Compound Data So Far

A **posn** is

(make-posn X Y)

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

- **(make-posn 1 2)** is a value

- **(posn-x (make-posn 1 2))** → **1**

- **(posn-y (make-posn 1 2))** → **2**

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

Body

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; Return the X part of p is 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)
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    [(> (posn-x p) (posn-y p)) (posn-x p)]
    [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)

Body

- The most creative step: implement the function body

Test

- Run the examples

~~Body~~ Template

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; max-part : posn -> num
; ...
(define (max-part p)
  ... (posn-x p) ... (posn-y p) ...)
```

Check: number of parts in template =

number of parts data definition named in contract

A **posn** is

```
(make-posn X Y)
```

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

~~Body~~ Template

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 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:

- **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
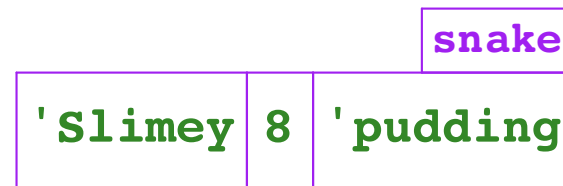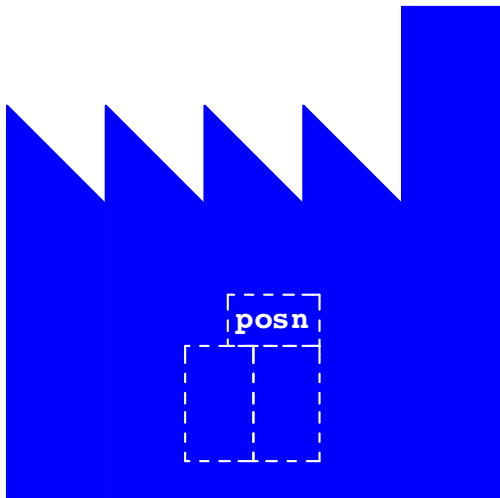**(snake-weight (make-snake X Y Z)) → Y**
(snake-food (make-snake X Y Z)) → Z
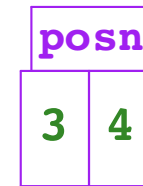
```
(define-struct snake (name weight food))
```
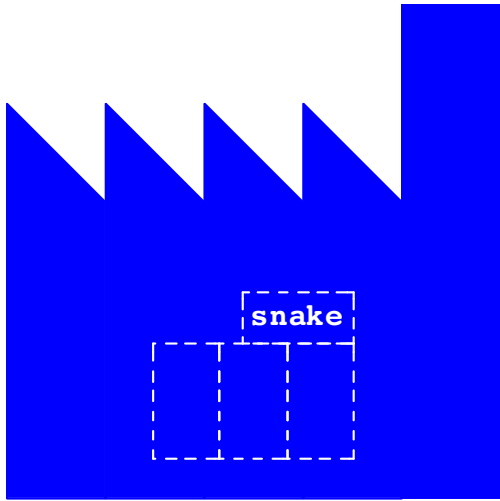
snake
| 'Slinky | 10 | 'rats |

`(make-snake 'Slinky 10 'rats)`

snake
| 'Slimey | 8 | 'pudding |

`(make-snake 'Slimey 8 'pudding)`

```
(define-struct posn (x y))
```

posn
| 3 | 4 |
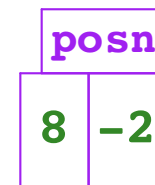
`(make-posn 3 4)`

posn
| 8 | -2 |

`(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 weights 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

<div align="right">... unless it's dead</div>