Compound Data So Far

A **posn** is

\[
\text{(make-posn X Y)}
\]

where **X** is a **num** and **Y** is a **num**

- \((\text{make-posn 1 2})\) is a value
- \((\text{posn-x (make-posn 1 2)}) \rightarrow 1\)
- \((\text{posn-y (make-posn 1 2)}) \rightarrow 2\)

So much for computation... how about program design?
If the input is compound data, start the body by selecting the parts
Body

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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)
  ...)

(check-expect (max-part (make-posn 10 11)) 11)
(check-expect (max-part (make-posn 7 5)) 7)
If the input is compound data, start the body by selecting the parts

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  ... (posn-x p) ... (posn-y p) ...)

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

; max-part : posn -> num
; Return the X part of p is it's bigger
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(define (max-part p)
  (cond
   [ (> (posn-x p) (posn-y p)) (posn-x p)]
   [else (posn-y p)])
(check-expect (max-part (make-posn 10 11)) 11)
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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)

Body

- The most creative step: implement the function body

Test

- Run the examples
Body Template

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

\[
; \text{max-part} : \text{posn} \rightarrow \text{num} \\
; \ldots \\
(\text{define} (\text{max-part} \ p) \\
  \ldots (\text{posn-x} \ p) \ldots (\text{posn-y} \ p) \ldots)
\]

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

A `posn` is

\[(\text{make-posn} \ X \ Y)\]

where `X` is a `num` and `Y` is a `num`
If the input is compound data, start the body by selecting the parts

Handin artifact: a comment (required starting with HW 2)

; max-part : posn -> num
; Return the X part of p is it's bigger
; than the Y part, otherwise the Y part
; (define (max-part p)
;    ... (posn-x p) ... (posn-y p) ...)
(define (max-part p)
    ... (posn-x p) ... (posn-y p) ...)
(check-expect (max-part (make-posn 10 11)) 11)
(check-expect (max-part (make-posn 7 5)) 7)
Other Kinds of Data

Suppose we want to represent snakes:

- 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 sym num)

... but make-snake is not built into DrRacket

We can tell DrRacket about snake:

(define-struct snake (name weight food))

Creates the following:

• make-snake
• snake-name
• snake-weight
• snake-food
Data Definitions and define-struct

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A snake is

(make-snake sym num sym)

... but make-snake is not built into DrRacket

We can tell DrRacket 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
(define-struct snake (name weight food))

(make-snake 'Slinky 10 'rats)

(make-snake 'Slimey 8 'pudding)

(define-struct posn (x y))

(make-posn 3 4)

(make-posn 8 -2)
Data

Deciding to define **snake** is in the first step of the design recipe

**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.

Implement `feed-snake`, which takes a snake and returns a snake with the same name and favorite food, but five pounds heavier.
Programming with Armadillos

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

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