The Price of Gold

```
double amount = Double.parseDouble(
  DialogBox.showInput(
    "Enter the amount of gold in kilos:",
    "The Price of Gold",
    DialogBox.QUESTION_MESSAGE));
ToolBox.crash(amount < 0.0,
  "The amount of gold cannot be negative.");
double pricePerOunce = Gold.price();
final double GRAMS_PER_KILO = 1000;
double pricePerKilo = GRAMS_PER_KILO
  / Gold.GRAMS_PER_TROY_OUNCE * pricePerOunce;
double priceInUSD = amount * pricePerKilo;
double priceInCAD = Currency.convert(priceInUSD,
  Currency.USD, Currency.CAD);
DialogBox.showValue(priceInCAD,
  "The Price of Gold",
  DialogBox.INFORMATION_MESSAGE);
```

Question

The class String of the package java.lang contains a method with the signature format(String, Object ...). It is very similar to the method printf(String, Object ...) which can be found in the class PrintStream of the package java.io. Find the format method in the API of the Java Standard Library. Use the format method to format the priceInCAD in the pop box.

Answer

String.format("%.2f", priceInCAD)

But . . .

What is the return type of the format method?

But . . .

What is the return type of the format method?

String

But . . .

What is the return type of the format method?

String

What is the type of the first parameter of the showValue method?

But . . .

What is the return type of the format method?

String

What is the type of the first parameter of the showValue method?

double

But . . .

What is the return type of the format method?

String

What is the type of the first parameter of the showValue method?

double

How can we convert the String into a double?

But . . .

What is the return type of the format method?

String

What is the type of the first parameter of the showValue method?

double

How can we convert the String into a double?

We can use the parseDouble method of the Double class.

Answer

Double.parseDouble(String.format("%.2f", priceInCAD))

Check03A

Number of students enrolled in the course: 225

Number of students that eChecked Check03A: 70

Practice!

Object-Oriented Programming

OOP

Programming Paradigms

- Object-oriented programming (CSE 1020, CSE 1030, ...)
- Imperative programming (CSE 2031)
- Functional programming (CSE 3401)
- Logic programming (CSE 3401)
- Concurrent programming (CSE 6490A)
- Event-driven programming (example in CSE 1030)
- Constraint programming
- ...

Different programming paradigms are compared in the course Programming Language Fundamentals (CSE 3301).

Object-Oriented Programming

Objects as a formal concept in programming were introduced in the 1960s in programming language Simula 67. This language was created by Ole-Johan Dahl and Kristen Nygaard of the Norwegian Computing Center in Oslo.

Ole-Johan Dahl

Ole-Johan Dahl (October 12, 1931 – June 29, 2002) was a Norwegian computer scientist and is considered to be one of the fathers of object-oriented programming.

source: ifi.uio.no

Kristen Nygaard

Kristen Nygaard (August 27, 1926 – August 10, 2002) was a Norwegian computer scientist and is considered to be one of the fathers of object-oriented programming.

source: ifi.uio.no

Dahl and Nygaard

In 2001, Ole-Johan Dahl and Kristen Nygaard won the Turing award.

The A.M. Turing Award is given annually by the Association for Computing Machinery (ACM) to "an individual selected for contributions of a technical nature made to the computing community." The Turing Award is recognized as the "highest distinction in Computer Science" and "Nobel Prize of computing."

source: ifi.uio.no

Advantages of OOP

- easy to re-use code
- easy to extend code
- easy to maintain code
- easy to test code
- fits well with the real world
- ...

However, (some of) these advantages are debatable.

Mordechai Ben-Ari. Objects never?: well, hardly ever!
Communications of the ACM, 53(9): 32–35, September 2010.

Result of Test

You want to record some data about each test. What kind of data would you record?

Result of Test

You want to record some data about each test. What kind of data would you record?

- the number of the test
- your score on the test
- the maximum score for the test
- the weight of the test
- the day, month and year of the test
- whether you were present at the test

Result of Test

For each datum, what is a descriptive name and the appropriate type?

- the number of the test
- your score on the test
- the maximum score for the test
- the weight of the test
- the day, month and year of the test
- whether you were present at the test

Result of Test

For each datum, what is a descriptive name and the appropriate type?

- the number of the test
  number : int
- your score on the test
- the maximum score for the test
- the weight of the test
- the day, month and year of the test
- whether you were present at the test

Result of Test

For each datum, what is a descriptive name and the appropriate type?

- the number of the test
  number : int
- your score on the test
  score : double
- the maximum score for the test
- the weight of the test
- the day, month and year of the test
- whether you were present at the test

Result of Test

For each datum, what is a descriptive name and the appropriate type?

- the number of the test
  number : int
- your score on the test
  score : double
- the maximum score for the test
  maximumScore : double
- the weight of the test
- the day, month and year of the test
- whether you were present at the test

Result of Test

For each datum, what is a descriptive name and the appropriate type?

- the number of the test
  number : int
- your score on the test
  score : double
- the maximum score for the test
  maximumScore : double
- the weight of the test
  weight : double
- the day, month and year of the test
- whether you were present at the test

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For each datum, what is a descriptive name and the appropriate type?

- the number of the test
  number : int
- your score on the test
  score : double
- the maximum score for the test
  maximumScore : double
- the weight of the test
  weight : double
- the day, month and year of the test
  day : int
  month : int
  year : int
- whether you were present at the test

Result of Test

For each datum, what is a descriptive name and the appropriate type?

- the number of the test
  number : int
- your score on the test
  score : double
- the maximum score for the test
  maximumScore : double
- the weight of the test
  weight : double
- the day, month and year of the test
  day : int
  month : int
  year : int
- whether you were present at the test
  present : boolean

Result of my First Test

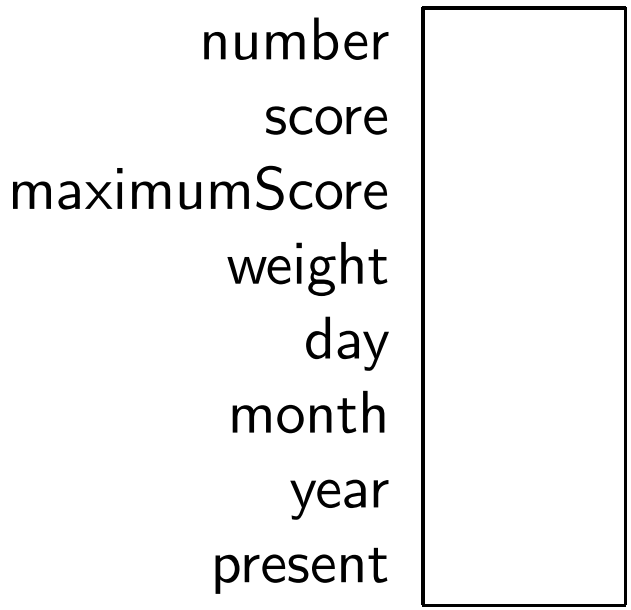
number	1
score	14.76
maximumScore	20.0
weight	0.06
day	23
month	9
year	2010
present	true

Result of my Second Test

number	2
score	13.50
maximumScore	18.0
weight	0.06
day	30
month	9
year	2010
present	true

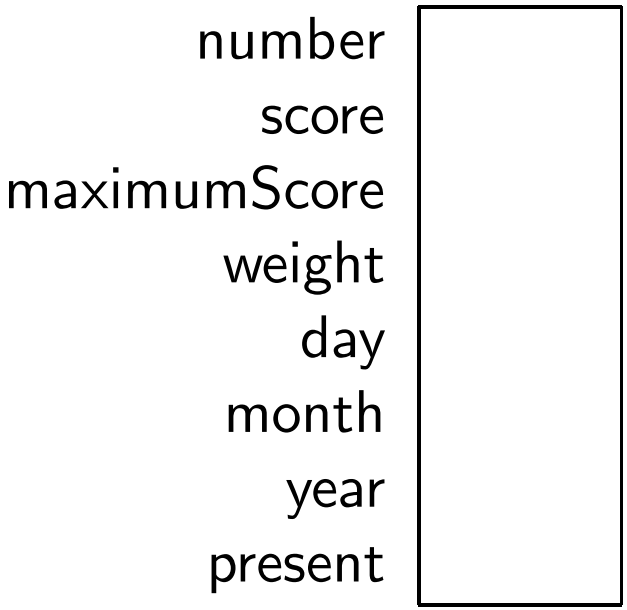
Result of Test

All results are an instance of the following pattern.



Result of Test

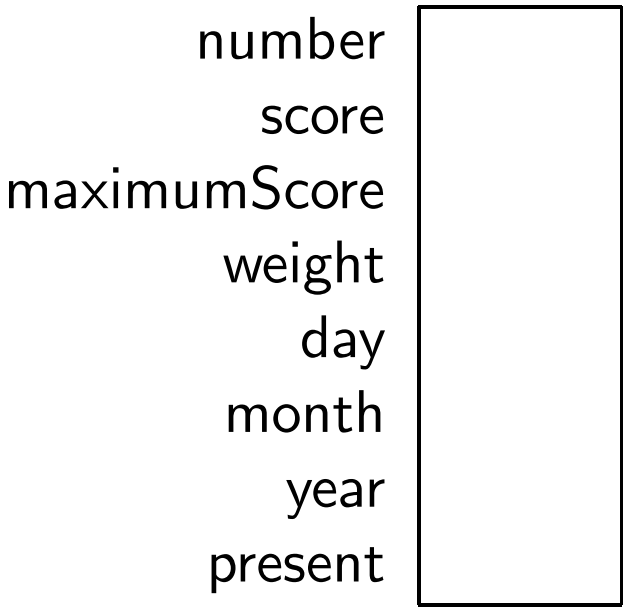
If you are given an instance of the pattern



what kind of questions may you want to ask about this data?

Result of Test

If you are given an instance of the pattern



what kind of questions may you want to ask about this data?

- What is the number of this test result?
- What is the score of this test result?
- ...
- What is the letter grade of this test result?
- What is the percentage grade of this test result?
- ...

Objects and Classes

What is an object?

Objects and Classes

What is an object?

"An instance of a class"

Objects and Classes

What is an object?

"An instance of a class"

What is a class?

Objects and Classes

What is an object?

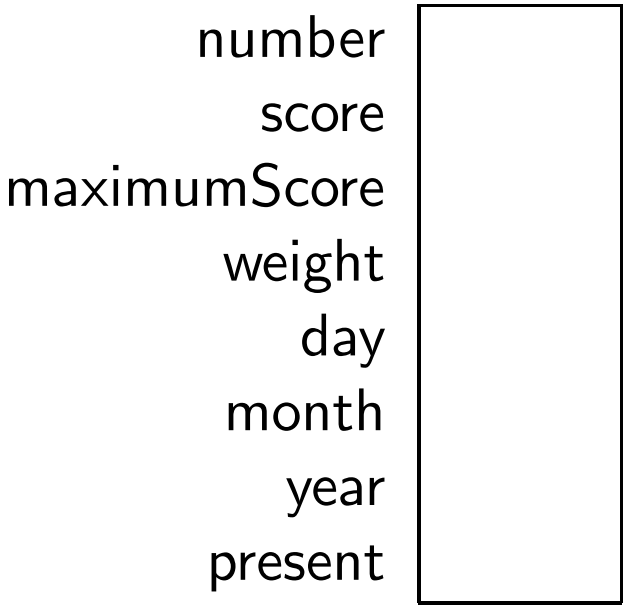
"An instance of a class"

What is a class?

"A blueprint for objects"

You often find these circular definitions, but they are not particularly helpful.

What is a Class?



A class contains attributes. Each attribute has a name and a type.

number : int
score : double
maximumScore : double

What is a Class?

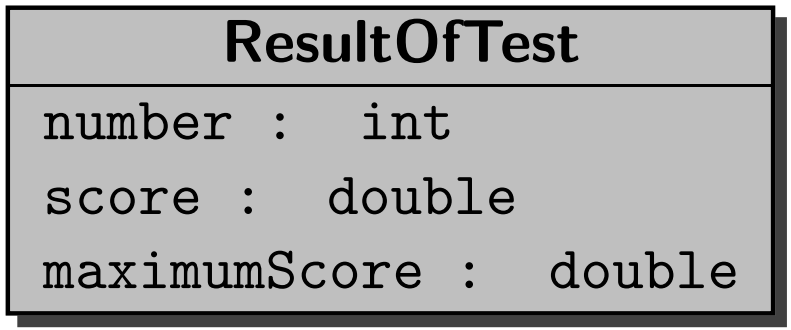
- What is the number of this test result?
- What is the score of this test result?
- ...
- What is the letter grade of this test result?
- What is the percentage grade of this test result?
- ...

A class contains methods. Each method has a name, a signature and possibly a return type.

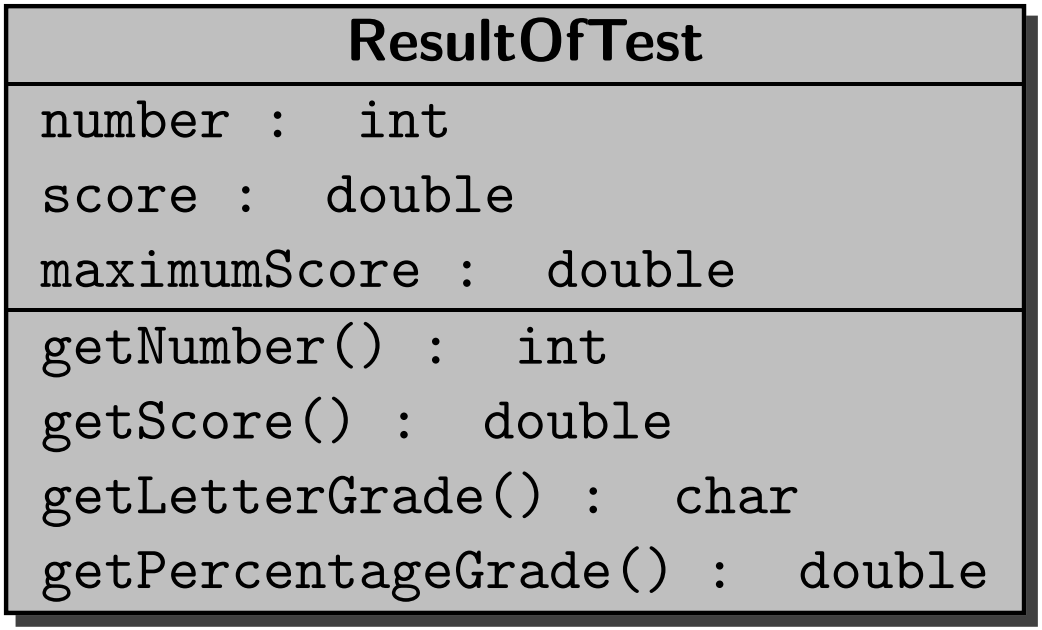
getNumber() : int
getScore() : double
getLetterGrade() : char
getPercentageGrade() : double

UML Class Diagram

UML Class Diagram



UML Class Diagram



What is an Object?

An object is an instance of a class.

An object has a state. The state of an object consists of the attributes of the class and their values.

number	1
score	14.76
maximumScore	20.0

What is an Object?

An object has an identity. This identity is unique. That is, two different objects have different identities.

This is an abstract notion. In more concrete terms, you may think of an object's identity as the address in memory where it is stored. Obviously, two different objects cannot be stored at the same memory address.

What is a Class?

A class contains constructors. Each constructor has a name, which is the same as the name of the class, and a signature.

ResultOfTest(number : int)
ResultOfTest(number : int, score : double,
maximumScore : double)