---

Q1 Fill in the blank below so that the following recursive function computes the integer division a / b by using the formula ⌊a/b⌋ = ⌊(a-b)/b⌋ + 1. Assume that a is a non-negative integer, and b is a positive integer. You are not permitted to use the operators *, / and %.

```
int intdiv ( int a, int b )
{
   if (a < b) return 0;
   return __________ ;
}
```

---

ANS: 1 + intdiv(a-b,b)

---

Q2 The following recursive function accepts a character array A of size n. Fill in the blank to complete the code so that the function, when called with A = "PDS 2021" and n = 8, changes A to "1202 SDP".

```
void strFunc (char *A, int n)
{
   char t;

   if (n <= 1) return;

   t = A[0];
   A[0] = A[n-1];
   A[n-1] = t;

   strFunc ( __________ );
}
```

---

ANS:

```
   &A[1], n - 2
```

or

```
   A + 1, n - 2
```

---

Q3 A function f() is defined as follows.

$f(0) = f(1) = 2;$
$f(n) = f(n+1) - f(n-1)$ for $n \geqslant 1$.

Complete the code of the following recursive function to compute f(n). Assume that n is non-negative.

```
int f ( int n )
{
   if ((n == 0) || (n == 1)) return 2;
   return __________ ;
}
```

---

ANS: f(n-1) + f(n-2)

---

Q4 Let A be an n x n matrix with entries $a_{ij}$. We want to write A as a matrix sum A = B + C, where the elements of B satisfy $b_{ij} = b_{ji}$, and the elements of C satisfy $c_{ij} = -c_{ji}$, for all i,j in [0,n-1]. We can take

$b_{ij} = (a_{ij} + a_{ji}) / 2$, and $c_{ij} = (a_{ij} - a_{ji}) / 2$

for all i,j. Use these formulas to populate the elements of B and C in the blank provided. Assume that $n \leqslant 100$, and A is appropriately initialized. You may write multiple statements.

```
float A[100][100], B[100][100], C[100][100];

for (i=0; i<n; ++i) {
   for (j=0; j<n; ++j) {
      __________
   }
}
```

---

ANS:

```
B[i][j] = (A[i][j] + A[j][i]) / 2;
C[i][j] = (A[i][j] - A[j][i]) / 2;
```

---

Q5 Consider the following structure.

```
struct mycollection {
   int n;
   int A[MAXSIZE];
};
```

The following function takes a structure C of this type as an argument, and returns a new collection D with the array A[] reversed. Fill in the blank to complete the code.

```
struct mycollection reverse ( struct mycollection C )
{
   struct mycollection D;
   int i;

   D.n = C.n;
   for (i=0; i<C.n; ++i) __________ ;
   return D;
}
```

---

ANS: D.A[i] = C.A[C.n-1-i]

---

Q6 Consider the following definition of a structure.

```
typedef struct {
   int emp_id;
   char name[20];
} abc;

abc x, *p;
```

Suppose that the fields of x are set appropriately, and then you make the assignment:

```
p = &x;
```

Now, you want to print the fields emp_id and name of the structure pointed to by p. Write appropriate printf statement(s). You must not use x anywhere in your answer.

---

ANS:

```
printf("%d\n", p -> emp_id);
printf("%s\n", (*p).name);
```

---

Q7 Consider the following definitions.

```
   struct centre {
      int xcoord;
      int ycoord;
   };

   struct circle {
      int radius;
      struct centre C;
      char color[10];
   };

   struct circle C1 = { 10, {10, 15}, "red" };
   struct circle C2 = { 20, {12, 20}, "blue" };
```

Write printf statement(s) to print the radius of the red circle and the centre of the blue circle, by accessing the fields of C1 and C2.

---

ANS:

```
   printf("%d\n", C1.radius);
   printf("%d %d\n", C2.C.xcoord, C2.C.ycoord);
```

---

Q8 Let A be a null-terminated string. The following function shifts A by one character to the left. The shifted string is stored in A itself. For example, if A stores "PDS 2021" before the call, the function changes A in place so that it stores "DS 2021" after the call. Fill in the blank to complete the code.

```
   void lshift ( char *A )
   {
      while (*A) {
         __________
         ++A;
      }
   }
```

---

ANS:

```
   *A = *(A + 1);
```

or

```
   A[0] = A[1];
```

---

Q9 Fill in the blanks below so that the function F takes a null–terminated string S as a parameter and returns (through parameters) the number of characters in it. You cannot change the return type from void. Do not use any string library function.

```
[A]   void F ( __________ )
      {
         int i;

         for (i=0; S[i] != '\0'; i++);
[B]      __________
      }
```

---

ANS:

```
   [A] char *S, int *count
   [B] *count = i;
```

---

Q10 Fill in the blank so that the following program prints 463.

```
   int main( )
   {
       char *s1 = "463 897", *p;

       __________
       *p = '\0' ;
       printf ("%s", s1);
   }
```

---

ANS:

```
   p = s1 + 3;
or
   p = &s1[3];
```

---