EXAMPLE PROGRAM CIRCLE CALCULATION REPORT

1. Requirements

To produce a program that calculates the circumference and area of a circle given its radius. Assume "PI" is equivalent to 3.14 and that the radius is input by the user as a floating point number. Area of a circle = PI × diameter = 2 × PI × radius and Volume = PI × radius^2.

2. Design

A top down analysis is presented in Table 1.

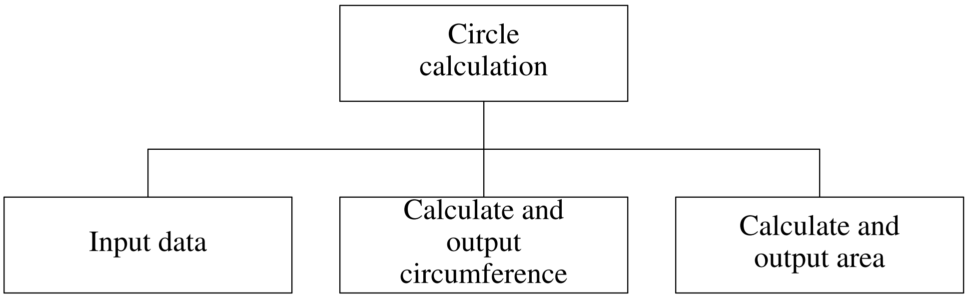

Table 1: *Top down analysis*

These operations are simple enough to be wrapped up into a single procedure:

1) `CIRCLE_CALC` (top level procedure): Input radius, and calculate and output circumference and area. Uses the following two data items.

NAME	DESCRIPTION	TYPE	VALUE/RANGE
PI	Global constant	FLOAT	3.14
RADIUS	Global input variable	FLOAT	Default

The detailed design for this procedure is given by the Nassi-Shneiderman chart presented in Table 2.

Input RADIUS
Calculate and output circumference
Calculate and output area

Table 2: *Nassi-Shneiderman Chart*

3. Implementation

Implementation is as shown in Table 3.

```
-- CIRCLE CALCULATION
-- 15 August 1997
-- Frans Coenen
-- Dept Computer Science, University of Liverpool

with CS_IO;
use CS_IO;

procedure CIRCLE_CALC is
        PI: constant FLOAT := 3.14;
        RADIUS: FLOAT;
begin
        PUT_LINE("Input radius: ");
        GET(RADIUS);
-- Calculate circumference using 2xPIxRadius
        PUT("The circumference is: ");
        put(2.0*PI*RADIUS,FORE => 3,AFT=>4,EXP =>0);
        NEW_LINE;
-- Calculate area using PIxRadius^2
        PUT("The area is: ");
        put(PI*RADIUS*RADIUS,FORE => 3,AFT=>4,EXP =>0);
        NEW_LINE;
end CIRCLE_CALC;
```

Table 3: *Implementation*

4. Testing

Arithmetic testing|fR: Test using positive, negative and zero input values for `Radius` as shown in Table 4.

TEST CASE	EXPECTED RESULT	
RADIUS	CIRCUMFERENCE	AREA
10.0	62.8000	314.0000
0.0	0.0000	0.0000
-10.0	-62.8000	314.0000

Table 4: *Test cases*

Note negative circumference? A screen dump illustrating the output produced as a result of running the above test cases is given in Table 5.

```
kuban-349 $ circle_calc
Input radius:
10.0
The circumference is:  62.8000
The area is: 314.0000

kuban-350 $ circle_calc
Input radius:
0.0
The circumference is:   0.0000
The area is:   0.0000

kuban-351 $ circle_calc
Input radius:
-10.0
The circumference is: -62.8000
The area is: 314.0000
```

Table 5: *Arithmetic test output*

Data validation testing: Test input with wrong type and too many inputs. Result shown in table 6.

```
kuban-289 $ circle_calc
Input radius:
x
Ada-runtime: Exception
FLOAT_INPUT_ERROR_DIGIT_NOT_READ
propagated out of main.

kuban-290 $ circle_calc
Input radius:
5.0 10.0
The circumference is:  31.4000
The area is:  78.5000
kuban-291 $ 10.0
ksh: 10.0:  not found
```

Table 6: *Data validation test output*