ELEKTRIJADA 2017

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INFORMATICS

Tasks

Please, suppose in all tasks that Little Endian is used, and sizeof(int)=sizeof(int*)=sizeof(float)=4 sizeof(long long)=sizeof(double)=8

❶ **Find the output of the following program:**

```
#include <stdio.h>
#define AB "45""67"
int main()
{
  int x=printf("\"B%%L\"\n");
  int a, b;
  printf("1:%d\n",x);
  printf("2:%d\n",printf("3:""O""K""\n"));
  printf("4:%d\n",sscanf(AB,"%i%i",&a,&b));
  return 0;
}
```

❷ **Find the output of the following program:**

```
#include <stdio.h>
#include <string.h>
#define SL(x) sizeof(x)
char gs[10]="BUDVA";
char *f1(char *a, char *b)
{
  char *t; t=a; a=b; b=t;
  return a;
}
int f2()
{
  return printf(gs);
}
int main()
{
  char c=0x45;
  char *ss="NOVI SAD";
  char q[10]="BECICI"; f1(gs,q);
  printf("1:%s\n",q);
  printf("2:"); f2; printf("\n");
  printf("3:");
  for (char c='A', y=8*sizeof(c); y--; )
    printf("%d", c>>y&1);
  printf("\n");
  printf("4:%x\n", c<<0x4|c>>0x4);
  printf("5:%d",fwrite(ss,1,SL(ss),stdout));
  return 0;
}
```

❸ **Find the output of the following program:**

```
#include <stdio.h>
#include <stdlib.h>
#include <string.h>
#define MS(a,b) s1[0]=a, s2[0]=b
#define X(a,b) MS(a,b), strcmp(s1,s2)+1
typedef struct _n
  { char c; int n; struct _n *p[3]; } NODE;
NODE *t,*h;   char s1[2], s2[2];
NODE *newNode(char c)
{
  NODE *q=(NODE*)calloc(1,sizeof(NODE));
  q->c=c; return q;
}
void ft1(NODE *q, int d)
{
  if (q) {
    printf("%c",q->c);
    for (int i=2; i-d; i--) ft1(q->p[i],d);
  }
}
int ft2(NODE *q, int d)
{
  static int k=0;
  if (q)
  {
    for (int i=2; i-d; k++, i--)
      ft2(q->p[i],d);
    return k;
  }
}
NODE *fc(NODE *h, char c)
{
  if (!h) return newNode(c);
  h->p[X(c,h->c)]=fc(h->p[X(c,h->c)],c);
  return h;
}
int main()
{
  NODE *h=NULL;
  char *s[]={"ELEKTRIJADA","2017"};
  h=fc(h,*s[0]++);
  for (int i=0; i<2; i++)
  {
    while (*s[i]) h=fc(h,*s[i]++);
    printf("%d:%d\n", 1+2*i,ft2(h,i));
    printf("%d:", 2+2*i); ft1(h,i);
    printf("\n");
  }
  return 0;
}
```

❹ **Find the output of the following program:**

```
#include <stdio.h>
#define N 4
typedef int(*PP)(int*,int);

int fs(int *x, int g)
{
  int i;
  for (i=0; i<g; i++) printf("%d", x[i]);
  printf("\n");
  return 1;
}

void fb(int *x, int n, int m, PP p)
{
  int c=0, i, t;
  static int k=0;
  while (1)
  {
    if (n>2) fb(x,n-1,m,p);
    if (c>=n-1) return;
    i=(n&1)?0:c; c++;
    t=x[n-1], x[n-1]=x[i], x[i]=t;
    if (!(++k%8))
    {
       printf("%d:",k/8+1);
       if (p) (*p)(x,m);
    }
  }
}

void f(int *x, int n, PP cb)
{
  printf("1:");
  if (cb) (*cb)(x,n); fb(x,n,n,cb);
}

int main()
{
  int i, x[N];
  for (i=0; i<N; i++) x[i]=i+1;
  f(x, N, fs);
  return 0;
}
```

❺ **Find the output of the following program (suppose that IEEE FP 754 is used):**

```
#include <stdio.h>
int main()
{
  char *s[]={"YES","NO"};
  float f = 2.0/0.0;
  printf("1:%x\n", *(int*)&f);
  union U1 {float d; int i;} u1;
  union U2 {double d; long long i;} u2={f};
  printf("2:%d\n", u2.i>>52);
  u1.d=u2.d=1.2;
  printf("3:%s\n", s[u1.d==u2.d]);
  u1.d=u2.d=1.25;
  printf("4:%s\n", s[u1.d==u2.d]);
  return 0;
}
```

❻ **Find the output of the following program:**

```
#include <stdio.h>
#define N 4
#define ms(i,j) {i+=j; j=i-j; i-=j;}
typedef int(*PP)(int*,int);

int fs(int *x, int g)
{
  int i;
  for (i=0; i<g; i++) printf("%d", x[i]);
  printf("\n");
  return 1;
}

int fn(int *a, int n)
{
  int k, m;
  for (k=n-1; k&&a[k-1]>=a[k]; k--);
  if (!k--) return 0;
  for (m=n-1; a[m]<=a[k]; m--);
    ms(a[k],a[m]);
  for (k++,m=n-1; m>k; m--,k++)
    ms(a[k],a[m]);
  return 1;
}

void f(int *x, int n, PP p)
{
  int k=0;
  do
  {
    if (!(k++%8))
    {
      printf("%d:", k/8+1); if (p) (*p)(x,n);
    }
  } while (fn(x,n));
}

int main()
{
  int i, x[N];
  for (i=0; i<N; i++) x[i]=i+1;
  f(x, N, fs);
  return 0;
}
```

❼ **Find the output of the following program (suppose common compiler settings):**

```
#include <stdio.h>
int main()
{
  typedef struct _s1 { int i; char c; } S1;
  typedef struct _s2 { S1 s1; char c; } S2;
  S2 arr[10], *ps1=arr, *ps2=arr;
  ps1+=sizeof(S1); ps2-=sizeof(S2);
  printf("1:%d\n", sizeof(arr));
  printf("2:%d\n", ps1-arr);
  printf("3:%d\n", (char*)ps1-(char*)arr);
  printf("4:%d\n", ps1-ps2);
  printf("5:%d\n", (char*)ps1-(char*)ps2);
  return 0;
}
```

❽ **Find the output of the following program:**

```
#include <stdio.h>
#define MAX 1000
#define INT(x,y,z) x>y&&x<z
typedef struct _x
  { int n, m[10][10], t[10][10]; } X;

void ff(X *x)
{
  int m1=0, m2=0, m3=0, bk=0;

  void ft(int p, int k, int m)
  {
    bk++;
    if (p==k)
    {
      if (m) printf("%d", p);
      if (bk>m1) m1=bk; bk=0;
    }
    else
      if (x->t[p][k])
      {
         ft(p,x->t[p][k],m);
         if (m) printf("%d",k);
      }
  }

  for (int i=1; i<=x->n; i++)
    for (int j=1; j<=x->n; j++)
      x->t[i][j]=INT(x->m[i][j],0,MAX)?i:0;

  for (int k=1; k<=x->n; k++)
    for (int i=1; i<=x->n; i++)
      for (int j=1; j<=x->n; j++)
        if (x->m[i][j]>x->m[i][k]+x->m[k][j])
        {
          x->m[i][j]=x->m[i][k]+x->m[k][j];
          x->t[i][j]=x->t[k][j];
        }

  for (int i=1; i<=x->n; i++)
    for (int j=1; j<=x->n; j++)
    {
      ft(i,j,0);
      m2=x->m[i][j]>m2?x->m[i][j]:m2;
    }

  printf("1:%d\n", m2);

  printf("2:%d\n", m3=m1);
  for (int i=1; i<=x->n; i++)
    for (int j=1; j<=x->n; j++)
    {
      m1=0; ft(i,j,m3==m1);
      if (m3==m1) { ft(i,j,m3==m1); return; }
    }
}

int main()
{
  X x = {4,{{},{0,0,1,MAX,4},{0,1,0,1,MAX},
         {0,MAX,1,0,1},{0,4,MAX,1,0}}};
  ff(&x);
  return 0;
}
```

Appendix: ASCII table

	0	1	2	3	4	5	6	7
0	NUL	DLE	space	0	@	P	`	p
1	SOH	DC1 XON	!	1	A	Q	a	q
2	STX	DC2	"	2	B	R	b	r
3	ETX	DC3 XOFF	#	3	C	S	c	s
4	EOT	DC4	$	4	D	T	d	t
5	ENQ	NAK	%	5	E	U	e	u
6	ACK	SYN	&	6	F	V	f	v
7	BEL	ETB	'	7	G	W	g	w
8	BS	CAN	(	8	H	X	h	x
9	HT	EM	)	9	I	Y	i	y
A	LF	SUB	*	:	J	Z	j	z
B	VT	ESC	+	;	K	[	k	{
C	FF	FS	,	<	L	\	l	|
D	CR	GS	-	=	M	]	m	}
E	SO	RS	.	>	N	^	n	~
F	SI	US	/	?	O	_	o	del