What is the aim of debugging ?

Code can frequently become a very complex beast

Often we don't understand exactly what it is doing !

Subtle run-time behaviour can cause strange results

The problem is that code usually runs as a black box

(We can't see what is going on inside)

We really need some kind of transparency

Apologies

Sorry if you already use a debugger

The aim of this briefing is getting you to switch

Even if you are using the debugger already,

you might still learn something new !

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Problems with Println

Most programmers start out using printf or println
Provides basic but workable approach to debugging

You have to decide *which* variable to print out
Then add some temporary code to print it out
Maybe even a loop to iterate (if its an array)

If you chose to print out the wrong variable
(or just want to switch to another variable)
You have to go through the whole process again

Not forgetting to delete all the printlns afterwards !

Problems with volume of Data

I've written a Java renderer to render 3D models

vertex-data

But there is a bug reading in the 3D vertices !

After we've read in the data from the file

Lets print out position of each vertex

BunnyViewer

Power of Debuggers

Debuggers are like MRI scanner with freeze-frame !
We can pause execution and see EVERYTHING inside

Look at content of ANY variable
CHANGE that content manually
Pause/resume execution
Step through execution...
...line by line

Demonstration

We have some code to calculate first 100 primes
Problem is this code doesn't work properly :o(
The code just loops forever and prints nothing out

Let's take a look at the "Primes" project in IntelliJ
And use Intellij's debugger to find the problem !

Don't shout out if they see any faults in the code !

IntelliJ

Switching over

Using printf/println probably feels safe and familiar
The problem is that it is easy to continue using it
Long after it has become inefficient & ineffective

Learning overhead of switching to a debugger
Often discourages people from making use of them

However the time invested will reap greater rewards

Medical Metaphor Revisited

If a debugger is a bit like an MRI scanner...
Then using printlns is a bit like:
hitting different body parts with a little hammer

MRI is more complex to operate
But a lot more powerful !
(once you get the hang of it)

Why wait until now to introduce it ?

TBH some are still getting to grips with the hammer ;o)

Pro User Features...

Pro User Features: Reset Frame

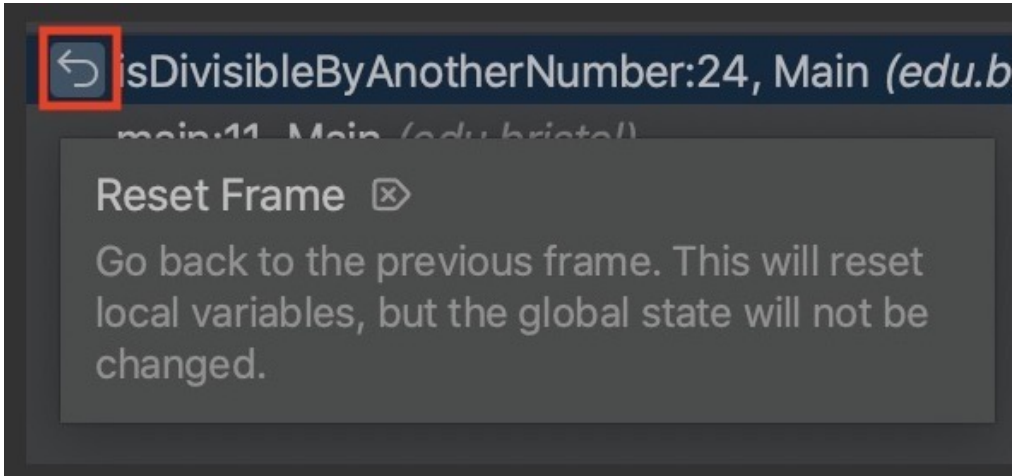
As close as you can get to "step back"

Returns back from the current method

(as though that method had never been called)

There is not true "step back" (rewind)

I guess it is just too hard to implement !

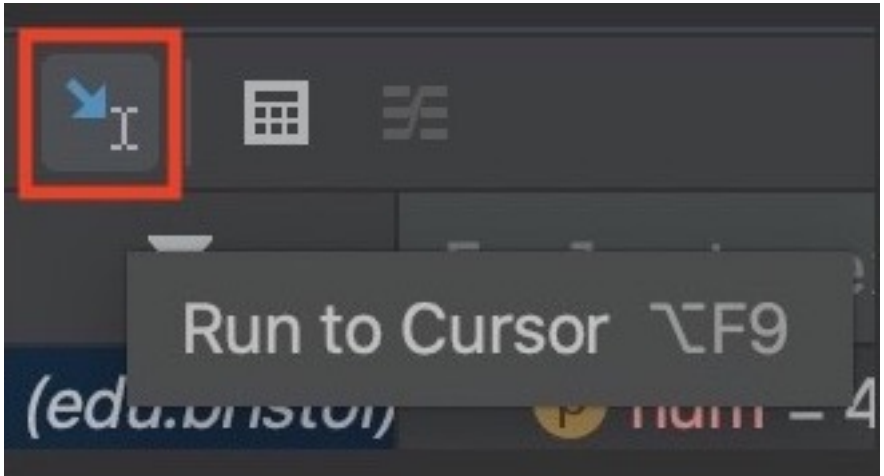


Pro User Features: Run to Cursor

Unpauses execution, then runs until...

The currently selected line of code is reached

(basically like creating a temporary break point)



It's up to you - you decide !

Let's take a look at this week's workbook

README