www.findstat.org An introductory example

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Example

Decompose the group algebra of the symmetric group into irreducibles:

$$\mathbb{C}[\mathcal{S}_1] = V_1$$
$$\mathbb{C}[\mathcal{S}_2] = V_2 \oplus V_{11}$$
$$\mathbb{C}[\mathcal{S}_3] = V_3 \oplus 2V_{21} \oplus V_{111}$$
$$\mathbb{C}[\mathcal{S}_4] = V_4 \oplus 3V_{31} \oplus 2V_{22} \oplus 3V_{211} \oplus V_{1111}$$

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Question

What do the coefficients count?

What is this project about?

What is a combinatorial statistic?

- We assume a combinatorial collection to be a set S, for which the elements admit a "combinatorial description".
- A combinatorial statistic on a set S is - in our context - a map

$$st : S \longrightarrow \mathbb{Z}.$$

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- Providing a web interface to
  - test if your data is a known combinatorial statistics in our **database**, or
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- Providing a platform to gather information about combinatorial collections and statistics, and about their relations. This includes
  - adding new combinatorial statistics to the database, and
  - filling the wiki with information.

Another example on permutations

Example

$$[1,2,3] \mapsto 0$$

$$[1,3,2] \mapsto 2$$

$$[2,1,3] \mapsto 1$$

$$[2,3,1] \mapsto 2$$

$$[3,1,2] \mapsto 1$$

$$[3,2,1] \mapsto 3$$

Yet another example on Dyck paths

Example

$$10101010 \mapsto 16$$

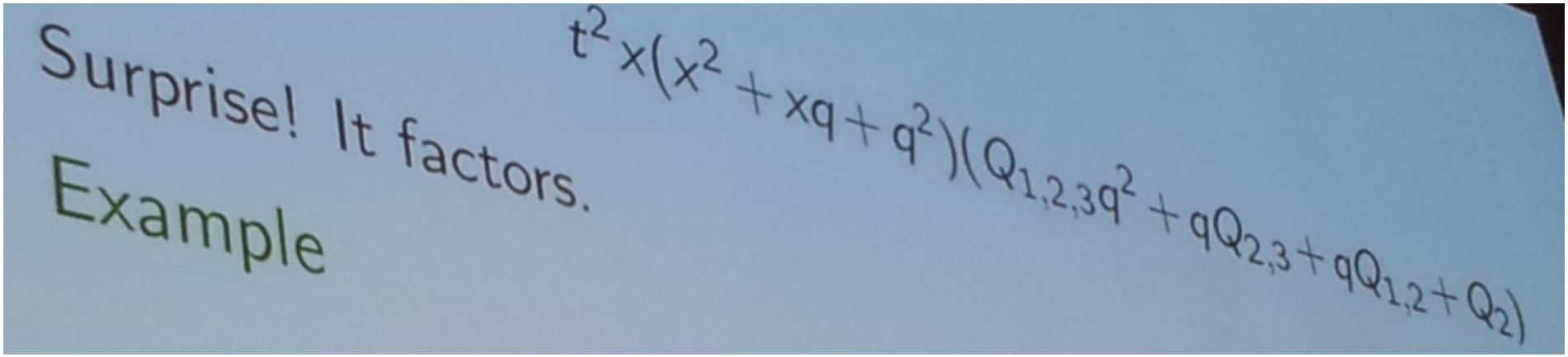
$$10101100 \mapsto 5$$

$$10110010 \mapsto 6$$

$$10110100 \mapsto 3$$

$$10111000 \mapsto 1$$

An example from Angela Hicks' talk earlier today



One could now ask two questions for statistics on compositions:

- Are the coefficients of $Q_{1,2,3}$, $Q_{2,3}$, $Q_{1,2}$, and Q_2 known?
- If all coefficients are q powers: Are their exponents known?

If someone knows what these statistics count, then they can go into the database!

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- Support for
  - permutations
  - Dyck paths
  - integer partitions and compositions
  - standard Young tableaux
- About 25-30 entries in the database
- dozens of combinatorial maps between these objects
- A more or less documented wiki for permutation and Dyck paths

What we would like (with your support)

To get the project running, we need to

- fill the database,
- fill the wiki,
- provide support for more combinatorial objects, and
- provide generating function and partital generating function functionality.

You (and your students!) are more than invited to help the project grow!

Thanks

This project is based on the following open software projects

- MoinMoin Wiki,
- Sage,
- MathJax, and

is hosted by LaCIM, UQAM, Montreal, Canada, with the help of

- Jason Grout, Franco Saliola, and Jerome Tremblay.