Problem Analysis and Specification

Consider the following problem:-

The course work assessment of a certain subject consists of a number of exercises (between 6 and 8).

A program is required to read in the number of exercises and the possible marks for each exercise which range from 10 to 100 and then read in the identification numbers and marks for each student. The program should output these details together with the total percentage mark (rounded up) and grading of each student. The grading is to be found from the following table

Percentage mark	*grade*
80 - 100	*1*
70 - 79	*2*
60 - 69	*3*
55 - 59	*4*
50 - 54	*5*
45 - 49	*6*
40 - 44	*7*
35 - 39	*8*
30 - 34	*9*
00 - 29	*10*

Any student who acheives grades 1 - 5 should have the word "PASS" printed at the end of their output record.

The number of students may vary and the end of the list will be indicated by the id_number 0. The average percentage mark for all students should be printed at the end.

It is vague and does not clearly state what is required of the software. It is referred to as a brief since it is a brief description of a problem. The first step in the undertaking of a software project is to specify precisely what a program is to do (its function) and how well it is to do it (its performance).

To make up a specification from a brief may require further meeting with a customer to present the possibilities available and to clarify their requirements. All necessary requirements for the software are gathered at this stage.

This will involve a detailed analysis of the system the program is to become part of, as well as a top-level analysis of the problem itself. The outcome of this stage will be a document called the *Software Specification*. This will be drawn up by a systems analyst and will be a precise and accurate description of the requirements for the software. It should satisfy the following points:-

- it is clear, unambiguous and written in a appropriate style
- it clearly indicates the required results
- all information requirements are fully described
- it takes full account of user requirements indicated in the brief.

The specification will be handed to a programmer or programming team. It will contain all information they need to know to develop and perfect a working software system. The specification is to do with what is **required** from the software, not how it is to do it.

Standard layout

The specification will be subdivided and presented in the following layout:-

Description of the problem

- what is the background of the problem?
- what is the system intended to do?

Inputs and their description

- what are the inputs?
- for each input:
  - where does it come from?
  - what is its type/format?
  - at what stage in a run is it input to the program?

  include appropriate input screen layouts

Outputs and their description

- what are the outputs?
- for each output:
  - what device(s) is it to appear on?
  - what is its structure/format to be?
  - at what stage in a run is it to be output?

  include appropriate output screen and print layouts

Other requirements

- are there any special requirements or constraints for the software?
- Is the program to interact with other software/systems
- validation of input data?
- error trapping?
- precision of numeric data
- appearance of textual data
- performance requirements etc.

Program Specification

Description of Problem

The course work assessment of a certain subject consists of a number of exercises (between 6 and 8).

A program is required to read in the number of exercises and the possible marks for each exercise which range from 10 to 100 and then read in the identification numbers and marks for each student. The program should output these details together with the total percentage mark (rounded up) and grading of each student. Any student who acheives grades 1 - 5 should have the word "PASS" printed at the end of their output record.

The number of students may vary and the end of the list will be indicated by the id_number 0. The average percentage mark for all students should be printed at the end.

Input (from the keyboard)

1. Number of exercises (6 to 8)
2. The possible marks for each exercise
3. For each student an id. number and their actual marks

Output (to the screen)

1. For each student:-
   - their actual marks in each subject
   - the possible marks in each subject
   - their total percentage mark
   - their grading

The output layout for each student will be

ID number: 56

	EX1	EX2	EX3	EX4	EX5	EX6	EX7	%	Grade
Actual	12	15	65	45	6	20	50	76	2
Possible	20	30	100	50	10	25	50	100	PASS

2. The average percentage mark for all students.

Other Requirements

- The input of all data is to be completed before the output of results.
- All percentage marks are to be rounded up.
- The grading is to be found from the following table

Percentage mark	grade
80 - 100	1
70 - 79	2
60 - 69	3
55 - 59	4
50 - 54	5
45 - 49	6
40 - 44	7
35 - 39	8
30 - 34	9
00 - 29	10

Example 2

Problem Brief

The SEDLC Mail Order Company wishes a program which will allow them to prepare invoices. The customer sends in an order form with their name and address, the item-code and item-name from the catalogue and the quantity required. Item codes, item-names and unit prices are held as data on the computer system. Given the data from the customer order form as input the program is to produce invoices each with

- the customers name and address
- the date
- descriptions of orders (upto 20) detailing:-
  Item Code Description Unit Price Quantity Total Item Price
- total price of the invoice, vat at 17.5% and total price plus vat
- the number of items ordered

Program Specification

Description of System

The SEDLC Mail Order Company wishes a program which will allow them to prepare invoices. A customer sends in an order form with their name and address, the item-code and item-name from the catalogue and the quantity required. Item codes, item-names and unit prices are held as data in a reference file on the computer system. Given the data from the customer order form as input the program is to produce 2 types of output: invoices for customers detailing their order(s), and a record of each transaction to be written to a transaction-file on disc.

Input Descriptions

Two types of input are necessary for the program:

1 customer orders to be input from the keyboard.
   - each customer order is input into a standard input screen presented to the user during a program run. The data required is:
     - date
     - customer name
     - customer address
     - for each item: item number (max 9999) and quantity required

2 catalogue details are held on a reference file which will be searched for the relevant entries after input of a customer order.
   - search key will be the item number.

Output Descriptions

Two types of output are to be generated:

1 invoices to be output to printer in a standard design (see attached) after input of a customer order. Each invoice will contain:
   - the customers name and address
   - the date
   - descriptions of orders (upto 20) detailing:-
     Item Code Description Unit Price Quantity Total Item Price
   - total price of the invoice, vat at 17.5% and total price plus vat
   - the number of items ordered

2 Details of customer order to be written to transaction file on disc at time of processing.

Record structure to be

date	alphanumeric
name	alphanumeric
address	alphanumeric
total plus vat	numeric
order details	list of records with structure
	item number: numeric
	unit price : numeric
	quantity : numeric

Processing Requirements

- item number in range 0001 to 9999
- Input of all numeric data to be validated
- Alphanumeric data to be capitalized
- suitable error messages and recovery to be implemented at time of error
- all money totals to be rounded up to nearest pence

Standard layout for invoices (printed on A4 sheet)

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                    SEDLC Mail Order Co.
Niklaus Wirth
14 Avenue Lois
Zurich 18/01/89

Item                           Unit                  Total
Code   Description             Price    Quantity    Item Price

02   RoseBush(Glenfiddich)   12.50        6         75.00
11   Spade                   13.00        1         13.00
37   GardenTable             37.00        1         37.00
38   Chair                   21.00        3         63.00
                                         Total     188.00
                                      17.5% vat     28.20
                               Total + 17.5% vat    216.20
                 Number of items ordered = 11
```