

## PROBLEM #1

- a.  $H_1 SB = \text{All } x_1 \text{ and } x_2 \text{ s.t. } 4 < \sqrt{x_1^2 + x_2^2} < 7$ .  
*This is in order to capture the points (4, -2) and (-4, 5) in the torus.*

$H_1 GB = \text{All } x_1 \text{ and } x_2 \text{ s.t. } 3 < \sqrt{x_1^2 + x_2^2} < 9$ .  
*This is in order to avoid encompassing (-8, 6).*

The resulting size of the version space is  $\{(4, 9), (4, 8), (4, 7), (3, 7), (3, 8), (3, 9)\} = 6$

b.

Let's define  $H_2$  to be as 2 4-tuples where  $S_1$  represents the y-axis parallel lines in the shape and  $S_2$  represents the x-axis parallel lines in the shape.

$\langle a, b, c, d \rangle \ni Z^4$ , where  $y = a < S_1 < y = b$  and  $y = c < S_1 < y = d$ .

$\langle e, f, g, h \rangle \ni Z^4$ , where  $x = e < S_2 < x = f$  and  $x = g < S_2 < x = h$

so  $H_2 = (\langle a, b, c, d \rangle, \langle e, f, g, h \rangle)$

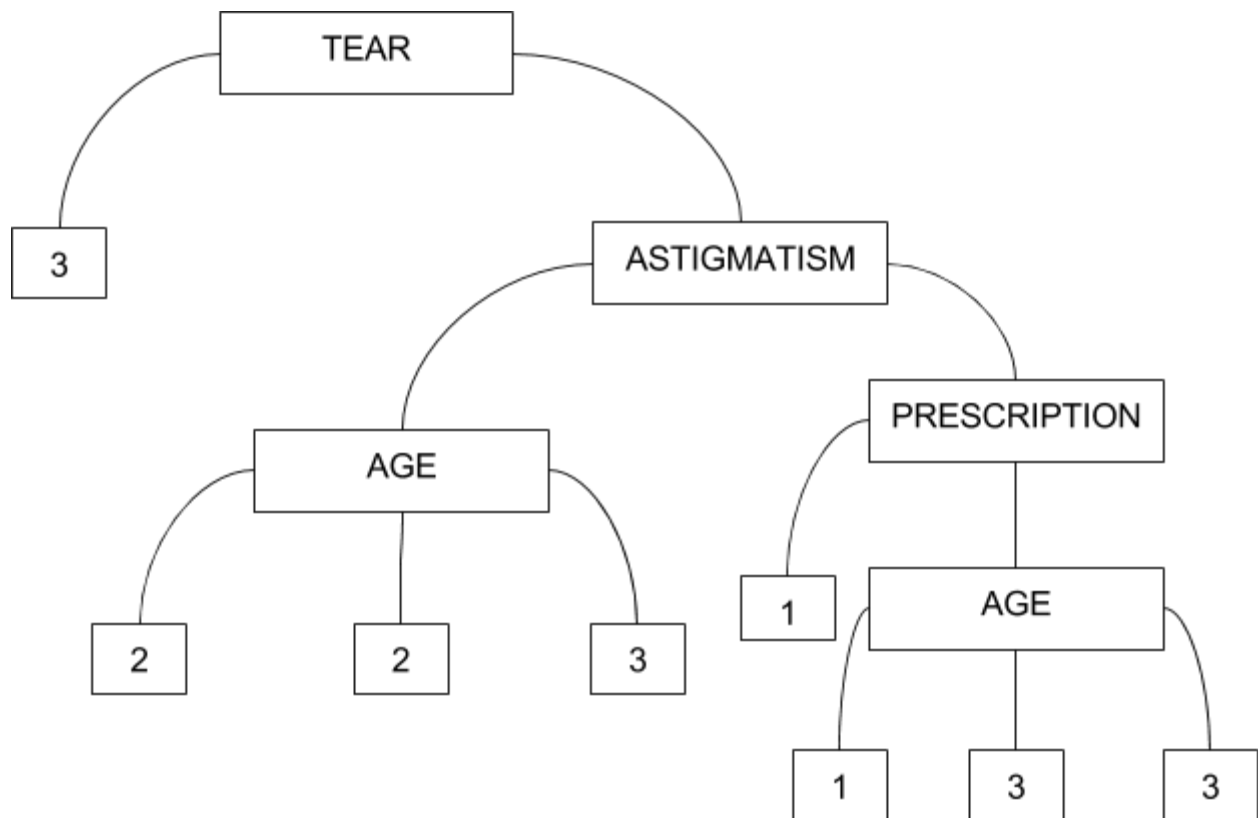
$H_2 SB = (\langle -6, -3, 1, 6 \rangle, \langle -5, -1, 2, 7 \rangle)$

$H_2 GB = (\langle -8, -2, 1, 8 \rangle, \langle -8, 1, 2, 8 \rangle)$

So the size of the version space is 143. However there are many more GBs that can be constructed.

- c. (0, -6) would shrink both version spaces since if it is positive, SB must grow in order to encompass it, and if it is negative, GB must shrink to avoid encompassing it. The point (-7, 7) would be labeled as a negative in  $H_1$  but this would be positive in  $H_2$  so it would shrink the version space.
- d. I would think that  $H_2$  would be more generalizable. This is because we are on a Cartesian grid and it is easier to describe more complicated regions in rectangles. With restrictive negative cases, with circles we have to limit the radius of the circle, whereas with rectangle we can get around this by describing the version space with a multitude various sized rectangles.

## PROBLEM #2



This tree gives that 5 out of the 6 Testing cases are correctly labeled and only 1 of the 6 is labeled incorrectly.