

Please complete the following homework assignment on a separate piece of paper. It is due on November 15th at 9:30 am.

1. (a) Describe the symmetries of the figures below in words.
 The first figure has reflection symmetry about each of the diagonal lines and 180° rotational symmetry. The second figure has 120° degree and 240° rotational symmetry.

- (b) Create a group table for the symmetry groups of the figures.

For the first figure the group table is:

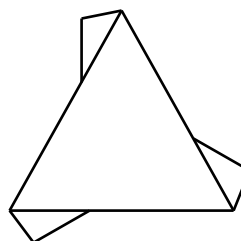
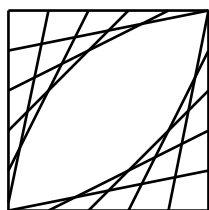
For the second figure the group table is:

	I	r	x	y
I	I	r	x	y
r	r	I	y	x
x	x	y	I	r
y	y	x	r	I

	I	r	r^2
I	I	r	r^2
r	r	r^2	I
r^2	r^2	I	r

- (c) What are the symmetry groups?

The symmetry groups are D_2 and C_3



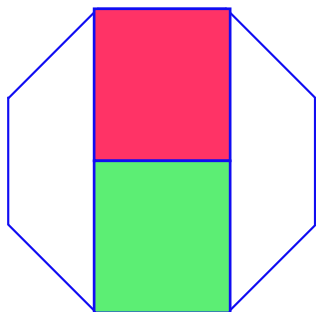
2. For each one of the following symmetry groups, draw a figure with those symmetries.

- | | | | |
|-----------|--|-----------|--|
| (a) D_6 | | (e) D_2 | |
| (b) C_4 | | (f) C_1 | |
| (c) C_7 | | (g) C_8 | |
| (d) D_4 | | (h) D_3 | |

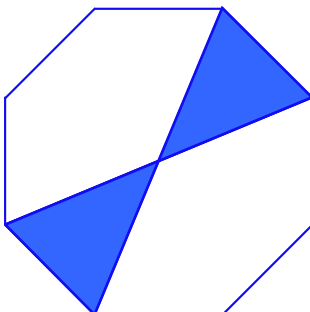
Of the above groups write down which are subgroups of another group that is listed?
 Recall that if a group has n symmetries, the number of symmetries of its subgroups must be a factor of n . The trivial group C_1 is a subgroup of all groups. D_2 is a subgroups of D_6 and D_4 . It cannot be a subgroup of C_4 or C_8 because these groups do not have reflection symmetry.

C_4 is a subgroup of C_8 , but not of D_6 . This is because D_6 has 6 rotation symmetries and C_4 has 4, which is not a factor of 6. The only other subgroup is D_3 which is a subgroup of D_6 .

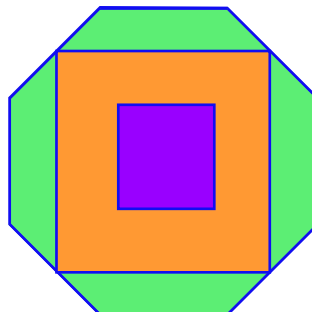
3. On a separate piece of paper draw six regular octagons like the one below. Using both color and line, draw figures corresponding to six different subgroups of the octagon. Label the symmetry group of each of your drawings. Be creative.



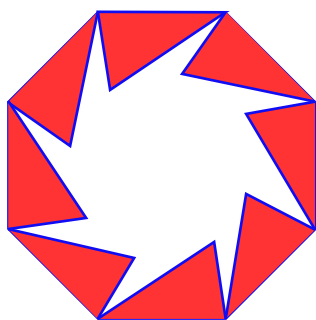
D_1



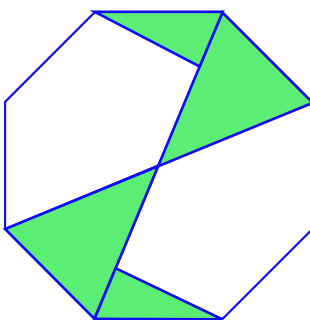
D_2



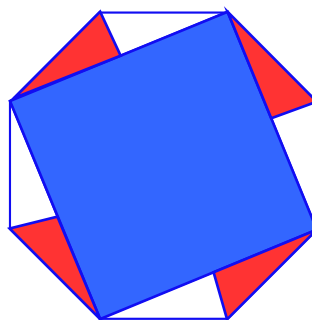
D_4



C_8



C_2



C_4