Advanced Programming
Tutorial -2

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Topics: Identifying Classes and Objects, and Relationships Between Classes

Exercise - Identify Classes, Instance variables, Methods and Relationships

We at IIITD have many courses. Each course has an instructor/professor, a few TAs and lots of students. A student is required to have a minimum attendance. The attendance is taken using a biometric machine. The instructor designs a problem statement for lab each week. Each student writes the solution for the problem and submits it on classroom page. Finally, the TAs run a plagiarism check on the solution and evaluate the same for each student.

A student passes the course if he achieves the following thresholds:
Learning > 0.4 * Number of Classes
Attendance > 0.75 * Number of Classes
Labs > 0.6 * Number of Labs

Further Details

Each course has one professor and a professor cannot take any other courses.
Each course has a few TAs and each TA can only teach in one course.
Students can take various courses.
TA is a special type of student with added responsibilities.
Two classes and one lab is held for each course each week.
A student attends the class with some probability (0.8 in our case)
If a student attends the class, He learns something. Denoted by a value between (0, 1)
The lab submitted by a student is correct by some probability (0.8 in our case)
The institute has only one attendance machine which is shared by each course.
Each lab is evaluated by one TA and TAs shift in a round-robin manner.

Solution

Course - String course_name, Professor professor, TeachingAssistant[] teachingAssistants, Student[] students, AttendanceMachine attendanceMachine, HashMap<Student, Integer> labScores, circulate_attendance_machine(), simulate_week(), calculate_final_grades()

Professor - String Name, String Course_Name, teachClass(), makeLabAssignments(Lab)

Student - String name, String/Int Roll Number, HashMap<String, Double> course_learning, attendClass(class_name, attendanceMachine), submitLab(Lab)
Teaching Assistant - String course_TA, evaluateLab(Lab, Student[] students)

Attendance Machine - attendance_data, takeAttendance(course_name, student), getAttendance(course_name, student)

Relationships

Course → Professor (Composition)
Course → Student (Association)
Course → Teaching Assistant (Composition)
Professor, Student (Association)
Professor, Teaching Assistant (Association)
Teaching Assistant, Student (Association)

Course, Attendance Machine (Dependency)
Student, Attendance Machine (Dependency)

Course → Lab (Composition)
Professor, Lab (Dependency)
Teaching Assistant, Lab (Dependency)
Student, Lab (Dependency)

Command Prompt

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Lecture 2
Professor Dr. Vivek Kumar takes class for Advanced Programming
a (1) present, Learning: 0.37303866738947455
b (2) present, Learning: 0.8650839234650913
c (3) present, Learning: 0.7865712076703607
d (4) present, Learning: 0.9229045995429068
e (5) absent
f (6) present, Learning: 0.9301472632057828
g (7) absent
h (8) present, Learning: 0.002770645939129901
i (9) present, Learning: 0.5941882270742127
j (10) absent

WEEK 12
Lecture 1
Professor Dr. Vish Visweswaran takes class for Computer Organization
a (1) present, Learning: 0.10445532490094167
b (2) present, Learning: 0.28200235907722093
c (3) present, Learning: 0.8223430998754324
d (4) absent
e (5) present, Learning: 0.0031733171313084174
f (6) present, Learning: 0.02372796838795288
g (7) present, Learning: 0.6953699239534352
h (8) absent
i (9) absent
j (10) present, Learning: 0.6829728323610147

Lab
Professor Dr. Vish Visweswaran makes the lab assignment
a (1) submits the lab assignment
b (2) submits the lab assignment
c (3) submits the lab assignment
d (4) submits the lab assignment
e (5) submits the lab assignment
```

Command Prompt

```
j (10) absent

WEEK 13
Lecture 1
Professor Dr. Vish Visweswaran takes class for Computer Organization
a (1) present, Learning: 0.5024130019446633
b (2) present, Learning: 0.4980748724523165
c (3) present, Learning: 0.7918707376049651
d (4) present, Learning: 0.6363461796337453
e (5) present, Learning: 0.21365580970038112
f (6) present, Learning: 0.7986844904249754
g (7) present, Learning: 0.9356897090820446
h (8) present, Learning: 0.9560332460742471
i (9) present, Learning: 0.20513185962154779
j (10) present, Learning: 0.1189994815179859

Lab
Professor Dr. Vish Visweswaran makes the lab assignment
a (1) submits the lab assignment
b (2) submits the lab assignment
c (3) submits the lab assignment
d (4) submits the lab assignment
e (5) submits the lab assignment
f (6) submits the lab assignment
g (7) submits the lab assignment
h (8) submits the lab assignment
i (9) submits the lab assignment
j (10) submits the lab assignment
TA Assigned for the lab: F (16)
F (16) evaluating lab for a (1). Result: SUCCESS
F (16) evaluating lab for b (2). Result: SUCCESS
F (16) evaluating lab for c (3). Result: SUCCESS
F (16) evaluating lab for d (4). Result: FAILURE
F (16) evaluating lab for e (5). Result: SUCCESS
F (16) evaluating lab for f (6). Result: SUCCESS
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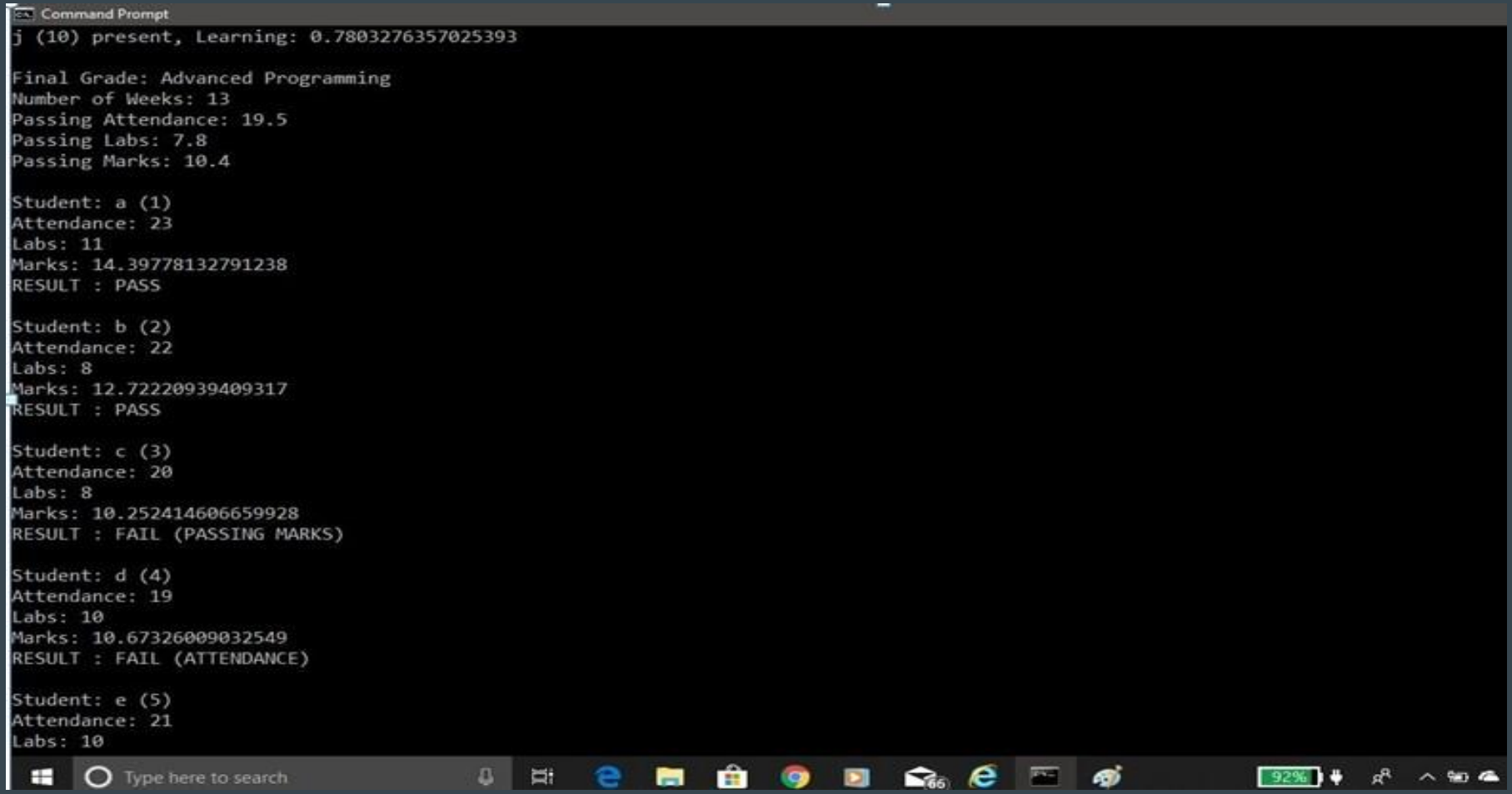
Command Prompt
j (10) present, Learning: 0.7803276357025393
Final Grade: Advanced Programming
Number of Weeks: 13
Passing Attendance: 19.5
Passing Labs: 7.8
Passing Marks: 10.4
Student: a (1)
Attendance: 23
Labs: 11
Marks: 14.39778132791238
RESULT : PASS
Student: b (2)
Attendance: 22
Labs: 8
Marks: 12.72220939409317
RESULT : PASS
Student: c (3)
Attendance: 20
Labs: 8
Marks: 10.252414606659928
RESULT : FAIL (PASSING MARKS)
Student: d (4)
Attendance: 19
Labs: 10
Marks: 10.67326009032549
RESULT : FAIL (ATTENDANCE)
Student: e (5)
Attendance: 21
Labs: 10
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