MATHEMATICAL ENCOUNTERS

Abstract. We present some mathematical and combinatorial objects that can be encountered in real life. In the first section, we list a few unusual definitions and illustrative descriptions. In the second section, we give more well-known examples of the same objects. The third section remains a mystery.

1. Definitions

Definition 1. Un, dos, tres, quatre, cinc, sis, set,...

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Definition 2. Crucial advocate of a cause.

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Definition 3. Filmed non-human actors.

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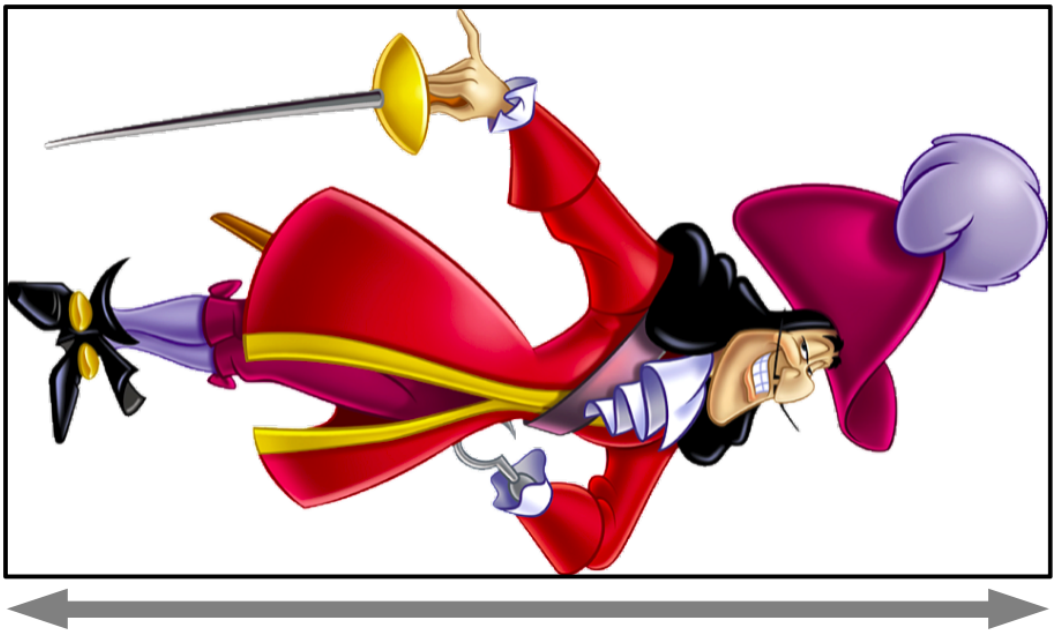
Definition 4.



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Definition 5.

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Definition 6.

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Definition 7.

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Definition 8. Autopilot services in a car, useful if you have a narrow garage.

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Definition 9. A plan or idea that will likely not work.

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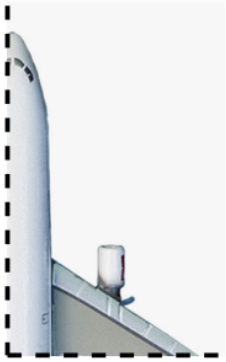
Definition 10.



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Definition 11. Look on your face that shows how logical you are.

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Definition 12. Someone from Warsaw who is not very smart.

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Definition 13.

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Definition 14. Personality of someone who is always completely optimistic.

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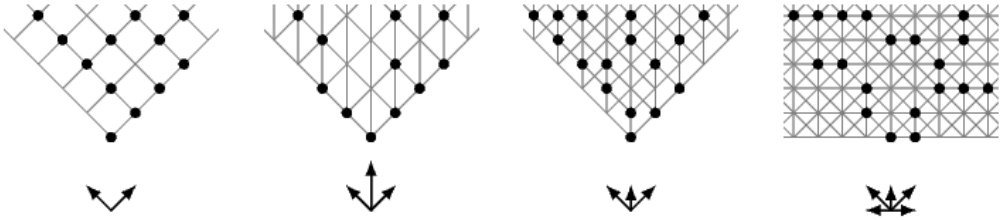
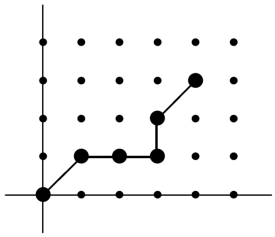
2. Examples

Example A. $\{(x, y) \in \mathbb{Z}^2,\ x \geq 0 \text{ and } y \geq 0\}$

Example B.



Example C.

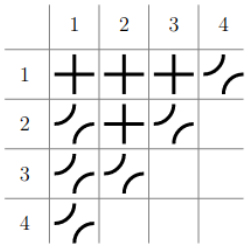


Example D.

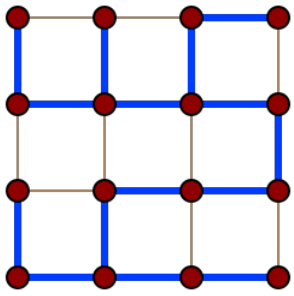
$\mathbf{n = 2}$: 11 12 21

$\mathbf{n = 3}$: 111 112 121 211 113 131 311 122 212 221 123 132 213 231 312 321

Example E.

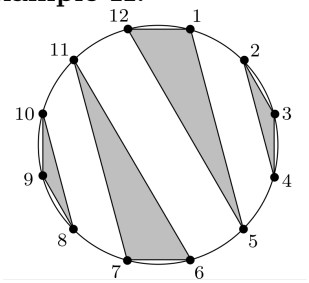


Example F.



Example G. $1, 1, 2, 5, 14, 42, \ldots$

Example H.



Example I. For $p(z) = \dfrac{z+2}{(8-z)(5-z)^2}$, 8 is the only one.

Example J. Property of a sequence that satisfies $a_i^2 \geq a_{i-1}a_{i+1}$ for all i.

Example K. A property of a matrix whose minors are all nonnegative.

Example L. $\dfrac{x^4 - 2x^3 + x^2 + 1}{x^2 + 7x - 28}$

Example M. For generalized ballot sequences in two dimensions, its value is always $-3/2$.

Example N.

8	7	5	2	1
5	**4**	**2**		
4	**3**	1		
2	**1**			

3. Conclusion

The study of the matrix M below is left to the reader as a trivial exercise.

$$M = \begin{pmatrix} n & o & w & m & a & y & b & e & t & r & y & t & o & w \\ o & r & k & o & u & t & t & h & e & d & e & f & i & n \\ i & t & i & o & n & s & a & n & d & a & l & s & o & a \\ l & l & t & h & e & e & x & a & m & p & l & e & s & \cdot \\ r & e & l & a & t & e & t & h & e & m & t & o & g & e \\ t & h & e & r & n & i & c & e & l & y & \cdot & t & h & e \\ n & o & b & t & a & i & n & / & s & e & l & e & c & t \\ h & e & r & e & y & o & u & r & 1 & 4 & c & o & r & r \\ e & c & t & e & n & t & r & i & e & s & \cdot & t & h & e \\ d & e & f & i & n & i & t & i & o & n & s & c & o & r \\ r & e & s & p & o & n & d & t & o & r & o & w & s & , \\ w & h & e & r & e & a & s & c & o & l & u & m & n & s \\ a & r & e & o & u & r & e & x & a & m & p & l & e & s \\ \cdot & g & e & t & l & i & n & k & a & n & d & w & i & n \end{pmatrix}$$

Acknowledgements. The author is grateful to Tomack Gilmore, Yvonne Kemper, and Henri Mühle who helped with some of the definitions from Section 1, and to Gwendal Collet who acted as a "referee" of a previous version of this work.

Sources for the images:

- Definition 5: Andrew Bossi on Wikipedia
- Definition 13: Graphics RF on Vecteezy
- Example B: Axel Bacher
- Example C: Christian Krattenthaler
- Example E: Cameron Marcott
- Example F: David Eppstein on Wikipedia
- Example H: Drew Armstrong

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