#### How can you compile and load a module into the erl shell?

c(module.erl).

#### Now that module's functions can be accessed with:

module:func

What doe Erlang programs begin with?

-module(filename).

... for a program defined in filename.erl.



#### How can you use methods in other modules without module qualification?

-import(filename, [func1/arity1, ..., funcN/arityN]).

#### How can you make your module's functions available to other modules?

-export(filename, [func1/arity1, ..., funcN/arityN]).

or

-compile(export\_all).

What are the Erlang case rules?

Similar to Prolog, and Haskell, functions and atoms begin with

a lower case, variables begin with a capital letter or an

underscore.

What is an atom?

What are its lexical rules?

An atom is a word that stands for itself.
It begins with a lowercase letter or is enclosed in single

quotes.

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What are Erlang's primitive data types?

Integers, floats, strings, atoms, lists, tuples, binaries.

How are lists, tuples, and binaries written?

### Lists are enclosed in square brackets, tuples in curly brackets, and binaries in double angle brackets.

#### What's odd about Erlang's Boolean operators?

They don't short-circuit by default. For short-circuiting you have andalso and orelse.

## How are "greater or equal to" and "less than or equal to" expressed?

>= and =<. **not** <=.

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What are the equality operators?

How are they used?

- == equal to
  /= not equal to
  =:= exactly equal to
- =/= not exactly equal to

The non-exact versions will coerce its into floats. Otherwise use exact versions to give better hints to the compiler.

What is = in Erlang?

Pattern matching, not assignment. "Assignment" is just a

simple case of pattern matching.

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What is the syntax of case expressions?

case Expression of
 Pattern1 [when Guard1] -> Expression\_sequence1;

...
PatternN [when GuardN] -> Expression\_sequenceN

# What is i

What is its value?

What is an expression sequence?

A sequence of expressions separated by commas.

The value of the last expression evaluated.

Give the syntax of if expressions.

```
if
    Guard1 -> Expression_sequence1;
...
Guard2 -> Expression_sequence2
```

end

#### What happens if no guard in an if expression is true?

How can this be avoided.

An error will be returned.

One can use the true atom as the final guard, although it is usually better to use something more explicit than true when possible.

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What is the huge restriction on guards?

To enforce no-side-effects, they cannot be user-defined.

You can use type tests, many operators, and a number of built-in functions.

How do you access the length of a list?

Of a tuple?

length(List)		
size(Tuple)		

Give the syntax of named functions.

name(Patterns1) -> Expression\_sequence1;
...

name(PatternsN) -> Expression\_sequenceN.

Give the syntax of anonymous functions.

What are they often used for?

They are often used as parameters to other functions.

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Give the syntax of list comprehensions.

[Expression || Generator, GuardOrGenerator, ..., GuardOrGenerator]

The expression typically makes use of variables defined by a generator. Guards are simply boolean expressions.

Generators are of the form El <- List.

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Give a generator that doubles the members of a list.

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```
[X * 2 || X <- [1, 2, 3, 4]]
```

### Which list functions do not need to be imported or qualified?

hd (head), tl (tail), length	

Create a range of integers.

lists:seq(From, To, Step)

lists:seq(From, To)

Note: To is inclusive, unlike in Scala/Python/etc

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Get a line from stdin.

Put a line to stdout.

```
Line = io:get_line(Prompt).
```

io:format(FormatString, ListOfData).

How do you write to a file?

```
{ok, Stream} = file:open(FileName, write),
io:format(S, FormatString, ListOfData),
file:close(S).
```

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# What are the reserved sequences in format strings?

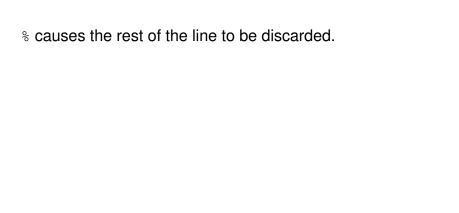
~s a string

 $\sim_W$  a value in its standard syntax (e.g., strings as lists of integers)

 $\sim$ p a value, pretty printed (e.g., strings with quotes around them)

~n or \n newline

What is the comment syntax?



filter and map take which arguments?

First the function to apply to the members of the list, and then the list.

How can you get truncating division?

0> 2 rem 3.

## How can you use previously defined functions as parameters to other functions?

Create an anonymous function in-line using the function's full name, *funcName/arity*.

E.g.,

```
get_red() -> filter(fun is_red/1, fruit()).
```

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What are strings, really?

Lists of ASCII integer values.

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What do lists: all and lists: any do?

# The same as Scala's forall and exists.

# How is Erlang's zip more restrictive than other languages'?

# The two lists must be of the same length.

#### Append two lists.

```
lists:append([1, 2], [3, 4])

or
[1, 2] ++ [3, 4]

result in

[1, 2, 3, 4]
```

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What do takewhile and dropwhile do?

takewhile scans through a list until the predicate fails for the first time, at which point it discards the failed element and everything after.

 ${\tt dropwhile} \ \ \text{scans through the list, discarding everything until the predicate holds for the first time.}$ 

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What does partition do?

It creates a tuple of two lists. The first list holds the elements of the input list for which the predicate held, and the second holds the elements for which the predicate failed.

How can you run code in a new process?

```
Pid = spawn(Function)
```

## How can you generate a "return address" to send with your message?

self() results in the Pid of the executing process.

Give the syntax of receive.

```
receive
    Pattern1 [when Guard1] -> Expression_sequence1;
    ...
    PatternN [when GuardN] -> Expression_sequenceN
```

PatternN [when GuardN] -> Expression\_sequenceN
after Timeout ->

Timeout ->
TimeoutExpressionSequence

#### How is Erlang's loop () different from Scala's?

loop in Scala is a control structure in the actors library that does the looping for you.

In Erlang loop is just the name of a function you're calling so you must make the recursive call at the end of each receive case.

# What's an idiomatic way to set up an Erlang remote procedure call server?

Provide a function that takes as an argument the Pid of the instance of the module to send the message to.

Send the message there, wait for a response, and then reply.

Ultimately a user may start several processes, but after that point will interact with the blocking rpc function.

#### Describe Pid registration.

Registering a Pid makes it globally available.

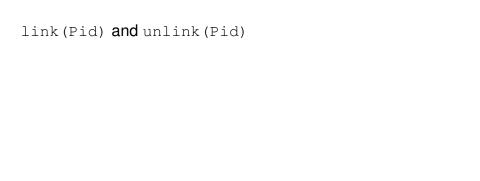
register(AnAtom, Pid) gives Pid a name
unregister(AnAtom)
registered() -> [AnAtom :: atom()]
returns a list of all registered processes
whereis(AnAtom) -> Pid | undefined
gets Pid of a registered process, or undefined if no such
process

#### What's the difference between spawn and spawn\_link?

spawn creates a processes independent from the current one.

spawn\_link creates a new process linked to the current one, such that if the new process exits non-normally, so will the current one.

## How can you introduce/remove links between two running processes?



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How can you terminate the current process?

How can you send exit signals *without actually exiting*?

 ${\tt exit}$  (Reason)  $\,$  exits and sends signals to linked processes.

exit (Pid, Reason sends the exit signal to the given process, but doesn't terminate the current process.

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How can you link to a process while reserving the right to handle the partner process's exit however you like?

process\_flag(trap\_exit, true)
spawn\_link(Function)

Now exit signals are converted to regular { 'EXIT', From, Reason} messages.

However, if the reason is  $\mathtt{kill}$  , exit will still be forced.

Why isn't try/catch much used in Erlang?

Crashed processes are normally handled through linking, not in catch sequences.

#### What is a common strategy for making functions tail recursive?

# Create a helper function with an additional argument that will serve as an accumulator.