OOM Lab 2

Convocation

Note:

- Each question must be implemented using inheritance. You must be able to find the best implementation of inheritance that is not indicated in the question. Similarly now you need to find out the number and architecture of classes to implement. It is advisable to spend time in the design before coding. No single function must have too much of code. Poor architectures shall be zeroed.
- No class attribute must be public. You may use getters and setters
- All class attributes and methods must have names that convey the work being done by them
- All class attributes and methods must have comments explaining what they do
- All classes must have necessary constructors
- There must be minimum code in the main function and main class. All codes must lie in the other classes.
- While you will make classes in the mechanism available as per your IDE, please pack all the classes in one file for submission to enable submission on the portal.

1. In an institute there are five types of courses:
   i. *Undergraduate* (UG)*:* Associated with a department only. A student will have a duration of registration (e.g. 4 years), a CGPA and number of credits earned.
   ii. *Postgraduate* (PG)*:* Associated with a department (e.g. IT) and a specialization (e.g. robotics). A student will have a duration of registration (e.g. 4 years), a CGPA, number of credits earned and a thesis area.
   iii. *Dual degree undergraduate and postgraduate* (UG+PG)*:* Associated with a department (e.g. IT) and specialization (e.g. robotics). A student will have a duration of registration (e.g. 4 years), a CGPA, number of credits earned, a thesis area, and year of conformation to postgraduation (e.g. 4^{th} year).
   iv. *Doctoral* (PhD)*:* Associated with just a thesis area, number of credits earned and a period of residency (e.g. 4 years)
   v. *Dual degree postgraduate and doctoral* (PG+PhD)*:* Associated with a department (e.g. IT) and a specialization (e.g. robotics). A student will have a duration of registration (e.g. 4 years), a CGPA, number of credits earned a thesis area and a year of migration to doctoral program (e.g. 2^{nd} year).

The minimum and maximum period of registration and credit requirements is given as follows:

S. No.	Course	Minimum Registration Period	Maximum Registration Period	Minimum Credits
i.	UG	4	7	185
ii.	PG	2	4	80
iii.	UG+PG	5	8	265
iv.	PhD	2	6	64
v.	PG+PhD	4	7	138

You are given the data for *n* students. A student is eligible for convocation if his/her period of registration is between the maximum and maximum limits, and his/her credits earned are more than the minimum limits. Print the list of eligible students for convocation in the same order as given in the input. For every student print the roll number, name (string), course of study, department (if applicable), specialization (if applicable) and CGPA.

Input Format

The first input is *T*, the number of test cases. Thereafter, for every test case the first input is *n*, the number of students. The input format is different for students of different types of courses.

   i. *UG:* The first input is the string UG, followed by roll number, name, department, period of registration, CGPA (integer) and credits earned.
   ii. *PG:* The first input is the string PG, followed by roll number, name, department, specialization, period of registration, CGPA (integer), credits earned and thesis area (string).

iii. *UG+PG*: The first input is the string UG+PG, followed by roll number, name, department, specialization, period of registration, CGPA (integer), credits earned, thesis area (string) and year of conformation to postgraduation.
iv. *PhD*: The first input is the string PhD, followed by roll number, name, period of registration, credits earned and thesis area (string).
v. PG+PhD: The first input is the string PG+PhD, followed by roll number, name, period of registration, CGPA (integer), credits earned, thesis area (string) and year of migration to doctoral program.

Output Format
For every test case, first print the number of graduating students and then a variable number of lines, each line printing the roll number, name, course of study, department (if applicable), specialization (if applicable) and CGPA of a student eligible for convocation.

Sample Input	**Sample Output**
1 9 PhD RSI2016001 Vaibhav 2 40 Tracking UG IIT2013037 Shiv IT 4 9 185 PG IRO2015001 Himanshu IT Robotics 2 9 70 Simulation PhD RS113 Anup 4 90 Humanoids PG+PhD PRO2014002 Venkat 4 8 75 Planning 2 UG IIT2014141 Abhishek IT 3 9 166 UG+PG IRM2013002 Utkarsh IT Robotics 4 10 195 robotics 4 PG IRO2015004 Naveen IT Robotics 2 8 80 RL UG+PG IRM2013015 Shubham IT Robotics 4 9 195 SLAM 4	3 IIT2013037 Shiv UG IT 9 RS113 Anup PhD IRO2015004 Naveen PG IT Robotics 8

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2. For question 1, consider that the input is instead the result of a number of subjects that a student registers for. Each course has a number of credits, student's attendance (including leave), and grade. A student passes a course if the grade is not "F" and the attendance is greater than or equal to 75. Round off the CGPA to integer before printing.

Input Format
The first input is *T*, the number of test cases. Thereafter, for every test case the first input is *n*, the number of students. The input format is different for students of different types of courses.
i. *UG:* The first input is the string UG, followed by roll number, name, department, period of registration.
ii. *PG:* The first input is the string PG, followed by roll number, name, department, specialization, period of registration and thesis area (string).
iii. *UG+PG*: The first input is the string UG+PG, followed by roll number, name, department, specialization, period of registration, thesis area (string) and year of conformation to postgraduation.
iv. *PhD*: The first input is the string PhD, followed by roll number, name, period of registration and thesis area (string).
v. PG+PhD: The first input is the string PG+PhD, followed by roll number, name, period of registration, thesis area (string) and year of migration to doctoral program.

After all the inputs, the next input is *m*, the number of results available. Each line starts with a course code, number of credits against the course, roll number of student, attendance (integer) and grade. A student cannot appear in the same course again, if he/she passes and this is validated in the inputs given.

Output Format
For every test case, a variable number of lines, each line printing the roll number, name, course of study, department (if applicable), specialization (if applicable) and CGPA of a student eligible for convocation.

Input	**Output**
1 4 UG IIT2013037 Shiv IT 4 PG IRO2015001 Himanshu IT Robotics 2 Simulation PhD RS113 Anup 4 Humanoids PG+PhD PRO2014002 Venkat 4 8 75 Planning 2 17 IOOM332C 40 IIT2013037 80 F IAAP113C 20 IRO2015001 60 A+ IOOM332C 40 IIT2013037 95 A IMFR140C 10 IRO2015001 90 B+ IAAP113C 20 RS113 80 A+ ITOC330C 40 IIT2013037 78 A+ IMIT140C 20 IRO2015001 80 A+ ITOC330C 40 IIT2013037 88 F IAAP113C 20 IRO2015001 80 A+ EMIP332C 40 IIT2013037 89 B ICSE140C 10 IRO2015001 80 A IMIT140C 20 RS113 80 F IMIT140C 20 RS113 80 A IOPS332C 40 IIT2013037 94 A+ ICSE140C 10 RS113 80 B SMAT330C 40 IIT2013037 90 B IMFR140C 20 RS113 90 B+	2 IIT2013037 Shiv UG IT 9 RS113 Anup PhD **Explanation** **IIT2013037 Passed Subjects:** SMAT330C 40 B (7) IOOM332C 40 A (9) IOPS332C 40 A+ (10) EMIP332C 40 B (7) ITOC330C 40 A+ (10) **Total Credits: 200 (≥185)** **CGPA: (40*7+40*9+40*10+40*7+40*10)/200=8.6 (9)** **IRO2015001 Passed Subjects:** IMIT140C 20 A+ (10) IAAP113C 20 A+ (10) ICSE140C 10 A (9) IMFR140C 10 B+ (8) **Total Credits: 60 (<80)** **CGPA: (20*10+20*10+10*9+10*8)/60=9.5 (10)** **RS113 Passed Subjects:** IAAP113C 20 A+ (10) IMIT140C 20 A (9) ICSE140C 10 B (7) IMFR140C 20 B+ (8) **Total Credits: 70 (≥64)** **CGPA: (20*10+20*9+10*7+20*8)/70=8.71 (9)**

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3. For the above question, consider that there are four type of courses:

i. *Theory:* Marks are given for mid-sem, end-sem, assignment, quiz, internal assessment and attendance. Total of all marks is taken. 40% is the passing marks.
ii. *Lab*: Marks are given for mid-sem, end-sem, viva, attendance and continuous assessment. Total of all marks is taken. In order to pass a student must get 40% overall marks and non-zero marks in mid-sem and end-sem combined.
iii. *Project*: Marks are given by supervisor's marks, and marks for each panelist in mid-sem and end-sem. The total is supervisor's marks (on a scale of 25), average marks for all panelists in mid-sem (on a scale of 19) and average marks for all panelists in end-sem (on a scale of 56). To pass a student must score at least 50% marks by the supervisor and at least 50% marks by the panel with mid-sem and end-sem combined.

In the above question, instead of the CGPA print the weighted addition of percentage (weighted by credits).

Input Format:
The first part of the input format is common as per the last question.

The next input is *m*, the number of results available. The format depends upon the type of course:

i. Theory: The first input is the string T, followed by course code, number of credits against the course, roll number of student, attendance (integer), marks in mid-sem, end-sem, assignment, quiz, internal assessment and attendance.
ii. Lab: The first input is the string L, followed by course code, number of credits against the course, roll number of student, attendance (integer), marks in mid-sem, end-sem, viva, attendance and continuous assessment.
iii. Project: The first input is the string P, followed by course code, number of credits against the course, roll number of student, marks by supervisor, number of panelists (p), followed by p integers denoting marks of each panelist in mid-sem, followed by p integers denoting marks of each panelist in end-sem.

Each line starts with a course code, number of credits against the course, roll number of student, attendance (integer) and grade. A student cannot appear in the same course again, if he/she passes and this is validated in the inputs given.

Output Format

Same as previously, with the CGPA replaced by rounded of percentage (integer). Additionally, after every student print the list of courses passed **in ascending order**.

Sample Input

1
4
UG IIT2013037 Shiv IT 4
PG IRO2015001 Himanshu IT Robotics 2 Simulation
PhD RS113 Anup 4 Humanoids
PG+PhD PRO2014002 Venkat 4 8 75 Planning 2 22
T IOOM332C 25 IIT2013037 80 5 10 5 3 0 10
T IOOM332C 25 IIT2013037 80 25 60 10 10 5 8
T IAAP113C 10 IRO2015001 80 28 65 13 8 5 8
T IAAP113C 10 RS113 80 10 25 10 12 5 8
L IOPS332LC 25 IIT2013037 95 0 0 20 10 15
T IMFR140C 10 IRO2015001 90 25 55 8 12 4 9
T IMIT140C 20 RS113 80 15 67 10 12 4 8
T IMIT140C 20 IRO2015001 80 10 40 10 12 4 8
T ICSE140C 10 RS113 80 20 40 10 12 4 8
L IOPS332LC 25 IIT2013037 95 0 20 15 10 15
T SMAT330C 25 IIT2013037 90 28 55 8 12 4 9
L IAAP113LC 10 IRO2015001 76 10 10 5 0 7
L IAAP113LC 10 RS113 80 15 30 8 10 8
P IPRJ306C 50 IIT2013037 23 3 10 12 13 54 55 50
L IOOM332LC 25 IIT2013037 85 5 30 10 9 10
T ITOC330C 25 IIT2013037 98 12 45 10 4 3 10
L IAAP113LC 10 IRO2015001 80 15 10 10 5 8
T SMAT140C 20 RS113 80 15 25 14 15 3 8
T IAAP113C 10 IRO2015001 60 25 60 10 10 5 0
T ICSE140C 10 IRO2015001 80 10 25 10 15 5 8
T IOPS332C 25 IIT2013037 87 22 67 12 12 3 9
P IPRJ312C 20 RS113 25 2 18 16 54 52

Sample Output

2
IIT2013037 Shiv UG IT 74
IOOM332C IOPS332C SMAT330C IPRJ306C IOOM332LC ITOC330C IOPS332LC
RS113 Anup PhD
IAAP113C SMAT140C ICSE140C IAAP113LC IMIT140C IPRJ312C

Explanation

IIT2013037
~~T IOOM332C 25 80 **5 10 5 3 0 10** (Total 33/150=22%) FAIL~~
T IOOM332C 25 80 **25 60 10 10 5 8** (Total 118/150=78.67%) – PASS
T SMAT330C 25 90 **28 55 8 12 4 9** (Total 116/150=77.33%) - PASS
T IOPS332C 25 87 **22 67 12 12 3 9** (Total 125/150=83.33%) - PASS
T ITOC330C 25 98 **12 45 10 4 3 10** (Total 84/150=56%) - PASS

L IOOM332LC 25 85 **5 30 10 9 10** (Total 64/100=64%) - PASS
~~L IOPS332LC 25 95 **0 0 20 10 15** (Total 45/100=45%) FAIL (0 in mid and end)~~
L IOPS332LC 25 95 **0 20 15 10 15** (Total 60/100=60%) - PASS

P IPRJ306C 50 **23** 3 **10 12 13 54 55 50** (Total 23+(10+12+13)/3+(54+55+50)/3=87.67/100)

Total Credits: 200 (≥185)
CGPA:
(25*118/150+25*116/150+25*125/150+25*84/150+25*64/100+25*60/100+50*87.67/100)/200*100 = 74.33

IRO2015001
~~T IAAP113C 10 60 **25 60 10 10 5 0 (Total 110/150=73.33%) FAIL (Attendance)**~~
T IAAP113C 10 80 **28 65 13 8 5 8 (Total 127/150=84.66%) - PASS**
T IMIT140C 20 80 **10 40 10 12 4 8 (Total 84/150=56%) - PASS**
T ICSE140C 10 80 **10 25 10 15 5 8 (Total 73/150=48.67%) - PASS**
T IMFR140C 10 90 **25 55 8 12 4 9 (Total 113/150=75.33%) - PASS**

	~~L IAAP113LC 10 76 **10 10 5 0 7 (Total 32/100=32%) - FAIL**~~ L IAAP113LC 10 80 **15 10 10 5 8 (Total 48/100=48%) - PASS** **Total Credits: 60 (<80)** **RS113** T IAAP113C 10 80 **10 25 10 12 5 8 (Total 70/150=46.67%) - PASS** T IMIT140C 20 80 **15 67 10 12 4 8 (Total 116/150=77.33%) - PASS** T SMAT140C 20 80 **15 25 14 15 3 8 (Total 80/150=53.33%) - PASS** T ICSE140C 10 80 **20 40 10 12 4 8 (Total 94/150=62.67%) – PASS** L IAAP113LC 10 80 **15 30 8 10 8 (Total 71/100=71%) - PASS** P IPRJ312C 20 **25** 2 **18 16 54 52 (Total 25+(18+16)/2+(54+52)/2=95/100=95%) - PASS** **Total Credits: 90 (≥64)**