

Outline

➔ `posn`

➤ `define-struct`

Compound Data So Far

A `posn` is

`(make-posn num num)`

- `(make-posn 1 2)` is a value
- `(posn-x (make-posn 1 2))` → 1
- `(posn-y (make-posn 1 2))` → 2

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So much for computation... how about program design?

Design Recipe I

Data

- Understand the input data: `num`, `bool`, `sym`, or `image`

Contract, Purpose, and Header

- Describe (but don't write) the function

Examples

- Show what will happen when the function is done

Body

- The most creative step: implement the function body

Test

- Run the examples

Body

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```
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; Return the X part of p if it's bigger  
; than the Y part, otherwise the Y part  
(define (max-part p)  
  ...)
```

```
(max-part (make-posn 10 11)) "should be" 11  
(max-part (make-posn 7 5)) "should be" 7
```

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  ... (posn-x p) ... (posn-y p) ...)
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    [else (posn-y p)]))
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Since this guideline applies before the usual body work, let's split it into an explicit step

Design Recipe II

Data

- Understand the input data

Contract, Purpose, and Header

- Describe (but don't write) the function

Examples

- Show what will happen when the function is done

Template

- Set up the body based on the input data (and *only* the input)

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Check: number of parts in template =
number of parts data definition named in contract

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A `posn` is

```
(make-posn num num)
```

~~Body~~ Template

If the input is compound data, start the body by selecting the parts

Handin artifact: a comment (required starting with HW 3)

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; max-part : posn -> num
; Return the X part of p if it's bigger
; than the Y part, otherwise the Y part
; (define (max-part p)
;   ... (posn-x p) ... (posn-y p) ...)
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  ... (posn-x p) ... (posn-y p) ...)
(max-part (make-posn 10 11)) "should be" 11
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- Understand the input data

Contract, Purpose, and Header

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Other Kinds of Data

Suppose we want to represent snakes:

- name
- weight
- favorite food

What kind of data is appropriate?

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- name
- weight
- favorite food

What kind of data is appropriate?

Not num, bool, sym, image, or posn...

Data Definitions and define-struct

Here's what we'd like:

A `snake` is

```
(make-snake sym num sym)
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We can tell DrScheme about `snake`:

```
(define-struct snake (name weight food))
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Creates the following:

- `make-snake`
- `snake-name`
- `snake-weight`
- `snake-food`

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A `snake` is

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(make-snake sym num sym)
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But `make-snake` is not built into DrScheme

We can tell DrScheme about `snake`:

```
(define-struct snake (name weight food))
```

Creates the following:

```
(snake-name (make-snake X Y Z)) → X
```

```
(snake-weight (make-snake X Y Z)) → Y
```

```
(snake-food (make-snake X Y Z)) → Z
```

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Handin artifact: a comment and/or `define-struct`

```
; A snake is  
; (make-snake sym num sym)  
  
(define-struct snake (name weight food))
```

Now that we've defined `snake`, we can use it in contracts

Programming with Snakes

- Implement `snake-skinny?`, which takes a snake and returns `true` if the snake weighs less than 10 pounds, `false` otherwise

Programming with Snakes

- Implement **snake-skinny?**, which takes a snake and returns **true** if the snake weighs less than 10 pounds, **false** otherwise
- Implement **feed-snake**, which takes a snake and returns a snake with the same name and favorite food, but five pounds heavier

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- Pick a representation for armadillos ("dillo" for short), where a dillo has a weight and may or may not be alive

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- Implement **run-over-with-car**, which takes a dillo and returns a dead dillo of equal weight
- Implement **feed-dillo**, where a dillo eats 2 pounds of food at a time

... unless it's dead