

INTRODUCTION TO THIRD-ORDER JACOBSTHAL AND MODIFIED THIRD-ORDER JACOBSTHAL HYBRINOMIALS

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Abstract

The hybrid numbers are generalization of complex, hyperbolic and dual numbers. In this paper, we introduce and study the third-order Jacobsthal and modified third-order Jacobsthal hybrinomials, i.e., polynomials, which are a generalization of the Jacobsthal hybrid numbers and the Jacobsthal-Lucas hybrid numbers, respectively.

Keywords: third-order Jacobsthal numbers, recurrence relations, complex numbers, hyperbolic numbers, dual numbers, polynomials.

2010 Mathematics Subject Classification: 11B37, 11B39.

REFERENCES

- [1] G. Cerda-Morales, *Identities for third order Jacobsthal quaternions*, *Adv. Appl. Clifford Alg.* **27** (2017) 1043–1053.
doi:10.1007/s00006-016-0654-1
- [2] G. Cerda-Morales, *On a generalization of Tribonacci quaternions*, *Mediterranean J. Math.* **14** (2017) 1–12.
doi:10.1007/s00009-017-1042-3
- [3] G. Cerda-Morales, *A note on modified third-order Jacobsthal numbers*, *Proyecciones J. Math.* **39** (2020) 731–747.
doi:10.22199/issn.0717-6279-2020-02-0025
- [4] G. Cerda-Morales, *Some results on dual third-order Jacobsthal quaternions*, *FILOMAT* **33** (2019) 1865–1876.
doi:10.2298/FIL1907865C

- [5] G. Cerda-Morales, *Third-order Jacobsthal generalized quaternions*, J. Geom. Symmetry Phys. **50** (2018) 11–27.
doi:10.7546/jgsp-50-2018-11-27
- [6] C.K. Cook and M.R. Bacon, *Some identities for Jacobsthal and Jacobsthal-Lucas numbers satisfying higher order recurrence relations*, Ann. Math. Inform. **41** (2013) 27–39.
- [7] G.B. Djordjević, *Generalized Jacobsthal polynomials*, Fibonacci Quart. **38** (2000) 239–243.
- [8] G.B. Djordjević and H.M. Srivastava, *Incomplete generalized Jacobsthal and Jacobsthal-Lucas numbers*, Math. and Comp. Modelling **42** (2005) 1049–1056.
doi:10.1016/j.mcm.2004.10.026
- [9] A.F. Horadam, *Jacobsthal representation polynomials*, Fibonacci Quart. **35** (1997) 137–148.
- [10] A.F. Horadam, *Jacobsthal representation numbers*, The Fibonacci Quarterly **43** (1996) 40–54.
- [11] M. Özdemir, *Introduction to hybrid numbers*, Adv. Appl. Clifford Alg. **28** (2018).
doi:10.1007/s00006-018-0833-3
- [12] A. Szynal-Liana, *The Horadam hybrid numbers*, Discuss. Math. Gen. Alg. Appl. **38** (2018) 91–98.
doi:10.7151/dmgaa.1287
- [13] A. Szynal-Liana and I. Włoch, *The Fibonacci hybrid numbers*, Util. Math. **110** (2019) 3–10.
- [14] A. Szynal-Liana and I. Włoch, *On Jacobsthal and Jacobsthal-Lucas Hybrid Numbers*, Ann. Math. Silesianae **33** (2019) 276–283.
doi:10.2478/amsil-2018-0009
- [15] A. Szynal-Liana and I. Włoch, *Introduction to Fibonacci and Lucas hybrid numbers*, Complex Variables and Elliptic Equations (2019).
doi:10.1080/17476933.2019.1681416

Received 20 March 2020

Revised 22 June 2020

Accepted 23 November 2020