

2022/2023(1)
IF184301 Object Oriented Programming

Lecture #3d

Exercises

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Ex1. Circle area: Problem

- The area A of the circle is computed by $\pi \cdot r^2$.
- Write a Java-program that makes this computation, initialize the variable r to 5 and print the result.
- Which types do you use for the variables A and r ? (Hint: Use `Math.PI`).

Ex1. Circle area: Solution

```
public class Ex1 {  
    /** The variable A and r are declared as double and A is computed  
     *   from r as Math.PI * r * r and printed suitably.  
     *   The program is test with r = 5.  
     */  
    public static void main(String[] args) {  
        double a;  
        double r;  
        r = 5;  
        a = Math.PI * r * r;  
        System.out.println("The area of a circle with radius " + r +  
                            " is " + a + ".");  
    }  
}
```

Ex2. Conversion: Problem

- Write a Java-program that converts masses given in the imperial system into kilograms. Make use of the following conversions:
 - 1 ton 2240 pounds
 - 1 hundredweight 112 pounds
 - 1 quarter 28 pounds
 - 1 stone 14 pounds
 - 1 ounce 1/16 pounds
 - 1 drachm 1/256 pounds
 - 1 grain 1/7000 pounds
 - 1 pound 0.45359237 kilograms
- A person's weight corresponds to 11 stones and 6 pounds. Concretely the weight is stored by the two variables stones = 11; and pounds = 6; (all other variables such as tons are 0). Use your program to determine how many kilograms this is.

Ex2. Conversion: Solution (1)

```
public class Ex2 {
    /**
     * First the relationships are stored in variables:
     * 1 ton ~ 2240 pounds
     * 1 hundredweight ~ 112 pounds
     * 1 quarter ~ 28 pounds
     * 1 stone ~ 14 pounds
     * 1 ounce ~ 1/16 pounds
     * 1 drachm ~ 1/256 pounds
     * 1 grain ~ 1/7000 pounds
     * 1 pound ~ 0.45359237 kilograms
     * Then the imperial weight is transformed into pounds and
     * stored in a variable weightInPounds. Then this weight is
     * transformed in kilograms and the transformation is run for the 11 stones
     * and 6 pounds from the worksheet. Finally the result is suitably printed.
     */
}
```

Ex2. Conversion: Solution (2)

```
public static void main(String[] args) {
    double poundsPerTon          = 2240;
    double poundsPerHundredweight = 112;
    double poundsPerQuarter     = 28;
    double poundsPerStone       = 14;
    double poundsPerOunce       = 1/16.0;
    double poundsPerDrachm      = 1/256.0;
    double poundsPerGrain       = 1/7000.0;
    double kilogramsPerPound    = 0.45359237;

    double tons = 0;
    double hundredweights = 0;
    double quarters = 0;
    double stones = 0;
    double pounds = 0;
    double ounces = 0;
    double drachms = 0;
    double grains = 0;
}
```

Ex2. Conversion: Solution (3)

```
/* We compute first the pounds by converting the stones to pounds and
   add the pounds. Then we multiply by kilograms_per_pound.
   */
stones = 11;
pounds = 6;
double weightInPounds =
    tons * poundsPerTon +
    hundredweights * poundsPerHundredweight +
    quarters * poundsPerQuarter +
    stones * poundsPerStone +
    pounds +
    ounces * poundsPerOunce +
    drachms * poundsPerDrachm +
    grains * poundsPerGrain;
double weightInKilograms = weightInPounds * kilogramsPerPound;
System.out.println("A person with " + stones + " stones and " + pounds +
    " pounds has a weight corresponding to " + weightInKilograms + " kilograms.");
}
```

Ex3. Investment: Problem

- A capital of GBP 100 (£100) is invested at a fixed interest rate of 2.3 per cent.
- The interest is added to the capital at the end of each year.
- Use the formula to print the balance after each of the first 5 years and after 500 years.

$$\text{total} = \text{capital} * (1 + 0.01 * \text{interest rate})^{\text{years}}$$

Ex3. Investment: Solution (1)

```
public class Ex3 {  
    /** In this exercise, the variables are declared and  
     *   initialized, then the formula on the worksheet is  
     *   translated to Java and the total capital computed after 1,  
     *   2, 3, 4, 5, and 500 years. The code is repetitive (which is  
     *   bad), since we have not introduced methods at this point in  
     *   time yet.  
     */  
    public static void main(String[] args) {  
        double capital = 100; // the initial capital in pounds  
        double interestRate = 2.3; // the interest rate per year  
        int years = 1; // the time for which the capital is invested in years.  
        double total; // the resulting capital after interest added.  
        total = capital * Math.pow(1 + 0.01 * interestRate, years);  
    }  
}
```

Ex3. Investment: Solution (2)

```
System.out.println("After " + years + " years a capital of GBP " + capital +
    " grows with an interest rate of " + interestRate + "% to GBP " + Math.round(total));
    // % = percentSign (%)
years = 2;
total = capital * Math.pow(1 + 0.01 * interestRate, years);
System.out.println("After " + years + " years a capital of GBP " + capital +
    " grows with an interest rate of " + interestRate + "% to GBP " + Math.round(total));
years = 3;
total = capital * Math.pow(1 + 0.01 * interestRate, years);
System.out.println("After " + years + " years a capital of GBP " + capital +
    " grows with an interest rate of " + interestRate + "% to GBP " + Math.round(total));
years = 4;
total = capital * Math.pow(1 + 0.01 * interestRate, years);
System.out.println("After " + years + " years a capital of GBP " + capital +
    " grows with an interest rate of " + interestRate + "% to GBP " + Math.round(total));
years = 5;
total = capital * Math.pow(1 + 0.01 * interestRate, years);
System.out.println("After " + years + " years a capital of GBP " + capital +
    " grows with an interest rate of " + interestRate + "% to GBP " + Math.round(total));
years = 500;
total = capital * Math.pow(1 + 0.01 * interestRate, years);
System.out.println("After " + years + " years a capital of GBP " + capital +
    " grows with an interest rate of " + interestRate + "% to GBP " + Math.round(total));
}
```