Math 10: A few tips, and even fewer rules

Structure
A talk should have a well defined structure, and cover all the following basic steps, although not necessarily in the following order, and not all in the same depth:

(1) **motivation and context**: to spark interest in your talk as well as help understanding, put things into a context, when applicable make connections to other fields of research or to related famous results (this is particularly important when you are presenting your own research).

(2) **definitions/notations**: time spent in setting up notations and giving definitions is always well spent, poor notations and lack of definitions will get the audience confused, if so they might lose interest or hijack your presentations with too many questions.

(3) **statement of results**: This is one of the most important steps and you simply can not get this wrong. Make sure all hypotheses are clear, and before diving into further discussion try to give examples, both of objects satisfying the statement as well as objects which don’t as they fail the required hypotheses.

(4) **remarks/corollaries**: To help the audience understand the result, comment on the role of the hypotheses, and give examples of applications. Recall known results which play a role in the proof or which are special cases of the result you are discussing.

(5) **proof**: Frans Oort (a dutch mathematician) once told me ”Every math talk should contain at least one proof”. I agree with his recommendation and I wish to pass it along. Yet, there are many ways to do so. Your proof does not need to be complete (unless time allows it), you should make an effort to break down the proof into several steps and possibly focus only to one or two of them. You may choose to present a complete proof but only under simplifying hypotheses (sometime notations will be too much of a burden otherwise, or the proof too technical). You may even present the proof only in a specific example, if so choose it wisely.

Topic
You will deliver two talks: one on a known result at the level of MA 5, 6, 108, 109 or equivalent, the other on a more advanced topic (if you wish you may present your own research, mathematical topics at the intersection with other scientific disciplines are fine, history of mathematics is also OK). In either case, choose a topic you enjoy and one that can be delivered in 20 minutes. When presenting a topic already familiar to the audience (the result does not need to be familiar but the objects should be), you can put your focus on the presentation of statement, proof and applications. Motivations and most basic definitions (e.g what is a metric space) can
be assumed as familiar to the audience (although they are always allowed to ask!). By the same token notations will be easy to set up, and I do recommend you use standard convention (e.g. $\mathbb{R}$ for ring, $\mathbb{V}$ for vector space). You won’t need to spend much time explaining why the result is important or its context. Be careful, I am not saying to skip this, your talk should be as self-contained and complete as possible, but you can go over this quickly. On the other hand, the opposite can be said of your second talk. As topics are more advanced, the burden is on you to explain why they are important, how the result is or could be used, what insight it offers, which known results play a role in the proof. The proof per se might be hard to explain to an audience of non experts, and it is important that you focus on presenting the key ideas rather than the details. Yet, always remember to be rigorous, you may present under unnecessary simplifying assumptions and/or be vague on some more technical details but you should not find yourself making false statements, chances are you will be called on them!

**Length**

You have 20 minutes, plan accordingly. It takes some experience to perfectly predict how long your presentation will take, so I recommend you give it a try before presenting. Also, it helps and it is a good habit to compartmentalize your exposition so that you may skip ahead if needed (don’t simply go till you run out of time, your talk should have a punch line and you should deliver it before it ends). Always prepare a bit of extra material, so that you don’t have to end early, if you have extra time at the end you will be able take advantage of it (ending more then a few minutes early is possibly even more frowned upon than going overtime). The extra material might also come helpful during Q&A.

**Entertainment**

It is your job to keep the audience awake and engage, your talk should not sound like the reading of a bedtime story. Your goal is to explain to the audience how it all works and what the statement is really about, and make them think not just listen. Try to promote critical thinking when presenting. Stress when the hypothesis come into play, what makes it all click together. Share your insight and point of view on the subject. If it suits you, make the occasional joke. Always make eye contact and check that the audience is following your presentation. Be ready to take questions.

**Media use**

Ideally, one talk should be a blackboard presentation and the other a slide presentation. My recommendation is to do so in this order (i.e. reserve the slides for your research talk). When delivering a blackboard talk, think ahead of time what you’ll be writing on the board. Too much writing will slow you down, too little writing and your talk will go by too fast. What you write serves many purposes: it effectively repeats what you just said, it helps if someone gets distracted and falls behind, or if she/he forgot something
that was said and wishes to recall it. Sometimes it is even helpful to plan not just the order of the things you will say and write, but also the order you will use to erase them. Some boards might come handy a second time during the presentation as a reference/review. Please make notes, and bring them along. If you are writing remember to write large and clearly, otherwise the writing is no aid. Also always speak clearly (and be sufficiently loud for everyone to hear you). Much of this applies also to slide talks too, except that when preparing slides much of this is done ahead of time. The advantage is that you won’t be slowed down by the act of writing, the disadvantage is that you need to keep your focus not to go too fast. Don’t make your slides look crowded: it will be distracting. Don’t make them too empty either: one disadvantage of slides is that once you move on they are gone, so make each one of them count. Do not read your own slides when presenting: the audience can manage that on its own! Just as in the case of the blackboard, what you write should be close enough to what you say so that the audience can comfortably read and listen at the same time, without being confused. To do so, there is no need for the two to match word by word.

Q&A
You have 20 minutes for your talk, and it is OK to go a few (less than 5) minutes overtime, as questions might have slowed you down. The rest of the time (5-10 minutes) is for open questions. It helps to think ahead what people might ask you, you may even prepare one extra example or corollary as it might come handy, and you may try to hint to the audience a few questions you’d like to be asked (by mentioning a few things during the talk such as ”this result has a beautiful application in Number Theory” or ”the circle is a great example of such an object”).

Poster
You will give one poster presentation, its topic can be the same as one of your talks, or a different one. If you have done original research this is a great opportunity to present it, but it does not need to be original work. Your poster should be aesthetically inviting, as your goal is to attract people to come and speak to you. It does not need to contain all the details, in particular is does not need to include a proof, and if it does the proof should not be more than one line long. (e.g. ”The proof relies on a result in Class Field Theory and some explicit computations for $K = \mathbb{Q}[^2\sqrt{2}]$”, or ”the general statement can be reduced to the case of $M$ the projective line.”). Be ready to present your poster, plan a few minute long answer the question ”what is this poster about?”. The rest is Q&A, but again you can try to guess some likely questions and prepare for them.

Audience
As a member of the audience you pledge to listen and pay attention, to ask questions when confused and clarification is needed, to keep quiet and to
make comments only when appropriate. Your feedback should be honest, and constructive. Your comments are anonymous, this is not a free pass to rudeness!