

# CS19101 PROGRAMMING AND DATA STRUCTURES LABORATORY

## Assignment 3

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**Problem 1.** A circle in the XY-coordinate system is specified by the center coordinates (x, y) and radius (r). Read the values for 2 circles- x1, y1, r1 for C1 and x2, y2, r2 for C2.

- a. The first task is to determine whether the 2 circles intersect. To solve the problem it suffices to check if the distance between the 2 centers is lesser than the sum of radii of the 2 circles.
- b. The second task is to find the smallest circle that encloses the two circles and return its center coordinates and radius.

**Problem 2.** A triangle in the XY-coordinate system is specified by the coordinates (x, y) of the three vertices. Read the three vertex coordinates- (x1, y1), (x2, y2), (x3, y3). The task is to determine whether the triangle is **isosceles or equilateral or neither**. In case the triangle is isosceles, the program should return the two sides that are of equal length.

**Problem 3.** The finance department of a company has decided to calculate the gross salary of its employees from their basic salary and age based on the following conditions:

- a. Basic Salary  $\leq$  10000, Age  $\leq$  35 : HRA = 20%, DA = 75%
- b. Basic Salary  $\leq$  10000, Age  $>$  35 and  $\leq$  45 : HRA = 20%, DA = 80%
- c. Basic Salary  $\leq$  10000, Age  $>$  45 : HRA = 25%, DA = 85%
- d. Basic Salary  $>$  10000 and  $\leq$  20000, Age  $\leq$  45 : HRA = 25%, DA = 80%
- e. Basic Salary  $>$  10000 and  $\leq$  20000, Age  $>$  45 : HRA = 25%, DA = 90%
- f. Basic Salary  $>$  20000 : HRA = 30%, DA = 90%

Gross salary is calculated as:

$$\text{Gross salary} = \text{Basic salary} + (\text{HRA} * \text{Basic salary}) + (\text{DA} * \text{Basic salary})$$

Read the values of the basic salary and age of an employee. The task is to calculate the gross salary based on the above conditions.

**Problem 4.** Solve this question using switch-case statements. Read a two-digit integer within the range 20 - 99. The task is to print the number in English words. Also, check if the input is valid, and print “Invalid input” in such cases.

**Problem 5.** The entrance examination for admissions into a certain University follows certain guidelines:

- a. Marks in qualifying examination should be  $\geq 50\%$  ( $\geq 5.5/ 10$ )
- b. Students securing **EX and A grades** in the entrance examination are selected for admission
- c. Students securing **B and C grades** in the entrance examination are shortlisted for an interview process
- d. Students securing **D and P grades** in the entrance examination are shortlisted for a second phase examination followed by an interview
- e. Students securing **F grade** are not selected

The following tasks thus need to be completed to automate the problem:

- Read the name and application number of a student.
- Read the marks attained in qualifying examination and maximum marks in the qualifying examination (10 or 100). Display “Allowed to sit for the examination” or “Not allowed to sit for the examination” according to the criteria given. Also, display “Invalid maximum marks” in case maximum marks is entered other than 10 or 100. Exit from the program in case of “Not allowed...” or “Invalid...”.
- Either Absolute or Relative marking system can be used. Read input from the user where **0 signifies Absolute marking** and **1 signifies Relative marking**. Display “Invalid input” and escape in case of any other entry.
- For Absolute grading, the limits are: EX  $\geq 90$ , A  $\geq 80$ , B  $\geq 70$ , C  $\geq 60$ , D  $\geq 50$ , P  $\geq 40$  or F  $< 40$ . For Relative grading, read the 6 cut-offs and check their validity (cut-off for A  $>$  cut-off for B). Display “Invalid input” and escape otherwise.
- Read the marks obtained in the entrance examination. Display the resulting grade using the grading system specified, also display the grading system specified.
- Display the result following the guidelines above.