

**How do you
write a good
function?**

Robust code

- Spend time now to save time later
- Be explicit, e.g. `TRUE` and `FALSE`, not `T` and `F`
- Avoid functions that have different types of output (avoid `sapply`, beware `[]`)
- Avoid functions that use non-standard evaluation (no `subset`, `with`, `transform`)
- Check preconditions and fail fast

Vocabulary

- A broad R vocabulary lets you make use of existing R functions
- Existing functions are documented, better tested, often more general, ...
- But more importantly they will often have a standard name

Code = communication

- Rewrite important code: your first attempt isn't usually the best approach.
- Consider the audience; what vocabulary should you assume?
- Being obviously correct is better than just being correct, but it may take a lot of time to get there.

Debugging

<http://adv-r.had.co.nz/Exceptions-Debugging.html>

Steps

1. Realise that you have a bug
2. Make it repeatable
3. Figure out where it is
4. Fix it and test the fix

Tools

1. RStudio error inspector/
`traceback()`
2. RStudio's rerun with debug/
`options(error = browser)`
3. RStudio's breakpoints/`browser()`

Post-mortem debugging on another server

```
# In batch R process ----  
dump_and_quit <- function() {  
  # Save debugging info to file last.dump.rda  
  dump.frames(to.file = TRUE)  
  # Quit R with error status  
  q(status = 1)  
}  
options(error = dump_and_quit)  
  
# In a later interactive session ----  
load("last.dump.rda")  
debugger()
```


Testing

- Debugging gets it working now; testing ensure that it keeps working in the future. Really important!
- Recommend that you learn how to use `testthat`: <http://r-pkgs.had.co.nz/tests.html>

Reducing duplication

Rest of the day

- **Functional** programming: work with functions that take functions as input
- **Object oriented** programming: make code behave differently based on the type of input
- **Metaprogramming**: break all the rules!

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