

Introduction to Computer Science

Lab 6 – Fundamental Data Types

Name _____ Section _____ Score _____

Part 1: *Using Numbers*

Suppose you have 5 1/2 gallons of milk and want to store them in milk jars that can hold up to 0.75 gallons each. You want to know ahead of time, how many completely filled jars you will have. The following program has been written for that purpose.

```
public class MilkJarCalculator
{
    public static void main(String args[])
    {
        double milk = 5.5; // gallons
        double jarCapacity = 0.75; // gallons
        int completelyFilledJars = milk / jarCapacity;
        System.out.println(completelyFilledJars);
    }
}
```

1. What is wrong with it? Why? (Hint: What data types are used)

2. How can you fix it? (Hint: Only a very small change must be made in 2 places)

Part 2: *Using Numbers*

You want to know how many feet is 3.5 yards, and how many inches is 3.5 yards. You write the following program for that purpose:

```
public class DistanceConverter
{
    public static void main(String args[])
    {
        double yards = 3.5;
        double feet = yards * 3;
        double inches = feet * 12;
        System.out.println(yards + "yards are"
                           + feet + "feet");
        System.out.println(yards + "yards are"
                           + inches + "inches");
    }
}
```

The problem with this program is that using "magic numbers" makes it hard to maintain and debug. Modify the program so that it uses constants to improve legibility and make it easier to maintain. Be sure to use good names for the constants!

3. Run the program. What is the output?

Print it out and attach it with this sheet when you turn in your lab. Don't forget your header.

Part 3: *Arithmetic Operators and Mathematical Functions*

An *annuity* (sometimes called a reverse mortgage) is an account that yields a fixed payment every year until it is depleted. The *present value* of the annuity is the amount that you would need to invest at a given interest rate so that the desired payments can be made. The present value of an annuity (PV_{ann}) at the time of the first deposit can be calculated using the following formula:

$$PV_{\text{ann}} = \text{PMT} \cdot \left(\frac{\{[(1 + i)^n - 1] / i\}}{(1 + i)^n + 1} \right)$$

where:

PMT: periodic payment
i: periodic interest or compound rate
n: number of payments

4. What is the present value of an annuity with that pays out \$10,000 of retirement income in each of the next 20 years if the interest rate is 8%? (Use a calculator)

Write a program to calculate the present value of an annuity, for the values given in the problem. Remember that you can use `Math.pow(x, y)` to calculate x^y . Test it.

Part 4: *Reading Input*

The `Scanner` class lets you read keyboard input in a convenient manner. To construct a `Scanner` object, simply pass the `System.in` object to the `Scanner` constructor:

```
Scanner in = new Scanner(System.in);
```

Once you have a scanner, you use the `nextInt` or `nextDouble` methods to read the next integer or floating-point number. For example:

```
System.out.print("Enter quantity: ");  
int quantity = in.nextInt();  
System.out.print("Enter price: ");  
double price = in.nextDouble();
```

Modify the program you created in part 3 (the one that calculates the present value of an annuity) so that the user can provide the values for `pmt`, `i`, and `n` through the console.

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