The following are wallpaper patterns. On each one, indicate the following with colored ink:

- Shortest translations, $\tau_x$ and $\tau_y$, in two different directions, that preserve the pattern and form the boundary of a fundamental region $R$ for $T$.
- All $n$-centers for each possible $n$.
- All lines of symmetry.
- A fundamental region, $R$, for $T$. If $W$ is a $W_3$-group that contains lines of symmetry, base it at a 3-center on a line of symmetry. Otherwise base it at an $n$-center for the largest possible $n$.
- A fundamental region, $S$ for $W$.

1. Bricks:

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a) How many $T$-orbits are there of $n$-centers for each possible $n$?

b) What is the isotropy subgroup of each orbit of $n$-centers?

c) Which wallpaper group is $W$?
2. A rather complicated hex pattern. Take your time.

a) How many $T$-orbits are there of $n$-centers for each possible $n$?

b) What is the isotropy subgroup of each orbit of $n$-centers?

c) Which wallpaper group is $W$?
3. a) How many $T$-orbits are there of $n$-centers for each possible $n$?

b) What is the isotropy subgroup of each orbit of $n$-centers?

c) Which wallpaper group is $W$?

4. a) How many $T$-orbits are there of $n$-centers for each possible $n$?

b) What is the isotropy subgroup of each orbit of $n$-centers?

c) Which wallpaper group is $W$?
5. a) How many $T$-orbits are there of $n$-centers for each possible $n$?

b) What is the isotropy subgroup of each orbit of $n$-centers?

c) Which wallpaper group is $W$?