

# Veri Yapıları ve Algoritmalar-Ödev6

## 1-) Binary Search Algorithm

- Eşit Dağılımlı

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Etkinlikler Üçbirim 2 Nis 19:05
huseyinsoylu@vivobook: ~/Masaüstü/Okul/2021-2022 Bahar/Veri Yapıları ve Algoritmalar/Hafta-6-29.03.2022/Ev Odevi
huseyinsoylu@vivobook:~/Masaüstü/Okul/2021-2022 Bahar/Veri Yapıları ve Algoritmalar/Hafta-6-29.03.2022/Ev
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huseyinsoylu@vivobook:~/Masaüstü/Okul/2021-2022 Bahar/Veri Yapıları ve Algoritmalar/Hafta-6-29.03.2022/Ev
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- Eşit Dağılımsız

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Found time: 0.00013
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- Aramada 1000 Elemanlı bir sıralı dizi kullanılmıştır. 612 numaralı eleman toplam 9 iterasyonda bulunmuştur. Bulunma süresi 0.000013 – 0.000017 arasında değişmektedir.
- Algoritmanın zaman analizi  $O(\log(n))$ 'dir.
- Algoritma dizinin eşit dağılımlı olup olmamasına bağlı değildir.

## 2-) İnterpolasyon Search Algorithm

- Eşit Dağılımlı

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Etiklikler Uçbirim 2 Nis 19:59
huseyinsoylu@vivoobook: ~/Masasüstü/Okul/2021-2022 Bahar/Veri Yapıları ve Algoritmalar/Hafta-6-29.03.2022/Ev Odevi
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- Eşit Dağılımsız

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- Aramada 1000 Elemanlı bir sıralı dizi kullanılmıştır.
- Sabit dağılımlı dizi ile sabit aralıksız dizi arasında çok büyük bir fark gözlemlenmemiştir.
- Sabit dağılımlı dizi 0.000056 saniyede çözüme ulaşmıştır.
- Sabit dağılımsız dizi 0.000060 saniyede çözüme ulaşmıştır.(Birkaç kez çalıştırıldı)
- Çok fazla kez çalıştırsak aralarında fark olmadığını gözlemleriz
- Algoritmanın çalışma zamanı  $O(\log(n))$ ' dir.

### 3-) Sequential Search Algorithm

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```

- Aramada 1000 Elemanlı bir sıralı dizi kullanılmıştır.
- Bu arama türünde herhangi bir şekilde dağılımlı ya da dağılımsız diye ayırım yapmak doğru olmayacaktır. Çünkü aranan değer her yerde ise oraya kadar bir döngü yardımı ile gitmek zorundayız.
- Algoritmanın çalışma zamanı  $O(N)$ 'dir. Çünkü alternatif bir yol yoktur arama yaparken. Tek tek gezilmek zorundadır.
- Bulunan index: 590.
- Bulunma Zamanı: 0.000013 saniye.

Buraya kadar yapmış olduğum tüm algoritmalar durumu bilinmeyen algoritmalar olarak literatürde geçmektedir. Bundan sonraki vereceğim iki örnek ise durumu bilinen algoritmalar olarak literatürde geçmektedir.

## 4-) Prims - Kruskal Search Algorithm

```
huseyinsoylu@vivobook:~/Masaüstü/Okul/2021-2022 Bahar/Veri Yapıları ve Algoritmalar/Hafta-6-29.03.2022/Ev Odevi$ ./prims_kruskal
Edge : Weight
0 - 1 : 9
1 - 3 : 19
3 - 4 : 31
3 - 2 : 51
Matrix Size: 5X5
Step Count:4
Found time: 0.000313
huseyinsoylu@vivobook:~/Masaüstü/Okul/2021-2022 Bahar/Veri Yapıları ve Algoritmalar/Hafta-6-29.03.2022/Ev Odevi$
```

- Algoritma için 5X5 matris kullanılmıştır.
- Adım Sayısı : 4
- Çalışma Zamanı: 0.000313 Saniye.

### Karşılaştırma Tablosu

| <u>Algoritma</u>     | <u>Çalışma Zamanı</u> | <u>Karmaşıklık</u>    | <u>Adım Sayısı</u> |
|----------------------|-----------------------|-----------------------|--------------------|
| Binary Search        | 0.000013 – 0.000017   | $O(\log(n))$          | 612. İndex–9 Adım  |
| İnterpolation Search | 0.000056 - 0.000060   | $O(\log(n))$          | 520.İndex–521 Adım |
| Prims - Kruskal      | 0.000313              | Değişmekte - $O(n^2)$ | 4. Adımda buldu.   |
| Sequration Search    | 0.000013              | $O(n)$                | n. indis için n    |
|                      |                       |                       |                    |

\*1000 Elemanlı dizi ve 5X5 matris kullanılmıştır.

## KAYNAK KODLAR

### 1-)Binary Search

```
#include <stdio.h>
#include <time.h>
#include <stdlib.h>
#include <time.h>
```

```
void print_array(int array[],int num){

    for(int i=0;i<num;i++){
```



```
printf("%6d",array[i]);
```

```
}
```

```
printf("\n");
```

```
}
```

```
int main()
```

```
{
```

```
    int array[1000]={0,  5, 10, 15, 20, 25, 30, 35, 40, 45, 50, 55,
60, 65, 70, 75, 80, 85, 90, 95, 100, 105, 110, 115, 120, 125, 130,
135, 140, 145, 150, 155, 160, 165, 170, 175, 180, 185, 190, 195, 200,
205, 210, 215, 220, 225, 230, 235, 240, 245, 250, 255, 260, 265, 270,
275, 280, 285, 290, 295, 300, 305, 310, 315, 320, 325, 330, 335, 340,
345, 350, 355, 360, 365, 370, 375, 380, 385, 390, 395, 400, 405, 410,
415, 420, 425, 430, 435, 440, 445, 450, 455, 460, 465, 470, 475, 480,
485, 490, 495, 500, 505, 510, 515, 520, 525, 530, 535, 540, 545, 550,
555, 560, 565, 570, 575, 580, 585, 590, 595, 600, 605, 610, 615, 620,
625, 630, 635, 640, 645, 650, 655, 660, 665, 670, 675, 680, 685, 690,
695, 700, 705, 710, 715, 720, 725, 730, 735, 740, 745, 750, 755, 760,
765, 770, 775, 780, 785, 790, 795, 800, 805, 810, 815, 820, 825, 830,
835, 840, 845, 850, 855, 860, 865, 870, 875, 880, 885, 890, 895, 900,
905, 910, 915, 920, 925, 930, 935, 940, 945, 950, 955, 960, 965, 970,
975, 980, 985, 990, 995, 1000, 1005, 1010, 1015, 1020, 1025, 1030, 1035,
1040, 1045, 1050, 1055, 1060, 1065, 1070, 1075, 1080, 1085, 1090, 1095, 1100,
1105, 1110, 1115, 1120, 1125, 1130, 1135, 1140, 1145, 1150, 1155, 1160, 1165,
1170, 1175, 1180, 1185, 1190, 1195, 1200, 1205, 1210, 1215, 1220, 1225, 1230,
1235, 1240, 1245, 1250, 1255, 1260, 1265, 1270, 1275, 1280, 1285, 1290, 1295,
1300, 1305, 1310, 1315, 1320, 1325, 1330, 1335, 1340, 1345, 1350, 1355, 1360,
1365, 1370, 1375, 1380, 1385, 1390, 1395, 1400, 1405, 1410, 1415, 1420, 1425,
1430, 1435, 1440, 1445, 1450, 1455, 1460, 1465, 1470, 1475, 1480, 1485, 1490,
1495, 1500, 1505, 1510, 1515, 1520, 1525, 1530, 1535, 1540, 1545, 1550, 1555,
1560, 1565, 1570, 1575, 1580, 1585, 1590, 1595, 1600, 1605, 1610, 1615, 1620,
1625, 1630, 1635, 1640, 1645, 1650, 1655, 1660, 1665, 1670, 1675, 1680, 1685,
1690, 1695, 1700, 1705, 1710, 1715, 1720, 1725, 1730, 1735, 1740, 1745, 1750,
1755, 1760, 1765, 1770, 1775, 1780, 1785, 1790, 1795, 1800, 1805, 1810, 1815,
1820, 1825, 1830, 1835, 1840, 1845, 1850, 1855, 1860, 1865, 1870, 1875, 1880,
1885, 1890, 1895, 1900, 1905, 1910, 1915, 1920, 1925, 1930, 1935, 1940, 1945,
1950, 1955, 1960, 1965, 1970, 1975, 1980, 1985, 1990, 1995, 2000, 2005, 2010,
2015, 2020, 2025, 2030, 2035, 2040, 2045, 2050, 2055, 2060, 2065, 2070, 2075,
2080, 2085, 2090, 2095, 2100, 2105, 2110, 2115, 2120, 2125, 2130, 2135, 2140,
2145, 2150, 2155, 2160, 2165, 2170, 2175, 2180, 2185, 2190, 2195, 2200, 2205,
2210, 2215, 2220, 2225, 2230, 2235, 2240, 2245, 2250, 2255, 2260, 2265, 2270,
2275, 2280, 2285, 2290, 2295, 2300, 2305, 2310, 2315, 2320, 2325, 2330, 2335,
2340, 2345, 2350, 2355, 2360, 2365, 2370, 2375, 2380, 2385, 2390, 2395, 2400,
2405, 2410, 2415, 2420, 2425, 2430, 2435, 2440, 2445, 2450, 2455, 2460, 2465,
```

2470, 2475, 2480, 2485, 2490, 2495, 2500, 2505, 2510, 2515, 2520, 2525, 2530,  
2535, 2540, 2545, 2550, 2555, 2560, 2565, 2570, 2575, 2580, 2585, 2590, 2595,  
2600, 2605, 2610, 2615, 2620, 2625, 2630, 2635, 2640, 2645, 2650, 2655, 2660,  
2665, 2670, 2675, 2680, 2685, 2690, 2695, 2700, 2705, 2710, 2715, 2720, 2725,  
2730, 2735, 2740, 2745, 2750, 2755, 2760, 2765, 2770, 2775, 2780, 2785, 2790,  
2795, 2800, 2805, 2810, 2815, 2820, 2825, 2830, 2835, 2840, 2845, 2850, 2855,  
2860, 2865, 2870, 2875, 2880, 2885, 2890, 2895, 2900, 2905, 2910, 2915, 2920,  
2925, 2930, 2935, 2940, 2945, 2950, 2955, 2960, 2965, 2970, 2975, 2980, 2985,  
2990, 2995, 3000, 3005, 3010, 3015, 3020, 3025, 3030, 3035, 3040, 3045, 3050,  
3055, 3060, 3065, 3070, 3075, 3080, 3085, 3090, 3095, 3100, 3105, 3110, 3115,  
3120, 3125, 3130, 3135, 3140, 3145, 3150, 3155, 3160, 3165, 3170, 3175, 3180,  
3185, 3190, 3195, 3200, 3205, 3210, 3215, 3220, 3225, 3230, 3235, 3240, 3245,  
3250, 3255, 3260, 3265, 3270, 3275, 3280, 3285, 3290, 3295, 3300, 3305, 3310,  
3315, 3320, 3325, 3330, 3335, 3340, 3345, 3350, 3355, 3360, 3365, 3370, 3375,  
3380, 3385, 3390, 3395, 3400, 3405, 3410, 3415, 3420, 3425, 3430, 3435, 3440,  
3445, 3450, 3455, 3460, 3465, 3470, 3475, 3480, 3485, 3490, 3495, 3500, 3505,  
3510, 3515, 3520, 3525, 3530, 3535, 3540, 3545, 3550, 3555, 3560, 3565, 3570,  
3575, 3580, 3585, 3590, 3595, 3600, 3605, 3610, 3615, 3620, 3625, 3630, 3635,  
3640, 3645, 3650, 3655, 3660, 3665, 3670, 3675, 3680, 3685, 3690, 3695, 3700,  
3705, 3710, 3715, 3720, 3725, 3730, 3735, 3740, 3745, 3750, 3755, 3760, 3765,  
3770, 3775, 3780, 3785, 3790, 3795, 3800, 3805, 3810, 3815, 3820, 3825, 3830,  
3835, 3840, 3845, 3850, 3855, 3860, 3865, 3870, 3875, 3880, 3885, 3890, 3895,  
3900, 3905, 3910, 3915, 3920, 3925, 3930, 3935, 3940, 3945, 3950, 3955, 3960,  
3965, 3970, 3975, 3980, 3985, 3990, 3995, 4000, 4005, 4010, 4015, 4020, 4025,  
4030, 4035, 4040, 4045, 4050, 4055, 4060, 4065, 4070, 4075, 4080, 4085, 4090,  
4095, 4100, 4105, 4110, 4115, 4120, 4125, 4130, 4135, 4140, 4145, 4150, 4155,  
4160, 4165, 4170, 4175, 4180, 4185, 4190, 4195, 4200, 4205, 4210, 4215, 4220,  
4225, 4230, 4235, 4240, 4245, 4250, 4255, 4260, 4265, 4270, 4275, 4280, 4285,  
4290, 4295, 4300, 4305, 4310, 4315, 4320, 4325, 4330, 4335, 4340, 4345, 4350,  
4355, 4360, 4365, 4370, 4375, 4380, 4385, 4390, 4395, 4400, 4405, 4410, 4415,  
4420, 4425, 4430, 4435, 4440, 4445, 4450, 4455, 4460, 4465, 4470, 4475, 4480,  
4485, 4490, 4495, 4500, 4505, 4510, 4515, 4520, 4525, 4530, 4535, 4540, 4545,  
4550, 4555, 4560, 4565, 4570, 4575, 4580, 4585, 4590, 4595, 4600, 4605, 4610,  
4615, 4620, 4625, 4630, 4635, 4640, 4645, 4650, 4655, 4660, 4665, 4670, 4675,  
4680, 4685, 4690, 4695, 4700, 4705, 4710, 4715, 4720, 4725, 4730, 4735, 4740,  
4745, 4750, 4755, 4760, 4765, 4770, 4775, 4780, 4785, 4790, 4795, 4800, 4805,  
4810, 4815, 4820, 4825, 4830, 4835, 4840, 4845, 4850, 4855, 4860, 4865, 4870,  
4875, 4880, 4885, 4890, 4895, 4900, 4905, 4910, 4915, 4920, 4925, 4930, 4935,  
4940, 4945, 4950, 4955, 4960, 4965, 4970, 4975, 4980, 4985, 4990, 4995};

```
//print_randoms_array(array,0,5000,1000);
```

```
//bubble_short_array(array,1000);
```

```
clock_t start_t, end_t;
```

```

print_array(array,1000);
int low      = 0;
int high     = 1000;
int flag     = 0;
int s        = 3075;
int search_step=0;

start_t = clock();

while(low <= high){
search_step++;
    int index = low+(high-low)/2;
    if(array[index] == s){
        flag = 1;
        printf("Wanted: %d Found: %d. index And Step Count: %d \
n",s,index,search_step);
        break;
    }
    else if(array[index] < s){
        low  = index+1;
    }
    else{
        high = index-1;
    }
}
if(flag == 0){
    printf("Not Found!\n");
}
end_t = clock();
printf("Found time: %f\n", (double)(end_t - start_t) / CLOCKS_PER_SEC);
return 0;
}

```

---

## 1-)Interpolation Search

---

```

#include <stdio.h>
#include <time.h>
#include <stdlib.h>
#include <time.h>

void print_array(int array[],int num){

    for(int i=0;i<num;i++){

```

```

        printf("%6d",array[i]);
    }
    printf("\n");

}

/*int interpolationSearch(int arr[], int lo, int hi, int x)
{
    int pos;
    // Since array is sorted, an element present
    // in array must be in range defined by corner
    if (lo <= hi && x >= arr[lo] && x <= arr[hi]) {
        // Probing the position with keeping
        // uniform distribution in mind.
        pos = lo
            + (((double)(hi - lo) / (arr[hi] - arr[lo]))
              * (x - arr[lo]));

        // Condition of target found
        if (arr[pos] == x)
            return pos;

        // If x is larger, x is in right sub array
        if (arr[pos] < x)
            return interpolationSearch(arr, pos + 1, hi, x);

        // If x is smaller, x is in left sub array
        if (arr[pos] > x)
            return interpolationSearch(arr, lo, pos - 1, x);
    }
    return -1;
}*/

```

```

int interpol_search(int arr[], int lb, int ub, int x)
{
    int step_count=0;
    while ((arr[lb] != arr[ub]) && (x <= arr[ub]) && (x >= arr[lb])) {
        step_count++;
        int pos = lb + (((ub - lb) / (arr[ub] - arr[lb])) * (x - arr[lb]));
        if (arr[pos] == x){
            printf("Search Element :%d Step Count:%d\n",x,step_count);
            return pos;
        }
    }
}

```



```

    if (arr[pos] < x)
        lb = pos + 1;
    else
        ub = pos - 1;
    }
    return -1;
}

int main()
{
    int arr[]={0, 5, 10, 15, 20, 25, 30, 35, 40, 45, 50, 55, 60,
65, 70, 75, 80, 85, 90, 95, 100, 105, 110, 115, 120, 125, 130, 135,
140, 145, 150, 155, 160, 165, 170, 175, 180, 185, 190, 195, 200, 205,
210, 215, 220, 225, 230, 235, 240, 245, 250, 255, 260, 265, 270, 275,
280, 285, 290, 295, 300, 305, 310, 315, 320, 325, 330, 335, 340, 345,
350, 355, 360, 365, 370, 375, 380, 385, 390, 395, 400, 405, 410, 415,
420, 425, 430, 435, 440, 445, 450, 455, 460, 465, 470, 475, 480, 485,
490, 495, 500, 505, 510, 515, 520, 525, 530, 535, 540, 545, 550, 555,
560, 565, 570, 575, 580, 585, 590, 595, 600, 605, 610, 615, 620, 625,
630, 635, 640, 645, 650, 655, 660, 665, 670, 675, 680, 685, 690, 695,
700, 705, 710, 715, 720, 725, 730, 735, 740, 745, 750, 755, 760, 765,
770, 775, 780, 785, 790, 795, 800, 805, 810, 815, 820, 825, 830, 835,
840, 845, 850, 855, 860, 865, 870, 875, 880, 885, 890, 895, 900, 905,
910, 915, 920, 925, 930, 935, 940, 945, 950, 955, 960, 965, 970, 975,
980, 985, 990, 995, 1000, 1005, 1010, 1015, 1020, 1025, 1030, 1035, 1040,
1045, 1050, 1055, 1060, 1065, 1070, 1075, 1080, 1085, 1090, 1095, 1100, 1105,
1110, 1115, 1120, 1125, 1130, 1135, 1140, 1145, 1150, 1155, 1160, 1165, 1170,
1175, 1180, 1185, 1190, 1195, 1200, 1205, 1210, 1215, 1220, 1225, 1230, 1235,
1240, 1245, 1250, 1255, 1260, 1265, 1270, 1275, 1280, 1285, 1290, 1295, 1300,
1305, 1310, 1315, 1320, 1325, 1330, 1335, 1340, 1345, 1350, 1355, 1360, 1365,
1370, 1375, 1380, 1385, 1390, 1395, 1400, 1405, 1410, 1415, 1420, 1425, 1430,
1435, 1440, 1445, 1450, 1455, 1460, 1465, 1470, 1475, 1480, 1485, 1490, 1495,
1500, 1505, 1510, 1515, 1520, 1525, 1530, 1535, 1540, 1545, 1550, 1555, 1560,
1565, 1570, 1575, 1580, 1585, 1590, 1595, 1600, 1605, 1610, 1615, 1620, 1625,
1630, 1635, 1640, 1645, 1650, 1655, 1660, 1665, 1670, 1675, 1680, 1685, 1690,
1695, 1700, 1705, 1710, 1715, 1720, 1725, 1730, 1735, 1740, 1745, 1750, 1755,
1760, 1765, 1770, 1775, 1780, 1785, 1790, 1795, 1800, 1805, 1810, 1815, 1820,
1825, 1830, 1835, 1840, 1845, 1850, 1855, 1860, 1865, 1870, 1875, 1880, 1885,
1890, 1895, 1900, 1905, 1910, 1915, 1920, 1925, 1930, 1935, 1940, 1945, 1950,
1955, 1960, 1965, 1970, 1975, 1980, 1985, 1990, 1995, 2000, 2005, 2010, 2015,
2020, 2025, 2030, 2035, 2040, 2045, 2050, 2055, 2060, 2065, 2070, 2075, 2080,
2085, 2090, 2095, 2100, 2105, 2110, 2115, 2120, 2125, 2130, 2135, 2140, 2145,
2150, 2155, 2160, 2165, 2170, 2175, 2180, 2185, 2190, 2195, 2200, 2205, 2210,
2215, 2220, 2225, 2230, 2235, 2240, 2245, 2250, 2255, 2260, 2265, 2270, 2275,

```

2280, 2285, 2290, 2295, 2300, 2305, 2310, 2315, 2320, 2325, 2330, 2335, 2340,  
2345, 2350, 2355, 2360, 2365, 2370, 2375, 2380, 2385, 2390, 2395, 2400, 2405,  
2410, 2415, 2420, 2425, 2430, 2435, 2440, 2445, 2450, 2455, 2460, 2465, 2470,  
2475, 2480, 2485, 2490, 2495, 2500, 2505, 2510, 2515, 2520, 2525, 2530, 2535,  
2540, 2545, 2550, 2555, 2560, 2565, 2570, 2575, 2580, 2585, 2590, 2595, 2600,  
2605, 2610, 2615, 2620, 2625, 2630, 2635, 2640, 2645, 2650, 2655, 2660, 2665,  
2670, 2675, 2680, 2685, 2690, 2695, 2700, 2705, 2710, 2715, 2720, 2725, 2730  
2735, 2740, 2745, 2750, 2755, 2760, 2765, 2770, 2775, 2780, 2785, 2790, 2795,  
2800, 2805, 2810, 2815, 2820, 2825, 2830, 2835, 2840, 2845, 2850, 2855, 2860,  
2865, 2870, 2875, 2880, 2885, 2890, 2895, 2900, 2905, 2910, 2915, 2920, 2925,  
2930, 2935, 2940, 2945, 2950, 2955, 2960, 2965, 2970, 2975, 2980, 2985, 2990,  
2995, 3000, 3005, 3010, 3015, 3020, 3025, 3030, 3035, 3040, 3045, 3050, 3055,  
3060, 3065, 3070, 3075, 3080, 3085, 3090, 3095, 3100, 3105, 3110, 3115, 3120,  
3125, 3130, 3135, 3140, 3145, 3150, 3155, 3160, 3165, 3170, 3175, 3180, 3185,  
3190, 3195, 3200, 3205, 3210, 3215, 3220, 3225, 3230, 3235, 3240, 3245, 3250,  
3255, 3260, 3265, 3270, 3275, 3280, 3285, 3290, 3295, 3300, 3305, 3310, 3315,  
3320, 3325, 3330, 3335, 3340, 3345, 3350, 3355, 3360, 3365, 3370, 3375, 3380,  
3385, 3390, 3395, 3400, 3405, 3410, 3415, 3420, 3425, 3430, 3435, 3440, 3445,  
3450, 3455, 3460, 3465, 3470, 3475, 3480, 3485, 3490, 3495, 3500, 3505, 3510,  
3515, 3520, 3525, 3530, 3535, 3540, 3545, 3550, 3555, 3560, 3565, 3570, 3575,  
3580, 3585, 3590, 3595, 3600, 3605, 3610, 3615, 3620, 3625, 3630, 3635, 3640,  
3645, 3650, 3655, 3660, 3665, 3670, 3675, 3680, 3685, 3690, 3695, 3700, 3705,  
3710, 3715, 3720, 3725, 3730, 3735, 3740, 3745, 3750, 3755, 3760, 3765, 3770,  
3775, 3780, 3785, 3790, 3795, 3800, 3805, 3810, 3815, 3820, 3825, 3830, 3835,  
3840, 3845, 3850, 3855, 3860, 3865, 3870, 3875, 3880, 3885, 3890, 3895, 3900,  
3905, 3910, 3915, 3920, 3925, 3930, 3935, 3940, 3945, 3950, 3955, 3960, 3965,  
3970, 3975, 3980, 3985, 3990, 3995, 4000, 4005, 4010, 4015, 4020, 4025, 4030,  
4035, 4040, 4045, 4050, 4055, 4060, 4065, 4070, 4075, 4080, 4085, 4090, 4095,  
4100, 4105, 4110, 4115, 4120, 4125, 4130, 4135, 4140, 4145, 4150, 4155, 4160,  
4165, 4170, 4175, 4180, 4185, 4190, 4195, 4200, 4205, 4210, 4215, 4220, 4225,  
4230, 4235, 4240, 4245, 4250, 4255, 4260, 4265, 4270, 4275, 4280, 4285, 4290,  
4295, 4300, 4305, 4310, 4315, 4320, 4325, 4330, 4335, 4340, 4345, 4350, 4355,  
4360, 4365, 4370, 4375, 4380, 4385, 4390, 4395, 4400, 4405, 4410, 4415, 4420,  
4425, 4430, 4435, 4440, 4445, 4450, 4455, 4460, 4465, 4470, 4475, 4480, 4485,  
4490, 4495, 4500, 4505, 4510, 4515, 4520, 4525, 4530, 4535, 4540, 4545, 4550,  
4555, 4560, 4565, 4570, 4575, 4580, 4585, 4590, 4595, 4600, 4605, 4610, 4615,  
4620, 4625, 4630, 4635, 4640, 4645, 4650, 4655, 4660, 4665, 4670, 4675, 4680,  
4685, 4690, 4695, 4700, 4705, 4710, 4715, 4720, 4725, 4730, 4735, 4740, 4745,  
4750, 4755, 4760, 4765, 4770, 4775, 4780, 4785, 4790, 4795, 4800, 4805, 4810,  
4815, 4820, 4825, 4830, 4835, 4840, 4845, 4850, 4855, 4860, 4865, 4870, 4875,  
4880, 4885, 4890, 4895, 4900, 4905, 4910, 4915, 4920, 4925, 4930, 4935, 4940,  
4945, 4950, 4955, 4960, 4965, 4970, 4975, 4980, 4985, 4990, 4995};

```

clock_t start_t, end_t;

print_array(arr,1000);

int n = sizeof(arr) / sizeof(arr[0]);

start_t = clock();

int search_element = 2625;
int index = interpol_search(arr, 0, n - 1, search_element);

end_t = clock();

if (index != -1)
printf("Element found at index %d\n", index);
else
printf("Element not found.\n");

printf("Found time: %f\n", (double)(end_t - start_t) / CLOCKS_PER_SEC);

return 0;

}

```

---

### 3-)Sequation Search

---

```

#include <stdio.h>
#include <time.h>
#include <stdlib.h>

void print_array(int array[],int num){

    for(int i=0;i<num;i++){
        printf("%6d,",array[i]);
    }
    printf("\n");

}

```

```
int linear_search(int *pointer, int n, int find)
```

```
{
```

```
    int c;
```

```
    for ( c = 0 ; c < n ; c++ )
```

```
    {
```

```
        if ( *(pointer+c) == find )
```

```
            return c;
```

```
    }
```

```
    return -1;
```

```
}
```

```
int main()
```

```
{
```

```
    int array[]={6, 10, 14, 17, 39, 50, 61, 65, 77, 87, 89, 91, 93,
97, 109, 112, 118, 120, 133, 141, 144, 157, 167, 169, 169, 175, 187,
187, 190, 190, 200, 209, 214, 223, 225, 232, 234, 236, 237, 246, 246,
263, 265, 270, 274, 277, 282, 283, 286, 295, 308, 308, 313, 322, 323,
335, 340, 343, 366, 369, 370, 371, 375, 382, 384, 390, 390, 391, 393,
396, 400, 402, 405, 411, 412, 416, 420, 424, 424, 433, 438, 444, 446,
447, 454, 455, 457, 458, 461, 464, 470, 478, 478, 481, 487, 491, 493,
494, 494, 495, 496, 497, 502, 508, 509, 517, 531, 537, 537, 542, 545,
550, 566, 570, 572, 572, 573, 573, 576, 583, 585, 591, 598, 599, 606,
608, 610, 613, 619, 623, 624, 634, 635, 635, 648, 650, 654, 657, 667,
671, 673, 687, 690, 696, 700, 706, 712, 713, 730, 734, 736, 745, 752,
755, 793, 799, 801, 802, 802, 815, 823, 826, 827, 827, 828, 835, 836,
836, 839, 839, 852, 865, 870, 873, 873, 874, 876, 879, 896, 900, 909,
910, 919, 930, 931, 931, 933, 934, 934, 936, 939, 939, 942, 943, 944,
948, 966, 974, 984, 986, 990, 996, 1005, 1005, 1010, 1029, 1055, 1063,
1064, 1070, 1072, 1084, 1086, 1091, 1091, 1107, 1107, 1111, 1115, 1130, 1136,
1137, 1141, 1146, 1157, 1158, 1171, 1175, 1178, 1180, 1182, 1185, 1189, 1190,
1199, 1203, 1209, 1218, 1225, 1233, 1233, 1237, 1238, 1238, 1240, 1241, 1247,
1249, 1251, 1252, 1266, 1271, 1278, 1287, 1287, 1288, 1296, 1298, 1301, 1305,
1310, 1322, 1326, 1329, 1349, 1351, 1356, 1358, 1360, 1392, 1399, 1400, 1404,
1422, 1425, 1426, 1427, 1438, 1440, 1444, 1448, 1452, 1463, 1466, 1476, 1479,
1481, 1491, 1492, 1506, 1506, 1510, 1517, 1521, 1526, 1528, 1534, 1542, 1546,
1557, 1561, 1563, 1568, 1573, 1577, 1586, 1598, 1606, 1606, 1608, 1620, 1647,
1648, 1649, 1653, 1656, 1664, 1665, 1672, 1678, 1680, 1680, 1681, 1686, 1689,
1708, 1710, 1718, 1719, 1719, 1734, 1739, 1746, 1750, 1754, 1756, 1757, 1759,
1761, 1764, 1765, 1765, 1794, 1799, 1810, 1813, 1820, 1839, 1845, 1849, 1851,
```

1867, 1879, 1881, 1881, 1892, 1898, 1911, 1916, 1934, 1935, 1940, 1942, 1948,  
1948, 1956, 1960, 1964, 1964, 1977, 1978, 1979, 1979, 1989, 1993, 1997, 2001,  
2024, 2028, 2028, 2037, 2037, 2040, 2040, 2048, 2051, 2052, 2055, 2058, 2062,  
2064, 2065, 2066, 2081, 2081, 2082, 2085, 2087, 2100, 2105, 2107, 2113, 2118,  
2124, 2126, 2129, 2136, 2144, 2160, 2160, 2162, 2168, 2169, 2177, 2177, 2181,  
2181, 2187, 2188, 2191, 2202, 2206, 2208, 2211, 2222, 2228, 2229, 2233, 2234,  
2241, 2241, 2256, 2260, 2269, 2274, 2279, 2287, 2288, 2292, 2298, 2298, 2305,  
2306, 2319, 2323, 2350, 2351, 2359, 2361, 2363, 2364, 2369, 2370, 2373, 2375,  
2381, 2383, 2387, 2388, 2399, 2400, 2413, 2417, 2417, 2423, 2433, 2434, 2438,  
2444, 2447, 2447, 2448, 2450, 2455, 2465, 2470, 2477, 2479, 2491, 2499, 2505,  
2505, 2507, 2521, 2524, 2530, 2534, 2536, 2538, 2542, 2552, 2552, 2554, 2554,  
2555, 2556, 2556, 2559, 2559, 2572, 2572, 2573, 2573, 2575, 2575, 2579, 2580,  
2584, 2588, 2589, 2591, 2601, 2611, 2612, 2613, 2617, 2618, 2621, 2623, 2624,  
2625, 2637, 2638, 2639, 2639, 2642, 2643, 2654, 2655, 2666, 2673, 2675, 2677,  
2681, 2681, 2692, 2717, 2721, 2727, 2729, 2736, 2738, 2742, 2742, 2745, 2745,  
2758, 2766, 2770, 2773, 2778, 2778, 2782, 2786, 2795, 2796, 2799, 2804, 2806,  
2810, 2828, 2838, 2845, 2847, 2854, 2867, 2875, 2876, 2882, 2885, 2893, 2895,  
2898, 2903, 2919, 2920, 2923, 2925, 2932, 2944, 2951, 2951, 2951, 2956, 2964,  
2966, 2967, 2970, 2984, 2985, 2992, 2992, 3002, 3004, 3006, 3016, 3018, 3025,  
3026, 3032, 3033, 3034, 3034, 3037, 3041, 3047, 3050, 3050, 3055, 3072, 3073,  
3075, 3103, 3103, 3104, 3120, 3121, 3121, 3140, 3153, 3154, 3155, 3156, 3156,  
3171, 3176, 3176, 3176, 3187, 3188, 3191, 3197, 3197, 3210, 3212, 3214, 3216,  
3224, 3225, 3226, 3227, 3230, 3236, 3239, 3246, 3248, 3250, 3252, 3256, 3258,  
3264, 3270, 3272, 3283, 3290, 3291, 3293, 3300, 3303, 3312, 3314, 3322, 3322,  
3326, 3330, 3335, 3342, 3353, 3355, 3356, 3362, 3363, 3366, 3367, 3379, 3381,  
3381, 3383, 3383, 3386, 3387, 3394, 3394, 3394, 3394, 3397, 3400, 3414, 3419,  
3426, 3472, 3480, 3486, 3501, 3503, 3505, 3507, 3512, 3513, 3513, 3516, 3519,  
3519, 3535, 3537, 3540, 3540, 3541, 3541, 3544, 3545, 3553, 3554, 3562, 3566,  
3569, 3569, 3573, 3581, 3586, 3588, 3591, 3598, 3604, 3609, 3611, 3612, 3613,  
3615, 3617, 3639, 3640, 3643, 3644, 3645, 3650, 3652, 3652, 3663, 3671, 3677,  
3683, 3683, 3686, 3710, 3717, 3720, 3731, 3733, 3737, 3741, 3750, 3758, 3759,  
3759, 3759, 3765, 3772, 3774, 3776, 3783, 3784, 3787, 3797, 3808, 3811, 3819,  
3821, 3827, 3837, 3838, 3849, 3856, 3857, 3861, 3866, 3884, 3884, 3886, 3891,  
3893, 3898, 3899, 3918, 3919, 3924, 3933, 3935, 3942, 3950, 3959, 3981, 3981,  
3983, 3988, 3992, 3995, 3998, 4003, 4005, 4012, 4028, 4030, 4038, 4047, 4054,  
4057, 4057, 4059, 4060, 4061, 4061, 4063, 4064, 4070, 4073, 4073, 4080, 4084,  
4093, 4097, 4110, 4115, 4117, 4125, 4130, 4135, 4138, 4139, 4140, 4141, 4141,  
4141, 4143, 4149, 4158, 4164, 4167, 4176, 4184, 4185, 4186, 4201, 4201, 4202,  
4203, 4210, 4213, 4215, 4222, 4227, 4230, 4233, 4235, 4238, 4241, 4241, 4247,  
4247, 4261, 4265, 4271, 4280, 4284, 4290, 4293, 4295, 4298, 4300, 4305, 4307,  
4307, 4346, 4348, 4352, 4355, 4358, 4361, 4369, 4376, 4381, 4385, 4393, 4402,  
4414, 4422, 4424, 4432, 4440, 4444, 4448, 4451, 4452, 4454, 4460, 4469, 4479,  
4481, 4496, 4496, 4506, 4516, 4522, 4524, 4524, 4525, 4525, 4533, 4541, 4543,  
4547, 4552, 4560, 4561, 4568, 4572, 4573, 4577, 4584, 4584, 4598, 4599, 4600,

4600, 4610, 4625, 4635, 4637, 4644, 4645, 4647, 4649, 4656, 4659, 4662, 4663, 4667, 4674, 4685, 4691, 4694, 4702, 4702, 4721, 4725, 4727, 4728, 4729, 4730, 4739, 4739, 4749, 4749, 4751, 4753, 4761, 4763, 4783, 4783, 4802, 4803, 4805, 4811, 4818, 4822, 4830, 4832, 4849, 4859, 4865, 4865, 4868, 4876, 4887, 4888, 4895, 4897, 4904, 4905, 4913, 4914, 4919, 4923, 4931, 4937, 4938, 4947, 4948, 4951, 4951, 4951, 4969, 4971, 4972, 4982, 4984, 4986, 4986, 4992, 4997};

```
print_array(array,1000);
clock_t start_t, end_t;
```

```
int search, c, position;
```

```
start_t = clock();
position = linear_search(array, 1000, 2985);
end_t = clock();
```

```
if ( position == -1 )
printf("%d is not present in array.\n", 2985);
else
printf("%d is present at location %d.\n", 2985, position+1);
```

```
printf("Found time: %f\n", (double)(end_t - start_t) / CLOCKS_PER_SEC);
```

```
return 0;
```

```
}
```

---

#### 4-)Prim-Kruskal Search

---

```
#include<stdio.h>
#include<stdbool.h>
#include <time.h>
#include <string.h>
```



```

#define INF 9999999

// number of vertices in graph
#define V 5

// create a 2d array of size 5x5
//for adjacency matrix to represent graph
int G[V][V] = {
    {0, 9, 75, 0, 0},
    {9, 0, 95, 19, 42},
    {75, 95, 0, 51, 66},
    {0, 19, 51, 0, 31},
    {0, 42, 66, 31, 0}};

int main() {
    clock_t start_t, end_t;
    start_t = clock();
    int no_edge; // number of edge

    // create a array to track selected vertex
    // selected will become true otherwise false
    int selected[V];

    // set selected false initially
    memset(selected, false, sizeof(selected));

    // set number of edge to 0
    no_edge = 0;

    // the number of egde in minimum spanning tree will be
    // always less than (V -1), where V is number of vertices in
    //graph

    // choose 0th vertex and make it true
    selected[0] = true;

    int x; // row number
    int y; // col number

    // print for edge and weight
    printf("Edge : Weight\n");

    int step_count =0;

```

```
while (no_edge < V - 1) {
```

```
    step_count++;
```

```
    //For every vertex in the set S, find the all adjacent vertices
```

```
    // , calculate the distance from the vertex selected at step 1.
```

```
    // if the vertex is already in the set S, discard it otherwise
```

```
    //choose another vertex nearest to selected vertex at step 1.
```

```
    int min = INF;
```

```
    x = 0;
```

```
    y = 0;
```

```
    for (int i = 0; i < V; i++) {
```

```
        if (selected[i]) {
```

```
            for (int j = 0; j < V; j++) {
```

```
                if (!selected[j] && G[i][j]) { // not in selected and there is an edge
```

```
                    if (min > G[i][j]) {
```

```
                        min = G[i][j];
```

```
                        x = i;
```

```
                        y = j;
```

```
                    }
```

```
                }
```

```
            }
```

```
        }
```

```
    }
```

```
    printf("%d - %d : %d\n", x, y, G[x][y]);
```

```
    selected[y] = true;
```

```
    no_edge++;
```

```
}
```

```
end_t = clock();
```

```
printf("Matrix Size: 5X5\n");
```

```
printf("Step Count:%d\n",step_count);
```

```
printf("Found time: %f\n", (double)(end_t - start_t) / CLOCKS_PER_SEC);
```

```
return 0;
```

```
}
```