Hacking the Rust object system at Mozilla

Lindsey Kuper
Grinnell College
April 5, 2012

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- Ph.D. student at Indiana studying PL since fall 2008

My field: programming language semantics

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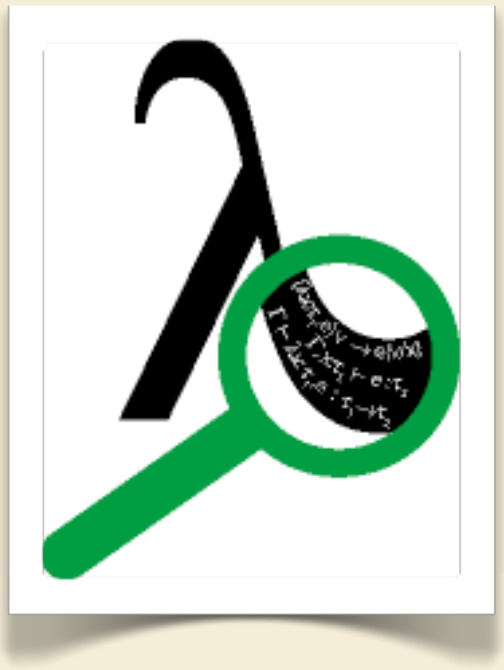

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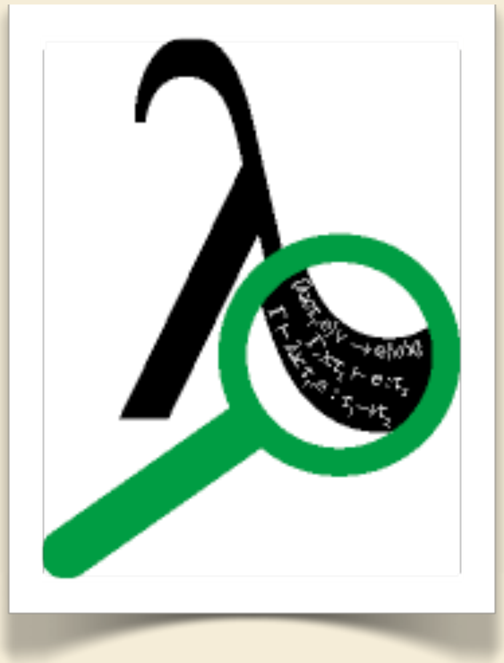

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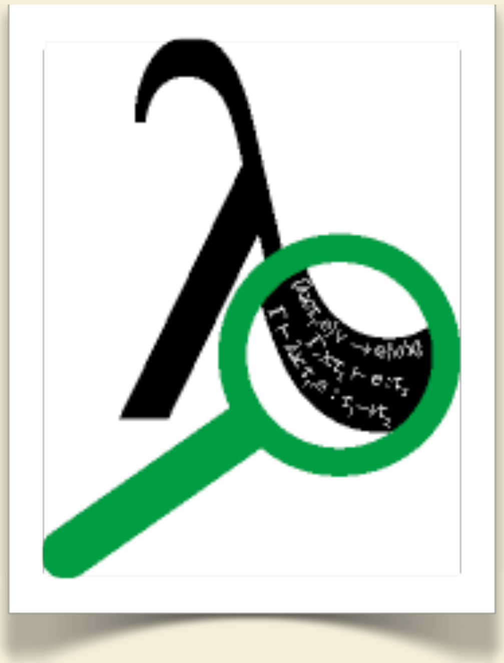

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  - Can source language A be translated into target language B?

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  - Java and C# are Fast and Safe

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Why Rust?

A systems language
pursuing the trifecta:
fast, concurrent, safe

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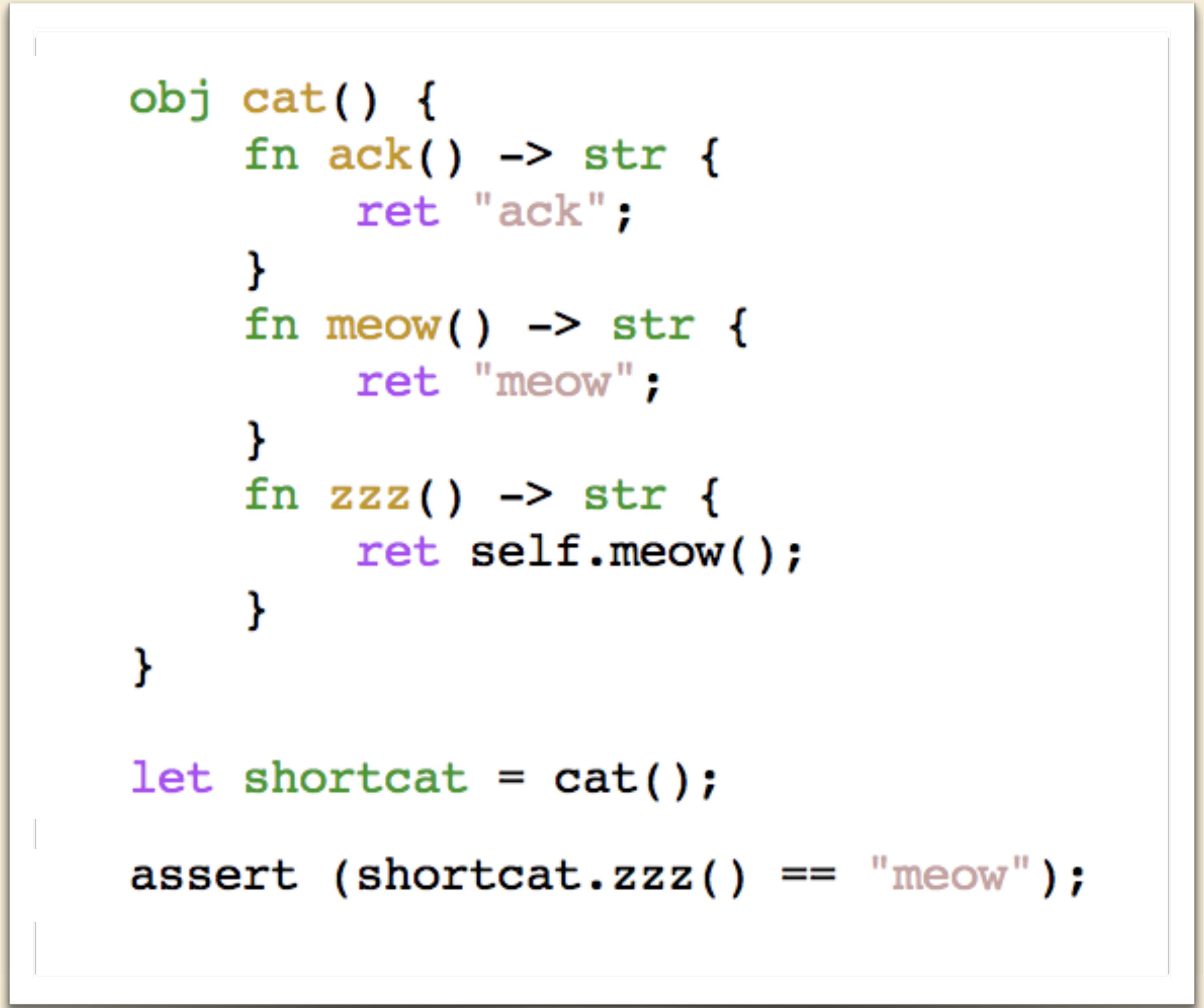
    - and learned that they interact with each other in interesting ways

Self-dispatch

Self-dispatch



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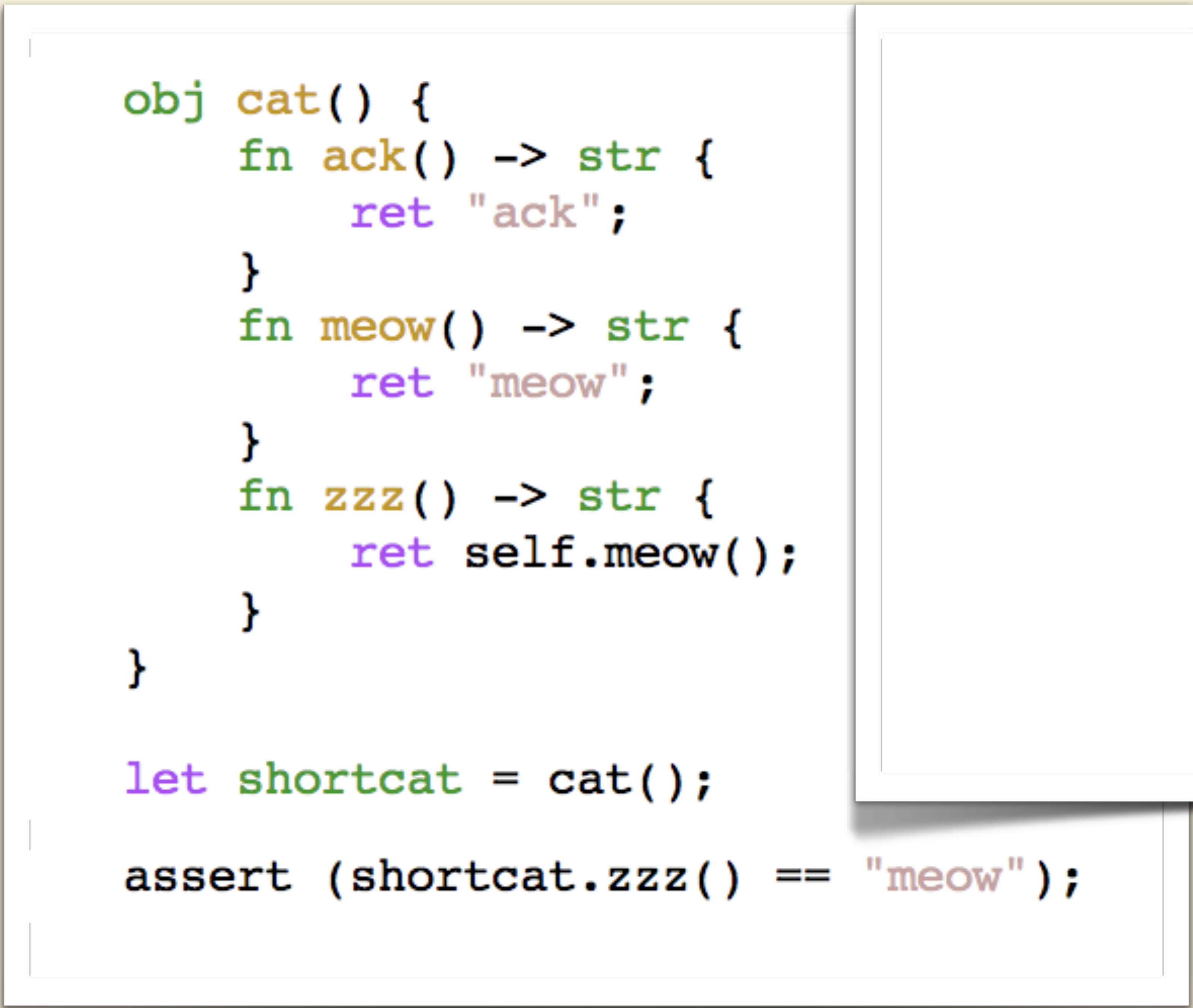

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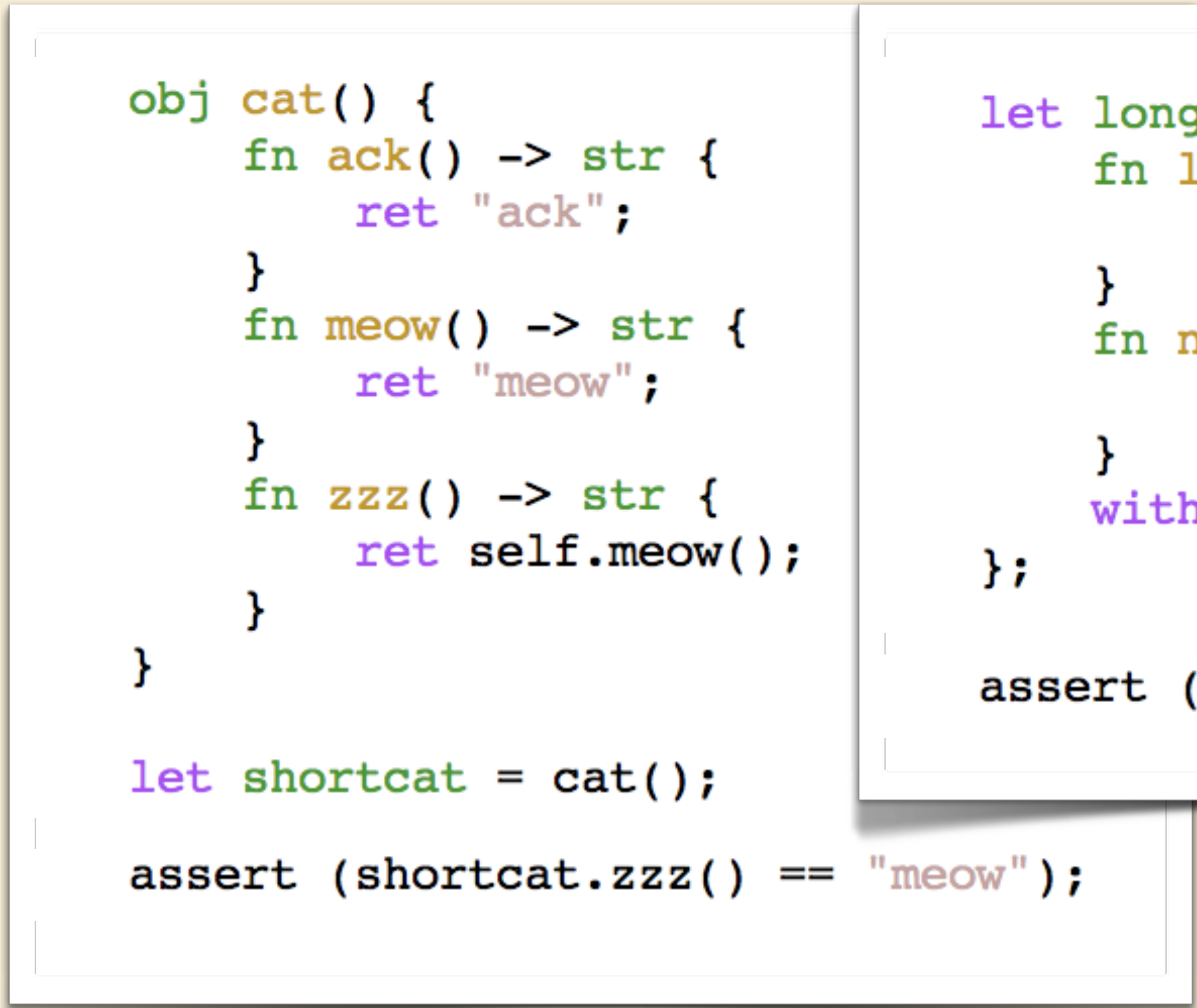

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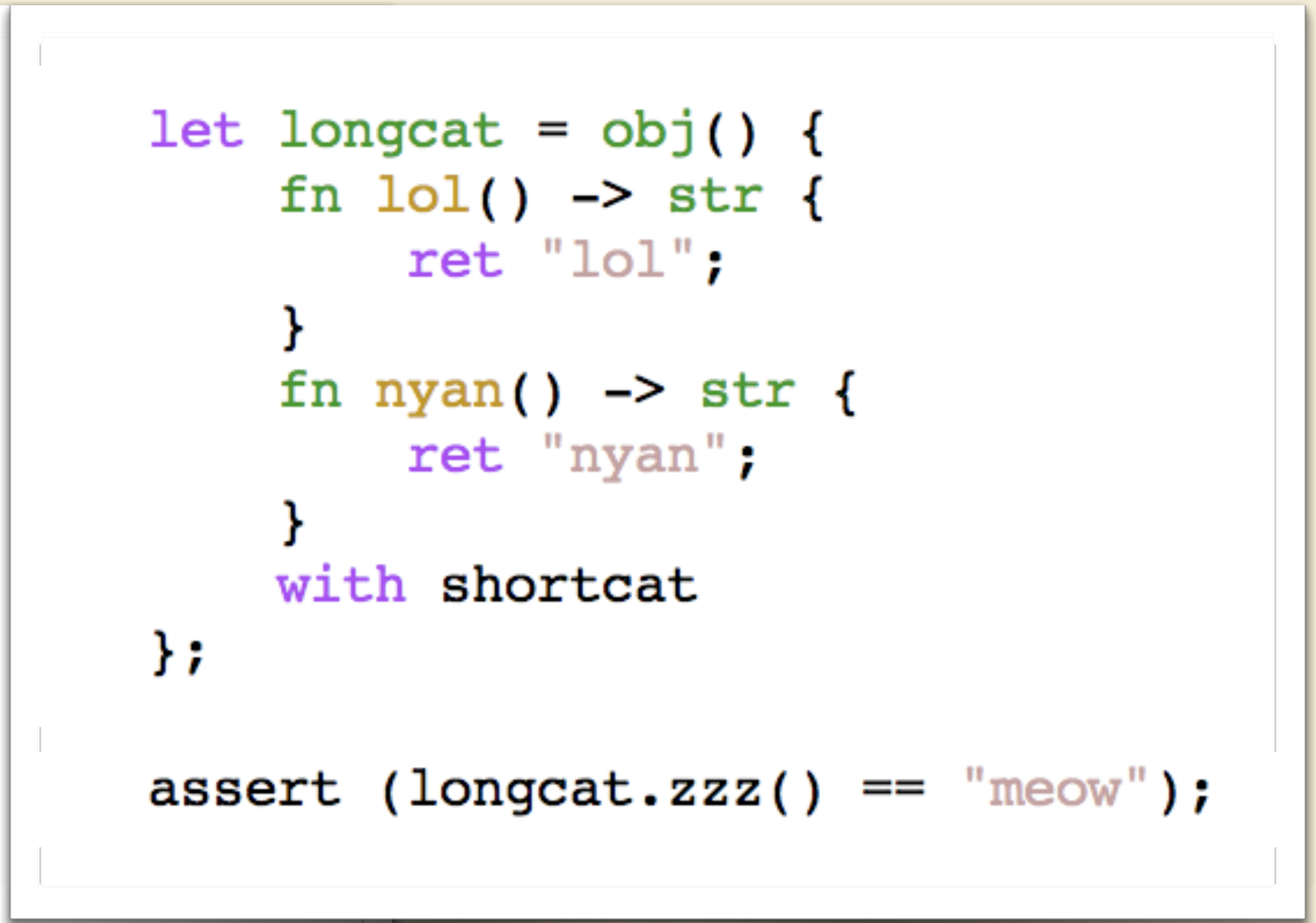

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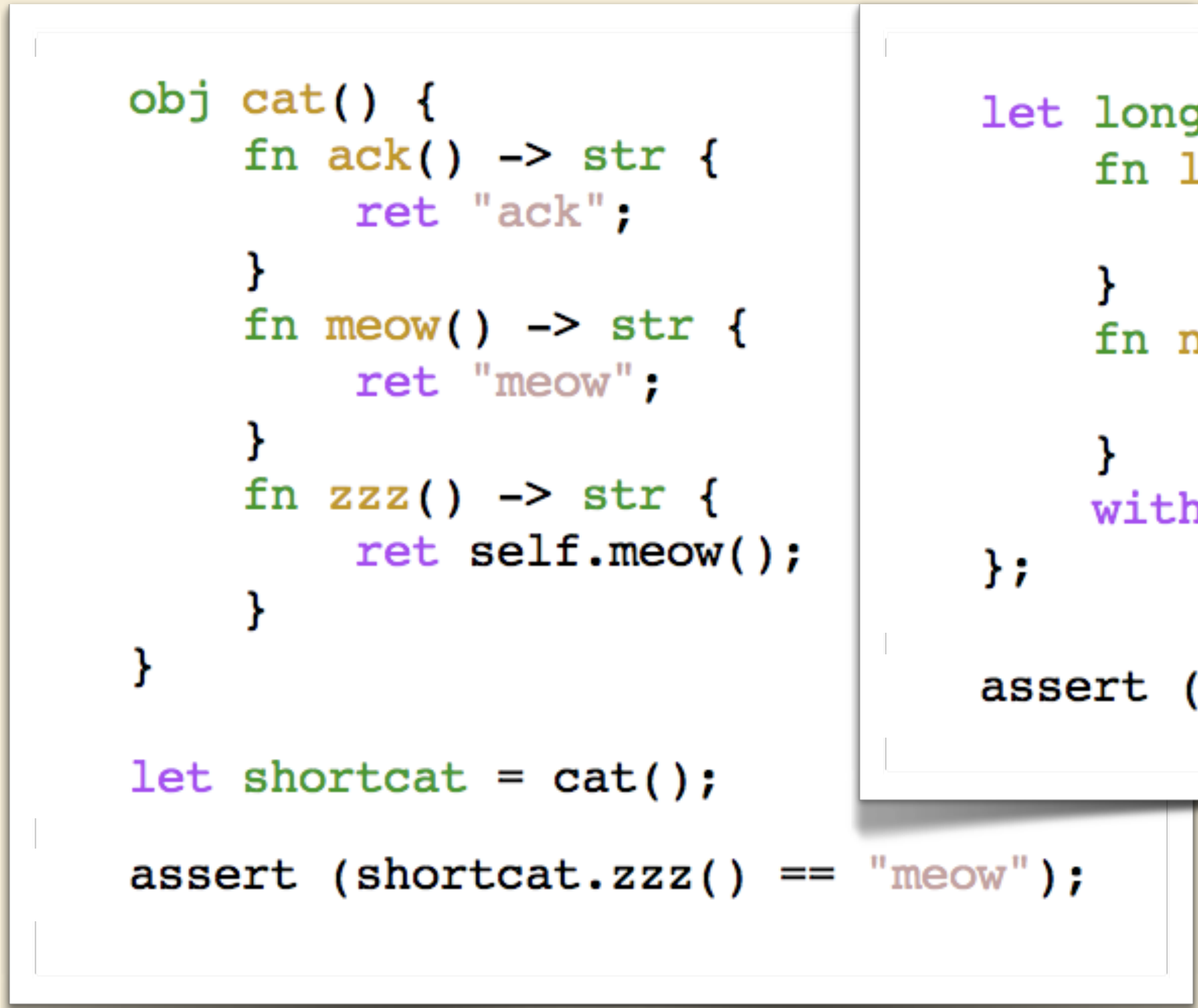

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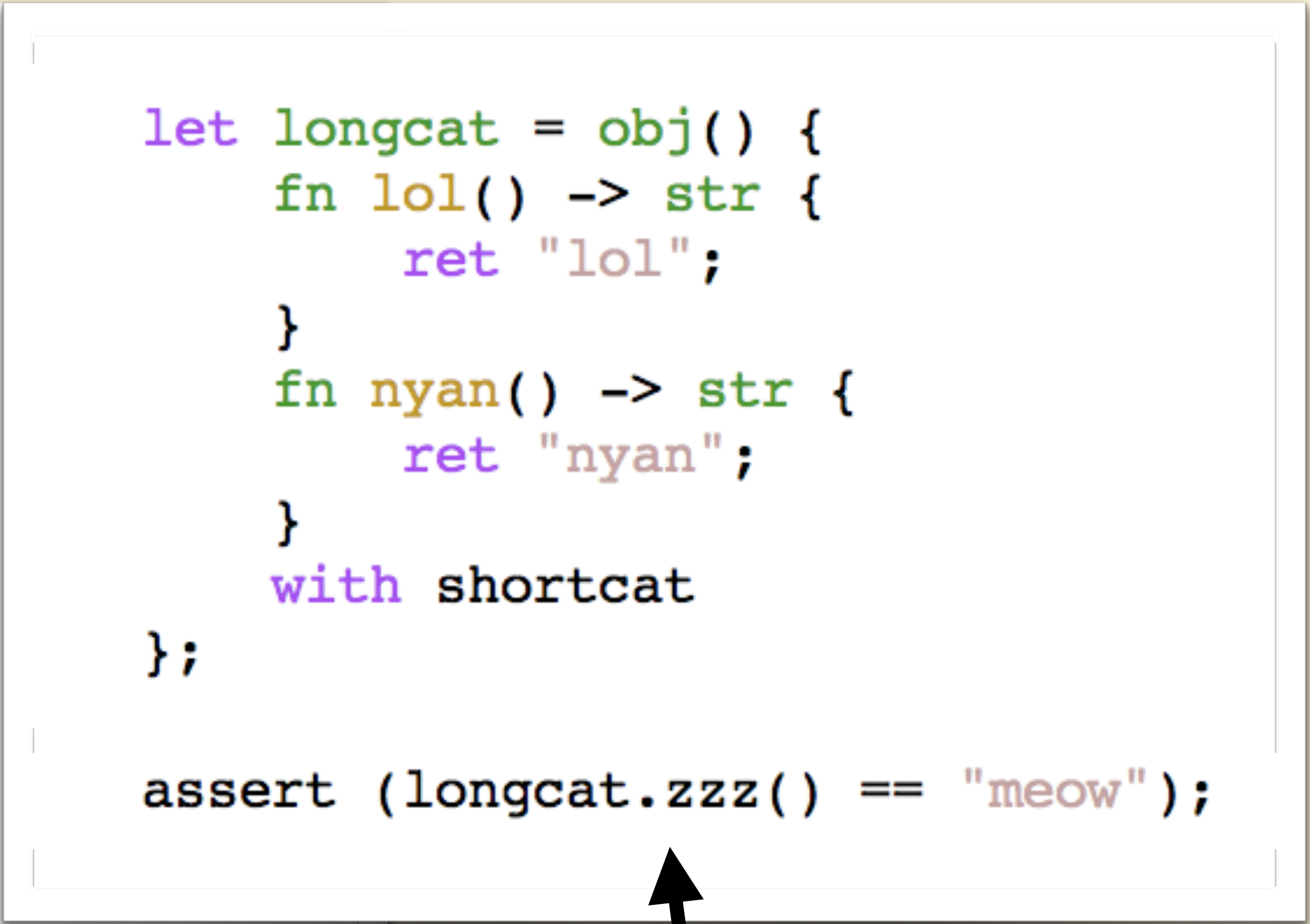

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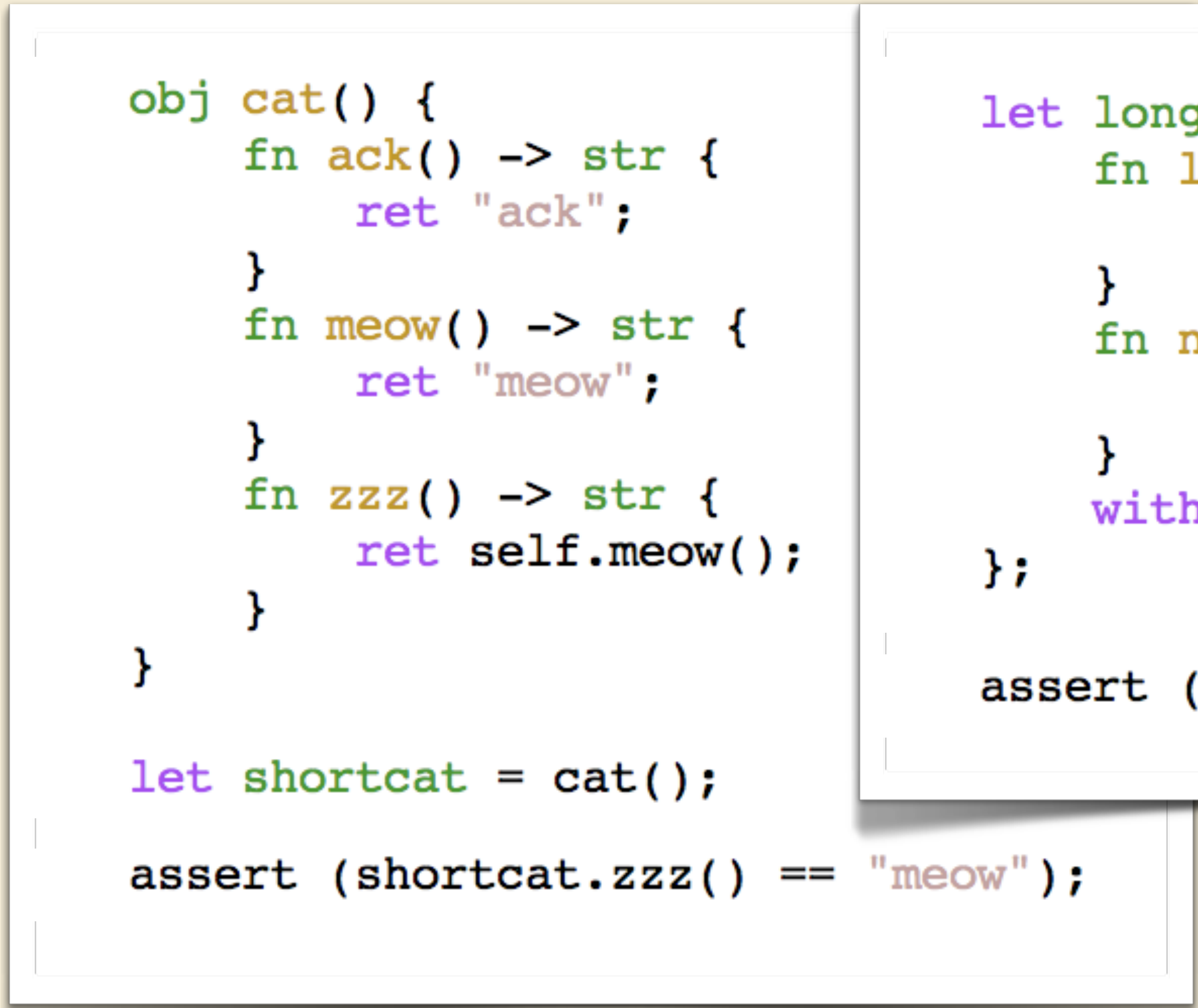

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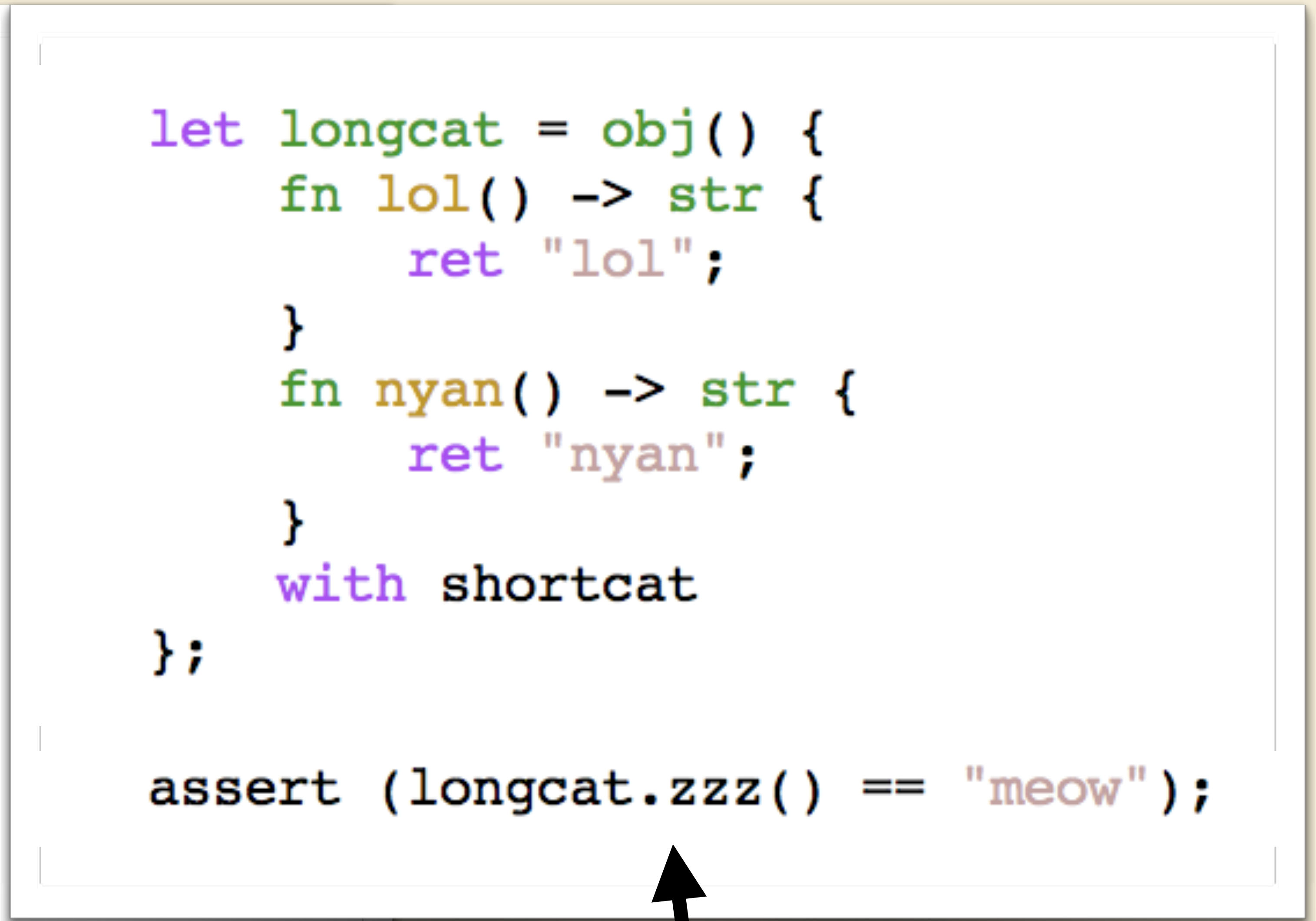

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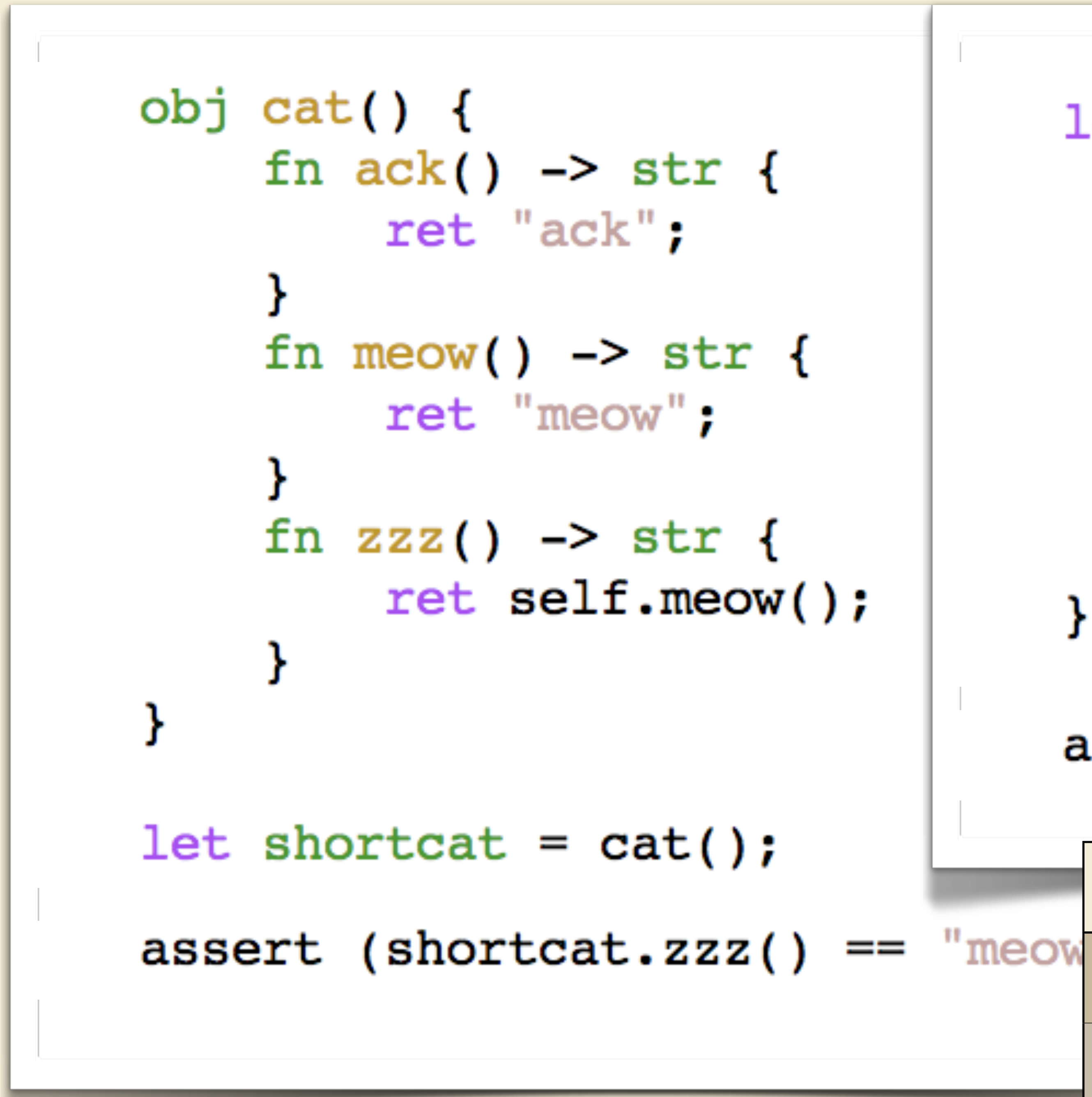

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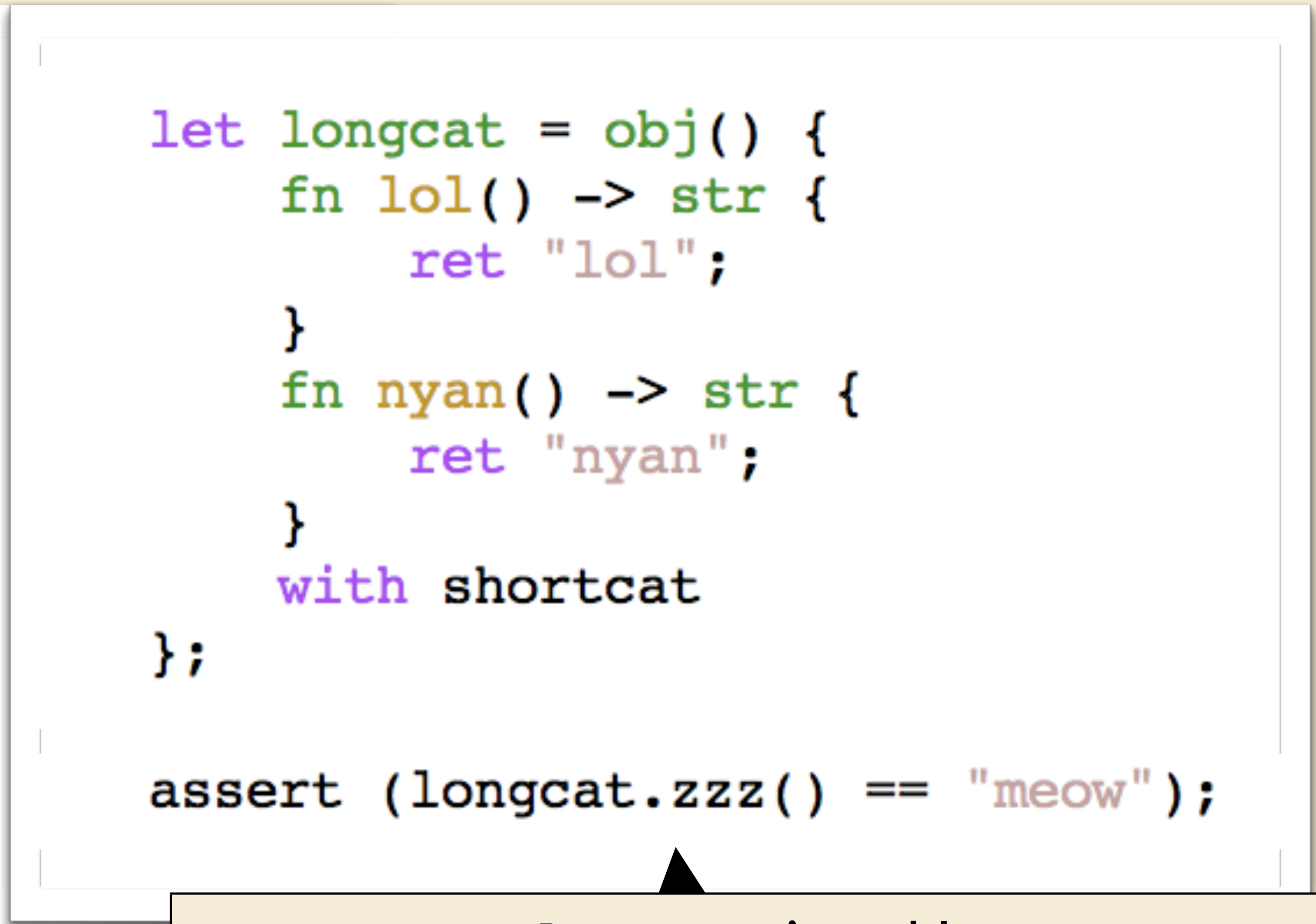

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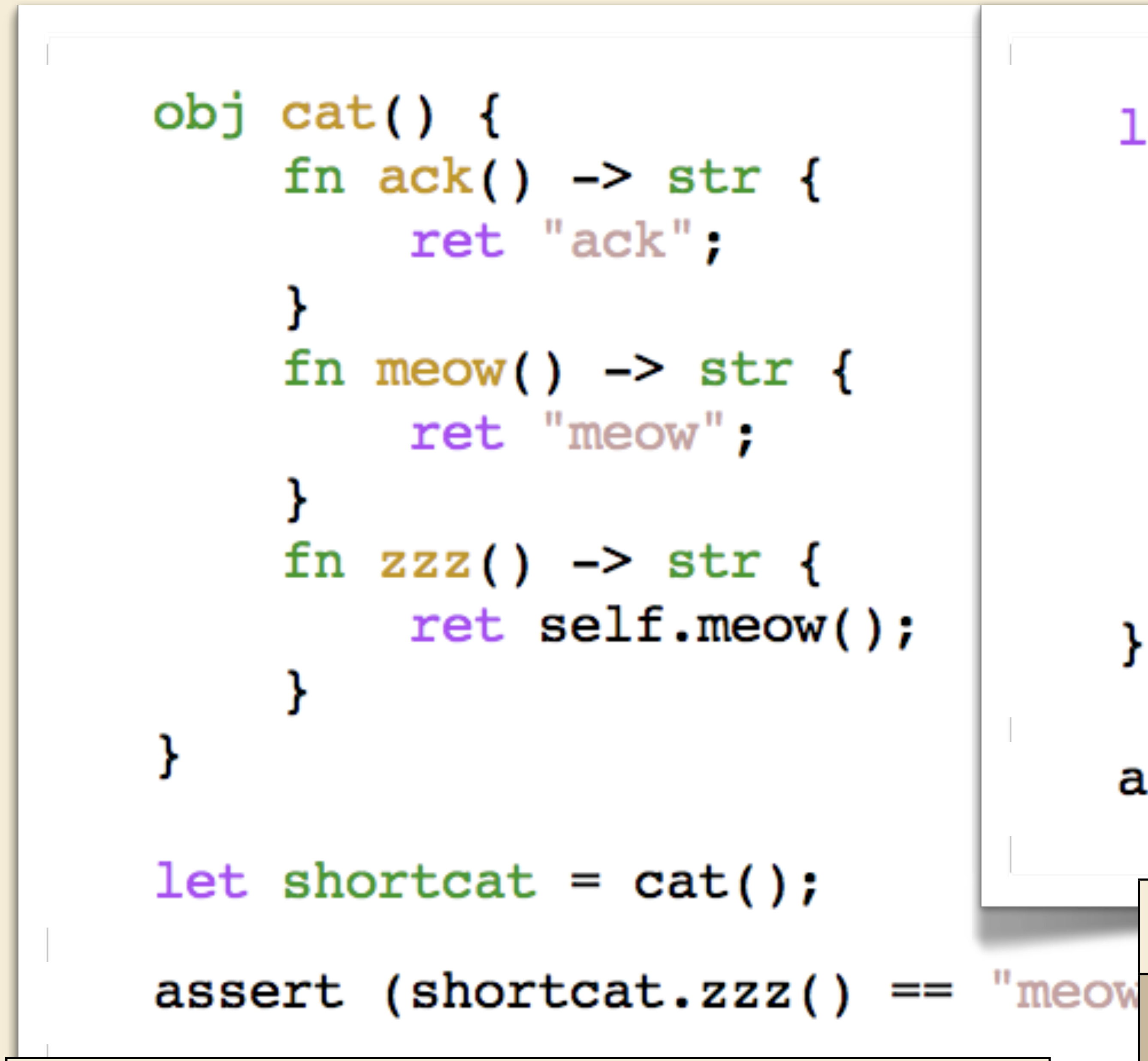

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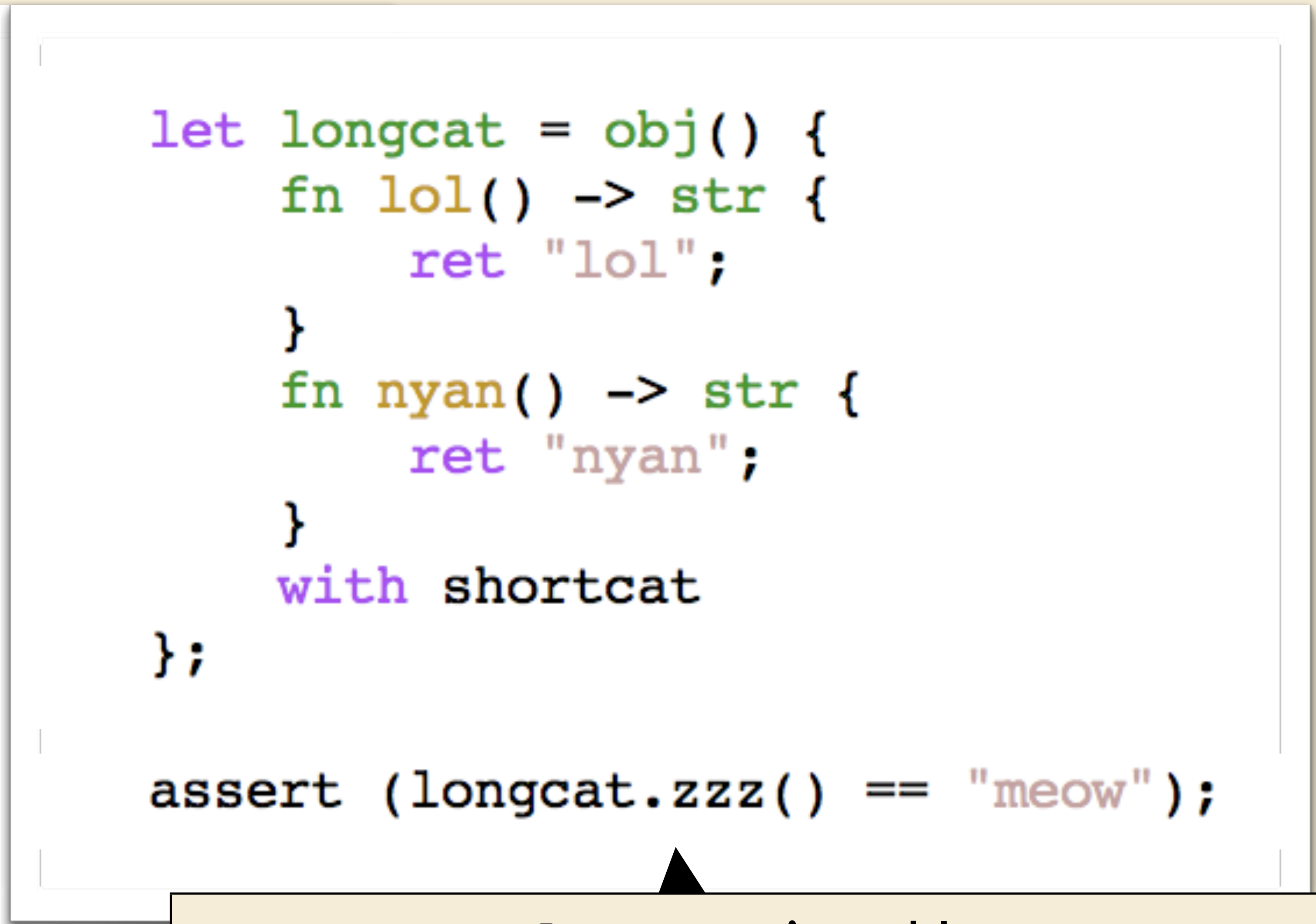

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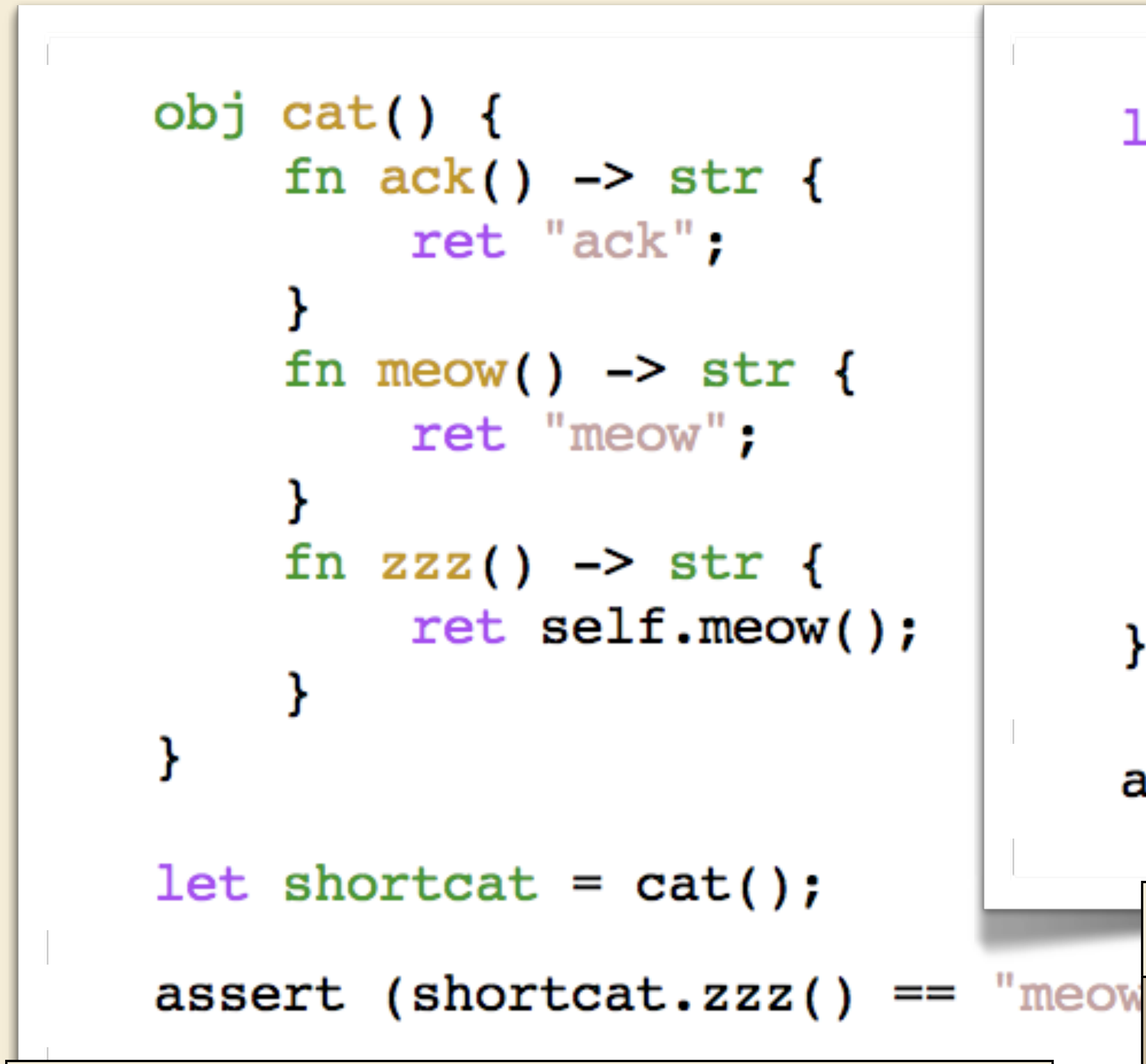

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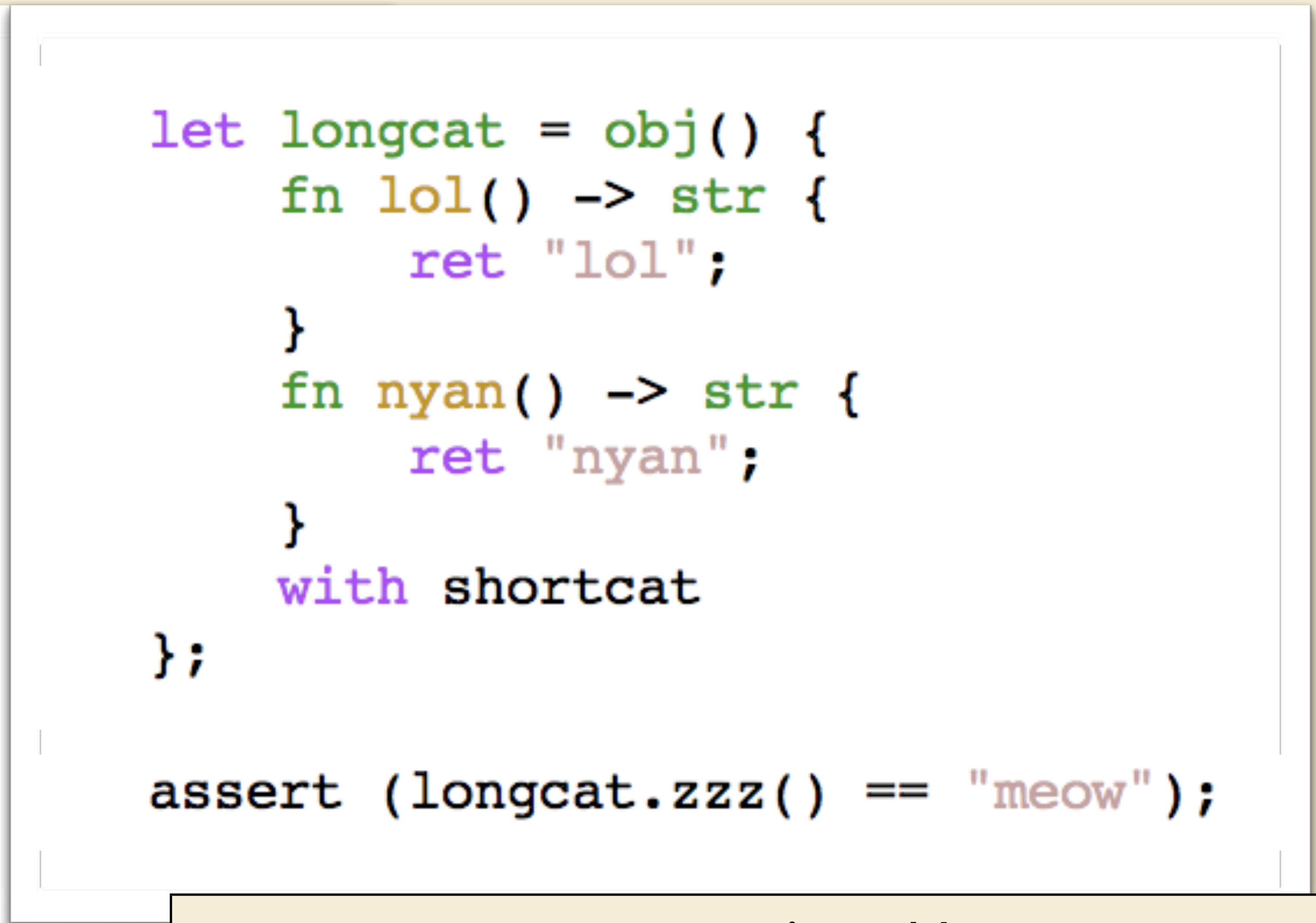

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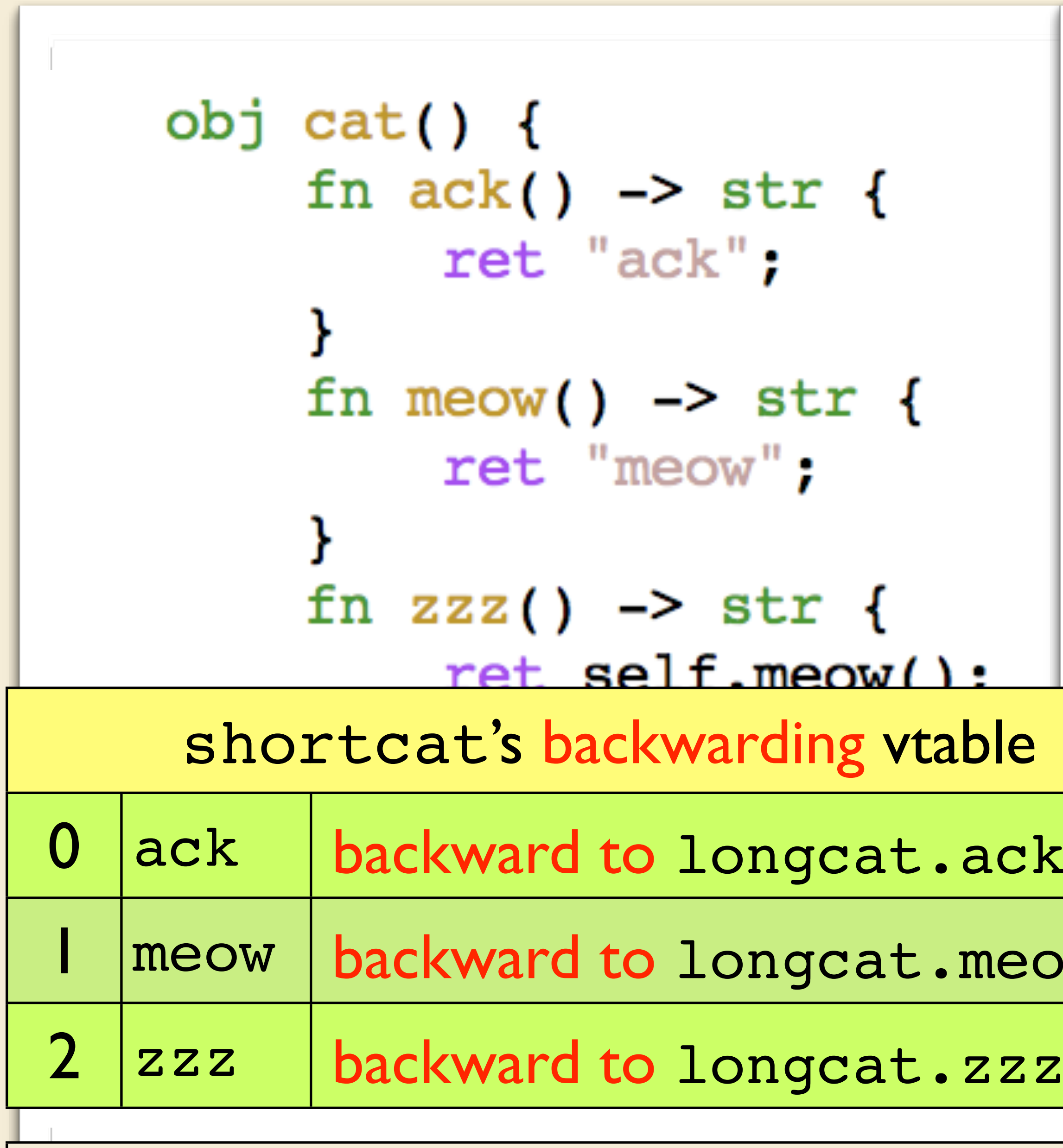

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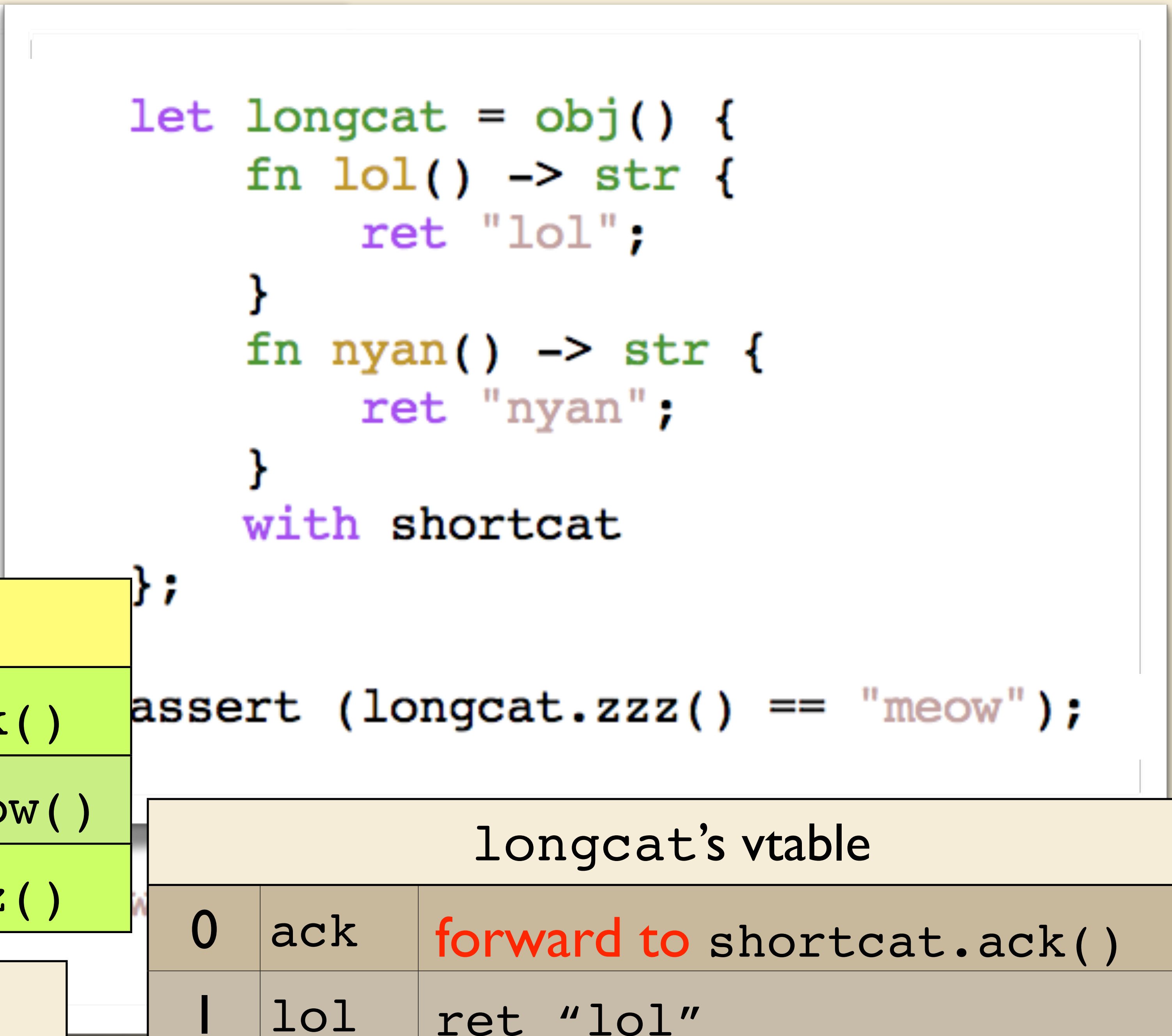

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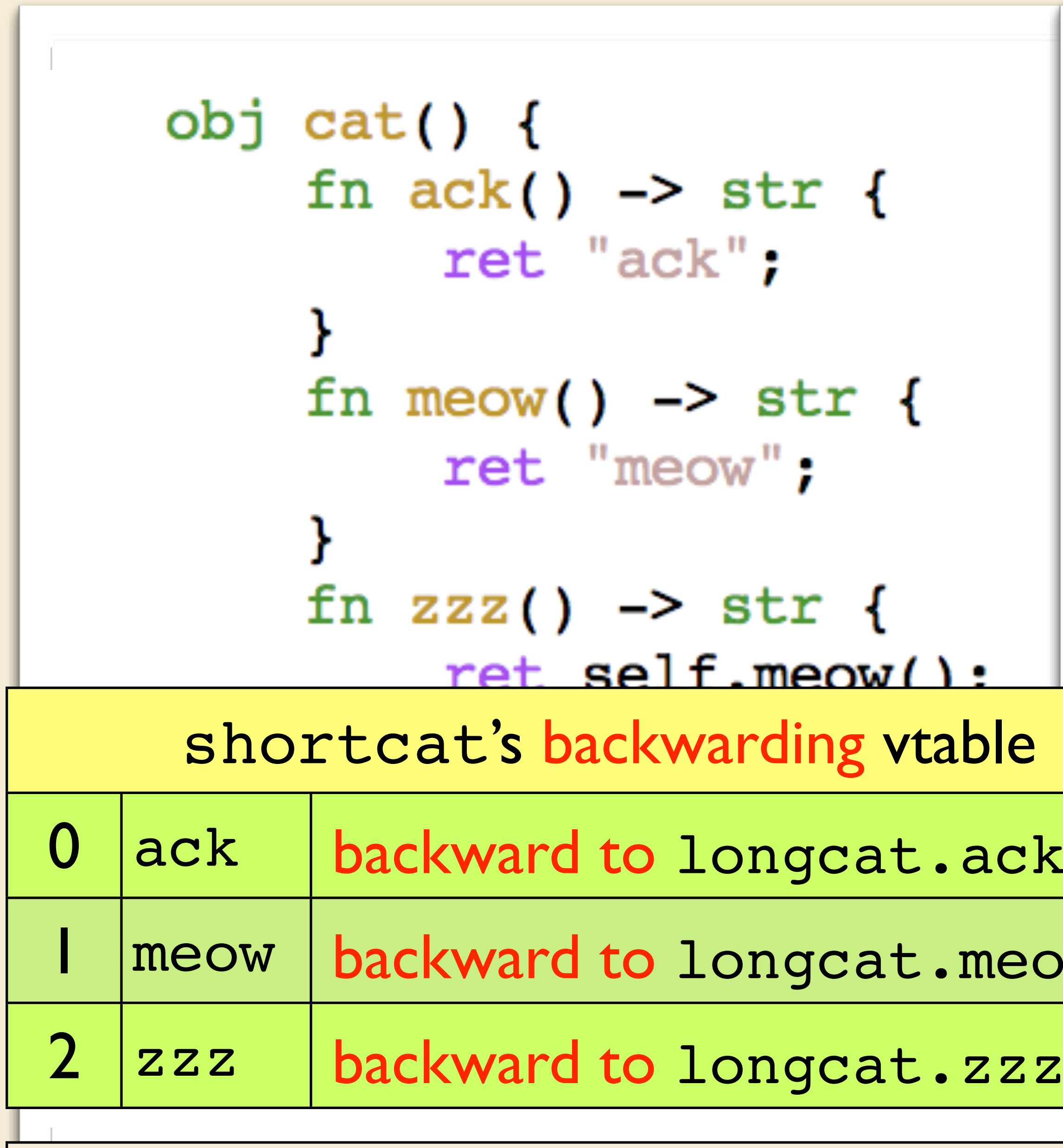

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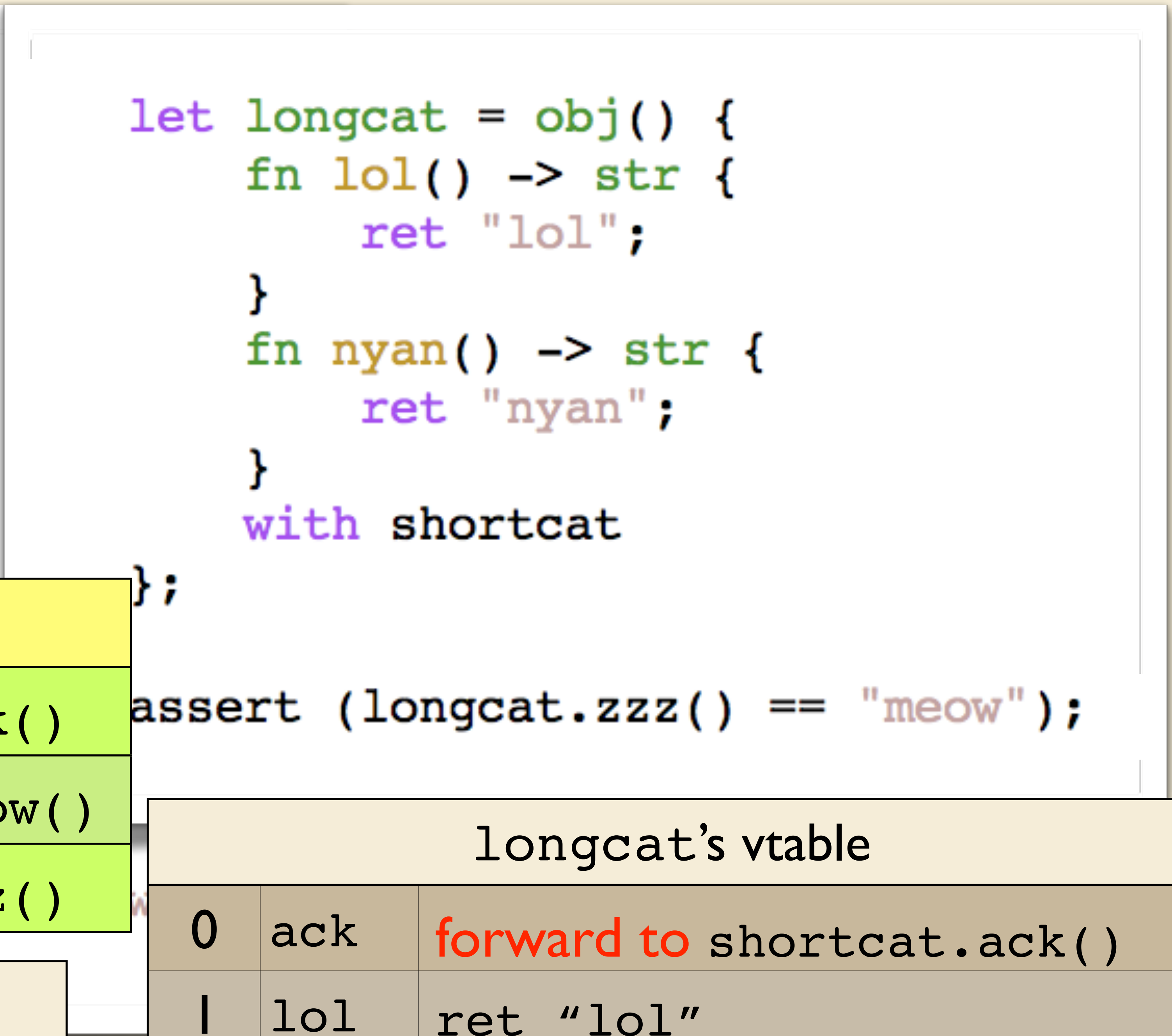

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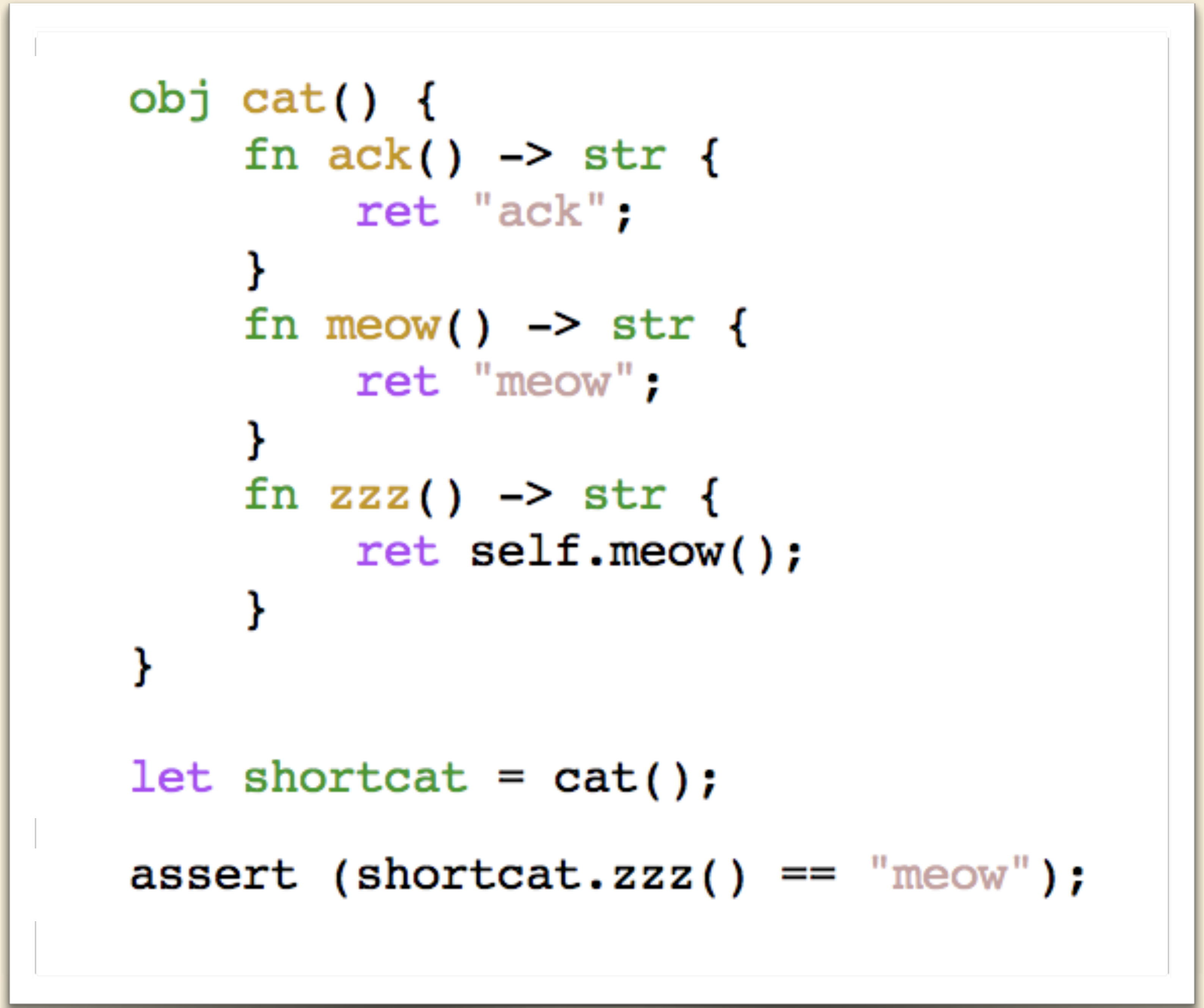

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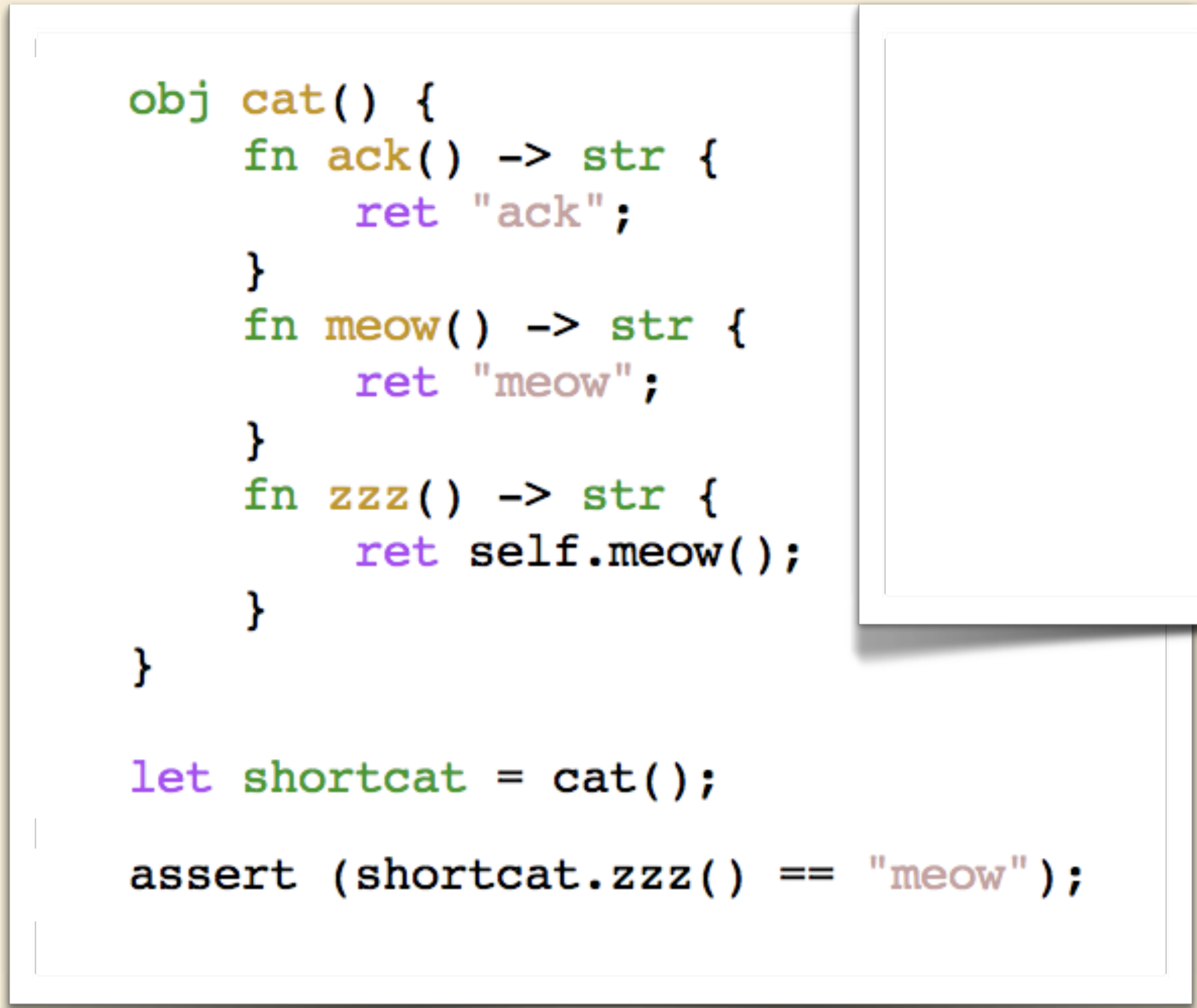

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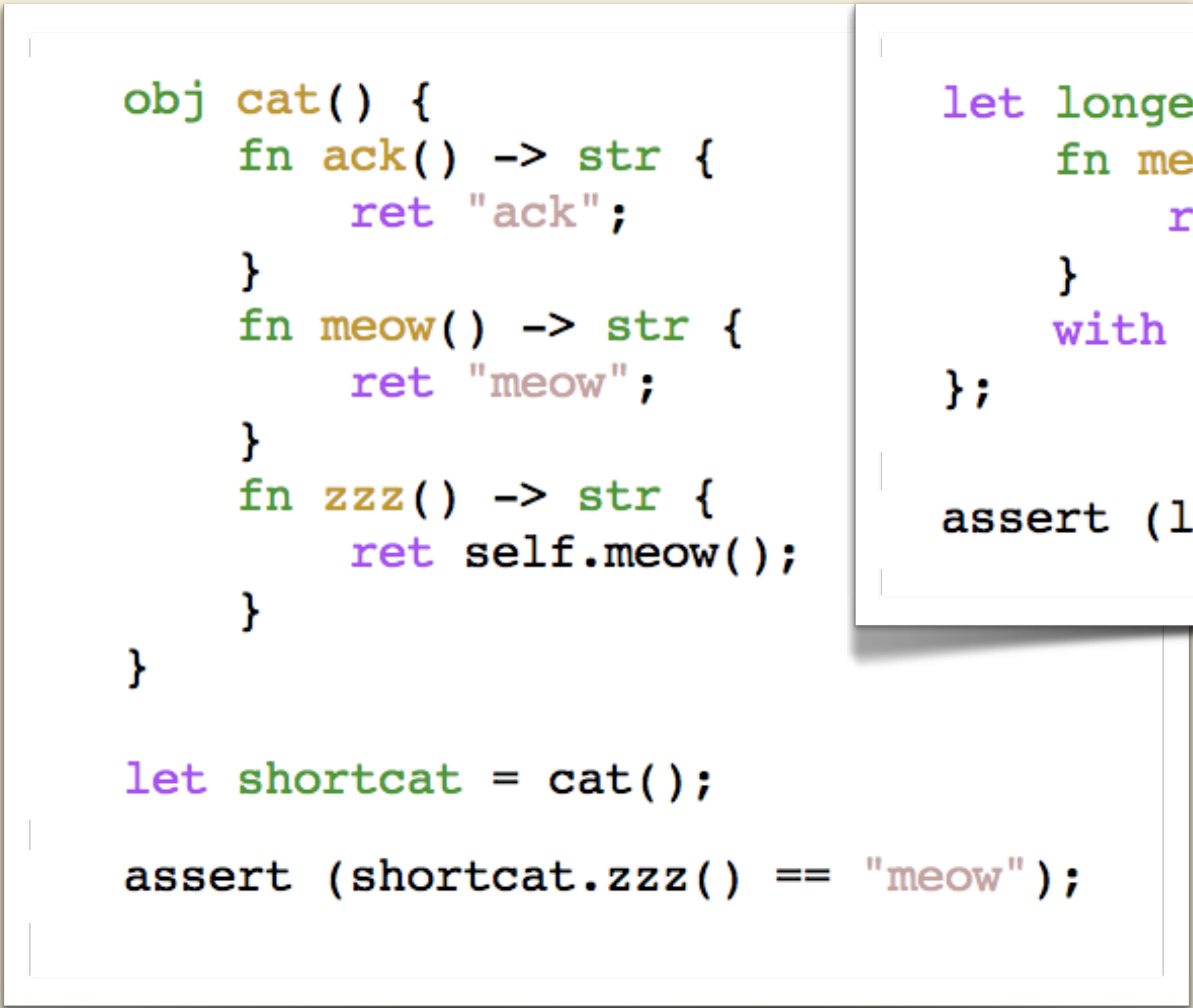

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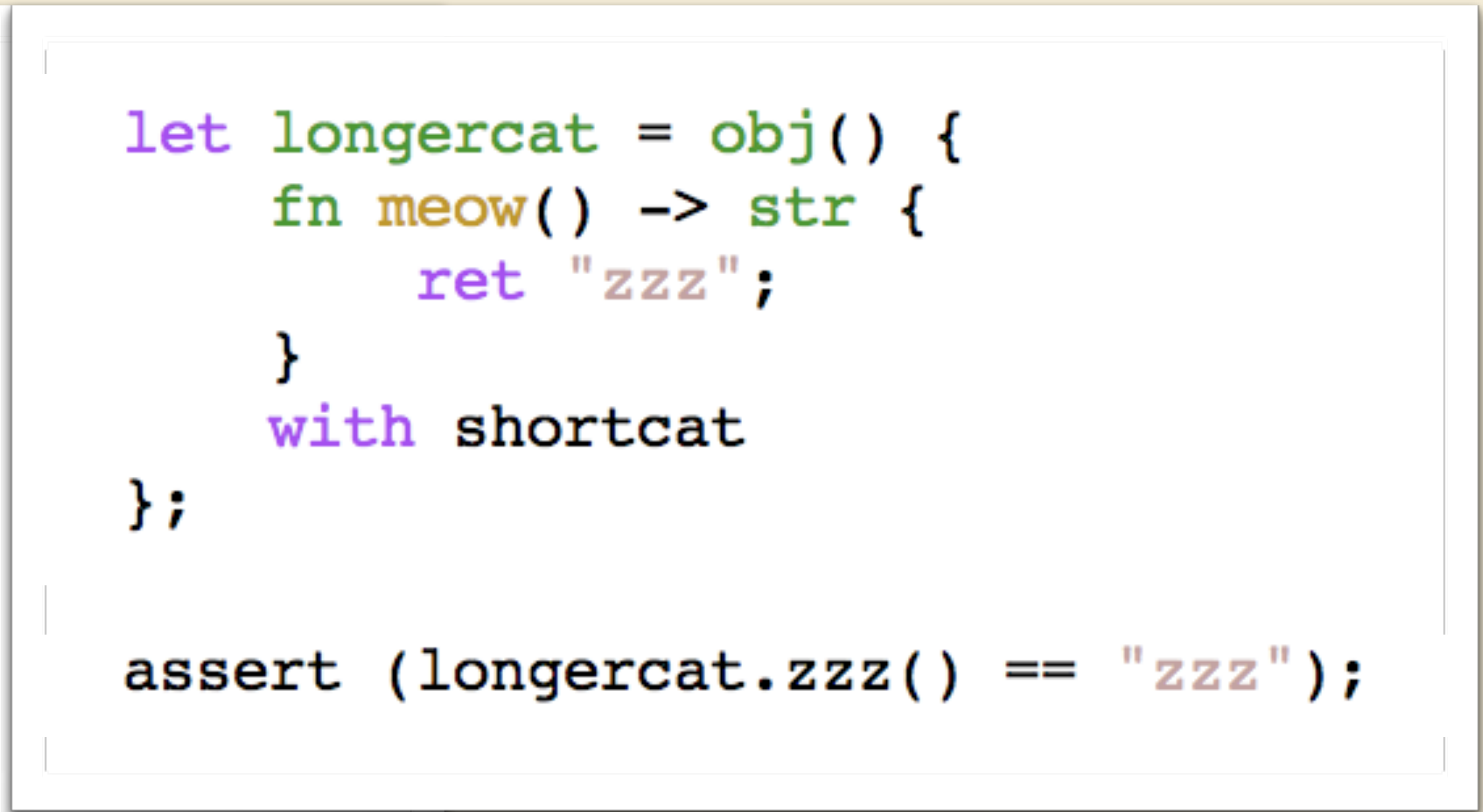

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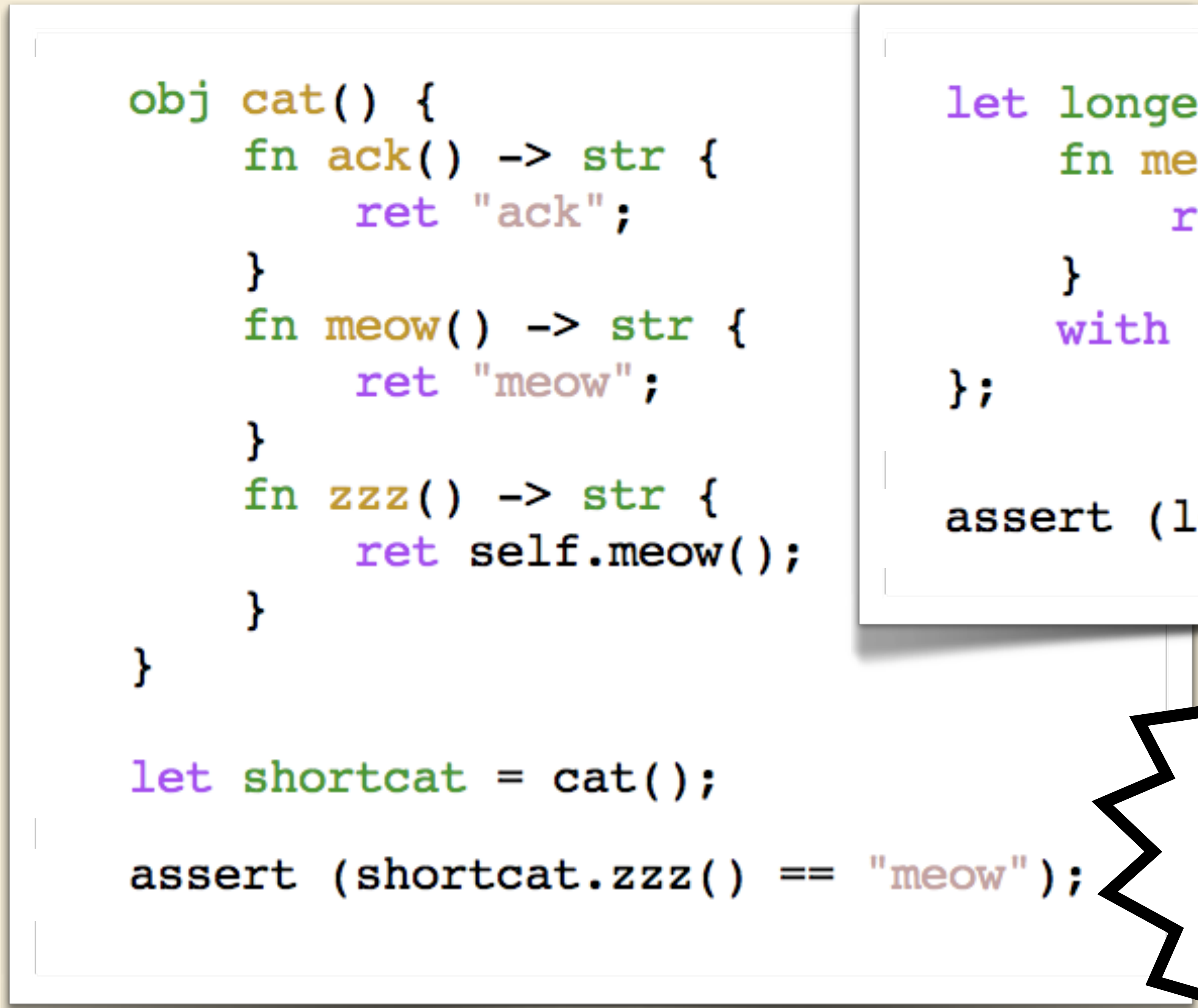

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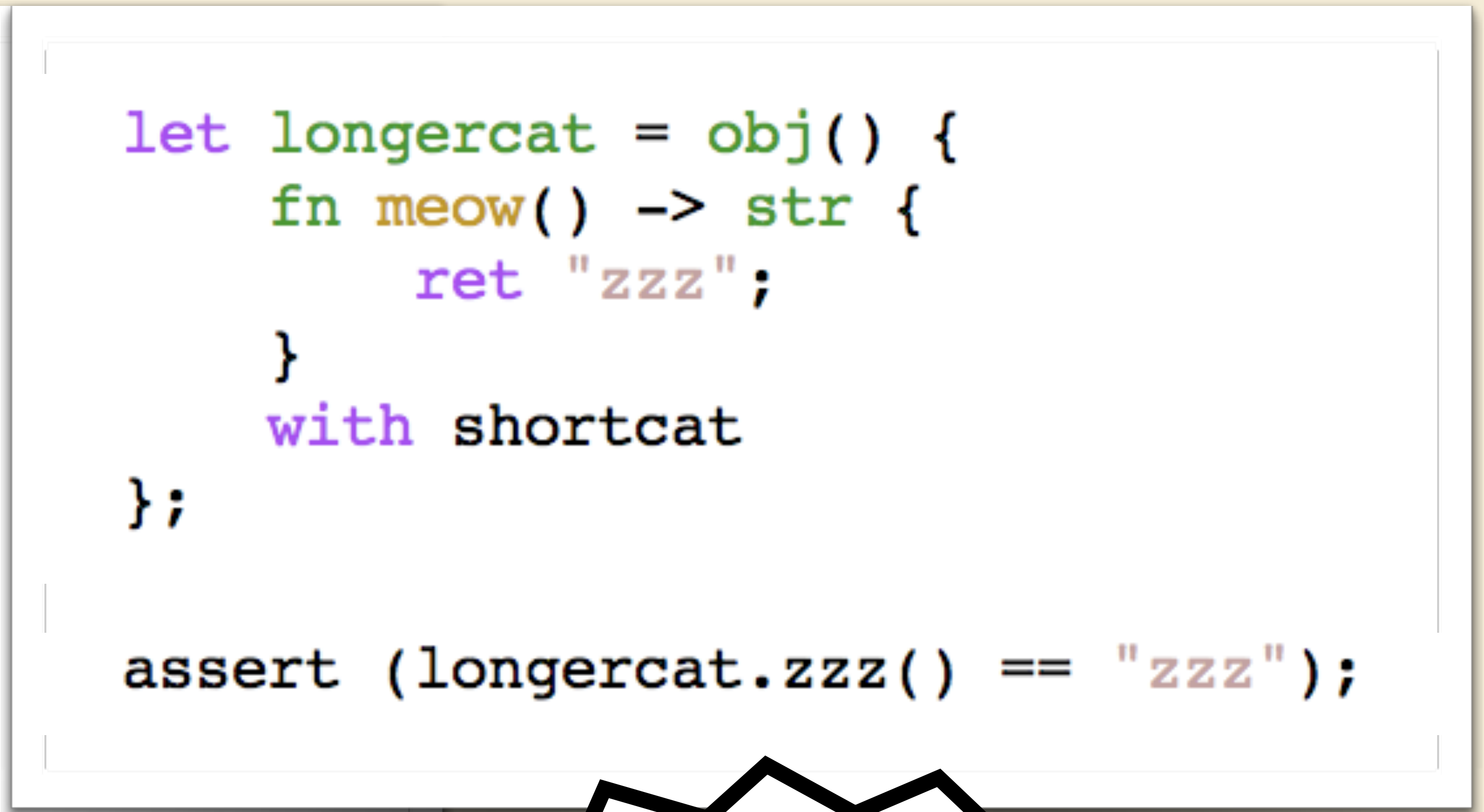

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Caveat: Some disagreement on whether it should work this way (see: Aldrich, "Selective Open Recursion")

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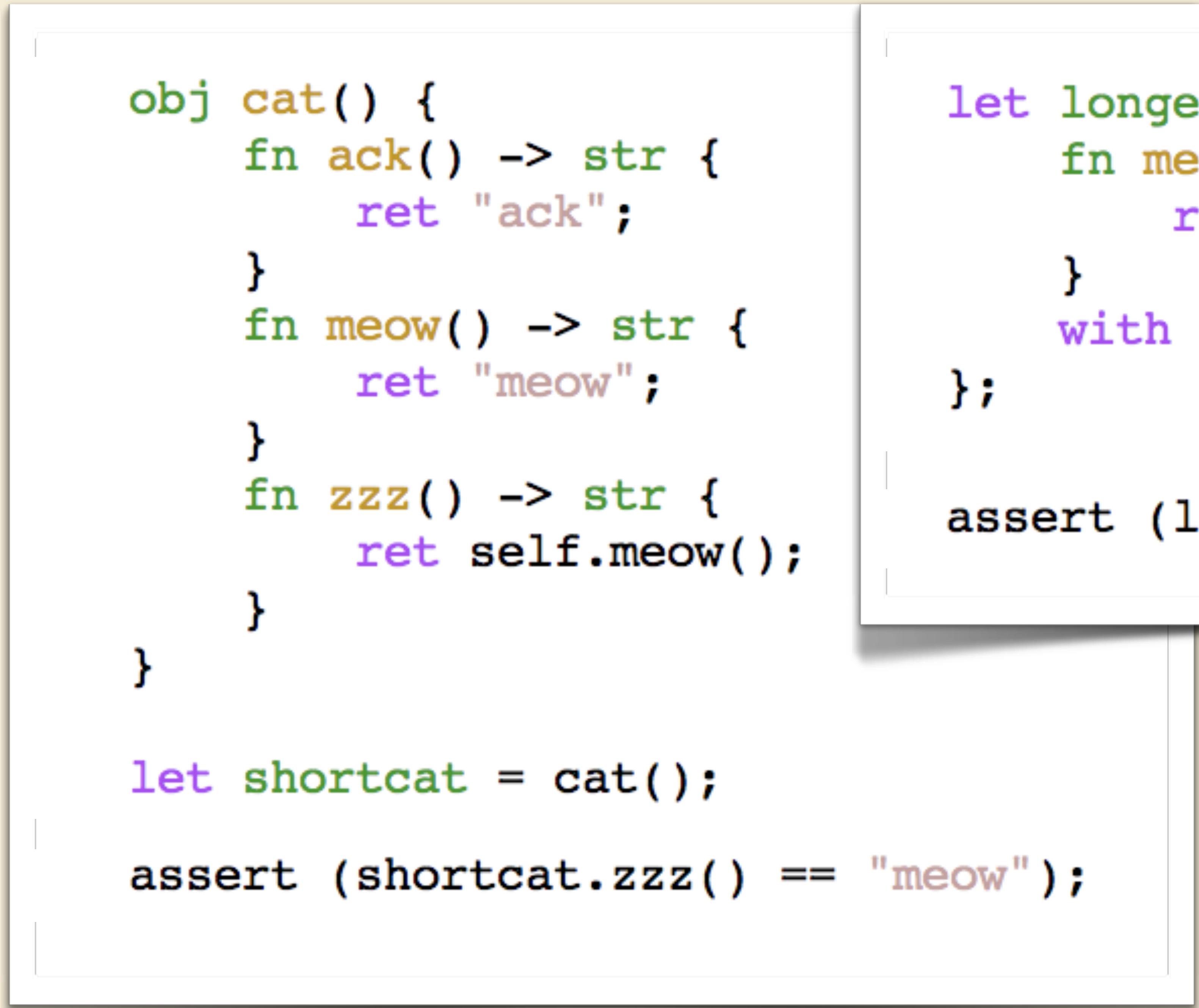

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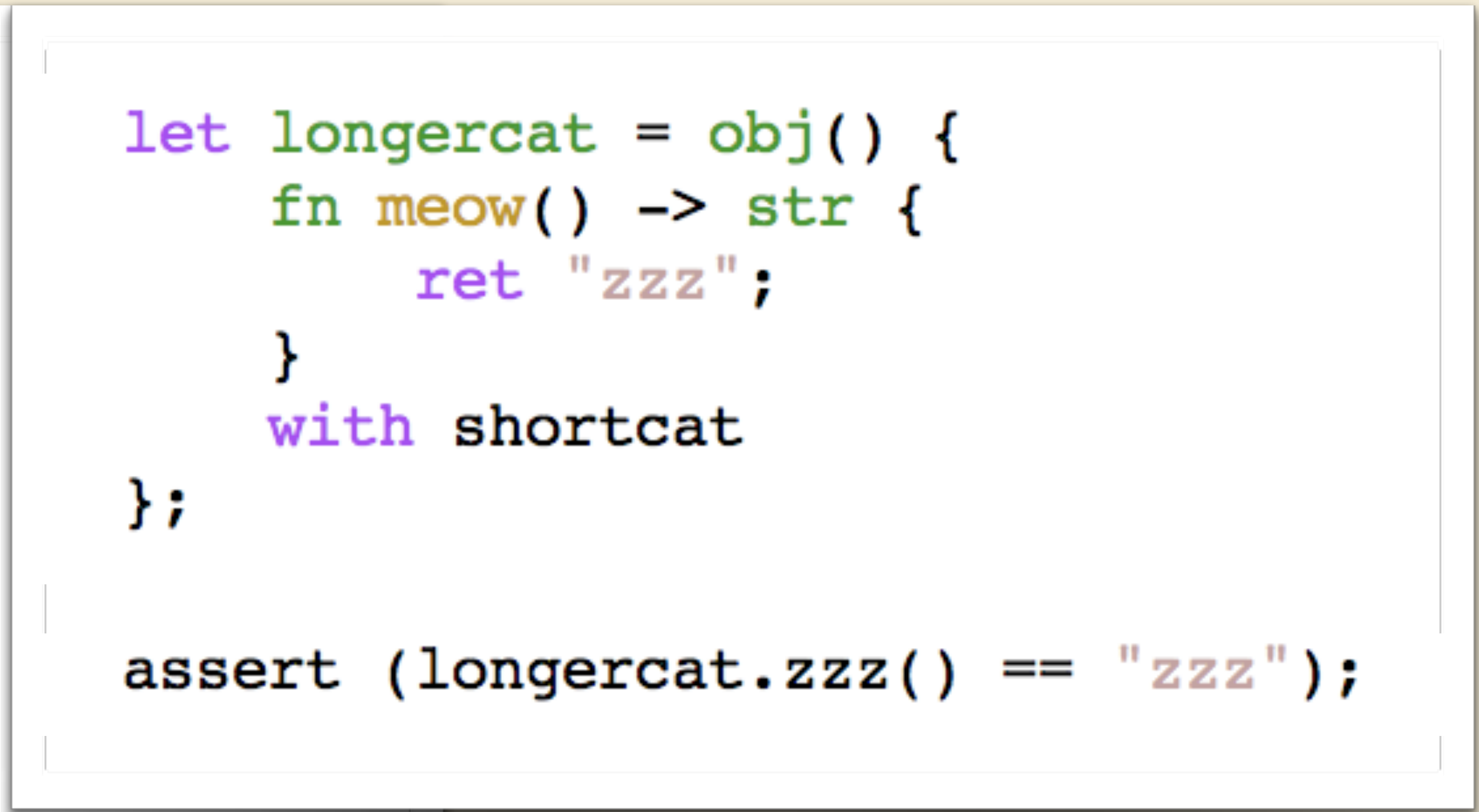

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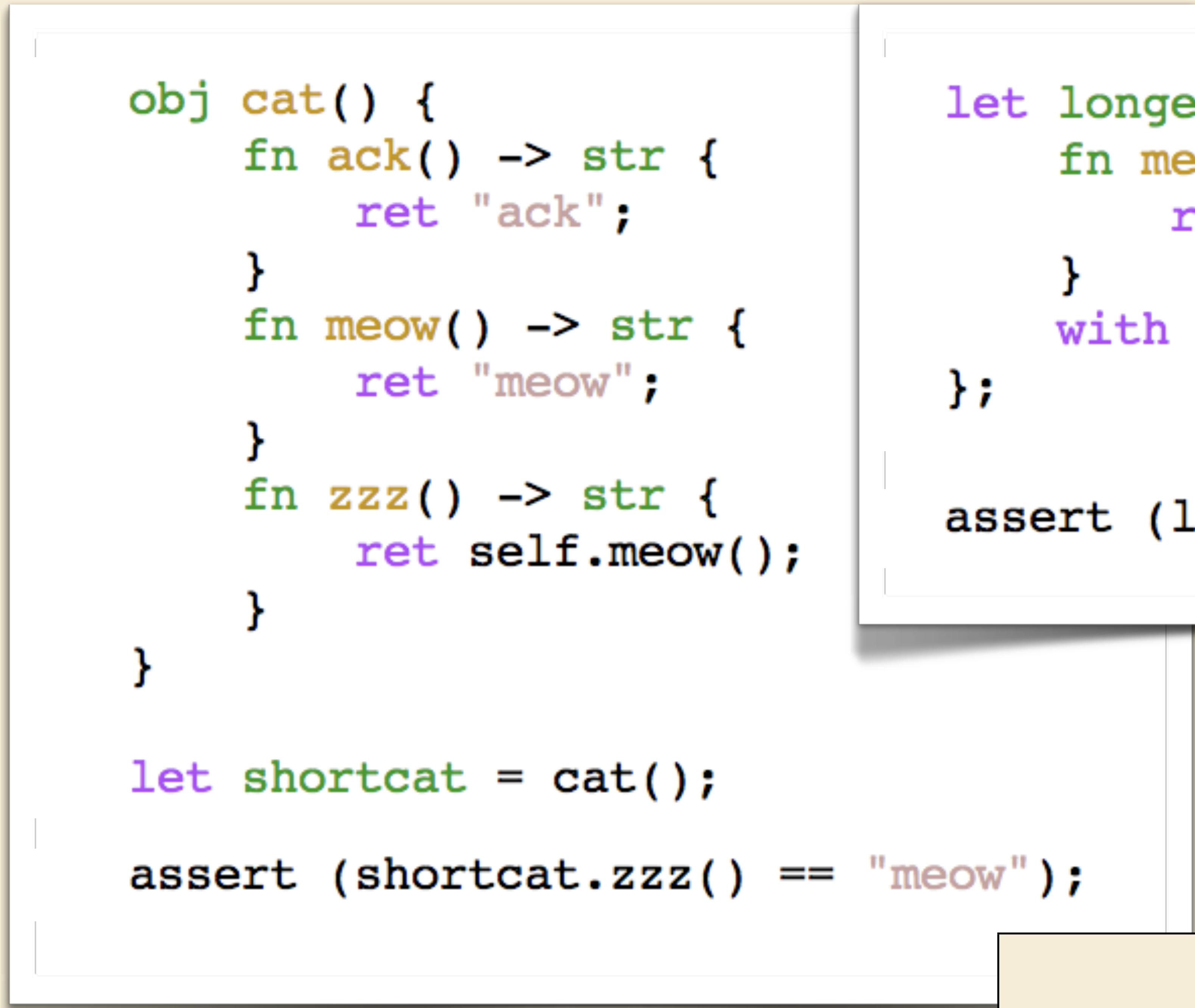
    fn meow() -> str {
        ret "zzz";
    }
    with shortcat
};

assert (longercat.zzz() == "zzz");
```

Self-dispatch + object extension + overriding



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obj cat() {
    fn ack() -> str {
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    }
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}

let shortcat = cat();

assert (shortcat.zzz() == "meow");
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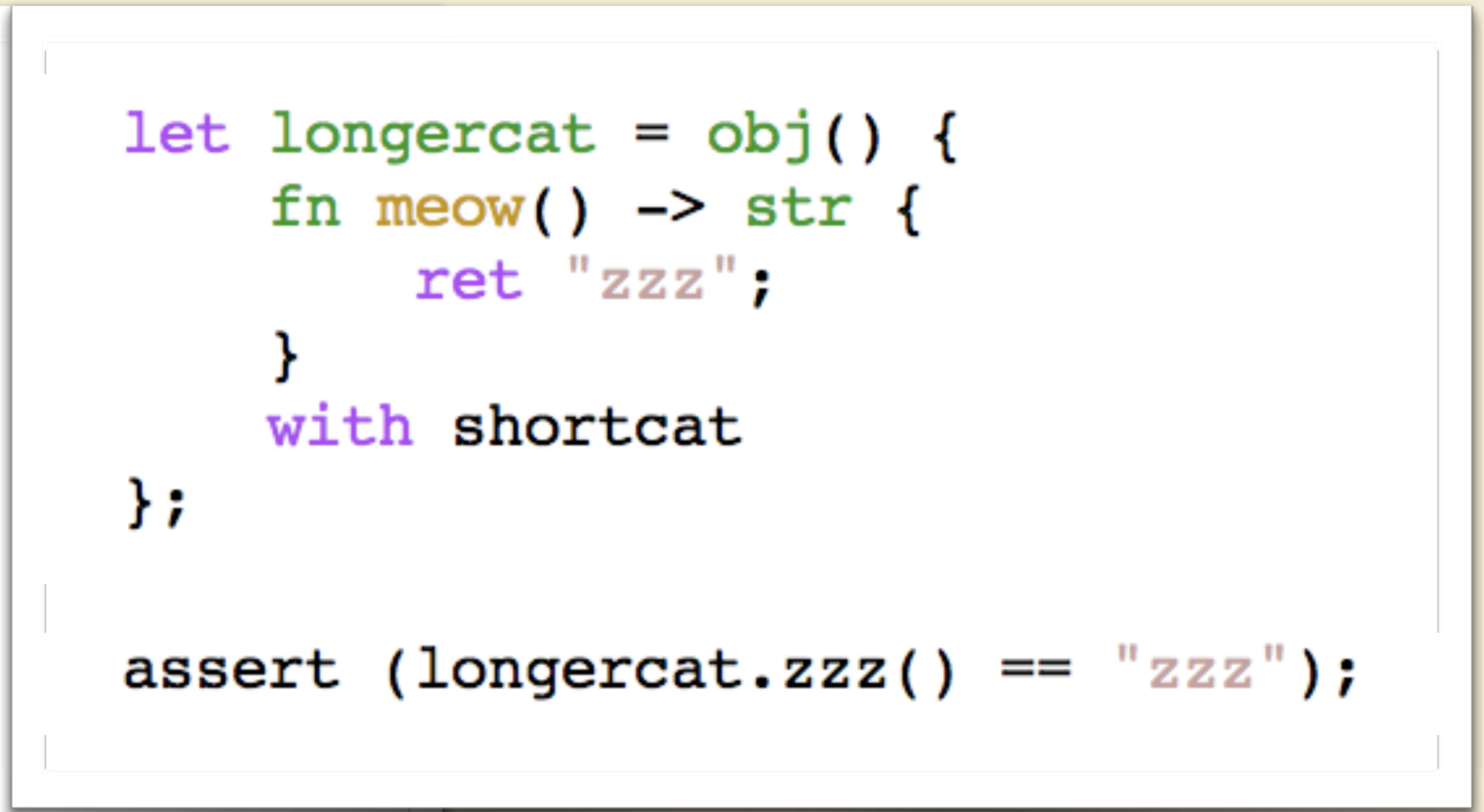

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assert (longercat.zzz() == "zzz");
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longercat's vtable		
0	ack	forward to shortcat.ack()
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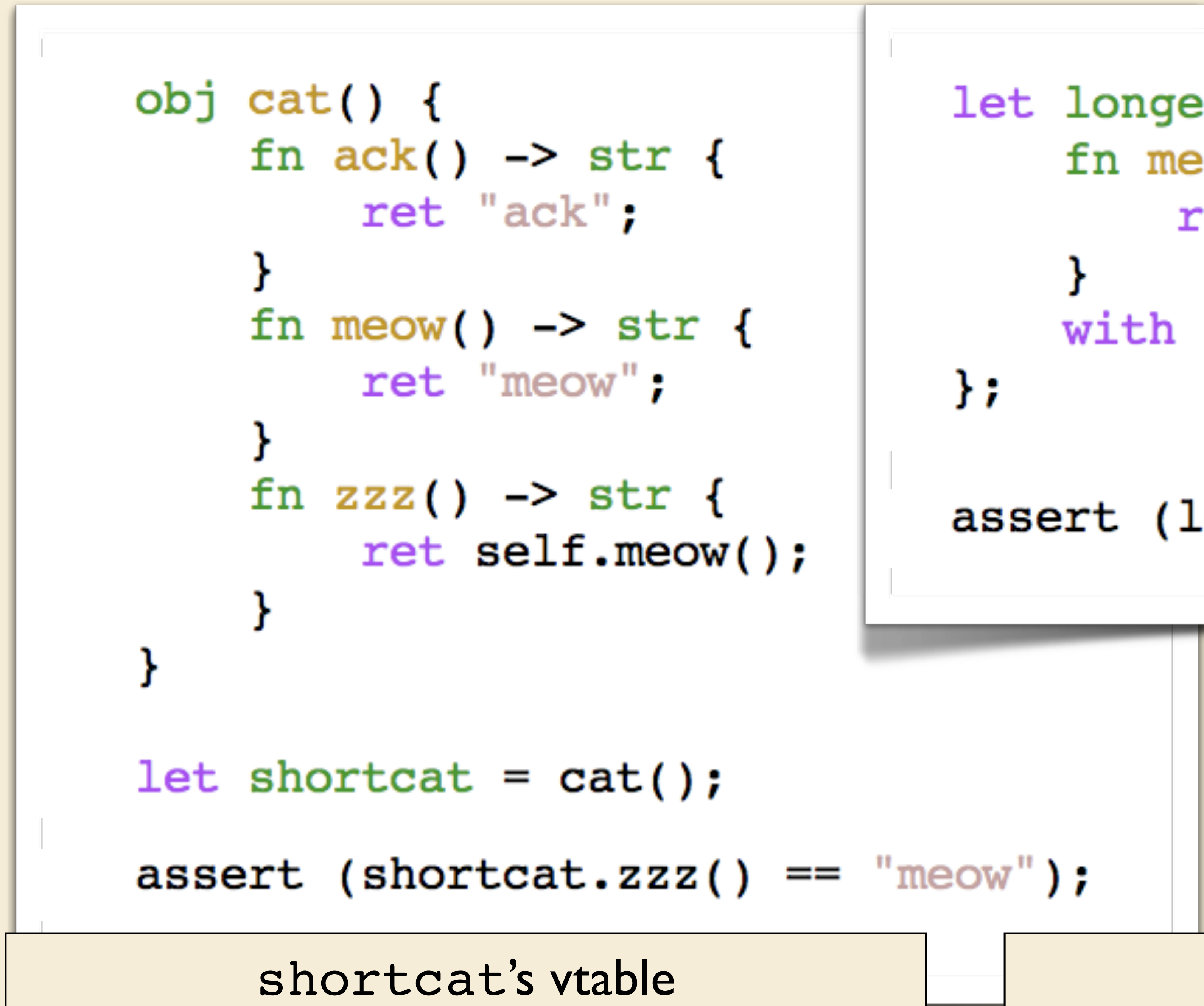
Self-dispatch + object extension + overriding



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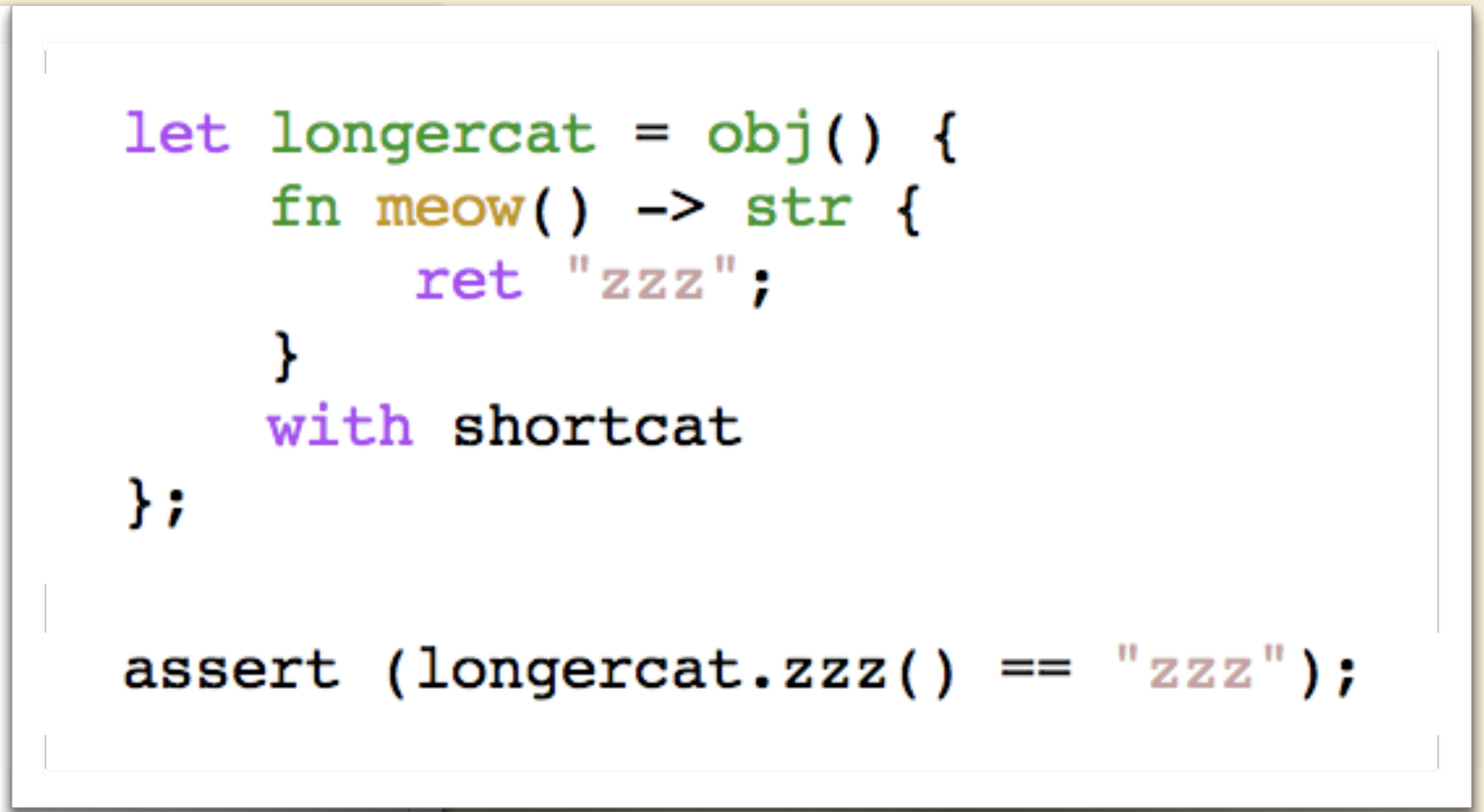

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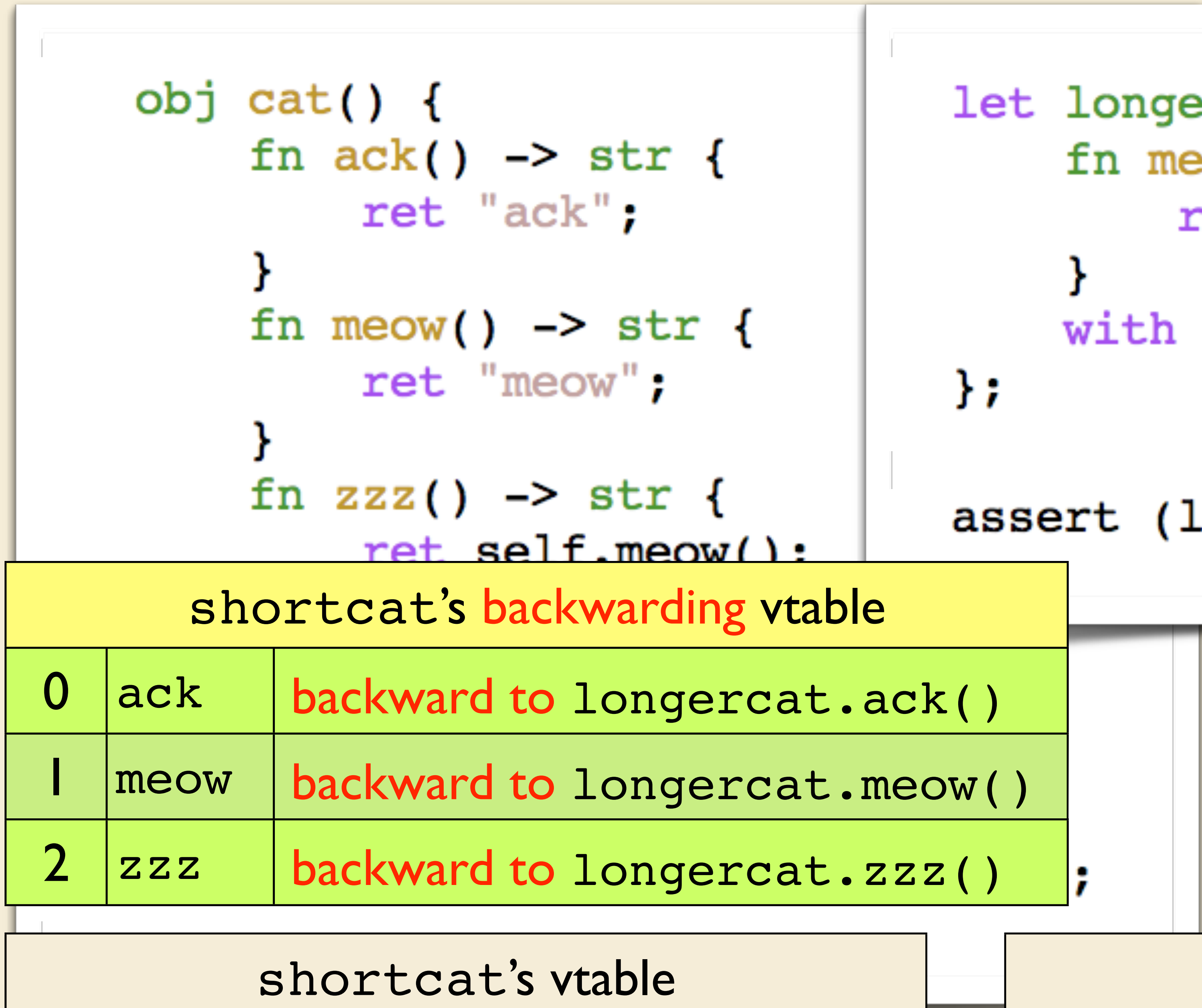

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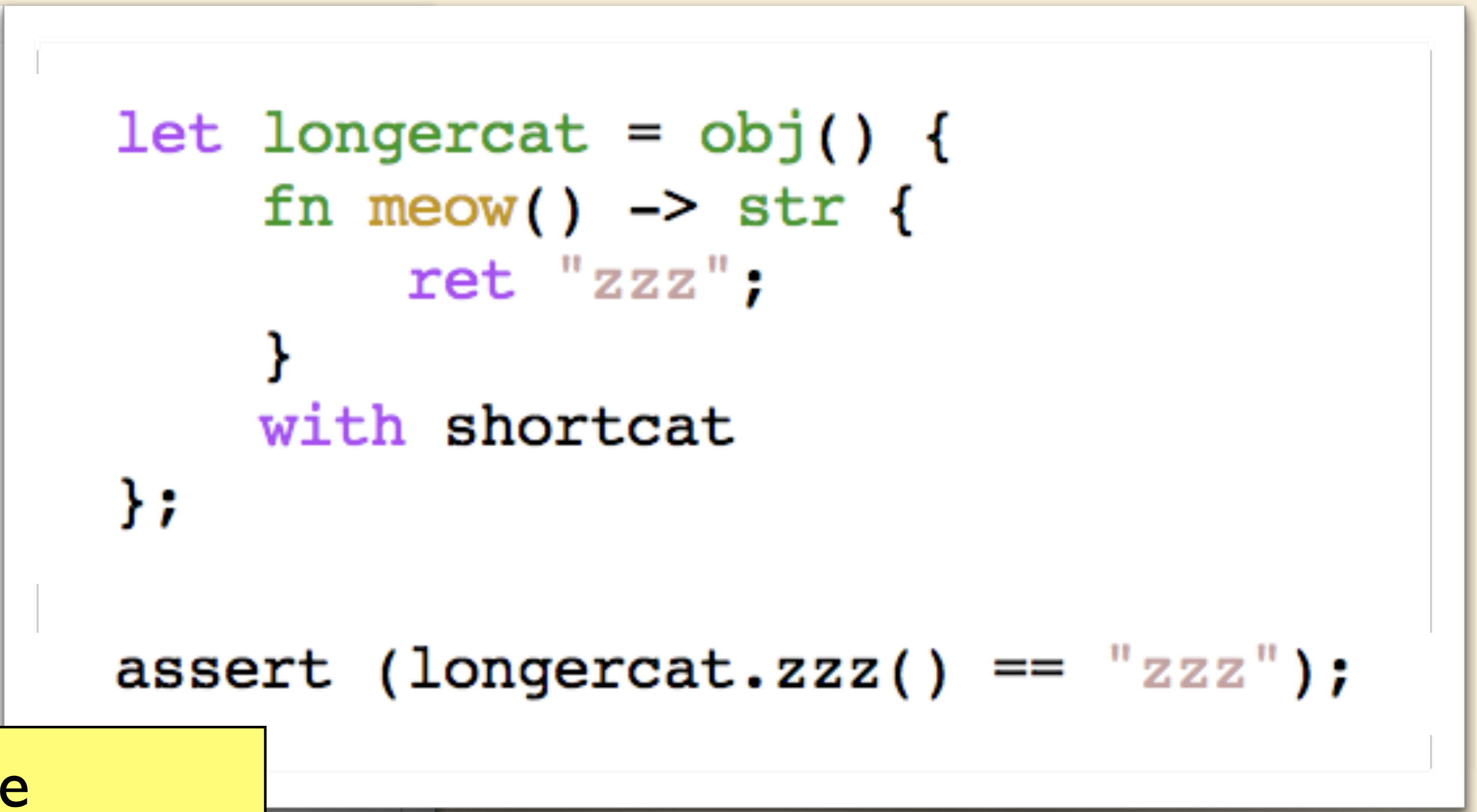

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```

shortcat's backwarding vtable		
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1	meow	backward to longercat.meow()
2	zzz	backward to longercat.zzz()

shortcat's vtable		
0	ack	ret "ack"
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0	ack	forward to shortcat.ack()
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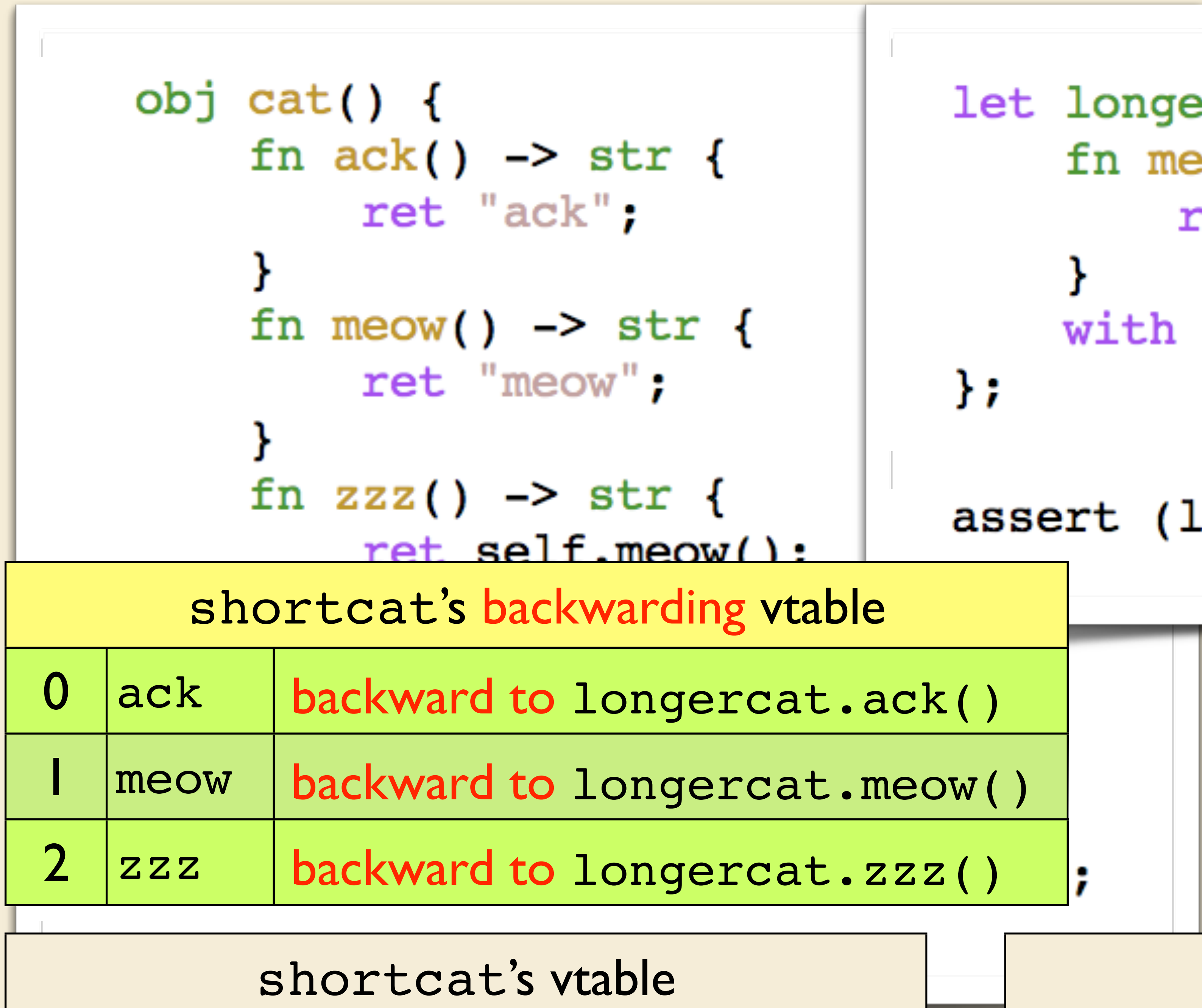
Self-dispatch + object extension + overriding



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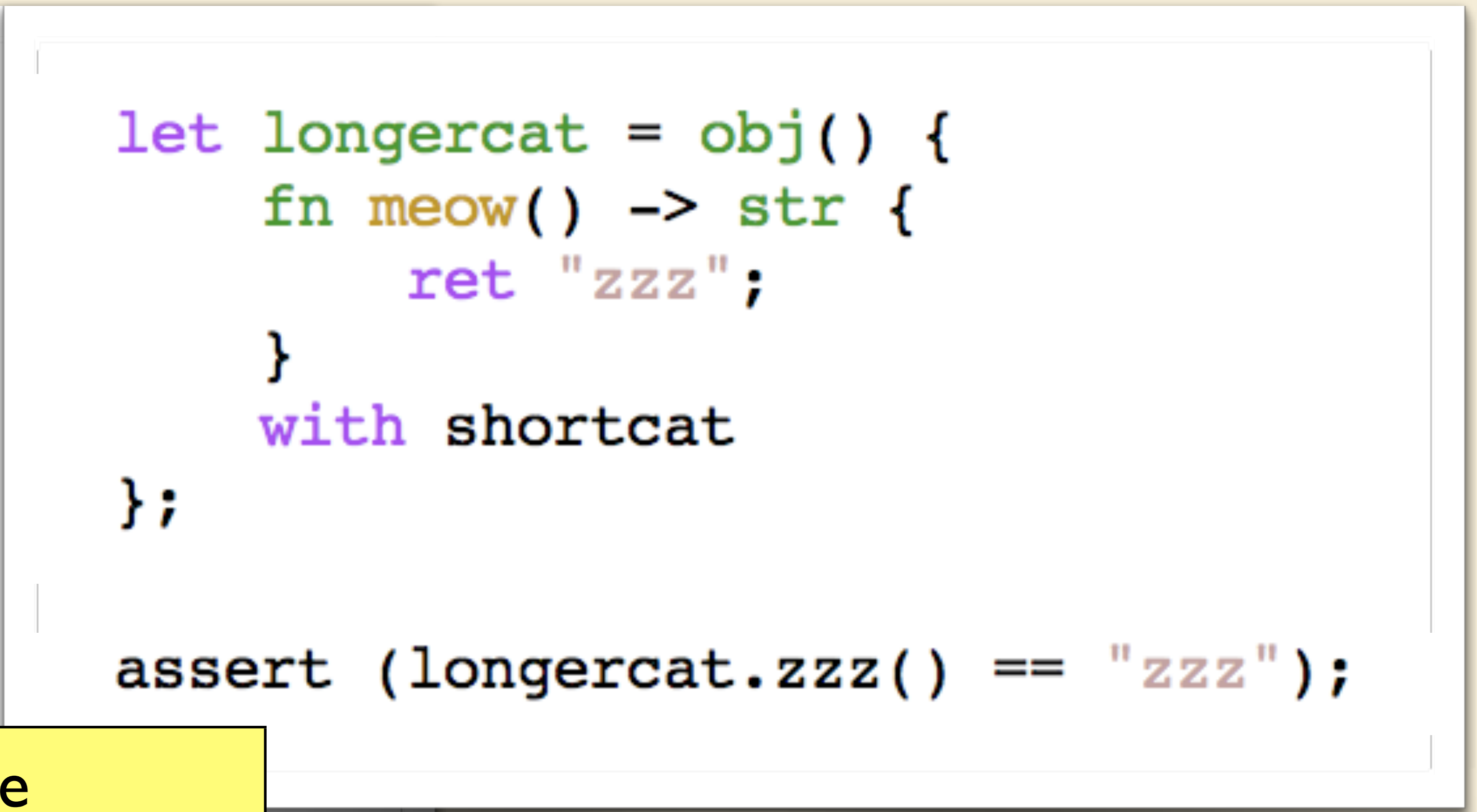

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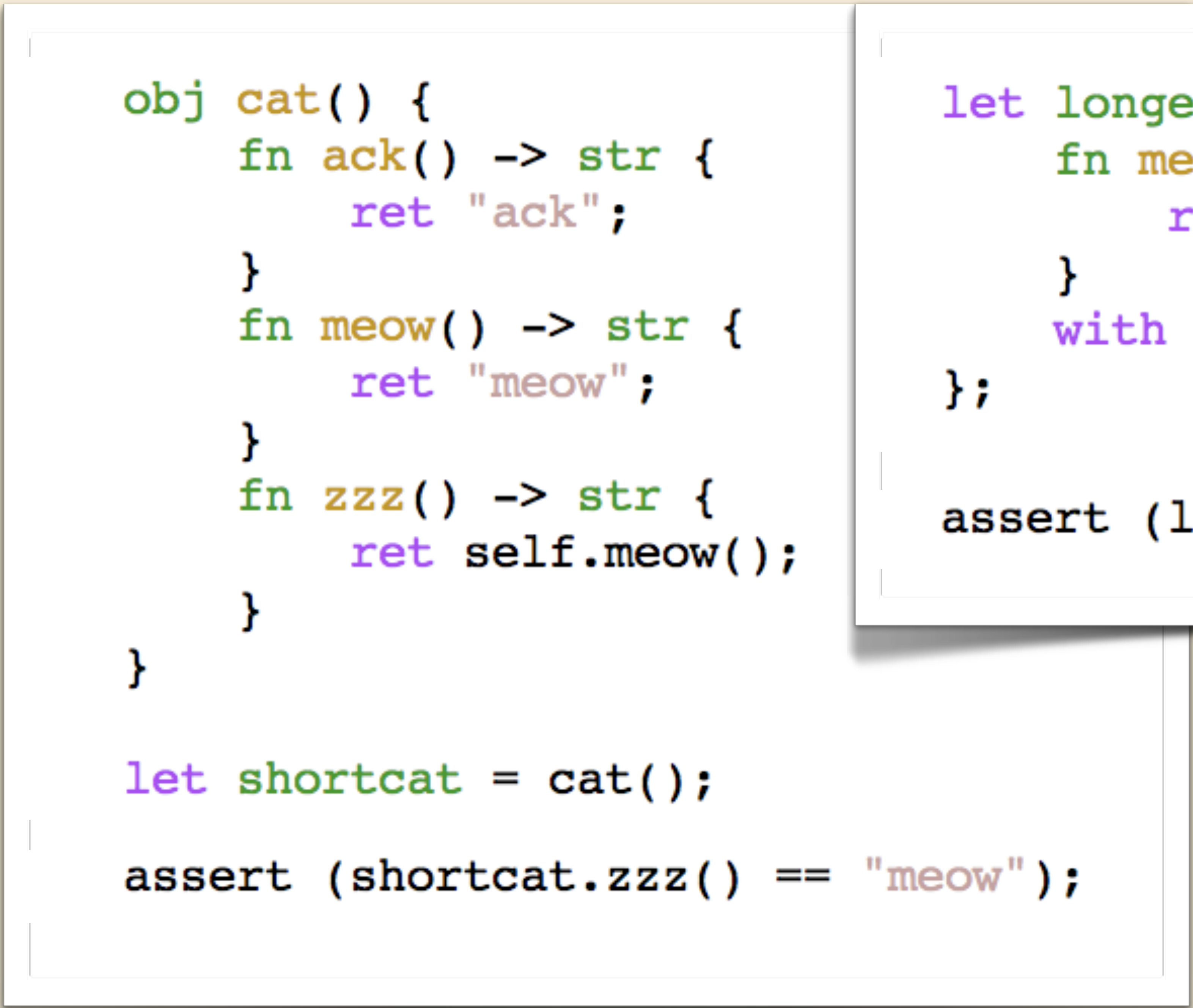
Self-dispatch + object extension + overriding to arbitrary depth



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    fn meow() -> str {
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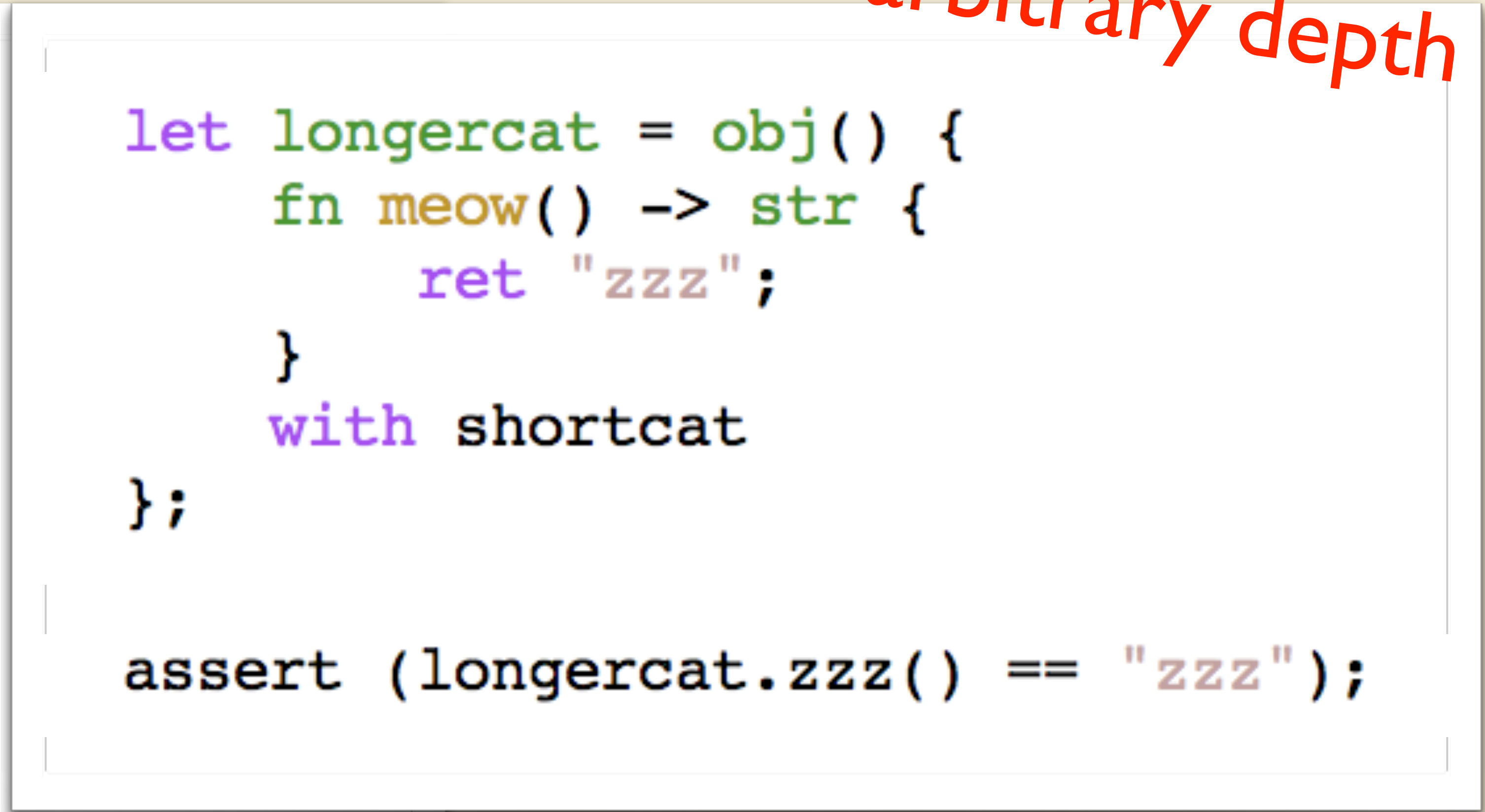
        ret self.meow();
    }
}

let shortcat = cat();

assert (shortcat.zzz() == "meow");
```



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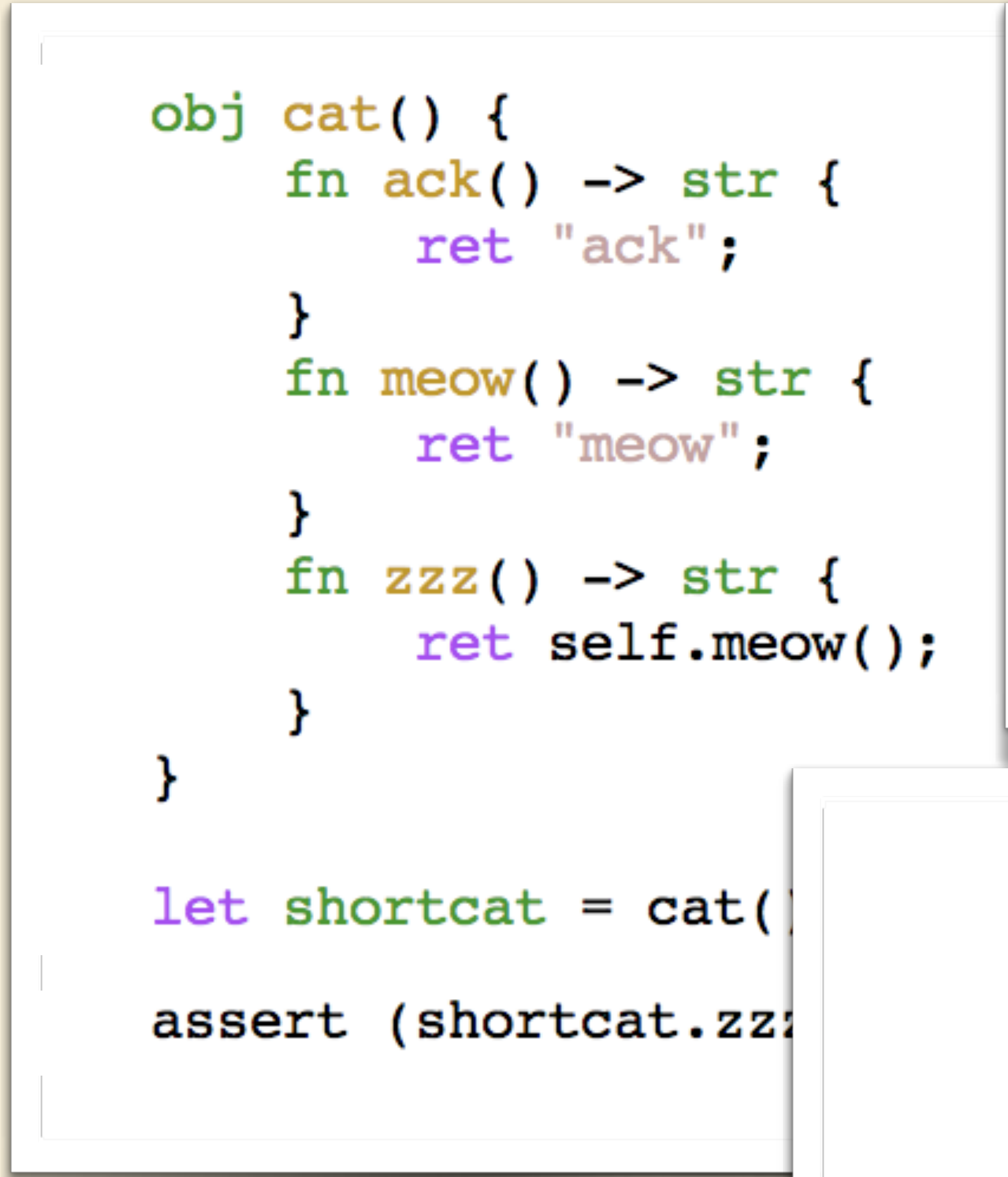
    }
    with shortcat
};

assert (longercat.zzz() == "zzz");
```

Self-dispatch + object extension + overriding ^to arbitrary depth



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let shortcat = cat(

assert (shortcat.zz
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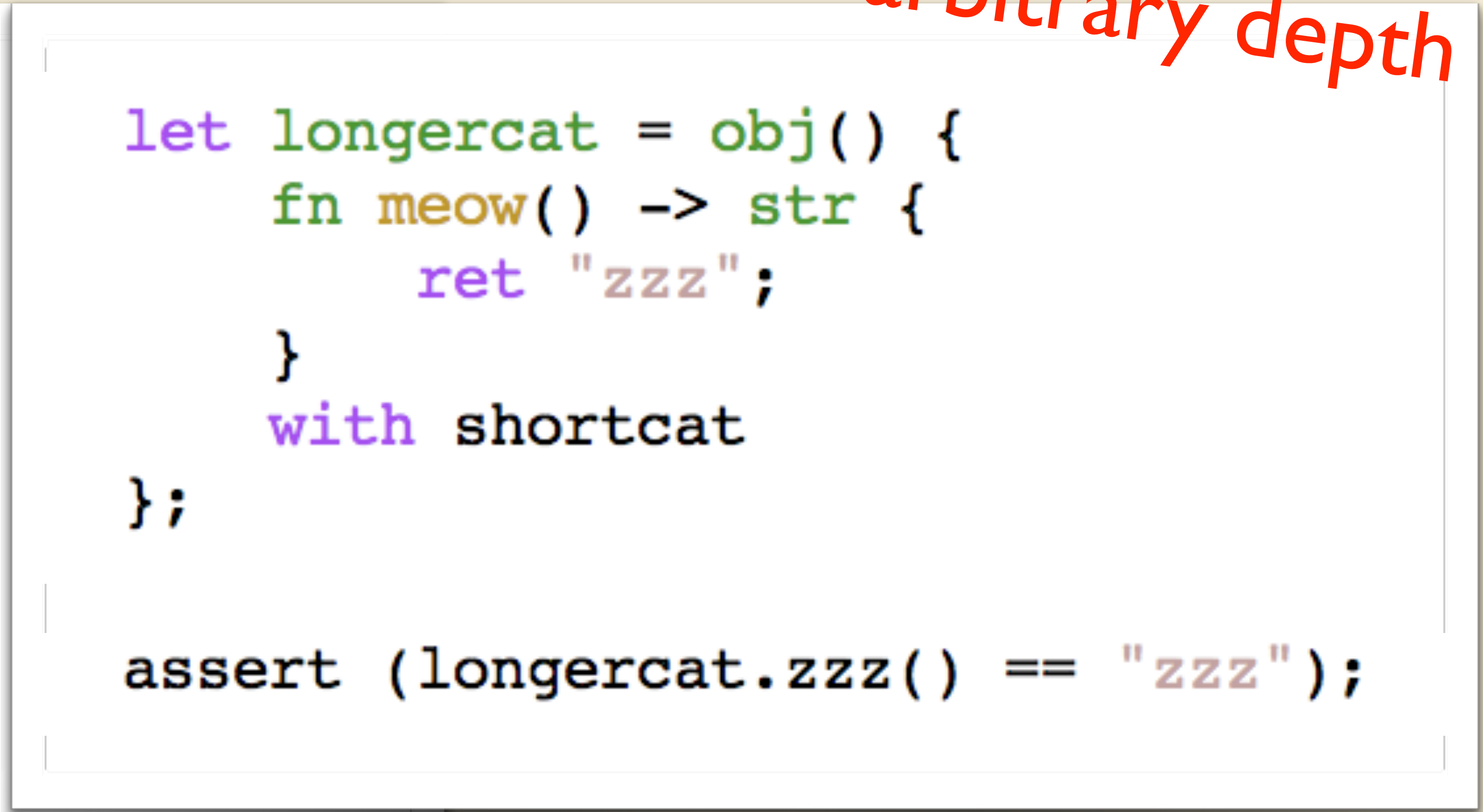

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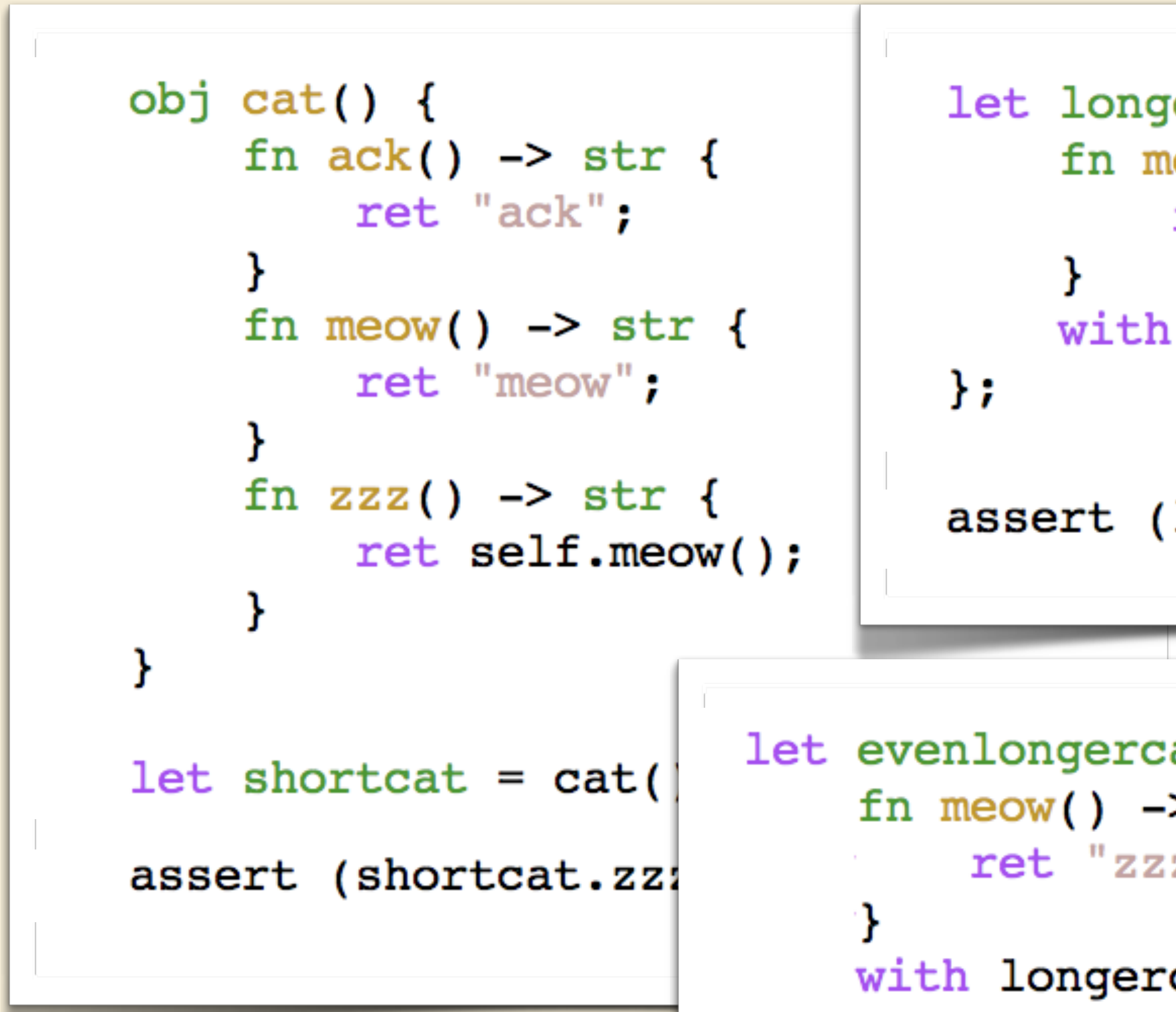
Self-dispatch + object extension + overriding

^ to arbitrary depth



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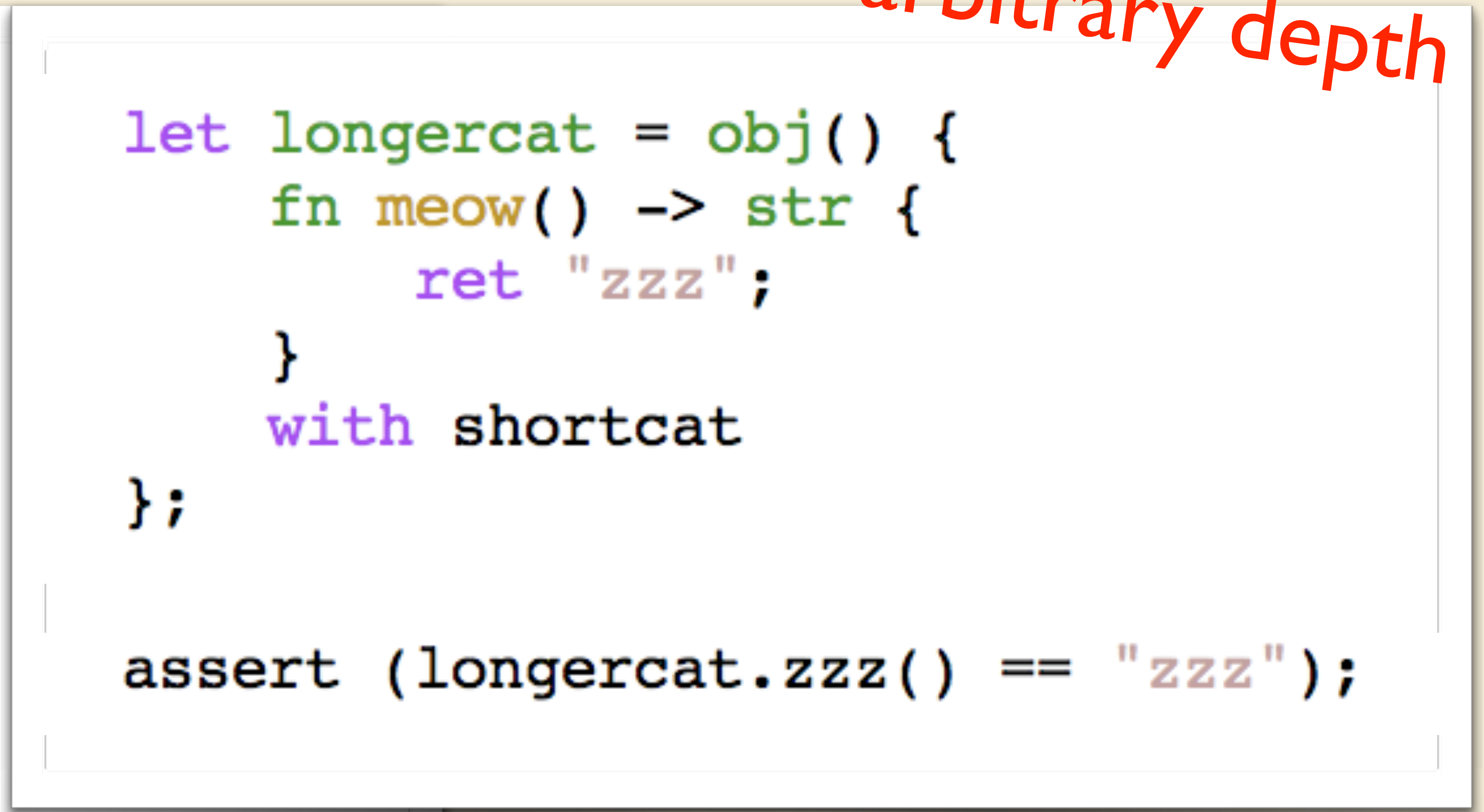

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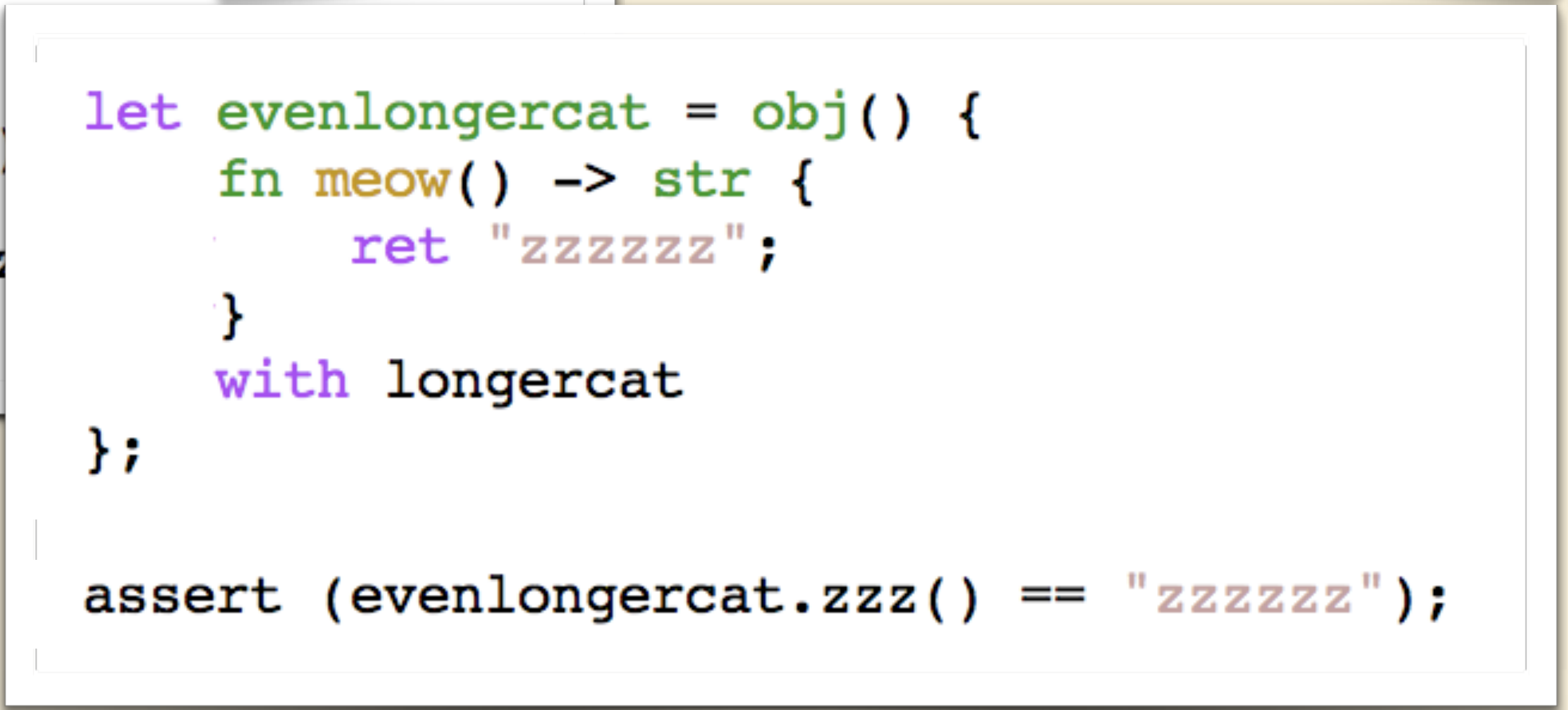
let longercat = obj() {
    fn meow() -> str {
        ret "zzz";
    }
    with shortcat
};

assert (longercat.zzz() == "zzz");
```



```
let evenlongercat = obj() {
    fn meow() -> str {
        ret "zzzzzz";
    }
    with longercat
};

assert (evenlongercat.zzz() == "zzzzzz");
```

Self-dispatch + object extension + overriding

^ to arbitrary depth

Self-dispatch + object extension + overriding ^ to arbitrary depth

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Self-dispatch + object extension + overriding ^ to arbitrary depth

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Self-dispatch + object extension + overriding ^ to arbitrary depth

- We need a way to temporarily pretend that self is the inner object, while still keeping track of what the extended self is
- Solution: create a stack of "fake selves" threaded through the run-time stack
- Every forwarding function allocates space in its frame for a "fake self" comprising a backwarding vtable and an inner object body

Go try it out!

rust-lang.org

Questions?

Thanks to:

Graydon Hoare and everyone on the Rust team

Dave Herman and everyone at Mozilla Research