



Polytechnic Tutoring Center

Midterm 2 REVIEW – CS1133, Spring 2021

Disclaimer: This mock exam is only for practice. It was made by tutors in the Polytechnic Tutoring Center and is not representative of the actual exam given by the Academic Department.

Question 1

A professor has the following matrix of exam grades for a particular class. Each row corresponds to a student. Each column corresponds to an exam.

```
GRADES = [ 61   18   16   6   9   66   45
           62   24   98   68  82   52   43
           86   89   71    4   82   98   83
           81    2   50    7   72   65    8
           58   49   47   52   15   80   13 ] ;
```

The professor wants to replace each student's lowest score with the average of all the other scores the student received rounded up to the nearest whole number (so if the average is 86.3, the lowest score should be replaced with an 87). If a grade is below 20, the grade should not be considered in the average used to determine the replacement for the lowest exam grade. If a student scores below 20 on three exams or more, the professor will not replace any of their grades.

Given the GRADES matrix, write a program which allows the professor to determine the above information for all of the students at once. You may NOT use vectorized operations.

You must have an output display. The output display for each student should depend on whether the student scored below 20 on three or more exams. You should also display the updated GRADES matrix, with all the applicable grades replaced. The correct output display for the matrix given above is shown below.

The original grades are:

61	18	16	6	9	66	45
62	24	98	68	82	52	43
86	89	71	4	82	98	83
81	2	50	7	72	65	8
58	49	47	52	15	80	13

Information for student 1:

There were too many bad grades.

Information for student 2:

The lowest grade is 24. It was for exam 2.
It should be replaced with 62.

Information for student 3:
The lowest grade is 4. It was for exam 4.
It should be replaced with 85.

Information for student 4:
There were too many bad grades.

Information for student 5:
The lowest grade is 13. It was for exam 7.
It should be replaced with 58.

The new grades are:

61	18	16	6	9	66	45
62	62	98	68	82	52	43
86	89	71	85	82	98	83
81	2	50	7	72	65	8
58	49	47	52	15	80	58

Question 2

Two cards are drawn with replacement from a standard 52 card deck (i.e. the first card is put back into the deck before the next card is drawn). Run a simulation to approximate the probability that the first card is a queen and the second card is a face card. You may use vectorized operations.

Note that a standard card deck contains 4 queens and 12 face cards in total. Queens are face cards.

For reference, the probability of this event can be calculated numerically as follows, where $P(A)$ represents the probability that the first card is a queen and $P(B)$ represents the probability that the second card is a face card.

$$P(A \text{ and } B) = \frac{4}{52} \times \frac{12}{52} = \frac{3}{169} \approx 0.0178$$

Extra Practice

A basketball player shoots free throws in order to improve their shooting form. If the player misses a shot three consecutive times, they stop shooting out of frustration. The player has a 60% chance of making any given shot.

Simulate the situation to determine the chance that the player will take 10 or more shots before giving up. You should also determine the average number of shots taken across trials. You may NOT use vectorized operations.

Your program should produce the following output display.

The player took an average of 9.8 shots.

The probability that the player will take more than 10 shots before stopping is 0.7.