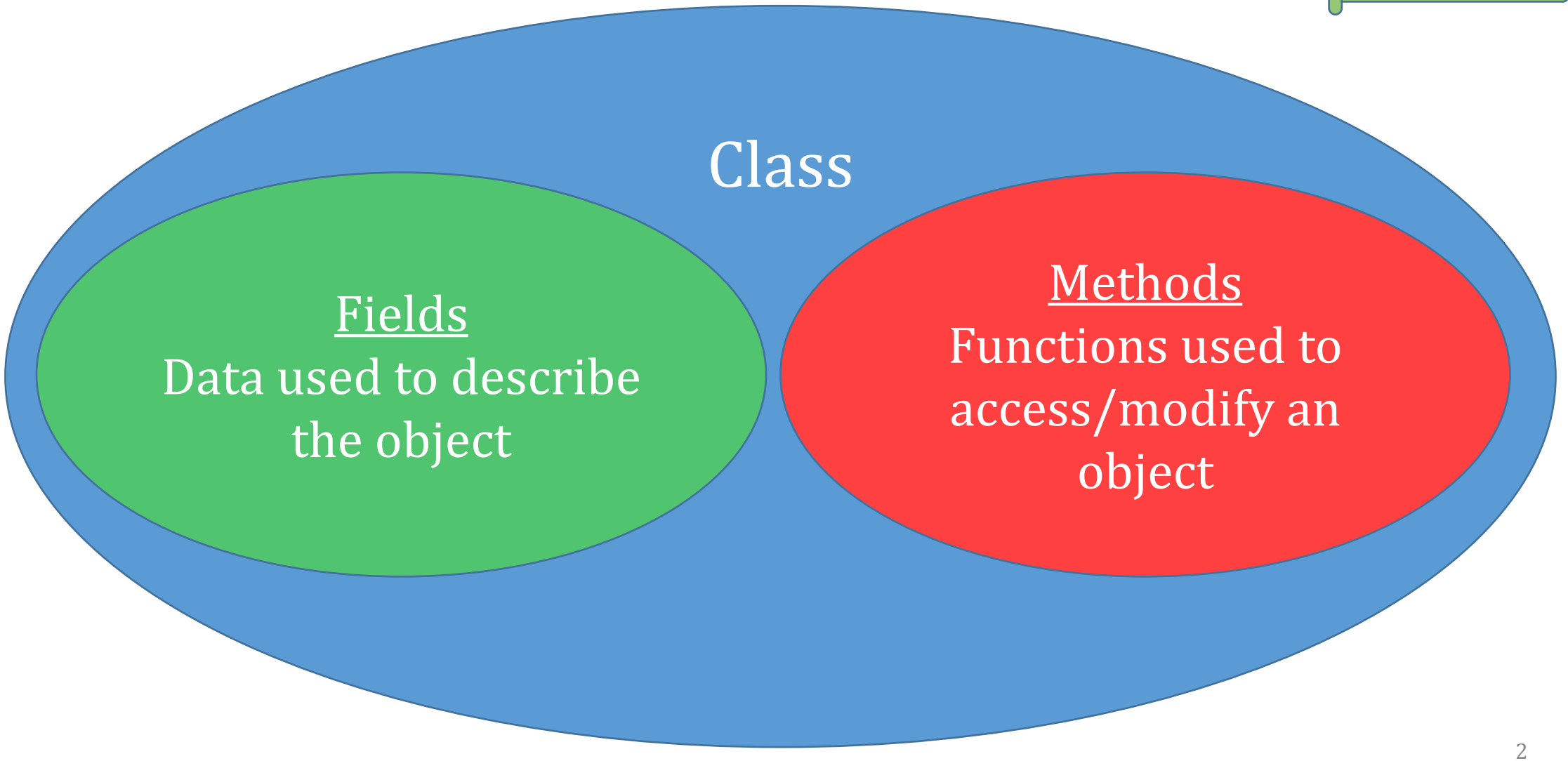
Java Fields

What's "in" a class?

Chap 2.1



Fields in Objects

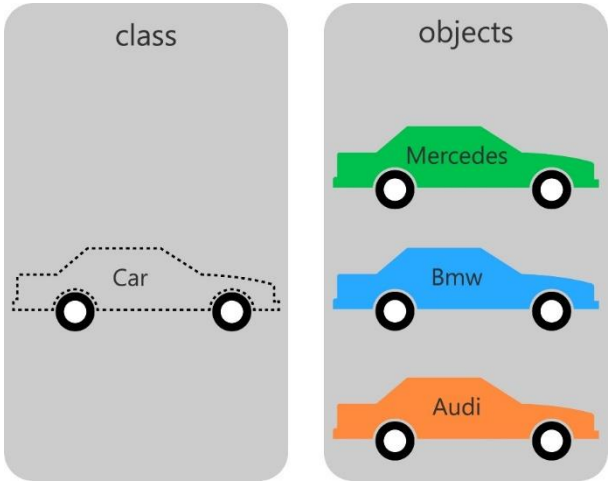
- An Object is a specific instance of a class
  - This specific soccer ball in the class of all balls ->

- When you create an object,
  you create a new instance of all fields in that class.
- The values of the fields are values associated with that object
  - type=fútbal, brand=Forza, diameter=22cm, color=white
- Each object has it's own fields and field values
- The field's values are valid until the object is no longer used.

Example Class: Car

How Cars are Described

- Make
- Model
- Year
- Color
- Owner
- Location
- Mileage



Actions that can be applied to cars

- Create (build at factory)
- …

Declaring Fields (or Instance Variables)

- For each data that is used to define an object
  - We need to define the name of the field
  - We need to define the type of the field

- Field Declaration Syntax:

```
class classname {
        modifier type fieldname;
                                    or
         modifier type fieldname = literal;
        …
}
```

What are Data Types?

Chap 4

- A data type describes how many bits make up the data
- A data type describes how bits should be interpreted
- A data type describes what operations are allowed

Type	Bits	Size	Encoding	Value
int	0000 0000 0000 0000 0000 0000 0000 0110	32	$\sum_{i=0}^{30} b_i \times 2^i$	6
char	0000 0000 0100 0111	16	UTF-16	‘G’
float	0100 0000 0100 1000 1111 0101 1100 0011	32	$-1^S \times 1.sig \times 2^{exp}$	3.14

Java Primitive Data Types

Sect. 4.1.1

Flavor	Type	Bits	Range	Precision
logic	boolean	? (8)	true or false	exact
symbol	char	16	a,b,c,,, A,B,C…, 0,1,… !,@,…	
Integer	byte	8	-128 to +127	
	short	16	-32,768 to +32,767	
	int	32	$\sim -2.14 \times 10^9$ to $\sim 2.14 \times 10^9$	
	long	64	$\sim -9.22 \times 10^{18}$ to $\sim 9.22 \times 10^{18}$	
floating point	float	32	$\sim -10^{38}$ to $\sim +10^{38}$	~7 digits
	double	64	$\sim -10^{308}$ to $+10^{308}$	~15 digits

Field Modifiers

- Access control: public, protected, private
  - public: any java code can read or write this field
  - protected: Only java code in this package OR sub-classes* can modify
  - private: Only java code in this class can modify
  - Default: "package-private" Only java code in this package can modify
- Class variables: static (presented later)
- Interpretation: final, transient, volatile
  - final: can only be assigned once (constant)
  - transient: fields which should not be "serialized"
  - volatile: fields which can change without Java code.

Examples of simple field declarations

```
public int input; // declaration
private char letter;
final double pi =  3.1414; // declaration and initialization
char aKoreanChar = '\ud55c';    //  한
```

Java Literals

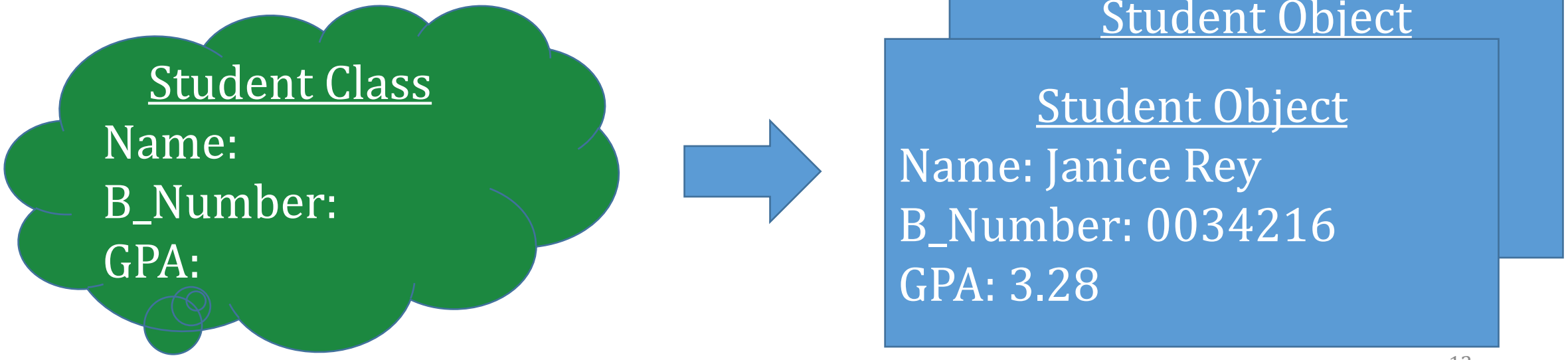
- Integer Literals (int unless L suffix added… then long)
  - numbers without leading 0 or decimal point (underscores allowed)
  - Hex: 0x… (digits are 0-9,a,b,c,d,e,f)
  - Octal: 0… (digits are 0-7)
  - Binary: 0b… (digits are 0,1)
- Floating Point Literals (double unless F suffix added, then float)
  - numbers with decimal point (underscores allowed)
  - may have exponent, e or E followed by (+/-)integer
- Boolean Literal (true or false)
- Character Literal (single character enclosed in single quotes)
- String Literal (multiple characters enclosed in double quotes)
- Null Literal: null

More literal examples:

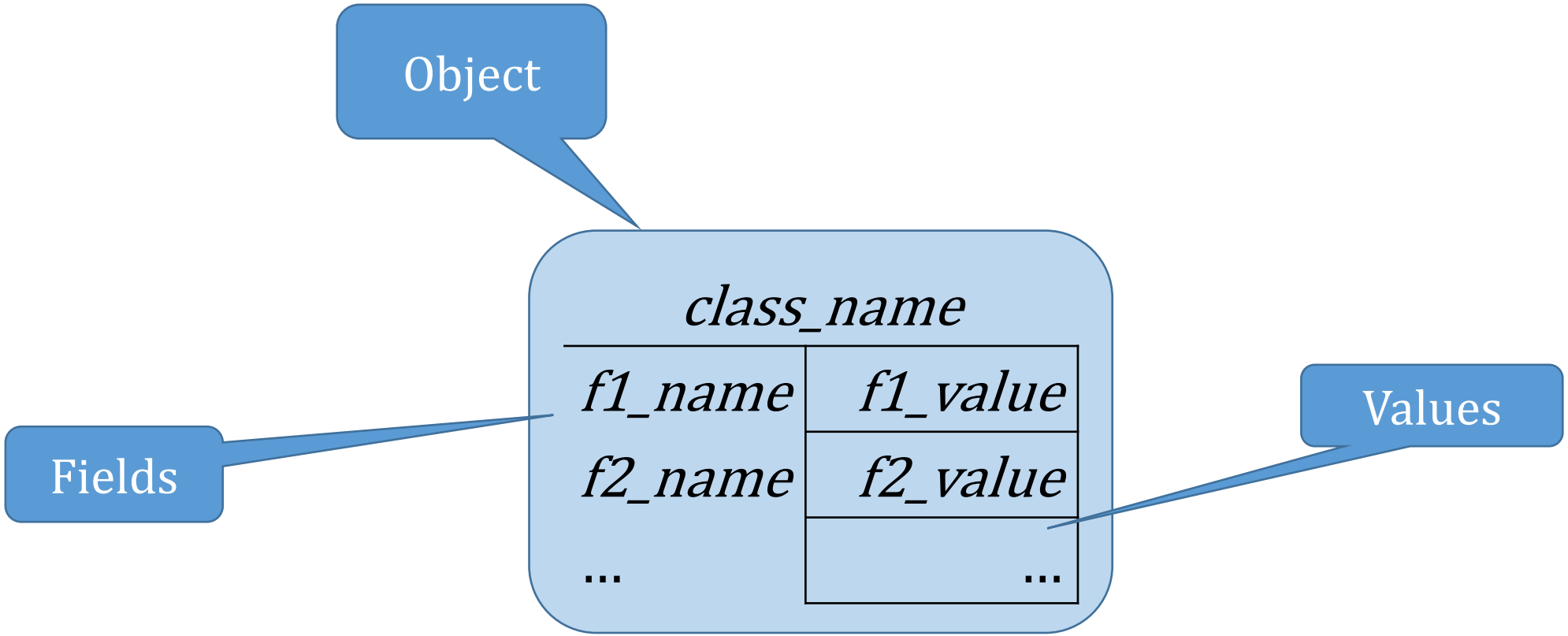
```
long large = 12345678901234567890L;
boolean choice = false;

double  precipAug = 3.59;
float  precipJuly = 2.69F;

byte  tiny  = (byte)110;   // values from -128 to 127
short  small = (short) 25000;  // from -32768 to 32767
```

Object Instantiation

- The process of creating an object of a specific class
- Requires specification of object's field values
  - Some fields can have default or automatically generated values
- Student Janice Rey is one “instance” of the Student class



Schematic Object Representation



Simple Object Instance example

```
class Account {
  long id;
  double balance;
  String type;
  …
}
```

- Fields used to define what we want to model about an account