Data Structures and Practice #3

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| **Topic** | Structure and Union |
| **Learning Objective** | You can solve the problems by applying the concepts of struct and union.  With multiple cases, you can be more familiar with struct and union |
| **Problem 1**  **(10)** | A complex number is represented as a form of *a*+*bi*, where *a* is called real part, *b* is imaginary part.  Following program is a program that adds two input complex numbers. Complete the function **add()** that adds two complex numbers.  **#include <stdio.h>**  **typedef struct complex {**  **float real;**  **float imag;**  **}complex;**  **complex add(complex n1,complex n2);**  **int main() {**  **complex n1,n2,temp;**  **printf("For 1st complex number \n");**  **printf("Enter real and imaginary respectively: \n");**  **scanf("%f%f",&n1.real,&n1.imag);**  **printf(" \nFor 2nd complex number \n");**  **printf("Enter real and imaginary respectively: \n");**  **scanf("%f%f",&n2.real,&n2.imag);**  **temp=add(n1,n2);**  **printf("Sum=%.1f+%.1f \n",temp.real,temp.imag);**  **return 0;**  **}**  **complex add(complex n1,complex n2)**  **{**  complex temp;  temp.real = n1.real+n2.real;  temp.imag = n1.imag+n2.imag;  return temp;  **}** |
| **Problem 2**  **(10)** | **[find the equation for a straight line, y=ax+b]**  1) If you know two points on the straight line like A(x1, y1) and B(x2, y2), you can find the slope like the following:  a = (y2-y1)/(x2-x1)  2) A straight line equation satisfies the following condition when the slope of the line is a and it passes (x1, y1)  y-y1=a(x-x1) |
| **#include <stdio.h>**  **typedef struct {**  double x, y;  **} pointType;**  **int get\_line\_parameter(pointType p1, pointType p2, float \*slope, float \*yintercept)**  /\* find the slope and intercept of the equation for the straight line that passes p1 and p2 \*/  **{**  **if ( p1.x == p2.x )**  /\* fill with the code to detect the situation that it is impossible to calculate the slope \*/  **{**  **return -1;**  **}**  **else** /\* fill with the code that calculates the slope and the intercept \*/  **{**  **\*slope = (p2.y-p1.y)/(p2.x-p1.x);**  **\*yintercept = p1.y -(\*slope)\*p1.x;**  **return 0;**  **}**  **}**  **main ()**  **{**  **pointType pt1; pointType pt2;**  /\* fill with the code to assign values to pt1 and pt2 \*/  printf(“Please enter the first coordinates: “);  scanf(“%lf %lf”, &p1.x, &p1.y);  printf (“Please enter the second coordinates: “);  scanf(“%lf %lf”, &p2.x, &p2.y);  **float s; float y;**  **if (get\_line\_parameter(pt1, pt2, &s, &y) == -1) {**  **printf("error \n");**  **} else {**  **printf("slope=%f, y-intercept=%f \n", s, y);**  **}**  **return;**  **}** |
| **Problem3**  **(20)** | **#include <stdio.h>**  **typedef union Job {**  **char name[32];**  **float salary;**  **int worker\_no;**  **} Job;**  **int main() {**  **Job u;**  **printf("Enter name: \n"); scanf("%s",&u.name);**  **printf("Enter salary: \n"); scanf("%f",&u.salary);**  **printf("Displaying \nName :%s \n",u.name); /\* ① \*/**  **printf("Salary: %.1f",u.salary);**  **return 0;**  **}**  1) Show what output ① will produce when the user inputs “Mike” and 82738495. Why do you think so?  [Answer]  1 is not Mike. Because u get the char type first and second is get salary the float type.  So when you try to print the char type, an error occurs. This is because the salary of float type interfered with the memory of char type  2) How many bytes will be allocated for u in the main memory? Why do you think so?  [Answer]  allocated u 32byte. Because The memory size of Union is the same as the largest.  Int is 4byte float is 4byte name[32] is 32 byte. So we allocated u 32byte. |
| **Problem 4**  **(20)** | We can categorize the online shopping mall customers into two types: consumer who buy things and seller who sells things. To manage the information of the customers, we need name and phone number for all types of customers. However, for consumers we just need the record of purchase. For sellers, we need just record of sales. Define your own data structure for customer information management using **struct** and **union**.  [Answer]  Typedef struct Customer{  char name [30];  char phone [15];  union{  int purchase;  int sales;  } record;  } customer; |
| **Problem 5**  **(40)** | Let’s assume that the players in a baseball team are categorized into two types: pitcher and batter. To manage the player information, we need name and count of games, and back number for all types of player. However, for pitchers, we just need the record of ERA (earned run average). For batters, we need just record of BA (batting average). Define your own data structure for baseball player information management using **struct** and **union**.  Develop a program that prints out the name of pitcher with the highest ERA and that of batter with the highest BA. The users input the records of five pitchers and five batters.  1) Design the structure of your program with flow chart or pseudo code.  [Answer]  typedef struct player{  int count;  int back;  char name [20];  union{  double ERA;  double BA;  } record;  } player;  2) Develop your code following the design. Upload your code to the e-class.  Typedef struct player{  int count;  int back;  char name [20];  union{  double ERA;  double BA;  } record;  } player;  int main()  {  float sum = 0;  float max = 0;  float ma = 0;  int n, t;  } |
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