

Forman Christian College, Lahore

(A Chartered University)

Assignment 4

Due: Monday 22/4/2013 at 12:00 am

Objective

1. To give students practice in using functions

Problem: Educational Software

Your little brother is having trouble with arithmetic. Your parents realize that after taking a few weeks of your Java programming course, that you could potentially write a computer program that will allow him to practice his arithmetic skills.

In particular, your program will allow your brother to play two separate games:

- 1) A game where he has to complete several additions or multiplications.
- 2) A game where he has to determine a secret number after being told if his guesses are too high or too low.

Your program should prompt your brother with the following menu:

- 1) Play Arithmetic Game
- 2) Play Guessing Game
- 3) Print Score
- 4) Quit

If he chooses option 1, then you should prompt him with the following menu choices:

- 1) Addition
- 2) Multiplication

Your program should then prompt him for the maximum value of the numbers to be used in the problems and the total number of questions.

Then it should play the game by prompting him with the desired number of additions/multiplications. Your program should keep track of how much time he takes for these problems. In addition, 5 penalty seconds should be added for each incorrect response. The total time he takes (taking into account the penalty seconds) will be used to determine his score for the round.

If he chooses option 2, then you should prompt him for the maximum integer, n , for the guessing game. Then your program should generate a random integer in between 1 and n , inclusive. After that, it should prompt your brother for his first guess. After each guess, your program should tell him whether to guess higher or lower. This continues until he gets the number exactly. Your program should also keep track of how much time the game takes to play. This value will be used to determine his score for the round.

For option 3, simply report your brother's total score, which is the sum of his scores from each round he plays.

Scoring Details

For the arithmetic game, the score your brother earns is equal to the total amount of time (in seconds) it took him to finish the problems (including penalty seconds) divided by the number of problems he solved.

For the guessing game, the score your brother earns is equal to the total amount of time (in seconds) it took him to guess the secret number divided by two times the number of digits in the maximum number allowed in the game. (For example if the maximum number was 1000, and he took 15 seconds to guess the correct number, then his score would be $15/(2*4) = 1.875$.)

The score in seconds then must be converted to an integer number of points in between 0 and 10. In particular, the conversion works as shown in the chart below:

| Time, t , (in seconds) | Corresponding Score |
|--------------------------|---------------------|
| $t < 1$ | 10 |
| $1 \leq t < 2$ | 9 |
| $2 \leq t < 3$ | 8 |
| $3 \leq t < 4$ | 7 |
| $4 \leq t < 5$ | 6 |
| $5 \leq t < 6$ | 5 |
| $6 \leq t < 7$ | 4 |
| $7 \leq t < 8$ | 3 |
| $8 \leq t < 9$ | 2 |
| $9 \leq t < 10$ | 1 |
| $t \geq 10$ | 0 |

Implementation Details

You will be required to write four functions with the prototypes given below. (Note: you may write other functions as well, but these three are required.) Your functions should do what the comments for them below specify:

```
// This function gives the user quantity arithmetic
// questions, where each operand ranges from 1 to max,
// inclusive. The value of operator dictates whether
// the problems are addition or multiplication problems.
// Namely, if op is 1, they are addition problems,
// otherwise, they are multiplication problems.
// The function returns the number of seconds the user took
// to play the entire game, divided by the number of
// problems they solved.
public static double arithGame(int max, int quantity, int op);

// This function allows the user to play the guessing game
// where the randomly generated number lies in between 1
// and max, inclusive. The value returned is the number of
// seconds the user took to finish the game divided by the
// 2 times the number of digits in the number max.
public static double guessGame(int max);

// Returns the number of digits in number.
public static int numDigits(int number);

// Returns the number of points the user has earned based
```

```
// on time. In particular, if time is less than 1, 10 is
// returned. Otherwise, if it is less than 2, 9 is
// returned, etc. If time is greater than or equal to 10,
// then 0 is returned.
```

```
public static int numPoints(double timesec);
```

Other Useful Information

Use `System.currentTimeMillis()` to get the current time. This function returns a long (which is just like int) and you can use it to calculate the time difference. For instance,

```
long x = System.currentTimeMillis();
```

stores the current time in x. So you can do something like this:

```
long start = System.currentTimeMillis();
// Insert code you want to time here.
long end = System.currentTimeMillis();
int timeSpent = (int) (end - start);
System.out.println("Your code took " + timeSpent + " milliseconds");
```

Please use the following constants for ADD and MULT

```
final int ADD 1
```

```
final int MULT 2
```

`final` makes a variable a constant. This means that this values can never be changed. If you try to change it, it will result in an error. Why is this useful? When you prompt the user to enter 1 for arithmetic, and 2 for multiplication questions, instead of hard-coding 1 and 2 in the if condition, you can use these variable names.

In order to carry out the scoring function, it may be helpful to look at the following functions in the math library:

```
Math.ceil
```

```
Math.floor
```

Remember, if you want to convert a double to a corresponding integer, you can use a cast as in the example below, where we assume that value is an integer and seconds is a double:

```
value = (int)seconds;
```

Restrictions

Name the file you create and turn in *Game.java*. Your program should include a header comment with the following information: your name, course number, section number, assignment title, and date. You should also include comments throughout your code, when appropriate.

Sample Output

Please make a selection from the following:

1. Play Arithmetic Game.
2. Play Guessing Game.
3. Print Score.
4. Quit.

1

Would you like, 1)Addition or 2)Multiplication?

1

What is the maximum number you would like?

100

How many problems do you want?

4

What is $21+86$?

107

Correct, great job!

What is $87+96$?

173

Sorry, that's incorrect, the answer is 183.

What is $86+70$?

156

Correct, great job!

What is $55+4$?

59

Correct, great job!

You took an average of 6.000000 seconds per question.

Your score for the round is 4.

Please make a selection from the following:

1. Play Arithmetic Game.
2. Play Guessing Game.
3. Print Score.
4. Quit.

2

Enter the maximum number for the game.

100

Enter the guess!

50

Your guess is too high, try again.

Enter your guess!

30

Your guess is too high, try again.

Enter your guess!

10

Your guess is too high, try again.

Enter your guess!

5

Your guess is too low, try again.

Enter your guess!

7

Your guess is too high, try again.

Enter your guess!

6

Great, you guessed the correct number 6 in 6 guesses in 10 seconds.

Your score for the round is 9.

Please make a selection from the following:

1. Play Arithmetic Game.
2. Play Guessing Game.
3. Print Score.
4. Quit.

3

Your score is 13.

Please make a selection from the following:

1. Play Arithmetic Game.
2. Play Guessing Game.
3. Print Score.
4. Quit.

4

Thank you for playing!

Submission instructions

You need to email the file, Game.java to TA.comp102@gmail.com with the subject as “COMP 102: Assignment 4 - Roll number.”

Notes on Grading

- All variables should have informative names.
- Your input/output should match the examples.
- Every program must have comments. There should be header comments in your program including your name and a brief introduction of the program. You should have at least one comment besides that.
- Any plagiarism/cheating would be strictly dealt with.
- Use correct indentation.
- 1 day late assignment would be penalized by a 10% grade deduction. 2 days late would be penalized by 25% grade deduction. Assignments submitted 2 days after the submission date would not be accepted.
- Failure to send Test.java would result in a zero for the assignment.