



# Reflection

How to find out more about Objects

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# Reflection

- Overview
- The Class class
- The Field class
- The Method class
- The Constructor class

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## Overview

- Package: java.lang.reflect for Field, Method, and Constructor classes
- Class class is in java.lang
- Ability to find out what class type an object is
- Ability to analyze class capabilities
- Ability to find public API of class
- Ability to invoke methods on objects without knowing the names of either
- All of this can be done at run time

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## The Class class

- Static methods to get a Class object given a String name of the class
- Methods for getting:
  - the constructors, methods, fields of the class
  - package of the class
  - get the fully qualified name of the class
  - many more ...
- Method to create a new instance of the class type:  
`classObject.newInstance()` // returns an Object

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## Getting Members of a Class

- Given a class object, you can get the public members via:
  - `getFields()`
  - `getMethods()`
  - `getConstructors()`
- You can also get all of the members via:
  - `getDeclaredFields()`
  - `getDeclaredMethods()`
  - `getDeclaredConstructors()`

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## Fields, Methods, and Constructors

- All have:
  - `getName()` method returns the name of the field, method, or constructor
  - `getModifiers()` method that returns an integer that describes the qualifiers/modifiers for the field
- The `Modifier` class has methods to decipher the return value from `getModifiers()`
  - all are static
  - return a boolean
  - E.g: `isPrivate(retValue)`

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## Fields, Methods, and Constructors

- Field has a `getType()` method that returns a Class object of the field type
- Constructor and Method have a `getParameterTypes()` method that returns an array of Class objects for the parameters for the given constructor or method
- Method has a `getReturnType()` method that returns a Class object of the return type for the method

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## Reflection Example

- The Java Tutorial Reflection Trail has excellent generic code examples. In particular we will look at:
  - Examining Classes
    - Identifying Fields
    - Discovering Class Constructors
    - Obtaining Method Information

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## Exercise

- Write a program that will take one of the Track subclass names as an argument on the command line and create an object of this class type, using the default constructor.
- Invoke toString() on the object to verify that the object created correctly.

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