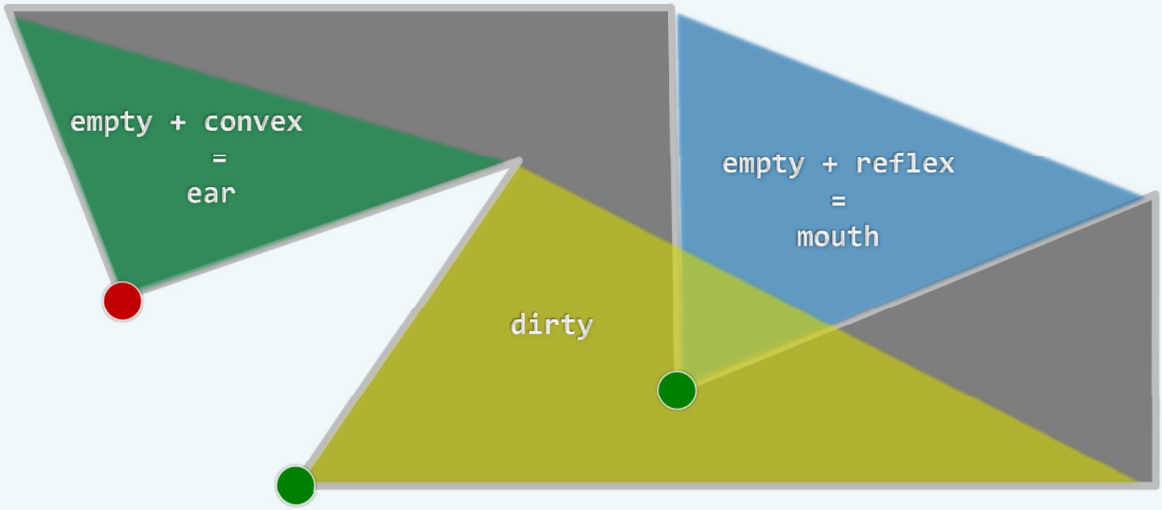
CH: Guarding the Great Wall: Graham Scan



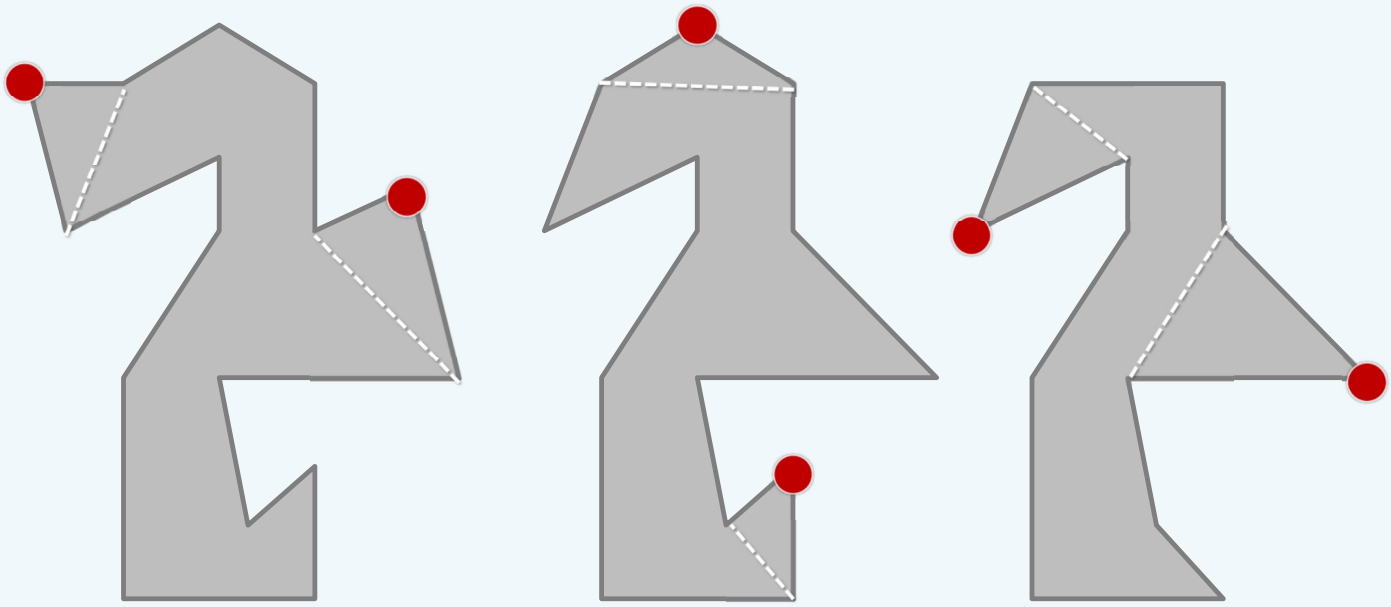
PT: Polygon Triangulation



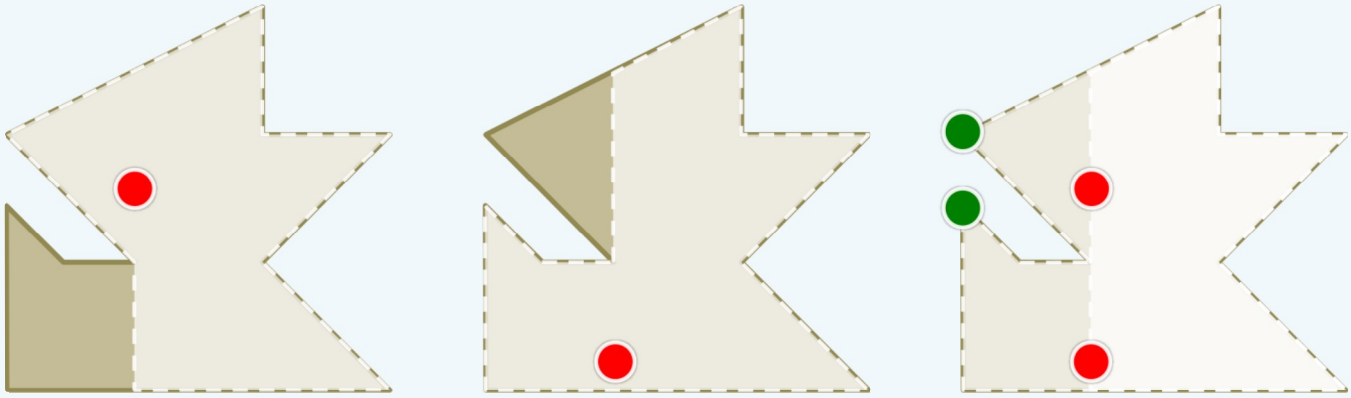
PT: Ear



PT: Ear-Cutting



PT: Art Gallery

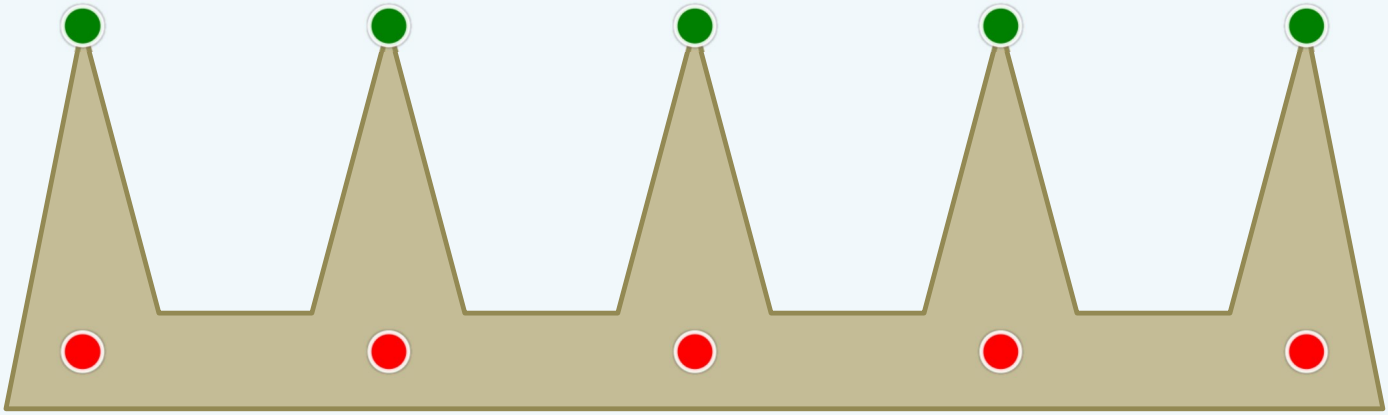


PT: Art Gallery Theorem

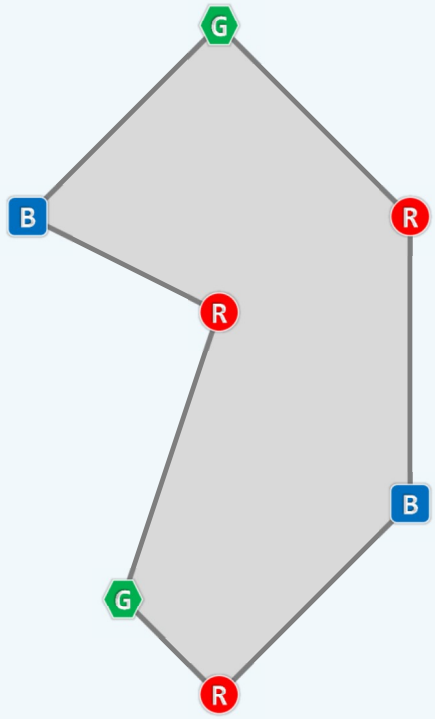
[Art Gallery Theorem, V. Chvatal, 1975]

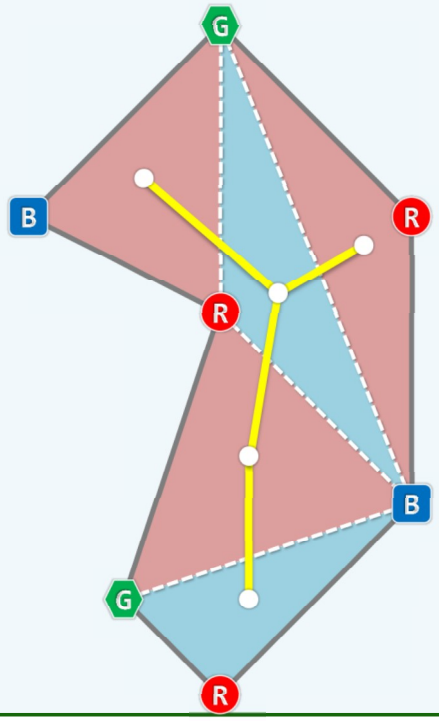
$\lfloor n/3 \rfloor$ guards are occasionally necessary and

always sufficient to cover an n-gon

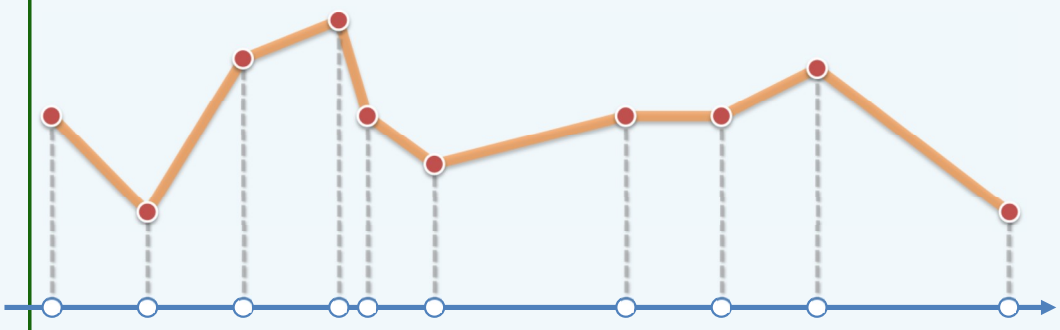


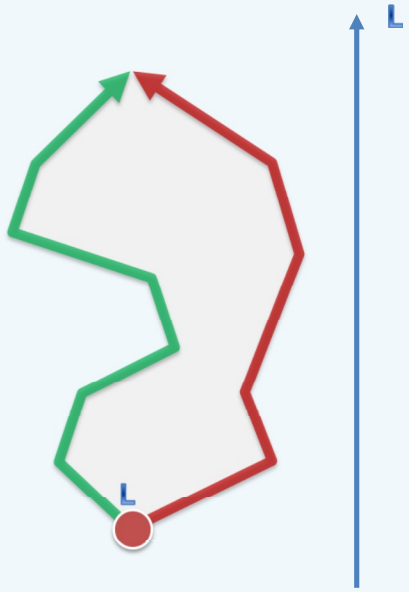
PT: Art Gallery: Fisk's Proof





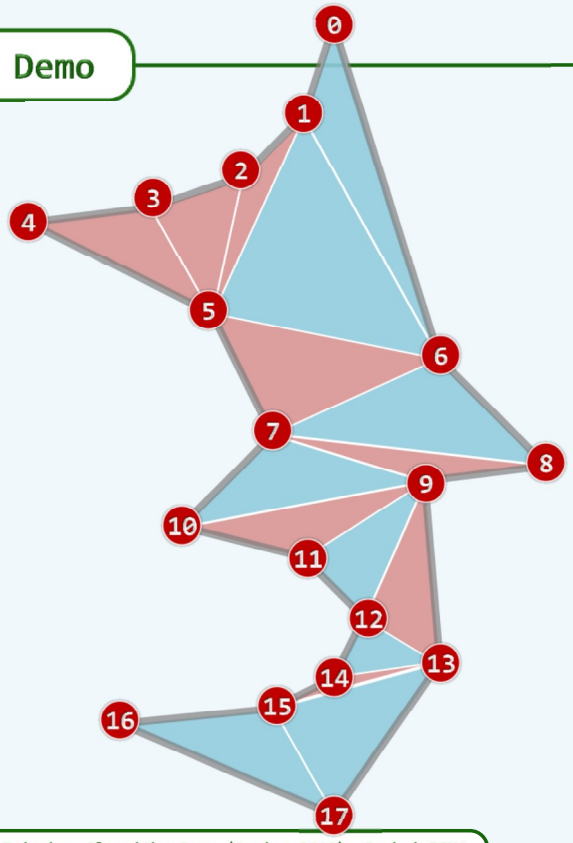
PT: Monotone Chain/Polygon



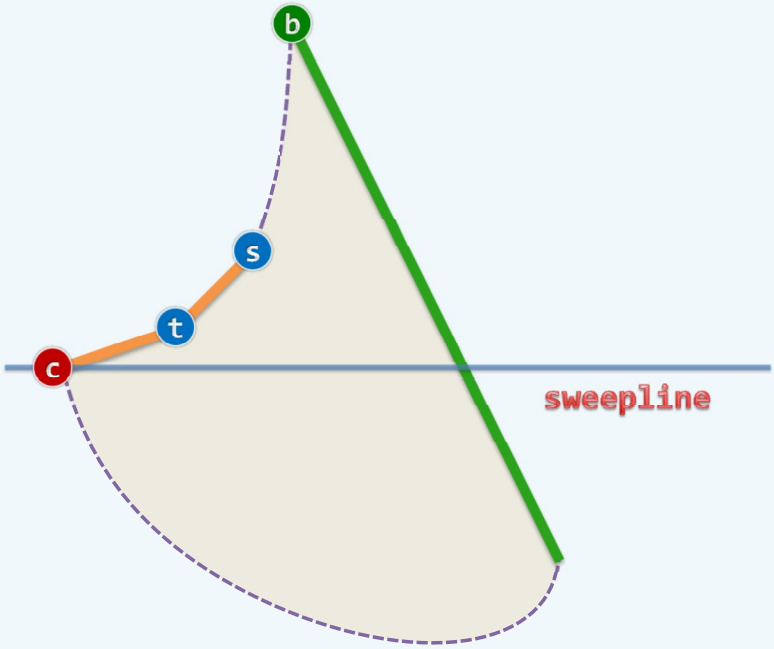


PT: Triangulating A Monotone Polygon: Demo

	Event Type	Output	Stack
0 1	init		0 1
2	Same/Reflex		0 1 2
3	Same/Reflex		0 1 2 3
4	Same/Reflex		0 1 2 3 4
5	Same/Convex	(5, 3) (5, 2) (5, 1)	0 1 5
6	Opposite	(6, 5) (6, 1)	5 6
7	Opposite	(7, 6)	6 7
8	Opposite	(8, 7)	7 8
9	Same/Convex	(9, 7)	7 9
10	Opposite	(10, 9)	9 10
11	Same/Convex	(11, 9)	9 11
12	Same/Convex	(12, 9)	9 12
13	Opposite	(13, 12)	12 13
14	Opposite	(14, 13)	13 14
15	Same/Convex	(15, 13)	13 15
16	Same/Reflex		13 15 16
17	Opposite	(17, 16) (17, 15)	16 17

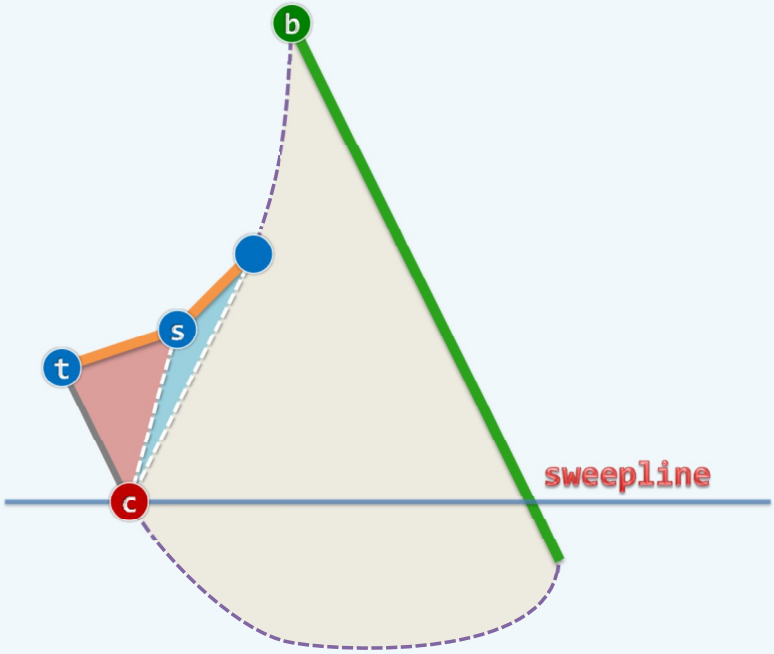


PT: Triangulating A Monotone Polygon: 1A (Same Side + Reflex)



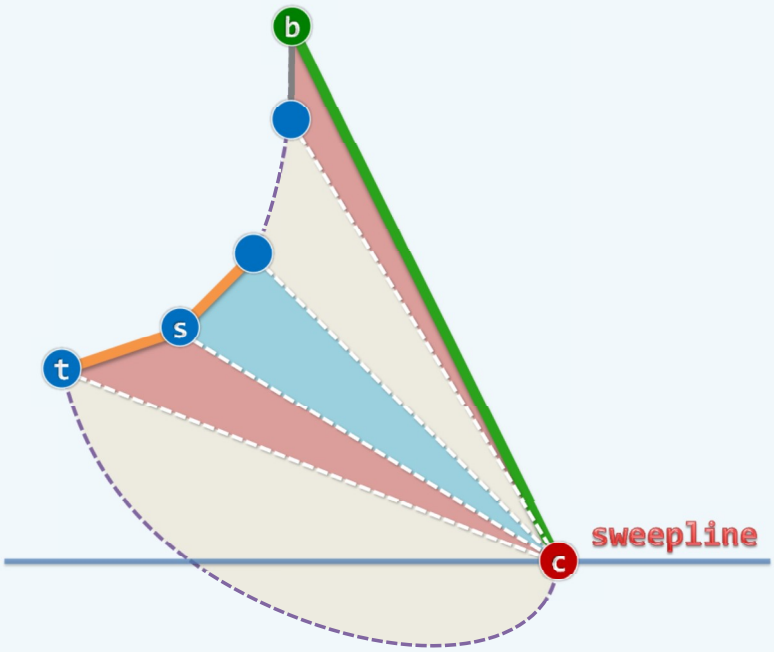
S.push(c);

PT: Triangulating A Monotone Polygon: 1B (Same Side + Convex)




```
repeat
   Chop( s = t.pred(), t, c );
   t = S.pop();
until ( reflex(t) or |S| == 1 );
S.Push( c );
```

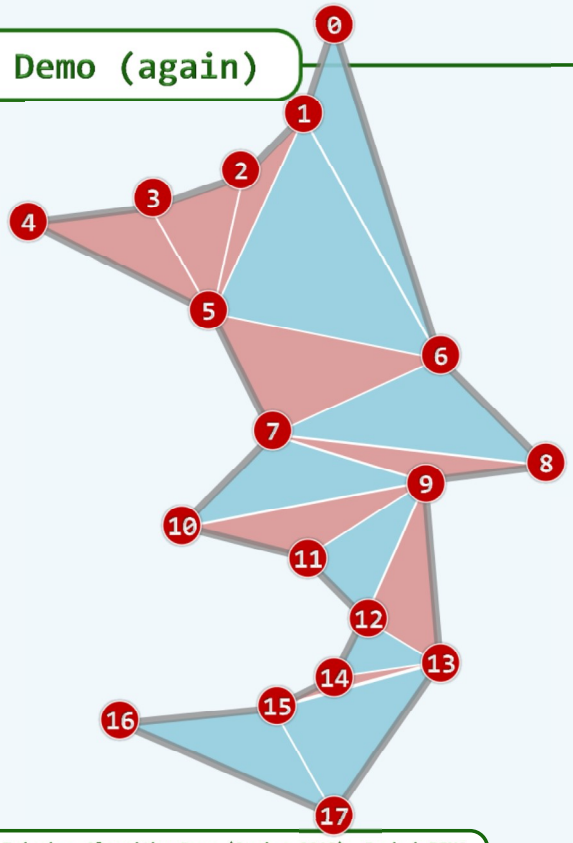

PT: Triangulating A Monotone Polygon: 2 (Opposote Side)




```
top =  t
repeat
   Chop( s = t.pred(), t, c );
   t = S.pop();
until ( |S| == 1 );
S.pop; S.Push(top); S.push(c);
```

PT: Triangulating A Monotone Polygon: Demo (again)

	Event Type	Output	Stack
0 1	init		0 1
2	Same/Reflex		0 1 2
3	Same/Reflex		0 1 2 3
4	Same/Reflex		0 1 2 3 4
5	Same/Convex	(5, 3) (5, 2) (5, 1)	0 1 5
6	Opposite	(6, 5) (6, 1)	5 6
7	Opposite	(7, 6)	6 7
8	Opposite	(8, 7)	7 8
9	Same/Convex	(9, 7)	7 9
10	Opposite	(10, 9)	9 10
11	Same/Convex	(11, 9)	9 11
12	Same/Convex	(12, 9)	9 12
13	Opposite	(13, 12)	12 13
14	Opposite	(14, 13)	13 14
15	Same/Convex	(15, 13)	13 15
16	Same/Reflex		13 15 16
17	Opposite	(17, 16) (17, 15)	16 17



PT: Monotone Decomposition