

Java's Built-in Data Definitions

- `int`

`1 5999 -10`

- `double`

`1.1 5999.33 -10.01`

- `boolean`

`true false`

- `String`

`"hello" "See you later!"`

Compound Data in Java

Beginner Scheme:

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

Beginner Java:

```
class Snake {  
    String name;  
    double weight;  
    String food;  
    Snake(String name, double weight, String food) {  
        this.name = name;  
        this.weight = weight;  
        this.food = food;  
    }  
}
```

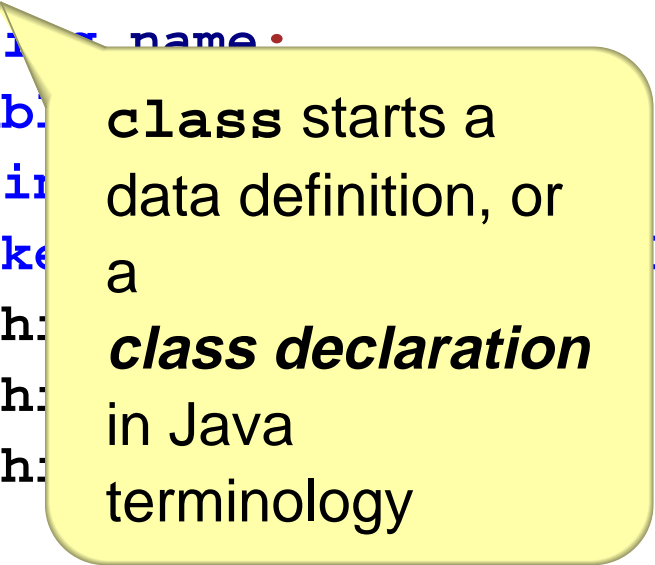
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```



class starts a data definition, or a **class declaration** in Java terminology

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```

Next is the name for the data definition; by convention, the name is capitalized

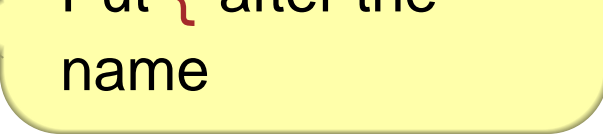
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```

For each part of the compound value, write **type** then **name** then **;**, one line for each part; this is a **field**

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```

After the parts, write the defined name again; this starts the **constructor**

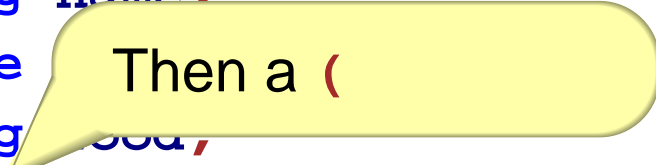
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    }  
}
```

Write each field again, but this time separate with **,** — these are the **constructor arguments**

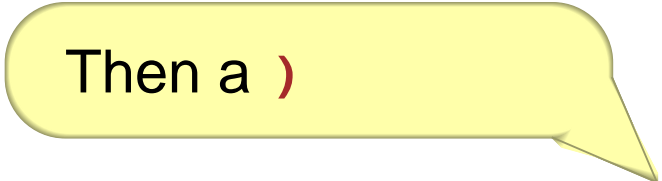
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Then a)

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        this.food = food;  
    }  
}
```

Each field, one more time... this then . then name then = then name then ;


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Closing } for the constructor

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        this.weight = weight;  
        this.food = food;  
    }  
}
```

} Closing } for the class declaration

Instances of Compound Data Types

Beginner Scheme:

```
(make-snake 'Slinky 12 'rats)  
(make-snake 'Slimey 5 'grass)
```

Beginner Java:

```
new Snake("Slinky", 12, "rats")  
new Snake("Slimey", 5, "grass")
```

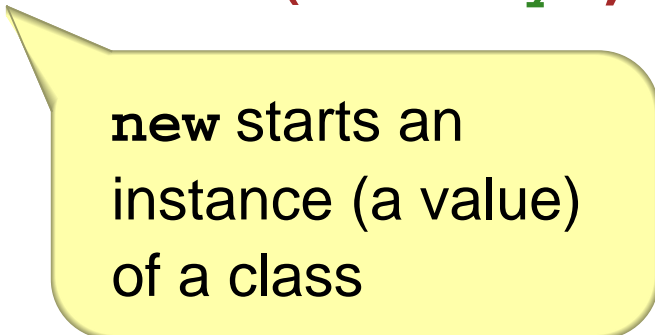
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Beginner Java:

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new Snake("slimey", 5, "grass")
```



new starts an
instance (a value)
of a class

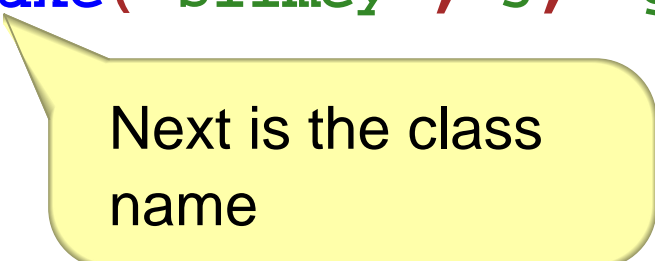
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Beginner Java:

```
new Snake("slinky", 12, "rats")  
new Snake("slimey", 5, "grass")
```



Next is the class
name

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Beginner Java:

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Then (

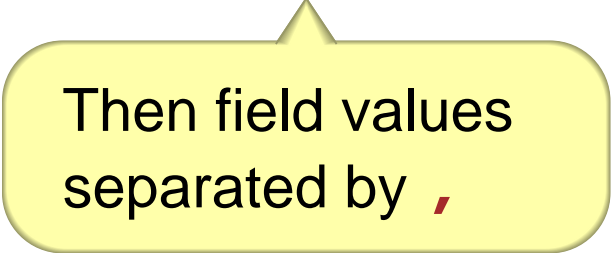
Instances of Compound Data Types

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Beginner Java:

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new Snake("slinky", 12, "rats")  
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```



Then field values
separated by ,

Instances of Compound Data Types

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(make-snake 'slinky 12 'rats)  
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```

Beginner Java:

```
new Snake("slinky", 12, "rats")  
new Snake("slimey", 5, "grass")
```

Then)

Armadillos

```
class Dillo {  
    double weight;  
    boolean alive;  
    Dillo(double weight, boolean alive) {  
        this.weight = weight;  
        this.alive = alive;  
    }  
}
```

```
new Dillo(2, true)  
new Dillo(3, false)
```

Posns

```
class Posn {  
    int x;  
    int y;  
    Posn(int x, int y) {  
        this.x = x;  
        this.y = y;  
    }  
}
```

```
new Posn(0, 0)
```

```
new Posn(1, -2)
```

Ants

```
class Ant {  
    double weight;  
    Posn loc;  
    Ant(double weight, Posn loc) {  
        this.weight = weight;  
        this.loc = loc;  
    }  
}
```

```
new Ant(0.0001, new Posn(0, 0))  
new Ant(0.0002, new Posn(1, -2))
```

Data with Variants

Beginner Scheme:

```
; An animal is either  
; - snake  
; - dillo  
; - ant
```

Beginner Java:

```
abstract class Animal {  
}  
  
class Snake extends Animal {  
  ... as before ...  
}  
  
class Dillo extends Animal {  
  ... as before ...  
}  
  
class Ant extends Animal {  
  ... as before ...  
}
```


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Beginner Java:

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abstract class Animal {  
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    }  
}
```

abstract class
for a data
definition with
variants

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}  
  
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}  
  
class Ant extends Animal {  
    ... as before ...  
}
```

No fields and no constructor when a class merely groups variants

Data with Variants

Beginner Scheme:

```
; An animal is either  
• ... snake
```

Change the class for each variant by adding **extends** then the grouping class name, all before {

Beginner Java:

```
ab  
}
```

```
class Snake extends Animal {  
  ... as before ...  
}  
class Dillo extends Animal {  
  ... as before ...  
}  
class Ant extends Animal {  
  ... as before ...  
}
```

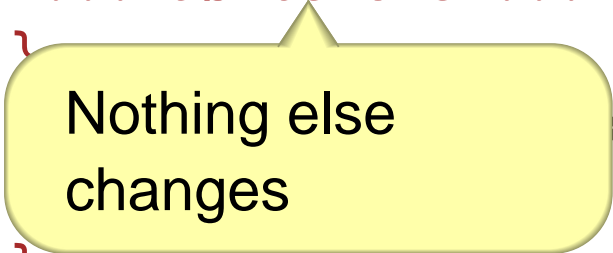
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class Dillo extends Animal {  
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```



Nothing else
changes

Variants in Java

- A data definition with variants must refer only to other data definitions (which are not built in)

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```
; A grade is either  
; - false  
; - num
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; A grade is either  
; - false  
; - num
```

⇒

```
; A grade is either  
; - no-grade  
; - num-grade
```

```
; A no-grade is  
; (make-no-grade)  
(define-struct no-grade ())
```

```
; A num-grade is  
; (make-num-grade num)  
(define-struct num-grade (n))
```

Variants in Java

- A data definition with variants must refer only to other data definitions (which are not built in)

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; A grade is either  
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; - no-grade  
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```

```
; A no-grade is  
; (make-no-grade)  
(define-struct no-grade ())
```

```
; A num-grade is  
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(define-struct num-grade (n))
```

- A data definition can be a variant in at most one other data definition