Action operads comments to fix

1. Introduction

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2. Action operads

- I put in G0abel (2.3.8) to prove: typed in proof of abelianness but need to show that $\mu(e_2; g, h) = gh$ (suffices to show that $\mu(e_2; g, e_0) = g$). Thought it would be a straightforward Eckmann-Hilton argument but it gets stuck.
- Proof of 2.3.4: just needs checking
- I have been changing tensor product to block sum for a lot of things, we need to go through and decide how to do that consistently
- Prop 2.5.19 follows from Theorem 3.3.8, except for the part about the monad map (it can't be (F, id) as it needs to use the coherence cells of F, so I've called it (F, ψ^F) and added details to the propositions).

3. Operads in the category of categories

- Prop 3.3.11-4 The proofs need filling out
- Should we change $E\Lambda(n) \times X^n/\Lambda(n)$ to be $(E\Lambda(n) \times X^n)/\Lambda(n)$?

4. Monoidal structures and multicategories

- Intro
- Use

  `\lmc`

  for lambda monoidal categories
- Lemma 4.3.2: Needs rewording. Is the *underlying set of the free monoid*?
- Prop 4.3.3: Is $im(\pi)$ defined? What is the underlying permutation operad? Does this mean the symmetrized operad?
- What is an action morphism? Update: Been through Ed's thesis. From what I can gather, they are morphisms which look like $\alpha(g; id_{x_1}, \ldots, id_{x_n})$.
- Do we want another notation to emphasise the underlying monoid?
- Lemma 4.3.8: Should be a $\Lambda(n)$, not just Λ.
- 4.3.8: extra couple of steps to show α is a monoid homomorphism?
- Defn 4.5.1: Odd mix of α and g. Think something is mixed up here. $(- \cdot \alpha)$. Also should the iso have $\pi(g)^{-1}$ in the target?
- Monad maps are defined in the specific case of the 2-category of categories in Section 2.5 - refer back to these definitions.

5. Invertible objects

- The notation in the very first sentence needs to be explained somewhere!
- Rewrite intro: Need to explain that the goal is to understand some group actions
- Decide on ELambda algebras or Lambda monoidal categories throughout (we decided the second!)

- New notation: added earlier (line 905, search beta_to_oplus), just need to implement, search for action maps or superscript tensors
- Fix weakly invertible section

Leftover fixes that I'm not sure about:

- Move comment (QQQ)
- Fix paragraph; make clear we are determining composition
- Explain M strategy, include forward refs

6. Invertibility and group actions

- I want to write $\Lambda^{\oplus}$ for the underlying monoid maybe??
- **why? This one involves real math**
- not happy with last section

7. Computing automorphisms of the unit

- 4.1.3 check 2.3.10: need to make sure this is in an earlier section, and ref'ed
- explain purpose
- improve proof 4.2.3
- check commutative Square
- redo 4.4
- insert diagram
- consistent text after 4.5.3
- move something to earlier
- highlight that star means the inverse under tensor product for morphisms
- check the note

8. a full description of L_n

- Think about n vs 2n in AGndef
- check reference
- rewrite calculation
- check universal property
- insert for a simple example

9. Examples

- Actually read this section, fix anything

Comments addressed

10. Invertible objects

- Include notation for η as the unit here
- Change to equalizers
- Change to $(LX)_{inv} = LX$
- Fix ()s
- Include triangle NO
- Uniform gp superscripts
- Remove actually
- Ref η
- Replace with is, remove parts
- Remove proof
- Fix ab superscripts, same as gp
- qi
- Under red line: move? make remark? delete some?
- Where do we say this?
- Need 2-adjunction: this should follow from Thm 8.6 in the enriched_sketches paper I saved
- include forward ref to where we use crefepi: I can't find it
- Get better Eckmann-Hilton ref: don't care anymore

11. Invertibility and group actions

- Forward ref
- definition env
- little wording fixes
- change G to Lambda
- S vs Sigma for symmetric groups: I picked Sigma
- Think about free monoid lem again
- Fix triangle
- lots of notation issues (e, G, length bars)
- why splitting
- missing ref?
- splits by construction: hmm
- ref?
- for v, v' not delta of something
- inverses for morphisms under comp vs tensor
- more G's (x2)
- another missing ref
- another G
- include corollary?
- forward refs
- practical?

12. Computing automorphisms of the unit

- in the next two results

- 4.1.2 two boxes
- the above following square
- insert =
- check 4n or 2n (it is correct in 7.2.1)
- mentioned Delta, I
- fixed proof 4.3.2
- remove functor
- isomorphism symbol
- clarify this
- make sure length and size notation is introduced earlier
- bad line break at the beginning of 4.5
- change prove to shows
- bad line break
- insert the proof from Ed's email
- put a short proof
- change express to describe
- isomorphism symbol
- change make sure to ensures
- remove calculation
- change we want to do

13. A full description of L_n

- bad line break
- remove exposition
- fix fancy G
- change G to lambda
- isomorphism symbol
- tensor product given component wise
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14. Examples

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