calculate the values of the characters of degree 1, 300, 260, 819 on most of the conjugacy classes and the remaining values are uniquely determined on all conjugacy classes of $PS\Omega^+(8, 3)$.

4. The Character Table. Applying the automorphism group to the irreducible characters determined above yields 11 irreducible characters. A large number of generalized characters can be determined by forming tensor products and symmetric and alternating products of the known irreducible characters. Other generalized characters can be determined by inducing characters from subgroups isomorphic to $PS\Omega(7, 3)$ and $PS\Omega^+(8, 2)$. The character table of $PS\Omega^+(8, 2)$ can be found in Dye [1]. The permutation representation on the cosets of a subgroup isomorphic to $PS\Omega^+(8, 2)$ is given as the final column of Table 1. $PS\Omega^+(8, 3)$ contains at least 4 conjugacy classes of subgroups isomorphic to $PS\Omega^+(8, 2)$. The above generalized characters are sufficient to determine the entire rational character table; see Table 2 on the microfiche supplement. Only one rational character is not absolutely irreducible, the last of the 113 which is the sum of 2 absolutely irreducible characters.

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1. R. H. Dye, "The simple group $FH(8, 2)$ of order $2^{12}\cdot 3^5\cdot 5^2\cdot 7$ and the associated geometry of triality," *Proc. London Math. Soc.* (3), v. 18, 1968, pp. 521–562. MR **37** #1468.
2. B. Fischer, "Finite groups generated by 3-transpositions. I," *Invent. Math.*, v. 13, 1971, pp. 232–246. MR **45** #3557.
3. D. C. Hunt, "Character tables of certain finite simple groups," *Bull. Austral. Math. Soc.*, v. 5, 1971, pp. 1–42. MR **46** #1896.
4. G. E. Wall, "On the conjugacy classes in the unitary, symplectic and orthogonal groups," *J. Austral. Math. Soc.*, v. 3, 1963, pp. 1–62. MR **27** #212.

The Character Table of Fischer's Simple Group, $M(23)$

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Abstract. This paper describes the calculation of the character table of $M(23)$, the sporadic simple group discovered by B. Fischer [1].

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1. Introduction. $M(23)$ is a group of order $2^{18}\cdot 3^{13}\cdot 5^2\cdot 7\cdot 11\cdot 13\cdot 17\cdot 23$ = 4, 089, 470, 473, 293, 004, 800. $M(23)$ is the second of three simple groups discovered by Fischer whilst characterising groups generated by a conjugacy class of 3-transpositions [1]. $M(23)$ contains two conjugacy classes of subgroups of relatively small index. M^* is of index 31671 in $M(23)$ and M^* factored by its centre of order 2 is isomorphic to $M(22)$, the smallest of Fischer's three groups. S is of index 137632 and S contains a subgroup P of index 6 in S with P isomorphic to the 8-dimensional orthogonal simple group $PS\Omega^+(8, 3)$. The character tables of $M(22)$ and $PS\Omega^+(8, 3)$ appear elsewhere (Hunt [2], [3]).

2. Conjugacy Classes of $M(23)$. Table 1 lists the 98 conjugacy classes of $M(23)$ by number, name and order of centralizer. The table also gives the values of the permutation characters of degree 31671 and 137632 on each conjugacy class and also the conjugacy number of the square and the cube of each element in the group. The restriction of both permutation representations to the subgroups M^* and S can be found and hence all conjugacy classes in $M(23)$ with representatives from M^* and S are determined. Other conjugacy classes are determined by the structure of the Sylow normalizers for large prime divisors of the group order. This determines all conjugacy classes up to a few alternatives which can be decided during the calculation of the characters.

3. The Character Table. The two permutation representations of degree 31671 and 137632 are both rank three and yield irreducible characters of degree 1, 782, 30888 and 106743. The values of these characters on almost all conjugacy classes can be found by restricting to the subgroups M^* and $PS\Omega^+(8, 3)$. The values on the remaining conjugacy classes are uniquely determined. A large number of characters can now be generated by forming tensor, alternating and symmetric products of known characters and by inducing characters from M^* and P. It is possible to determine all the irreducible characters from these generalized characters by forming linear combinations of them and also by restricting small linear combinations of irreducibles to the known subgroups and splitting them into irreducibles for the subgroups.

The table of conjugacy classes and the complete character table appear as Table 1 and Table 2 in the microfiche supplement.

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1. B. Fischer, "Finite groups generated by 3-transpositions. I," *Invent. Math.*, v. 13, 1971, pp. 232–246. MR **45** #3557.

2. D. C. Hunt, "Character tables of certain finite simple groups," *Bull. Austral. Math. Soc.*, v. 5, 1971, pp. 1–42. MR **46** #1896.

3. D. C. Hunt, "The character table of an eight-dimensional orthogonal group," *Math. Comp.*, v. 28, 1974, pp. 659–660.