

Example-Driven Development

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The Trouble with TDD

Where do tests come from?

How do we write the simplest code that passes?

What use is a green test?

What's an Example?

An example (method) is a test that returns an example.



An example of an example



An example method is a test that returns the object under test.



GToolkit-Demo-Memory > GtMemoryGameExamples

```
fixedGame
  <gtExample>
  | game |
  game := GtMemoryGame new setSymbols:
    '4753628368271451'.
  self assert: game cardsCount equals: 16.
  self assert: game visibleCards size equals: game
cardsCount.
^ game
```



accessing instance

nil

Composing examples

[illegible]

Why examples?

- Example composition reduces:
 - code duplication,
 - cascading failures.
- Examples can be reused in live documentation.
- EDD is an exploratory approach to TDD.

Modeling prices

A price can be something like 100 EUR.

Prices can be added or multiplied.

A price can also be discounted either by a fixed amount of money, or by a percentage.

All operations can be combined arbitrarily.

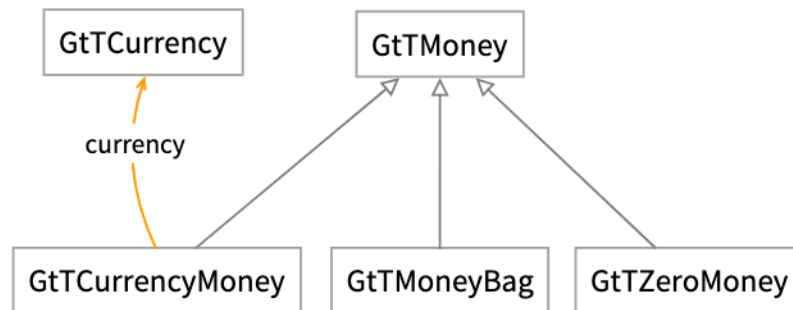
And for audit purposes, we want to track all operations that lead to a concrete amount of money.

Money classes

We already have classes that model amounts of money.

42 euros ▶ .

42 euros ▶ + 10 usd ▶ .



Money Examples

Package Hierarchy
Class Hierarchy
Recent

Packages	Classes	Categories	Methods
GToolkit-Spc	GtMoneyExan	instance side	instance side
GToolkit-Tes	GtMoneyUML	examples	bagWithEurosA
GToolkit-Trai			bagWithEurosA
GToolkit-Tre			derivedZeroEu
GToolkit-Tut			fortyTwoDollar
Examples			fortyTwoDollar
Model			fortyTwoEuro
Extension:			fortyTwoEuro
GToolkit-Uti			fortyTwoEuro
GToolkit-Uti			fortyTwoEuro
GToolkit-Uti			fortyTwoEuro
GToolkit-Uti			fortyTwoEuro
GToolkit-Uti			fortyTwoEuro
GToolkit-Uti			fortyTwoEuro
GToolkit-Uti			higherThan
GToolkit-Uti			lessThan
GToolkit-Uti			zeroEuro
GToolkit-Uti			zeroEuroLess1
GToolkit-Uti			zeroEuroPlusF
GToolkit-Uti			zeroMoney
GToolkit-Uti			zeroMoneyLess
GToolkit-Uti			zeroMoneyPlus

GtMoneyExamples -

Superclass: Object Package: GToolkit-Tutorial-Prices Tag: Examples

Methods
Examples map
Examples
Comment
References
Advice defi

Methods up to

GtMoneyExamples

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- bagWithEurosAndDollars** [examples](#) [instance](#)
- bagWithEurosAndDollarsMinusEuros** [examples](#) [instance](#)
- derivedZeroEuros** [examples](#) [instance](#)
- fortyTwoDollars** [examples](#) [instance](#)
- fortyTwoDollarsPlusZeroDollars** [examples](#) [instance](#)
- fortyTwoEuros** [examples](#) [instance](#)
- fortyTwoEurosDividedByTwo** [examples](#) [instance](#)
- fortyTwoEurosDividedByTwoEuros** [examples](#) [instance](#)
- fortyTwoEurosHigherThanZeroEuros** [examples](#) [instance](#)
- fortyTwoEurosHigherThanZeroMoney** [examples](#) [instance](#)
- fortyTwoEurosMultipliedByTwo** [examples](#) [instance](#)
- fortyTwoEurosPlusFourtyTwoEuros** [examples](#) [instance](#)
- fortyTwoEurosPlusFourtyTwoEurosMinusFourtyTwoEuros** [examples](#) [instance](#)
- fortyTwoEurosPlusZeroMoney** [examples](#) [instance](#)
- higherThan** [examples](#) [instance](#)
- lessThan** [examples](#) [instance](#)
- zeroEuros** [examples](#) [instance](#)

Introducing a Concrete Price

A price can be something like 100 EUR.

Prices can be added or multiplied.

...



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Start from an object



As a first step, we just have to get an object to work with.



```
ConcretePrice ▶ new ▶ money: ▶ 100 euros ▶ .
```



Create a factory method



We want to be able to create a Price object by sending asPrice to a Money instance.



```
100 euros ▶ .
```



Adding a view



We want to lift the money *Details* view to our Price object.



```
100 euros ▶ asPrice.
```



Extracting an example



This could make a nice example for testing.



```
100 euros ▶ asPrice.
```



Adding assertions



Let's introduce some tests.



`PriceExamples` ▶ `new` ▶ `hundredEuros` ▶ .

Price Examples

Package Hierarchy
Class Hierarchy
Rec Q +

Packages	Classes	Categories	Methods
GToolkit-Den	GtDMoneyExar	instance side	instance side
GToolkit-Den	GtDPriceExamj	examples	concretePrice
GToolkit-Den			concretePriceD
GToolkit-Den			concretePriceD
GToolkit-Den			concretePriceD
GToolkit-Den	Examples		concretePriceU
	Model		displayOfConcr
	Extension:		displayOfDivide
GToolkit-Den			displayOfMulti
GToolkit-Den			displayOfMulti
GToolkit-Den			dividedPrice
GToolkit-Den			fortyTwoEurosl
GToolkit-Den			fortyTwoEurosl
GToolkit-Den			hundredEurosl
GToolkit-Den			multipliedPrice
GToolkit-Den			multipliedPrice
GToolkit-Dep			summedPricelr
GToolkit-Diaj			summedPricelr
GToolkit-Doc			
GToolkit-Exa			
GToolkit-Exa			
GToolkit-Exa			
GToolkit-Exa			
GToolkit-Exa			
GToolkit-Exa			
GToolkit-Exa			
GToolkit-Exa			
GToolkit-Exa			
GToolkit-Exp			
GToolkit-Ext			
GToolkit-Ext			
GToolkit-File			
GToolkit-File			
GToolkit-Gen			
GToolkit-Gen			
GToolkit-Gen			
GToolkit-Gen			
GToolkit-Gle			
GToolkit-Iss			

Class

GtDPriceExamples -

Superclass: Object Package: GToolkit-Demo-Prices Tag: Examples

Methods Examples map Examples Comment References Advice defi Y + i [] ▶ Q

Methods up to ▾ GtDPriceExamples +

- concretePrice** [] examples instance
- concretePriceDiscountedByMoney** [] examples instance
- concretePriceDiscountedByMoneyAndDiscountedByPercentage** [] examples instance
- concretePriceDiscountedByPercentage** [] examples instance
- concretePriceUSD** [] examples instance
- displayOfConcretePriceDiscountedByMoneyAndDiscountedByPercentage** [] examples instance
- displayOfDividedPrices** [] examples instance
- displayOfMultipliedPrices** [] examples instance
- displayOfMultiplySummedPrices** [] examples instance
- dividedPrice** [] examples instance
- fortyTwoEurosDividedByTwoEuros** [] examples instance
- fortyTwoEurosLessThanHundredEuros** [] examples instance
- hundredEurosHigherThanFourtyTwoEuros** [] examples instance
- multipliedPrice** [] examples instance
- multipliedPriceInDifferentCurrencies** [] examples instance
- summedPriceInDifferentCurrencies** [] examples instance
- summedPriceInTheSameCurrency** [] examples instance

EDD in a Nutshell

- Start with an object
 - Prototype behavior in the playground
 - Extract methods
 - Introduce useful views
- Extract examples
 - Prototype assertions in the playground
 - Add them to the example method
 - Reuse examples as setups for new examples