

Algebra
Applied Mathematics
Calculus and Analysis
Discrete Mathematics
Foundations of Mathematics
Geometry
History and Terminology
Number Theory
Probability and Statistics
Recreational Mathematics
Topology
Alphabetical Index
Interactive Entries
Random Entry
New in MathWorld
MathWorld Classroom
About MathWorld
Contribute to MathWorld
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MathWorld Book

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Algebra > Group Theory > Group Properties >

Stabilizer

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Let G be a permutation group on a set Ω and x be an element of Ω . Then

$$G_x = \{g \in G : g(x) = x\} \tag{1}$$

is called the stabilizer of x and consists of all the permutations of G that produce group fixed points in x , i.e., that send x to itself. For example, the stabilizer of 1 and of 2 under the permutation group $\{(1)(2)(3)(4), (12)(3)(4), (1)(2)(34), (12)(34)\}$ is both $\{(1)(2)(3)(4), (1)(2)(34)\}$, and the stabilizer of 3 and of 4 is $\{(1)(2)(3)(4), (12)(3)(4)\}$.

More generally, the subset of all images of $x \in \Omega$ under permutations of the group G

$$G(x) = \{g(x) : g \in G\} \tag{2}$$

is called the group orbit of x in G .

A group's action on an group orbit through x is transitive, and so is related to its isotropy group. In particular, the cosets of the isotropy subgroup correspond to the elements in the orbit,

$$G(x) \sim G/G_x, \tag{3}$$

where $G(x)$ is the orbit of x in G and G_x is the stabilizer of x in G . This immediately gives the identity

$$|G| = |G_x| |G(x)|, \tag{4}$$

where $|G|$ denotes the order of group G (Holton and Sheehan 1993, p. 27).

SEE ALSO:

Group Action, Group Fixed Point, Group Orbit, Permutation Group

REFERENCES:

Holton, D. A. and Sheehan, J. Ch. 6 in *The Petersen Graph*. Cambridge, England: Cambridge University Press, p. 26, 1993.

Referenced on Wolfram|Alpha: Stabilizer

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THINGS TO TRY:

- = 12! / (4! * 6! * 2!)
- = d/dx x^2 y^4, d/dy x^2 y^4
- = minimize x^5 - 3x^4 + 5 ov



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