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`

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

Design Recipe I

Data

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

Signature, 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

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

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```
; 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)
```

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   [(> (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

Signature, 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

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~~Body~~ Template

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

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`(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

```
; posn -> num
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;
; (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)
```

Design Recipe II

Data

- Understand the input data

Signature, Purpose, and Header

- Describe (but don't write) the function

Examples

- Show what will happen when the function is done

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

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Other Kinds of Data

Suppose we want to represent snakes:

- name
- weight
- favorite food

What kind of data is appropriate?

Other Kinds of Data

Suppose we want to represent snakes:

- name
- weight
- favorite food

What kind of data is appropriate?

Not **`num`**, **`bool`**, **`string`**, **`image`**, or **`posn`**...

Data Definitions and define-struct

Here's what we'd like:

A **snake** is

```
(make-snake string num string)
```

Data Definitions and define-struct

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Creates the following:

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

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

We can tell DrRacket about `snake`:

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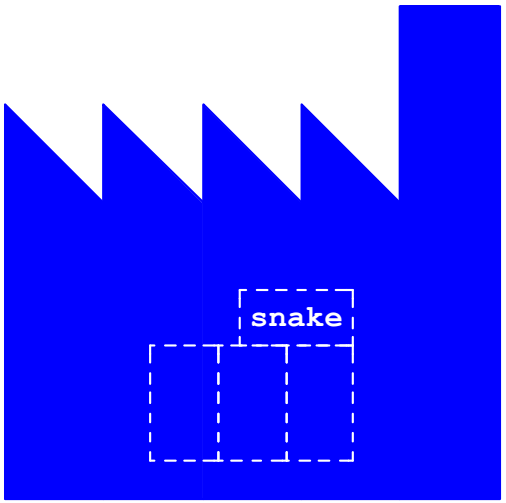
(define-struct snake (name weight food))
```

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
```



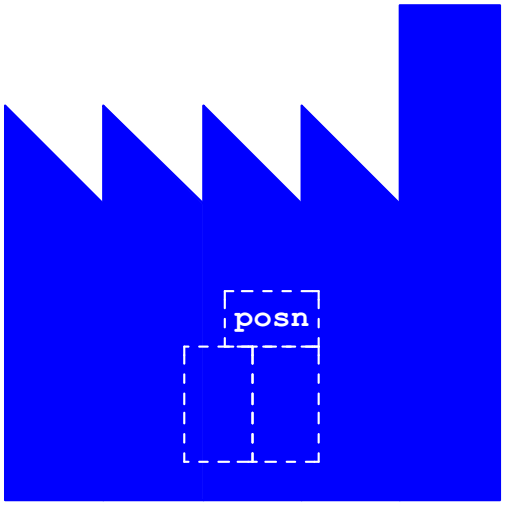

```
(define-struct snake (name weight food))
```

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)
```

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

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

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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 string num string)

(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

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

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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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Programming with Armadillos

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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

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