

P1 Find the generating function $\sigma_{\mathcal{K}}(\mathbf{z})$ of the cone

$$\mathcal{K} = \{\lambda_1(3, 4) + \lambda_2(1, 1) : \lambda_1, \lambda_2 \geq 0\}.$$

.....

P2 Compute the Ehrhart polynomial and Ehrhart series of the 3-cube, 4-cube and 5-cube.

.....

P3 Are t_1, t_2, t_5 vertices of a facet of the cyclic polytope $C_3(t_1, t_2, t_3, t_4, t_5)$ (where $t_1 < t_2 < t_3 < t_4 < t_5$)?

.....

P4 What do you know about the face lattice of the polar of a polytope?

.....

P5 Suppose that in a far-away kingdom, people only use golden coins worth 17, 117 and 1001 units. Write down a polytope P whose n^{th} dilate has as many integer points as the number of ways to pay $16n$ units using the above golden coins.

.....

P6 For each part of this problem state whether the statement is true or false. Briefly justify the reason for your answer. The first word in your answer should be “true” or “false.”

- The value that a partition function takes can be negative.
- The value that a partition function takes cannot be zero.
- A subdivision is a polyhedral complex.
- The polar of a polytope is a polytope.

- Pick's theorem is about the volume of a 3-polytope, and does not apply to higher dimensions.
- For a lattice polytope the leading coefficient of its Ehrhart polynomial is the volume of the polytope.
- For a lattice polytope the leading coefficient of its Ehrhart polynomial is the relative volume of the polytope.

.....

P7 What is the diamond property?

.....

P8 What is the definition of a regular triangulation?