THE CROSSING NUMBER OF JOIN OF THE
GENERALIZED PETERSEN GRAPH $P(3, 1)$
WITH PATH AND CYCLE¹

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Abstract

There are only few results concerning the crossing numbers of join of some graphs. In this paper, the crossing numbers of join products for the generalized Petersen graph $P(3, 1)$ with n isolated vertices as well as with the path P_n on n vertices and with the cycle C_n are determined.

Keywords: crossing number, drawing, join product, generalized Petersen graph.

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REFERENCES

- [1] J.A. Bondy and U.S.R. Murty, *Graph Theory with Applications* (Macmillan Press Ltd, London, 1976).
- [2] P. Erdős and R.K. Guy, *Crossing number problems*, Amer. Math. Monthly **80** (1973) 52–58.
doi:10.2307/2319261
- [3] M.R. Garey and D.S. Johnson, *Crossing number is NP-complete*, SIAM J. Algebraic Discrete Methods **4** (1983) 312–316.
doi:10.1137/0604033
- [4] V.R. Kulli and M.H. Muddebihal, *Characterization of join graphs with crossing number zero*, Far East J. Appl. Math. **5** (2001) 87–97.
- [5] D.J. Kleitman, *The crossing number of $K_{5,n}$* , J. Combin. Theory Ser. B **9** (1970) 315–323.
doi:10.1016/S0021-9800(70)80087-4
- [6] M. Klešč, *The join of graphs and crossing numbers*, Electron. Notes Discrete Math. **28** (2007) 349–355.
doi:10.1016/j.endm.2007.01.049
- [7] L. Tang, J. Wang and Y.Q. Huang, *The crossing number of the join of C_m and P_n* , Internat. J. Math. Com. **1** (2007) 110–116.
- [8] M. Klešč and S. Schrötter, *The crossing numbers of join products of paths with graphs of order four*, Discuss. Math. Graph Theory **31** (2011) 321–331.
doi:10.7151/dmgt.1548
- [9] M. Klešč, *The crossing numbers of join of the special graph on six vertice with path and cycle*, Discrete Math. **310** (2010) 1475–1481.
doi:10.1016/j.disc.2009.08.018

- [10] M. Klešč and S. Schrötter, *The crossing numbers of join of paths and cycles with two graphs of order five*, Lecture Notes in Comput. Sci. **7125** (2012) 160–167.
doi:10.1007/978-3-642-28212-6_15
- [11] Y.H. Peng and Y.C. Yiew, *The crossing number of $P(3, 1) \times P_n$* , Discrete Math. **306** (2006) 1941–1946.
doi:10.1016/j.disc.2006.03.058

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