

**MULTIPLICATION TABLES FOR TWO GROUPS OF ORDER
EIGHT**

On Friday we discussed the possible groups of order 8. There were two non-abelian alternatives: the quaternions and D_4 . Each must have an element of order 4 (call it g) and an element not in the cyclic subgroup generated by g (call it f). The elements of the group are then

$$e = g^0, g^1, g^2, g^3, f, fg, fg^2, fg^3.$$

Since neither are abelian, it turned out that $gf = fg^3$. There were two possibilities for f^2 : either $f^2 = e$ or $f^2 = g^2$. We'll complete the multiplication tables in both cases here.

\times	e	g	g^2	g^3	f	fg	fg^2	fg^3
e	e	g	g^2	g^3	f	fg	fg^2	fg^3
g	g	g^2	g^3	e	fg^3			
g^2	g^2	g^3	e	g				
g^3	g^3	e	g	g^2				
f	f	fg	fg^2	fg^3	e			
fg	fg	fg^2	fg^3	f				
fg^2	fg^2	fg^3	f	fg				
fg^3	fg^3	f	fg	fg^2				

\times	e	g	g^2	g^3	f	fg	fg^2	fg^3
e	e	g	g^2	g^3	f	fg	fg^2	fg^3
g	g	g^2	g^3	e	fg^3			
g^2	g^2	g^3	e	g				
g^3	g^3	e	g	g^2				
f	f	fg	fg^2	fg^3	g^2			
fg	fg	fg^2	fg^3	f				
fg^2	fg^2	fg^3	f	fg				
fg^3	fg^3	f	fg	fg^2				

Which is D_4 and which is the quaternions?