CONFIDENTIAL

Fakulti Komputeran

UNIVERSITI TEKNOLOGI MALAYSIA

PROBLEM SOLVING TEST

SEMESTER I 2016/2017

SUBJECT CODE	**: SCSJ1013**
SUBJECT NAME	**: PROGRAMMING TECHNIQUE I**
YEAR/COURSE	**: 1 (SCSJ / SCSV / SCSB / SCSR / SCSD)**
TIME	**: 2pm – 4pm**
DATE	**: 27 SEPTEMBER 2016**
VENUE	**: BK 1-6, N28**

INSTRUCTIONS TO THE STUDENTS:

THIS TEST BOOK CONSISTS OF 16 (SIXTEEN) PRINTED PAGES INCLUDING THIS PAGE

PART A: STRUCTURED QUESTIONS [65 Marks]

PART B: PROBLEM SOLVING [35 Marks]

Total [100 Marks]

ANSWER ALL QUESTIONS IN THIS QUESTION BOOKLET.

Name	
I/C No.	
Year/Course	
Section	
Lecturer Name	

PART A: STRUCTURED QUESTIONS

QUESTION 1 **[5 MARKS]**

Determine the output for each run of the pseudocode in **Figure 1** for the given input in **Table 1**.

```
1. Start
2. Read i
3. If (i > = 5)
   3.1  Start_If
      3.1.1   If (i > 10)
         3.1.1.1   Start_If
            3.1.1.1.1   j = i / 50 x 5
         3.1.1.2   End_If
      3.1.2  Else
         3.1.2.1   Start_If
            3.1.2.1.1   j = 50 / i x 5
         3.1.2.2   End_If
   3.2  End_If
4. Else
   4.1  Start_If
      4.1.1   j = 5 x i / 50
   4.2  End_If
5. Print j
6. End
```

Figure 1

Answer:

Table 1

Input, *i*	Output
3	
5	
8	
12	
10	

QUESTION 2 **[15 MARKS]**

The flowchart in **Figure 2** calculates the total amount for a reserved hotel room at a specified rate. Different types of tax (GST_TAX, SERVICE_TAX or HERITAGE_TAX) will be charged based on the hotel category. A discount will be given if the total amount is over than RM 500. Trace the algorithm based on the given input values in **Table 2** and determine the value of **`subtotal`** and **`totalPrice`** as well as the output of the flowchart for each run in the same table.

Answer:

Table 2

	Inputs					
No	**totalRoom**	**roomRate**	**hotelCategory**	**subtotal**	**totalPrice**	**Output**
i.	2	RM 75	B			
ii.	3	RM 150	H			
iii.	2	RM 320	S			
iv.	1	RM 230	S			
v.	0	RM 95	B			

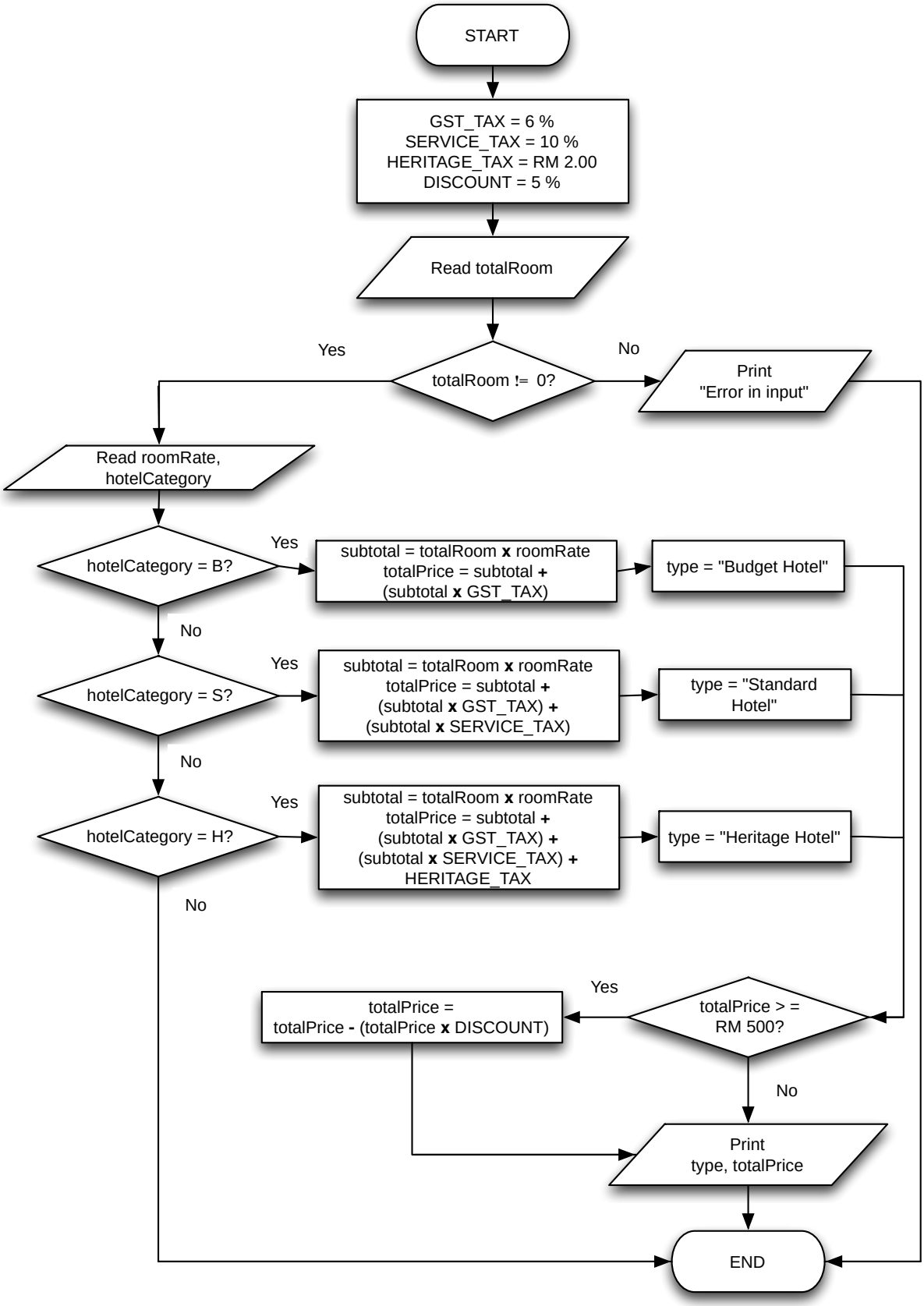
START
GST_TAX = 6 %
SERVICE_TAX = 10 %
HERITAGE_TAX = RM 2.00
DISCOUNT = 5 %
Read totalRoom
totalRoom != 0?
Yes
No
Print
"Error in input"
Read roomRate,
hotelCategory
hotelCategory = B?
Yes
subtotal = totalRoom x roomRate
totalPrice = subtotal +
(subtotal x GST_TAX)
type = "Budget Hotel"
No
hotelCategory = S?
Yes
subtotal = totalRoom x roomRate
totalPrice = subtotal +
(subtotal x GST_TAX) +
(subtotal x SERVICE_TAX)
type = "Standard
Hotel"
No
hotelCategory = H?
Yes
subtotal = totalRoom x roomRate
totalPrice = subtotal +
(subtotal x GST_TAX) +
(subtotal x SERVICE_TAX) +
HERITAGE_TAX
type = "Heritage Hotel"
No
totalPrice > =
RM 500?
Yes
totalPrice =
totalPrice - (totalPrice x DISCOUNT)
No
Print
type, totalPrice
END

Figure 2

QUESTION 3 **[9 MARKS]**

The purpose of the flowchart in **Figure 3** is to find the smallest and largest values for 20 percentage scores. Fill in the blank graphical symbols in **Figure 3** with appropriate instructions.

Answers:

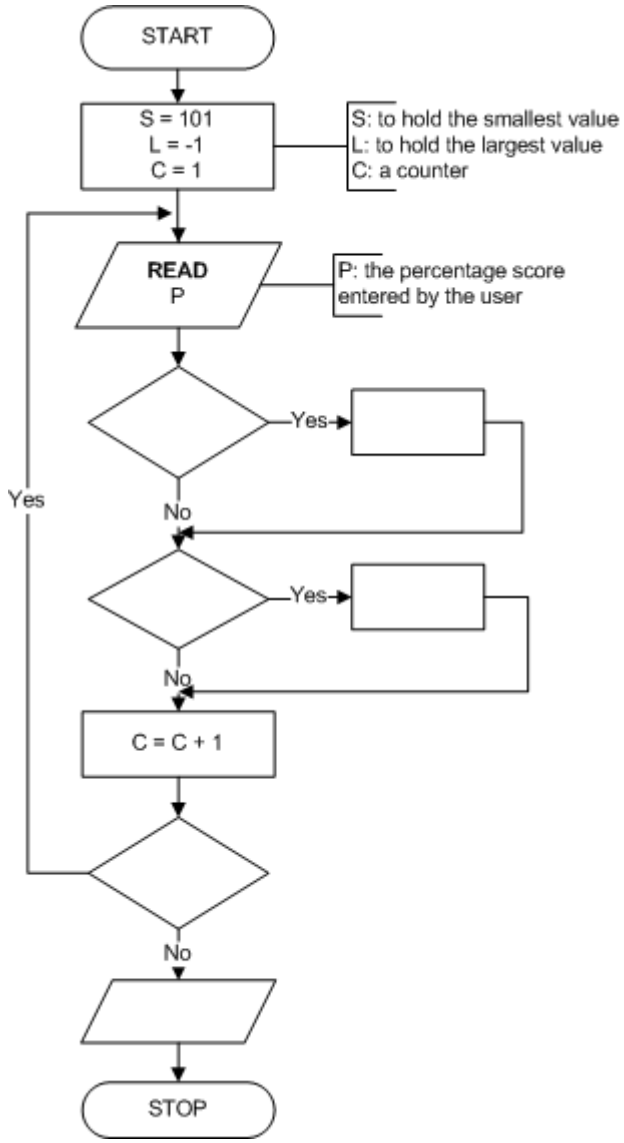

Figure 3

QUESTION 4 **[16 MARKS]**

a. Using a pre-test loop, design a flowchart in **Table 3**, to print the sum of numbers. The summation is based on how many numbers to be added determined from the user input. The sample output is as given in **Figure 4**. **(9 marks)**

b. Using a post-test loop, design a flowchart in **Table 4**, to print the sum of numbers. The summation is based on the sentinel value. **Figure 5** shows a sample output of the algorithm, where the sentinel value of "0" is used to end the loop. **(7 marks)**

```
How many numbers are to be added? 3
Enter a number? 10
Enter a number?  5
Enter a number?  2

The sum is 17
```

Figure 4

```
Enter a number, or "0" to end? 2
Enter a number, or "0" to end? 1
Enter a number, or "0" to end? 1
Enter a number, or "0" to end? 2
Enter a number, or "0" to end? 3
Enter a number, or "0" to end? 0

The sum is 9
```

Figure 5

Answers :

Table 3: Answer for Question 4(a)

Table 4: Answer for Question 4(b)

QUESTION 5 **[10 MARKS]**

Trace the execution of the flowchart in **Figure 6** and **Figure 7** by filling in the tracing tables in **Table 5** and **Table 6** accordingly.

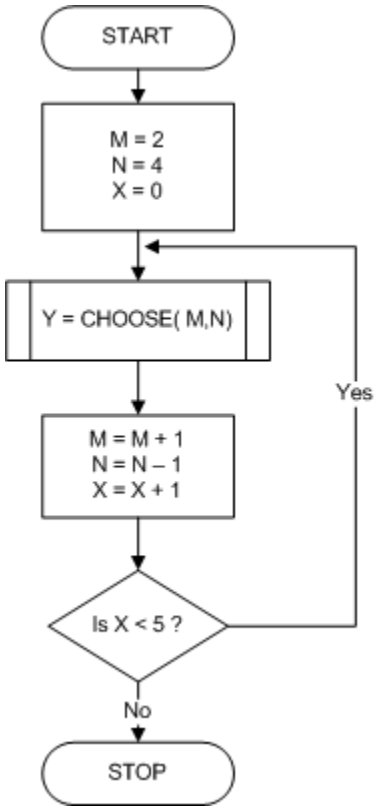

Figure 6

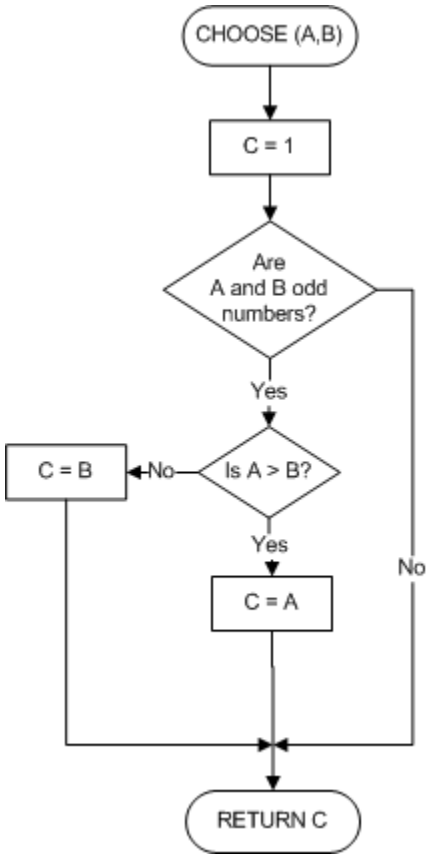

Figure 7

Answers:

Table 5

M	N	X	X<5?	Y

Table 6

A	B	C	A & B odd?	A>B?

QUESTION 6 **[10 MARKS]**

Suppose there is an algorithm to multiply the integers from *X* to *Y*, where *X* and *Y* are the starting and ending numbers specified by the user. Note that, *X* might be less than or equal to *Y*, or vice versa. **Table 7** shows the outputs of the algorithm for specified inputs.

Table 7

Input		Output
X	**Y**	
2	5	120 *(i.e., 2 x 3 x 4 x 5 = 120)*
5	5	5
9	7	504

The algorithm consists of two flowcharts, the main flowchart and a function flowchart named PRODUCT, as shown in **Figure 8 and Figure 9,** respectively**.** The purpose of the function PRODUCT is to perform the multiplication. Fill in the blank graphical symbols in **Figure 8** and **Figure 9** with appropriate instructions.

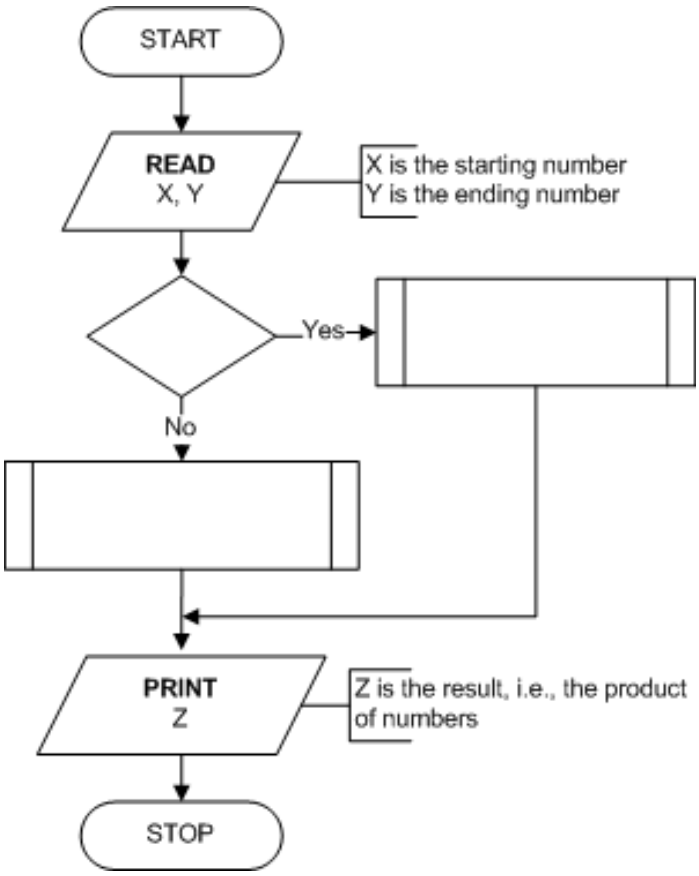

Figure 8

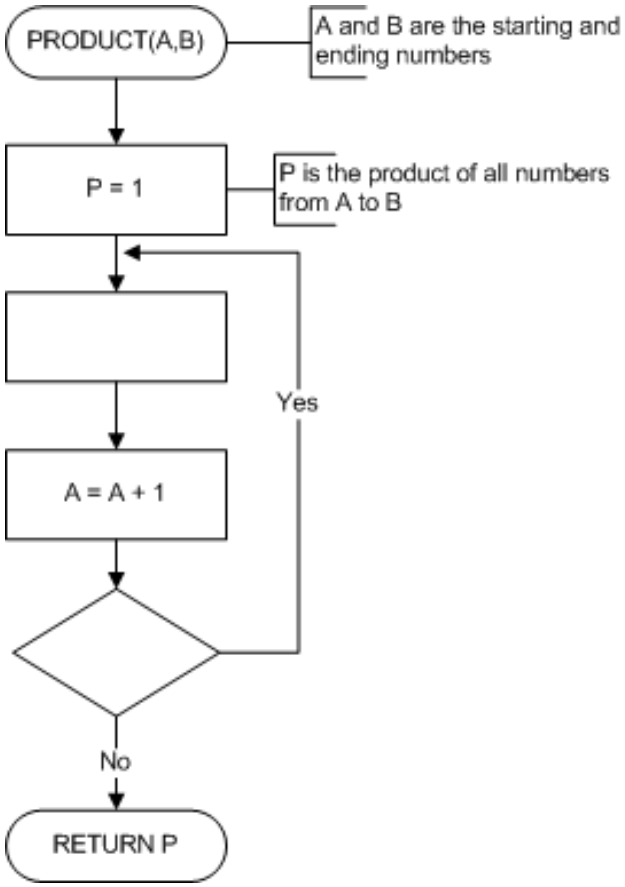
PRODUCT(A,B)
A and B are the starting and ending numbers
P = 1
P is the product of all numbers from A to B
Yes
A = A + 1
No
RETURN P

Figure 9

PART B: PROBLEM SOLVING QUESTION [35 MARKS]

Using flowcharts, design the algorithm for a software based on the problem given:

At the end of each semester, lecturers of a college are required to submit the results of their classes to the academic office. The grading for each course involves two assessments, i.e., 60% of coursework and 40% of examination. By far this tedious job has been done manually. Thus, a software that helps the lecturers to prepare their class result transcripts will be developed.

With this software, the lecturers only need to enter the following data:

- the course's and lecturer's names, and
- the list of students of the class, along with their coursework and examination scores.

The software will generate the result transcript with the following information:

- the individual performance for each student including the scores and the grade obtained by each student for the course,
- the overall performance for the class including the average, percentage and grades for each assessment items, and
- the course's and lecturer's names.

As for the overall performance for the class, the grade for each assessment item is determined based on the percentage score for the item. The percentage scores, for the coursework and examination, are calculated as follows:

$$PercentCoursework = \frac{AverageCoursework}{60} \text{ x } 100$$

$$PercentExam = \frac{AverageExam}{40} \text{ x } 100$$

where *AverageCoursework* and *AverageExam* are the average of raw scores for the coursework and examination, respectively.

Table 8 shows the grade based on percentage score. Whereas, **Figure 10** and **Figure 11** shows some examples of the result transcripts for different classes that can be generated by

the software. **Table 9** shows the overall requirements for the software and the specified marks.

Table 8

Grade	Score
A	80 – 100
B	70 – 79.9
C	55 – 69.9
D	45 – 54.9
E	0 – 44.9

Students Performance:

Student's Name	Coursework (60)	Exam (40)	Total (100)	Grade
ABDUL RAHMAN AKMAL	31	12	43	E
HAMID JALAL	49	27	76	B
MUHAMMAD ELIAS MUHAMMAD	40	32	72	B
NUR FATIHA KAMARUDDIN	45	28	73	B
NUR HAKIMAH MOHAMAD ZULHISYAM	47	14	61	C
OTHMAN KAMARUL	46	22	68	C
RAZALI ABU BAKAR	46	26	72	B
RINA ABDUL SALAM	38	33	71	B
SITI AMIRAH ZULKIFLI	39	13	52	D
ZULKAFLI ABDUL MALIK	44	31	75	B

Overall Class Performance:

	Coursework	Exam	Overall
Average	42.5	23.8	66.3
Percentage	70.8	59.5	66.3
Grade	B	C	C

Course: : ADVANCED COMPUTING
Lecturer: : PROF. DR. AHMAD BIN SUFIAN

Figure 10 : An example of class result transcript.

Example class result transcript 2

Students Performance:

Student's Name	Coursework (60)	Exam (40)	Total (100)	Grade
HAMIDAH MUHAMAD	50	36	86	A
MUHAMMAD SHAHRUL NIZAM FAZLAN	42	33	75	B
NUR AMALEENA HARUN	44	36	80	A
NUR HIDAYAH ABDUL HALIM	45	17	62	C
SITI NURHAZILA HUSSAIN	38	20	58	C
YAHYA MOHAMAD	39	34	73	B

Overall Class Performance:

	Coursework	Exam	Overall
Average	43.0	29.3	72.3
Percentage	71.7	73.3	72.3
Grade	B	B	B

Course: : FUNDAMENTAL OF COMPUTER PROGRAMMING
Lecturer: : DR. SITI AMINAH BINTI ABDUL RASHID

Figure 11: Another example of class result transcript

Table 9: Assessment Criteria

No	Criteria	Mark
	Overall	
(a)	Using appropriate notations and symbols	2.0
	Input	
(b)	Reading the course and lecturer names	1.0
(c)	Reading student's input: name, coursework score and exam score	1.0
	Output	
(d)	Printing student's info and result: name, coursework score, exam score, total score and the grade	1.0
(e)	Printing average score: coursework score, exam score and total	1.0
(f)	Printing percentage score: coursework score, exam score and total	1.0
(g)	Printing overall grade: coursework score, exam score and total	1.0
(h)	Printing class info: course and lecturer names	1.0
	Calculating the grade for each student	
(i)	Determining the total score	1.0
(j)	Determining the grade	2.0
	Calculating the overall result for the class	
(k)	Calculating the average scores: coursework, exam and the overall	9.0
(l)	Calculating the percentage scores: coursework, exam and the overall (using $PercentCoursework$ and $PercentExam$ formula)	3.0
(m)	Determining the grade for each item: coursework, exam and the overall	6.0
	Using an appropriate loop to handle the list of students	
(n)	Initialization	1.0
(o)	Condition	1.0
(p)	Update	1.0
(q)	Repetition and overall structure	2.0
	Total	**35.0**

Answers:

Answers: