Hints 3-4

3.1 If C and D lie on different sides with respect to AB then the segment CD intersects the line AB.

3.3 (*) This is a direct computation based on the definition of isometry.

3.4 This is just to apply the definition of a discrete action and of an orbit space.

3.5 (*) There are many ways to choose the group H for this question. Go for the easiest one: it will be helpful for later parts of this question.

(d) If F is a fundamental domain for G and H is a subgroup of G, then F tiles the fundamental domain for H (why?). The index [G:H] may be found as the number of the tiles.

4.1 The geodesics on X come from geodesics on $\mathbb{E}^2$ - just find the good ones.

4.2 Use lines of rational/irrational slopes on $\mathbb{E}^2$.

4.3 A couple of perpendicular bisectors will do the job.

4.4 (*) Try to project something somewhere.