

University of Cape Town
 Department of Computer Science
 Computer Science CSC115F

Supplementary Exam

- Answer all questions.
- All questions that refer to elements of programming make reference to the Java programming language as studied in class.
- Good luck !

Marks: 25

- Approximate marks per question are shown in brackets

Time: ?? minutes

- The use of calculators is permitted

	Surname		Initials
NAME:			

STUDENT NO:		COURSE CODE:	CSC
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This paper consists of 2 questions and 4 pages (including this cover page).

Mark Allocation							
Quest	Marks	Internal	External	Quest	Marks	Internal	External
1	[15]			2	[10]		
Total				Total			
Grand Total							
Final Mark							
Internal Examiner:				External Examiner:			

Section 1. Java Basics

Question 1. [15 marks]

- a) List the 3 syntax errors in the following code fragment (line numbers are added so you can refer to specific lines):

```
line1: public double func ( int a, b )
line2: {
line3:     float 3blindmice = 2a + 1;
line4:     return 12.0;
line5: }
```

- i) line1: int type missing for b
- ii) line3: 3blindmice is an invalid identifier
- iii) line1: 2a is missing an operator

[3]

- b) List one difference between local (method) variables and instance variables.

Local variables are only visible within their method while instance variables are visible to all methods.

[2]

- c) Prefix the expression $1/3$ with an appropriate typecast to force the calculation to occur in a floating-point context.

(float) 1/3

[1]

- d) Write the method `processPoly` to calculate the value of the expression $ax^{11} + bx^7 + cx^5 + d$ for a given value of x . Your method must assume that a , b , c and d are double instance variables. `processPoly` must take the double x as its single parameter and return `false` if the value of the expression is negative and `true` otherwise. The value of the expression must be stored in the instance variable `value`.

Remember that the `Math.pow (x, y)` method calculates x^y .

```
public boolean processPoly (double x)
{
    value = a * Math.pow (x, 11) + b * Math.pow (x, 7) +
           c * Math.pow (x, 5) + d;
    if (value < 0)
    {
        return false;
    }
    return true;
}
```

[4]

- e) Write a method `isValid` to determine if a date is valid or not. Your method must take 2 integer parameters for the month and day and return a boolean result. Month values range from 1 to 12. Assume that the year is not a leap year. For example, 24/05 is valid but 29/02 is not.

Remember: "30 days hath September, April, June and November, all the rest have 31 except February ..."

```
public boolean isValid (int day, int month)
{
    switch (month)
    {
        case 9: case 4: case 6: case 11:
            if ((day >= 1) && (day <= 30))
                return true;
            break;
        case 2:
            if ((day >= 1) && (day <= 28))
                return true;
            break;
        case 1: case 3: case 5: case 7: case 8: case 10: case 12:
            if ((day >= 1) && (day <= 31))
                return true;
    }
    return false;
}
```

[5]

Section 2. Number Systems

Question 2. [10 marks]

- a) In the context of boolean algebra, state precisely how the XOR operator functions and draw a truth table for the operator.

XOR is true if exactly one parameter is true - otherwise it is false. [2]

Truth Table:

A	B	A XOR B
0	0	0
0	1	1
1	0	1
1	1	0

[1]

[3]

- b) Convert 17.625_{10} into its octal representation. Show full calculations and clearly indicate your final answer.

2	17		
2	8	r	1
2	4	r	0
2	2	r	0
2	1	r	0
0		r	1

Thus, $17_{10} = 10001_2$ [1]

$0.625 * 2 = 1.250$ Intpart = 1

$0.250 * 2 = 0.500$ Intpart = 0

$0.500 * 2 = 1.000$ Intpart = 1

Thus, $0.625_{10} = 0.101_2$ [1]

Thus, $23.125_{10} = 010001.101_2 = 21.5_8$ [1]

[3]

c) Write an algorithm to convert a positive whole binary number into decimal.

1. Let $p = 0$, $sum = 0$ [1]

2. For each digit d , starting with the lsb [1]

3. ... $sum = sum + d * 2^p$ [1]

4. ... $p++$ [1]

[4]