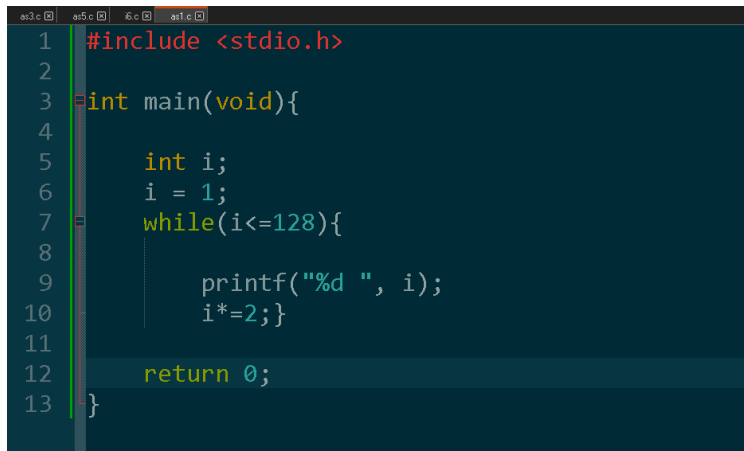


1. What is the output of the following program?

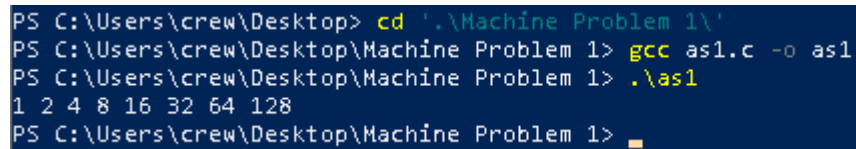
**Answer:**

1 2 4 8 16 32 64 128

**Screenshot:**



```
1 #include <stdio.h>
2
3 int main(void){
4
5     int i;
6     i = 1;
7     while(i<=128){
8
9         printf("%d ", i);
10        i*=2;}
11
12    return 0;
13 }
```



```
PS C:\Users\crew\Desktop> cd '.\Machine Problem 1\'
PS C:\Users\crew\Desktop\Machine Problem 1> gcc as1.c -o as1
PS C:\Users\crew\Desktop\Machine Problem 1> .\as1
1 2 4 8 16 32 64 128
PS C:\Users\crew\Desktop\Machine Problem 1> 
```

2. Which one of the following statements is not equivalent to the other two (assuming that the loop bodies are the same)?

**Answer:**

The do while is not equivalent to the other two since it may run at least once even if the condition is false.

**Screenshots:**

```
1  #include <stdio.h>
2
3  int main(void){
4
5      int i;
6      i = 10;
7      while(i<10){
8
9          printf("%d ", i);
10         i+=1; } printf("\n");
11     for(i=10;i<10;i+=1){
12
13         printf("%d ", i);
14     }
15     printf("\n");
16
17     i =10;
18     do{
19         printf("%d ", i);
20         i+=1;
21     }while(i<10);
22     printf("\n");
23     return 0;
24 }
25
```

PS C:\Users\crew\Desktop\Machine Problem 1> .\as1

10

PS C:\Users\crew\Desktop\Machine Problem 1>

3. Convert item 1 into an equivalent for statement. You can validate your answer by checking if the produced outputs by both the while and for statements are similar.

```
#include <stdio.h>

int main(void){

    int i=1;

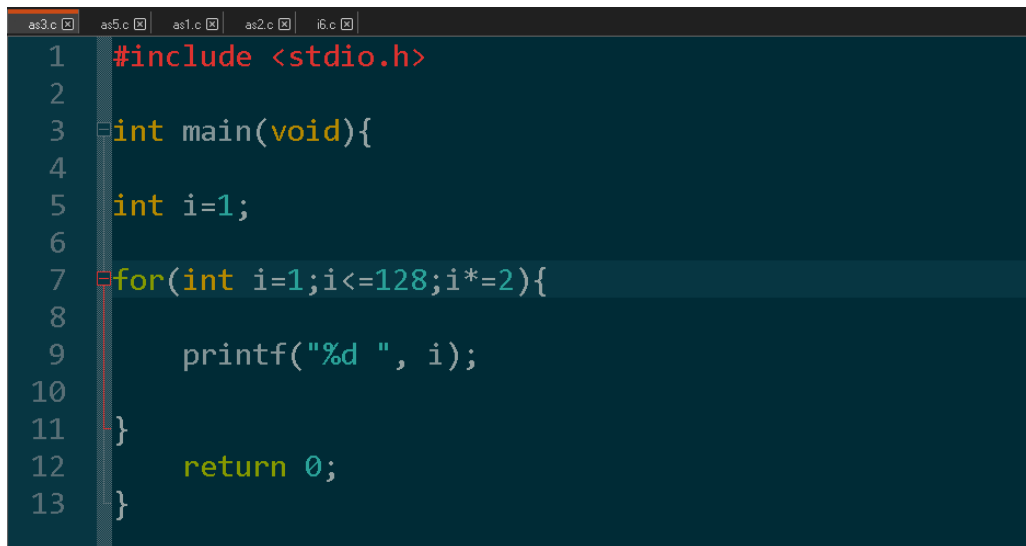
    for(int i=1;i<=128;i*=2){

        printf("%d ", i);

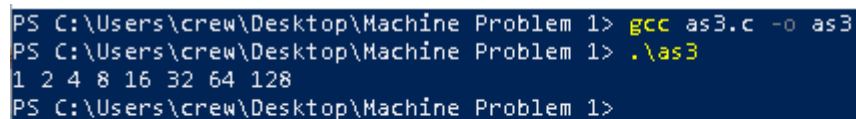
    }

    return 0;
}
```

#### Screenshots:

A screenshot of a code editor with a dark theme. The editor has several tabs at the top: 'as3.c', 'as5.c', 'as1.c', 'as2.c', and 'i6.c'. The 'as3.c' tab is active. The code is as follows:

```
1  #include <stdio.h>
2
3  int main(void){
4
5      int i=1;
6
7      for(int i=1;i<=128;i*=2){
8
9          printf("%d ", i);
10
11      }
12      return 0;
13  }
```

A screenshot of a Windows command prompt window. The text shows the following commands and output:

```
PS C:\Users\crew\Desktop\Machine Problem 1> gcc as3.c -o as3
PS C:\Users\crew\Desktop\Machine Problem 1> .\as3
1 2 4 8 16 32 64 128
PS C:\Users\crew\Desktop\Machine Problem 1>
```

4. Write a code that computes for the power of two:

```
as3.c x as5.c x as1.c x as2.c x i6.c x as4.c x
1  #include <stdio.h>
2
3  int main() {
4      int n;
5      int initial=1;
6      scanf("%d",&n);
7      printf("n      2 to the n\n---      -----\n");
8      for(int i=0;i<=n;i++){
9
10         printf("%-8d %d\n",i,initial);
11         initial = initial*2;
12     }
13     return 0;
14 }
```

```
PS C:\Users\crew\Desktop\Machine Problem 1> gcc as4.c -o as4
PS C:\Users\crew\Desktop\Machine Problem 1> .\as4
10
n      2 to the n
---      ----
0         1
1         2
2         4
3         8
4        16
5        32
6        64
7       128
8       256
9       512
10      1024
PS C:\Users\crew\Desktop\Machine Problem 1> █
```

5. Write a program that displays a one-month calendar.

```
1  #include <stdio.h>
2
3  int main(void){
4      int days, weekStart;
5      printf("Enter the number of days in month: ");
6      scanf("%d",&days);
7      printf("Enter the starting day of the week (1=Sun, 7=Sat): ");
8      scanf("%d",&weekStart);
9
10     int count = 8-weekStart;
11
12     for(int x=1;x<=days;x++){
13         while(weekStart>1){
14             printf(" ");
15             weekStart-=1;
16         }
17         if(count==0){
18             printf("\n");
19             count=7;
20         }
21         if(x<10){
22             printf("  %d",x);
23         }
24         else{
25             printf(" %d",x);
26         }
27         count-=1;
28     }
29
30     return 0;
31
32
33 }
```

```
PS C:\Users\crew\Desktop\Machine Problem 1> gcc as5.c -o as5
PS C:\Users\crew\Desktop\Machine Problem 1> .\as5
Enter the number of days in month: 31
Enter the starting day of the week (1=Sun, 7=Sat): 3
  1  2  3  4  5
 6  7  8  9 10 11 12
13 14 15 16 17 18 19
20 21 22 23 24 25 26
27 28 29 30 31
PS C:\Users\crew\Desktop\Machine Problem 1>
```

6. In the program below, an array named pathway contains eight bool values. Each bool element refers to whether a pathway is open or close for transportation.

Only pathways 0 and 2 are open while the rest are still close due to road constructions and fixings.

a. Revise line 16 such that you use a designated initializer to set pathways 0 and 2 to true, and the rest will be false. Make the initializer as short as possible.

**Answer:**

```
bool pathway[8]={ [0]=true,[2]=true};
```

b. Revise line 16 such that the initializer will be short as possible (without using a designated initializer)

**Answer:**

```
bool pathway[8]={true,false,true};
```

7. A road network can be represented using graphs. Assuming we have points / stations a, b, c, d, e, f, g, and h, we can represent a direct path from a point to another point using arrows.

```
as7.c
4  #include <stdio.h>
5
6  #define ROWS 9
7  #define COLS 9
8  #define INT_MAX 2147483647
9
10 int main(void){
11     char letters[COLS]={'a','b','c','d','e','f','g','h','i'};
12     char LETTERS[COLS]={'A','B','C','D','E','F','G','H','I'};
13     int road_networks[ROWS][COLS]={
14         {1, 1, 0, 0, 0, 1, 0, 0, 0},
15         {1, 1, 1, 0, 0, 0, 0, 0, 0},
16         {0, 1, 1, 0, 1, 1, 0, 0, 1},
17         {0, 0, 0, 1, 1, 0, 0, 0, 0},
18         {0, 0, 0, 1, 1, 0, 0, 0, 0},
19         {1, 0, 1, 0, 0, 1, 0, 0, 0},
20         {1, 0, 0, 1, 0, 0, 1, 0, 0},
21         {0, 0, 0, 0, 0, 1, 0, 1, 1},
22         {0, 0, 0, 0, 0, 0, 0, 1, 1}};
23
24     printf("Adjacency Matrix\n\n");
25     for(int i = -1; i < COLS; i++){
26         if(i == 2 || i == 3){
27             printf("[%c] ", letters[i]);
28         }
29         else{printf(" %-5c", letters[i]);}
30     }
31     for(int j = 0; j < COLS; j++){
32         if(i == -1){
33             if(j == 2 || j == 3){
34                 printf("[%c] ", letters[j]);
35             }
36             else{printf(" %-5c", letters[j]);}
37             continue;
38         }
39         printf(" %-5d", road_networks[i][j]);
40     }
41     printf("\n");
42 }
43
44 int point;
45 while(1){
46     printf("\nWhich point are you located? (0 - A, 1 - B, 2 - C, 3 - D, 4 - E, 5 - F, 6 - G, 7 - H, 8 - I)\n\n");
47     scanf("%d",&point);
48     if (point == 2 || point == 3) {
49         printf("\npoint: %c is a changing station\n", LETTERS[point]);
50         break;
51     }
52     int visited[COLS]={0 ... 8} = 0;
53     int distance[COLS]={0 ... 8} = INT_MAX;
54
55     distance[point]=0;
56
57     // Dijkstra's Algorithm
58     for(int i = 0; i < ROWS; i++){
59         int min=INT_MAX;
60         int curr;
61
62         // Min Distance Function integrated into the main Loop
63         for(int j=0; j < COLS; j++){
64             if(visited[j]==0 && distance[j] <= min){
65                 min = distance[j], curr=j;
66             }
67         }
68
69         visited[curr]=1;
70         //printf("curr: %d\n", curr);
71
72         for(int adj=0; adj < COLS; adj++){
73             if( visited[adj]==0
74                 && road_networks[curr][adj]==1
75                 && distance[curr] != INT_MAX
76                 && distance[curr]+road_networks[curr][adj] < distance[adj]){
77                 distance[adj] = distance[curr]+road_networks[curr][adj];
78             }
79         }
80     }
81     if(distance[2] == INT_MAX && distance[3] == INT_MAX){
82         printf("At point: %c\n",LETTERS[point]);
83         printf("No changing stations nearby.\n");
84         break;
85     }
86     else{
87         printf("At point: %c\n",LETTERS[point]);
88         printf("point: %c arrived to changing station.\n",LETTERS[2+(distance[2]>distance[3])]);
89         break;
90     }
91 }
92
93 }
```

```
PS C:\Users\crew\Desktop\Machine Problem 1> gcc as7.c -o as7
PS C:\Users\crew\Desktop\Machine Problem 1> .\as7
Adjacency Matrix

I   a   b   [c] [d] e   f   g   h   i
a   1   1   0   0   0   1   0   0   0
b   1   1   1   0   0   0   0   0   0
[c] 0   0   1   0   1   1   0   0   1
[d] 0   0   0   1   1   0   0   0   0
e   0   0   0   1   1   0   0   0   0
f   1   0   1   0   0   1   0   0   0
g   1   0   0   1   0   0   1   0   0
h   0   0   0   0   0   1   0   1   1
i   0   0   0   0   0   0   0   1   1

Which point are you located? (0 - A, 1 - B, 2 - C, 3 - D, 4 - E, 5 - F, 6 - G, 7 - H, 8 - I)

1
At point: B
point: C arrived to charging station.
PS C:\Users\crew\Desktop\Machine Problem 1>
```