ĐỀ 1:

Câu 1: Cho dãy A = { 1, 2, 4, 8, 16, 32, ... }

a) Thiết kế giải thuật tính đệ quy tính số thứ n trong dãy (n = 0, 1, 2...)

$$A(n) = \begin{cases} 1, & \text{nếu } n = 0 \\ 2 * A(n-1) & \text{nếu } n > 0 \end{cases}$$

b) Thủ tục

```
long long A(int n){
    if (n == 0) return 1;
    else return 2 * A(n-1);
}
```

Câu 2: Danh sách nối đơn: Môn học gồm mã môn học, tên môn học, số tín chỉ

a) Khai báo cấu trúc dữ liệu (5 môn)

```
struct MonHoc {
    char maMon[10];
    char tenMon[20];
    int soTinChi;
};
```

```
struct Node {
    MonHoc infor;
    Node *next;
};
```

```
typedef Node *TRO
    TRO L;
```

b) Thêm 1 phần tử vào đầu danh sách

```
void ThemDau(TRO &L, MonHoc elem){
    TRO Q = new Node();
    Q->infor = elem;
    Q->next = L;
    L = Q;
}
```

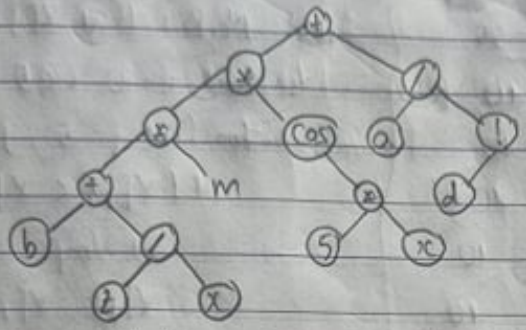
Hiển thị thông tin môn học có mã 123

```
void HienThi(TRO L){
    TRO Q = L;
    while(Q != NULL){
        if(Q->infor.maMon == "123"){
            cout << "ma mon: " << Q->infor.maMon
                 << "\n ten mon: " << Q->infor.tenMon
                 << "\n so tin chi: " << Q->infor.soTinChi;
        } return;
        Q = Q->next;
```

Date . . . No.

Câu 3: B = (b + z/x) * m * cos 5x + a/d!

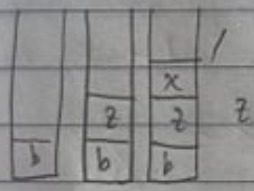
a) Dựng cây.



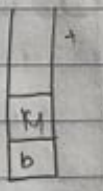
b) Tiền tố: + * + b / z x m cos * 5 x / a ! d

Hậu tố: b z x / + m * 5 x * cos * a d ! / +

c) Minh hoạ ngăn xếp hậu tố



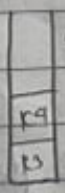
z/x = K1



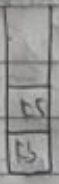
b + K1 = K2

K2 * m = K3

5 * x = K4

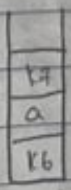


cos K4 = K5

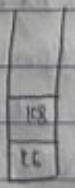


K3 * K5 = K6

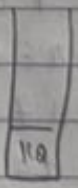
d! = K7



a / K7 = K8



K6 + K8 = K9



→ output: K9

Câu 4.

Date No.

X = {8, 21, 7, 56, 10, -35}

a) Thủ tục minh họa sx tăng dần nổi bọt

X	8	21	7	56	10	-35
i=0	8	21	7	56	-35	10
	8	21	7	-35	56	10
	8	21	-35	7	56	10
	8	-35	21	7	56	10
	-35	8	21	7	56	10
i=1	-35	8	21	7	10	56
	-35	8	21	7	10	56
	-35	8	7	21	10	56
	-35	7	8	21	10	56
i=2	-35	7	8	21	10	56
	-35	7	8	10	21	56
	-35	7	8	10	21	56
i=3	-35	7	8	10	21	56
	-35	7	8	10	21	56
i=4	-35	7	8	10	21	56

```
void NoiBot (int X[]) {
  for (int i=0; i<5; i++)
    for (int j=5; j>i; j--)
      if (X[j] < X[j-1]) {
        int tmp = X[j];
        X[j] = X[j-1];
        X[j-1] = tmp;
      }
}
```

b) Thủ tục minh họa tìm kiếm 15 = tìm kiếm nhị phân

X -35 7 8 10 21 56

l=0, r=5, m=2 → X[m]=8 < 15

X -35 7 8 [10 21 56]

l=3, r=5, m=4 → X[m]=21 > 15

X -35 7 8 [10] 21 56

l=3, r=3, m=3 → X[m]=10 < 15

X -35 7 8] 10 [21 56

l=4, r=2 → l<r sai dừng → không tìm thấy

```
int Timkiem (int X[], int l, int r) {
  int m = (l+r)/2;
  if (X[m] == 15) return m;
  else if (X[m] < 15) return Timkiem (X, l, m-1);
  else return Timkiem (X, m+1, r);
}
```

Date . . . No.

Đề 2

Câu 1: $A = \{1, 1, 3, 5, 11, 21, 43, \dots\}$

a) Giải thuật tính số thứ n trong dãy ($n = 0, 1, 2, \dots$)

$$A(n) = \begin{cases} 1 \text{ nếu } n = 0 \text{ hoặc } n = 1 \\ 2A(n-2) + A(n-1) \text{ nếu trường hợp còn lại} \end{cases}$$

b) Thủ tục

```
long long A(int n) {
    if (n == 0 || n == 1) return 1;
    else return 2*A(n-2) + A(n-1);
}
```

Câu 2: Lưu trữ tệp thông tin 5 môn học: mã MH, tên MH, số TC, điểm

Chiều dài mảng E = 10

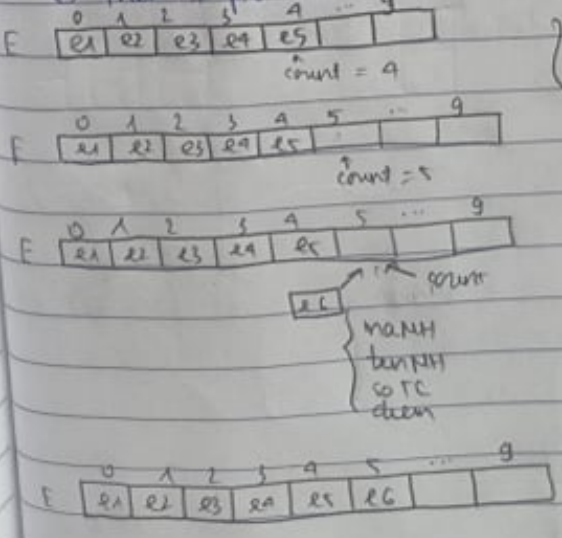
a) Khai báo cấu trúc dữ liệu

```
struct MonHoc {
    char maMH[10];
    char tenMH[20];
    int soTC;
    float diem;
};
```

```
struct list {
    int count;
    MonHoc E[10];
};
list L;
```

b) Mô tả & xây dựng hàm thực hiện

⊗ Thêm 1 phần tử vào cuối danh sách




```
int full(list L) {
    return L.count == 9;
}

void ThemCuoi(list &L, MonHoc elem) {
    if (full(L)) {
        cout << "Mang day";
        return;
    } else {
        L.count ++;
        L.E[L.count] = elem;
    }
}
```

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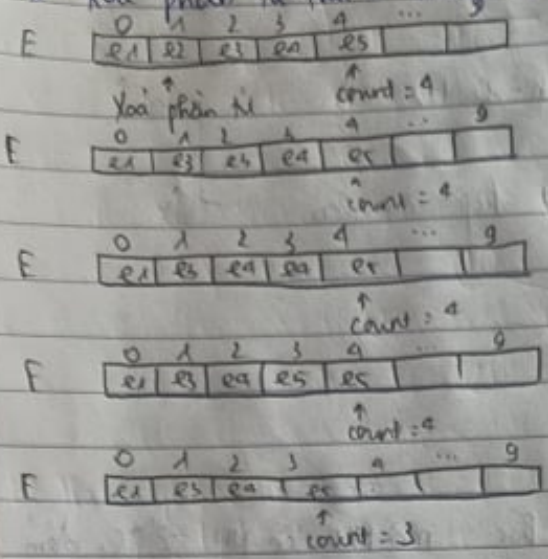
* Xoá phần tử thứ 2 trong danh sách:



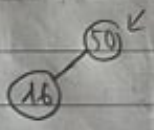

```
void XoaHai ( list &L)
{
  for (int i = 1; i < L.count; i++)
      L.E[i] = L.E[i+1];
  L.count -= 1;
}
```

Câu 3: X = { 50, 16, 25, 55, 45, 14, 23, 60, 58, 67, 10 }

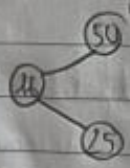
a) Hỏ tả dựng cây nhị phân

+) Xét 50 ta có 50 là Node Root

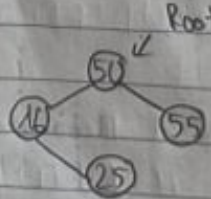
+) Xét 16 ta có 16 < 50 Root



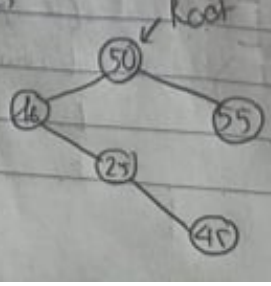
+) Xét 25 ta có { 25 < 50, 25 > 16 Root



+) Xét 55 ta có 55 > 50 Root



+) Xét 45 ta có { 45 < 50, 45 > 16, 45 > 25 Root



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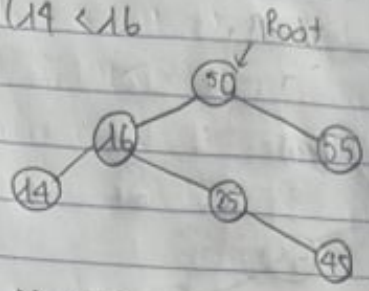
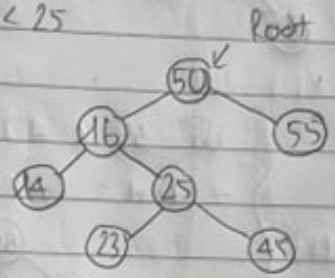
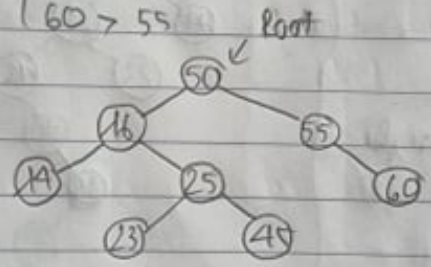
1+) Xét 14 ta có: $\begin{cases} 14 < 50 \\ 14 < 16 \end{cases}$



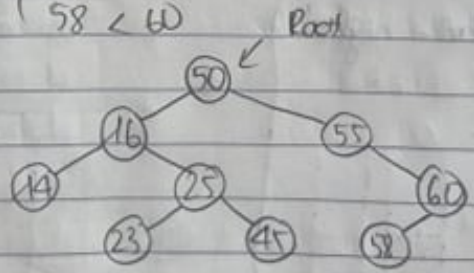
2) Xét 23 ta có: $\begin{cases} 23 < 50 \\ 23 > 16 \\ 23 < 25 \end{cases}$



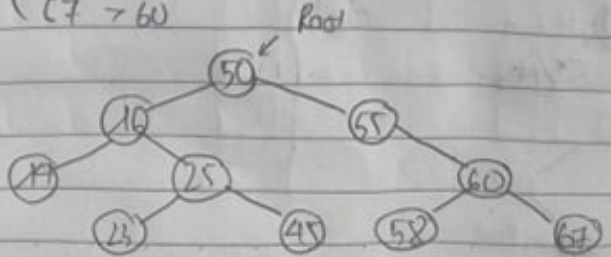
3) Xét 60 ta có: $\begin{cases} 60 > 50 \\ 60 > 55 \end{cases}$



4) Xét 58 ta có: $\begin{cases} 58 > 50 \\ 58 > 55 \\ 58 < 60 \end{cases}$



5) Xét 67 ta có: $\begin{cases} 67 > 50 \\ 67 > 55 \\ 67 > 60 \end{cases}$



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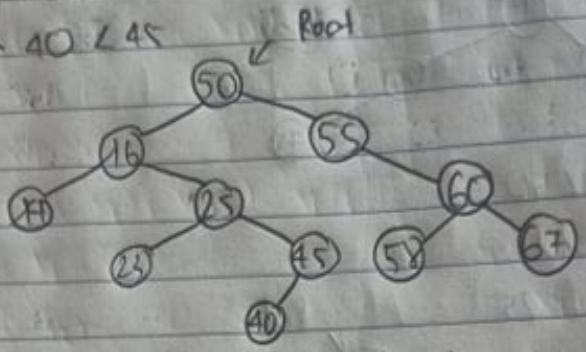
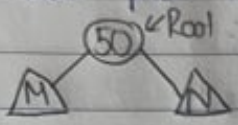
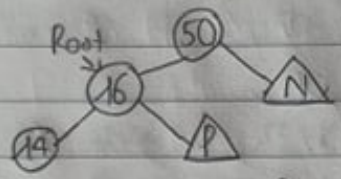
→ Xét 40 ta có: 40 < 50
40 > 16
40 > 25
40 < 45



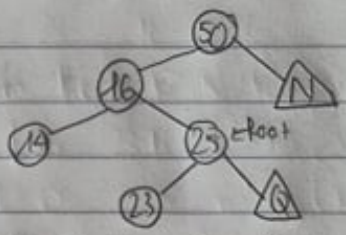
b) Thêm phần tử 35 vào



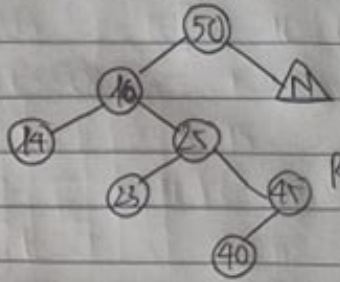
Vì 35 < 50 nên Root = Root → left



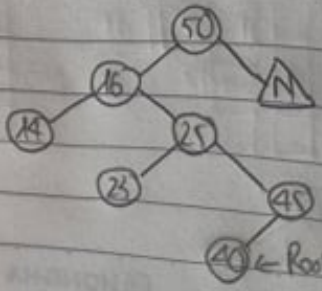
Vì 35 > 16 nên Root = Root → right



Vì 35 > 25 nên Root = Root → right

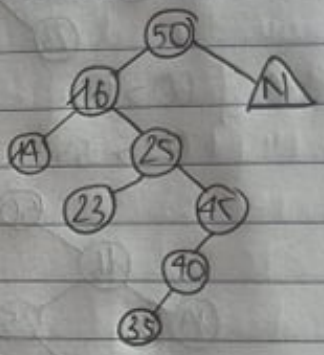


Vì 35 < 45 nên Root = Root → left



Vì 35 < 40 nên Root = Root →

→ Root = Root → left = 35



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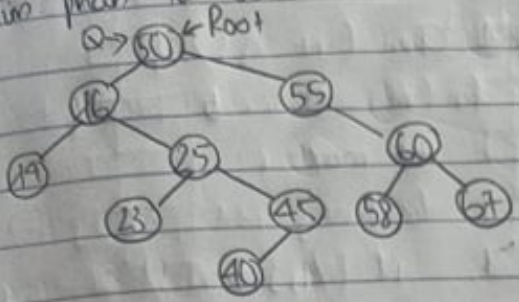
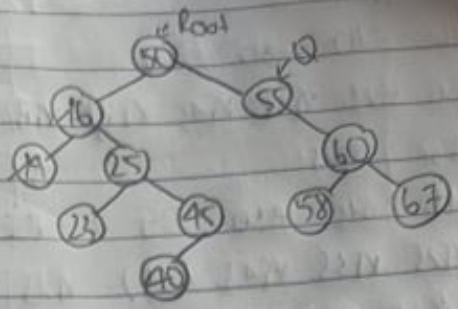
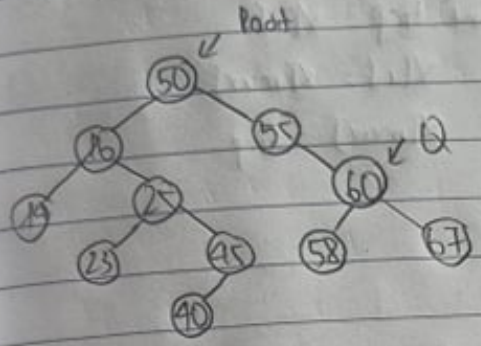
Xoá phần tử 60

→ Tìm phần tử 60



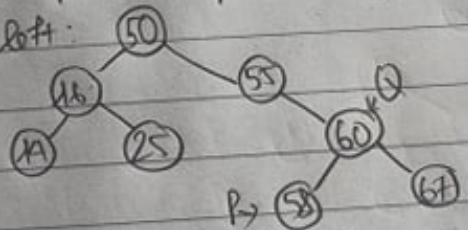




con trỏ Q trỏ vào nút 60 là nút cần xoá

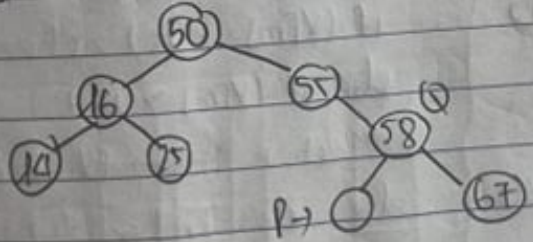
→ Tìm phần tử phải cùng của cây con trái của Q

P = Q → left:



P → right = NULL (Stop)

→ Q → infor = P → infor



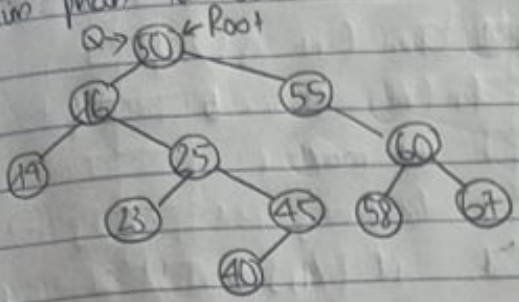
Q → right = NULL

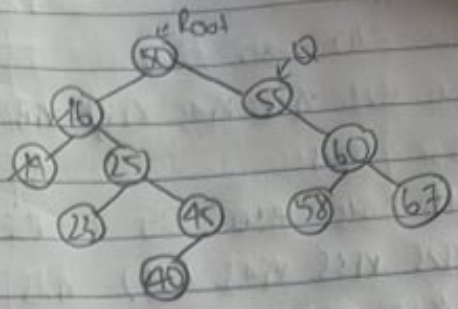
delete P;

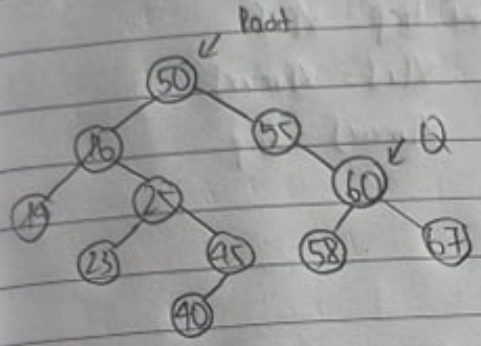
Date . . . No.

Xoá phần tử 60

→ Tìm phần tử 60



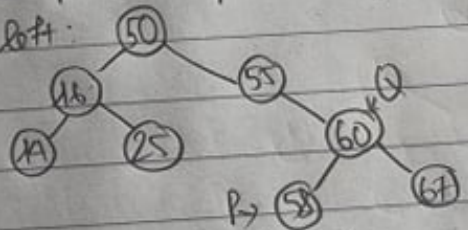




con trỏ Q trỏ vào nút 60 là nút cần xoá

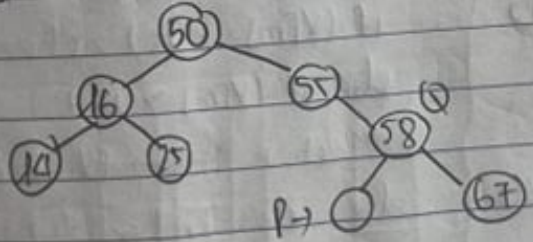
→ Tìm phần tử phải cùng của cây con trái của Q

P = Q → left:



P → right = NULL (Stop)

→ Q → infor = P → infor



Q → right = NULL

delete P;

Câu 4. V={8, 23, 16, 10, -30, 9}

⊛ Giải thích pp chọn

X 8 23 16 10 -30 9

i=0: max(X[0], X[1], X[2], X[3], X[4], X[5]) = X[1]

đổi chỗ X[0] và X[1]

23 8 16 10 -30 9

i=1: max(X[1], X[2], X[3], X[4], X[5]) = X[2]

đổi chỗ X[1] và X[2]

23 16 8 10 -30 9

i=2 max(X[2], X[3], X[4], X[5]) = X[3] = 10

đổi chỗ X[2] và X[3]

23 16 10 8 -30 9

i=3 max(X[3], X[4], X[5]) = X[5] = 9

đổi chỗ X[3] và X[5]

23 16 10 9 -30 8

i=4 max(X[4], X[5]) = X[5] = 8

đổi chỗ X[4] và X[5]

23 16 10 9 8 -30

```
void Chon(int X[]) {
  for(int i=0; i<5; i++) {
    int max=i;
    for(int j=(i+1); j<6; j++)
      if(X[j] > X[max]) max=j;
    int tmp = X[i];
    X[i] = X[max];
    X[max] = tmp;
  }
```

⊛ Tìm kiếm k=15 bằng PP nhị phân

X: [23 16 10 9 8 -30]

l=0, r=5, m=(l+r)/2=2

X[2] = 10 < 15

X: [23 16] 10 9 8 -30

l=0, r=1, m=0

X[0] = 23 > 15

X: 23 [16] 10 9 8 -30

l=1, r=1, m=1

X[1] = 16 > 15

X: 23 16][10 9 8 -30

→ tập rỗng → không tìm thấy k

```
int Timkiem(int X[], int l, int r)
{
  int m = (l+r)/2;
  if(X[m] == 15) return m;
  else if(X[m] > 15)
    return Timkiem(X, m+1, r);
  else return Timkiem(X, l, m-1);
}
```

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Đề 3.

Câu 1: $f(a) = \begin{cases} a & \text{nếu } a \geq 10 \\ a + f(a+1) & \text{nếu } a < 10 \end{cases}$

a) Viết hàm

```
int f(int a){
    if (a>=10) return a;
    else return a+f(a+1);
}
```

b) Tính f(4) và giải thích

$f(4) = 4 + f(4+1) = 4 + f(5) = 4 + 5 + f(5+1) = 9 + f(6)$

$= 9 + 6 + f(6+1) = 15 + f(7) = 15 + 7 + f(7+1) = 22 + f(8)$

$= 22 + 8 + f(8+1) = 30 + f(9) = 30 + 9 + f(9+1) = 39 + f(10)$

$= 39 + 10 = 139$

Câu 2: Mỗi nút đơn: 5 cuốn sách: mã sách, tên sách, tên TG, năm XB

a) Hãy biểu diễn cấu trúc dữ liệu

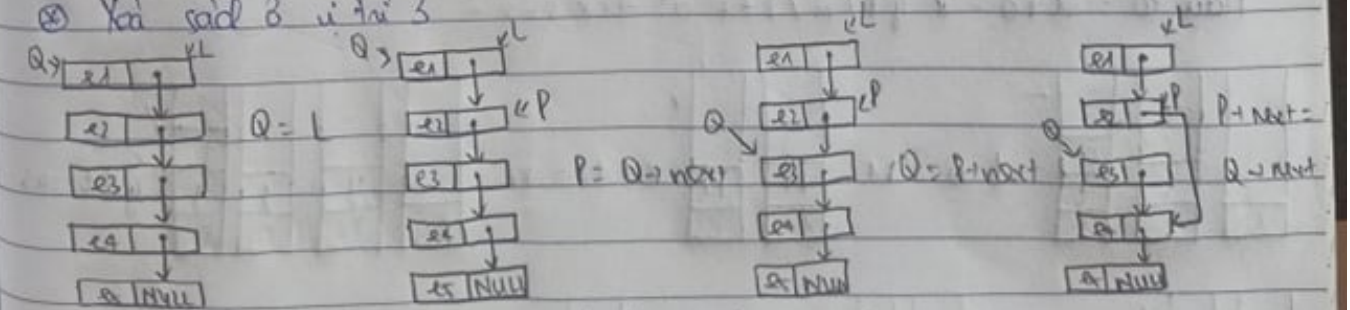
```
struct Sach {
    char maSach[10];
    char tenSach[10];
    char tenTG[10];
    int namXB;
};
```

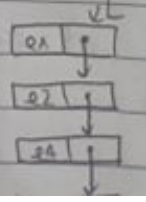
```
struct Node {
    Sach infor;
    Node *next;
};
```

```
typedef Node *TRO;
TRO L;
```

b) Mô tả và viết hàm

* Xoá sách ở vị trí 3






```
void XoaBa (TRO L){
    TRO Q = L;
    TRO P = Q->next; Q = P->next;
    P->next = Q->next;
```

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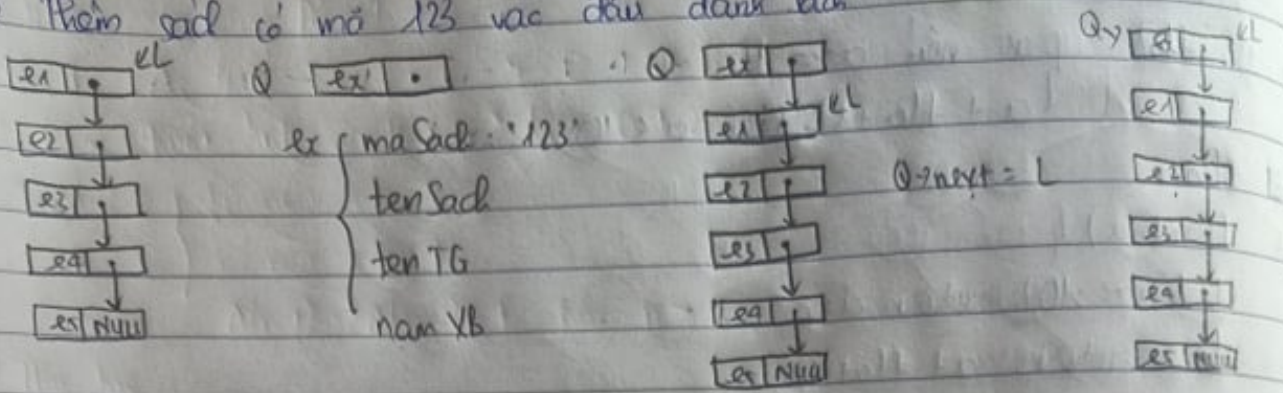
Thêm sách có mã 123 vào đầu danh sách



void ChenDau (TRO &L, NodeBook ex) {

TRO Q = new Node;

Q -> infor = ex;

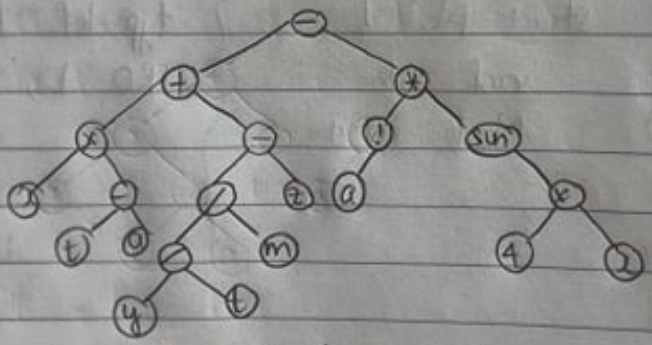
Q -> next = L;

L = Q;

}

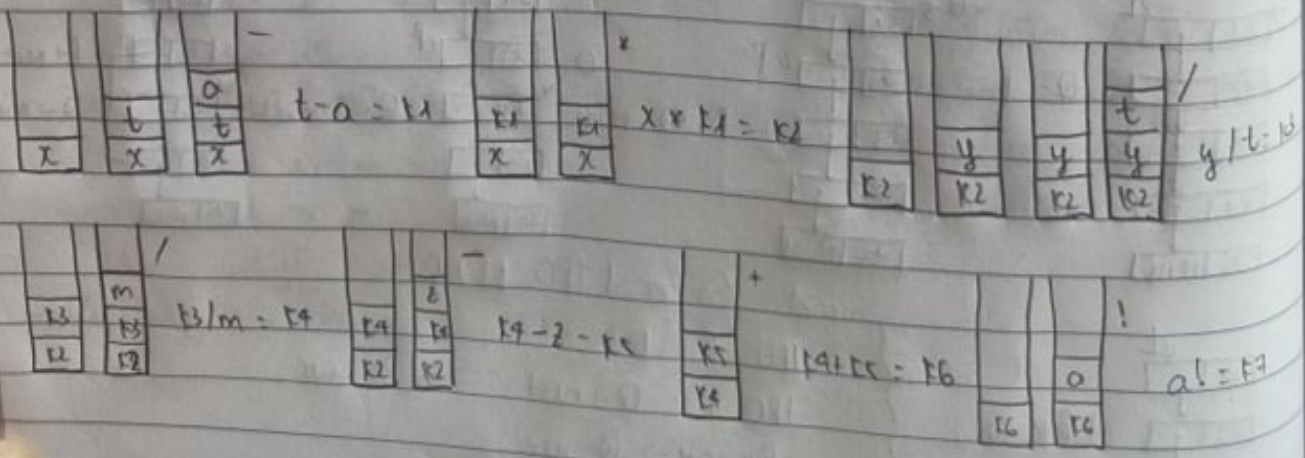
Câu 3 B = x * (t - a) + (y / t / m - z) - a! * sin 4x

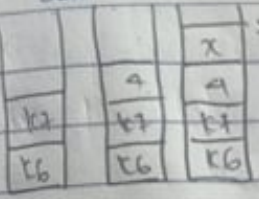
a) Dựng cây:



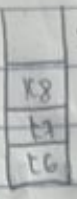
- Tiền tố: - + * x - ta - // y t m z * ! a sin * 4 x

Hậu tố: x t a - * y t / m / z - + a ! 4 x * sin x -

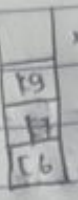




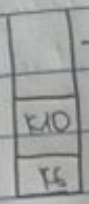
4 x x = r8



sin r8 = r9



r7 x r9 = r10



r6 - r10 = r0 → output = r0

Câu 4. X = {-14, 25, 12, 15, -45, 2}

a) Sắp xếp tăng dần quick sort

X[0]	X[1]	X[2]	X[3]	X[4]	X[5]
-14	25	12	15	-45	2

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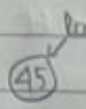
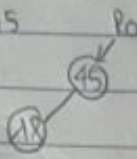
X = {45, 18, 60, 10, 20, 2, 1, 55, 58, 70, 50}

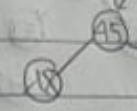
+) Xét 45 ta có: 45 là Root



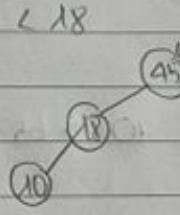
+) Xét 18 ta có: 18 < 45



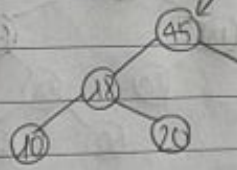
+) Xét 60 ta có: 60 > 45



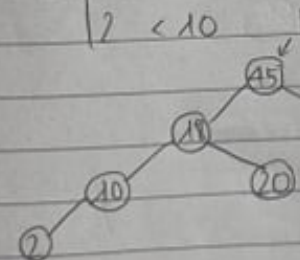
+) Xét 10 ta có: 10 < 45, 10 < 18



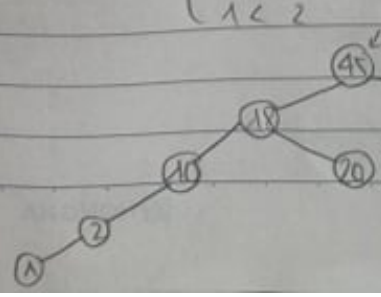
+) Xét 20 ta có: 20 < 45, 20 > 18



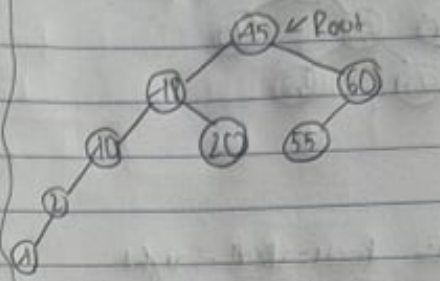
+) Xét 2 ta có: 2 < 45, 2 < 18, 2 < 10



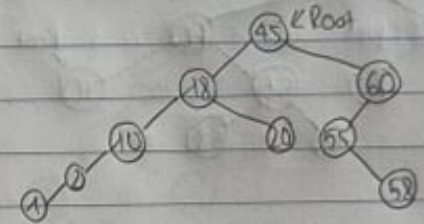
+) Xét 1 ta có: 1 < 45, 1 < 18, 1 < 10, 1 < 2



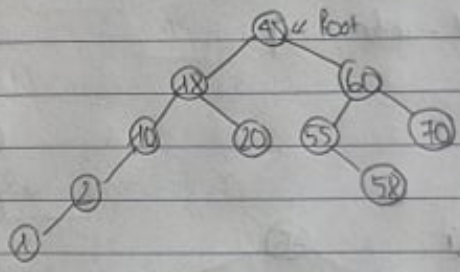
+) Xét 55 ta có: 55 > 45, 55 < 60



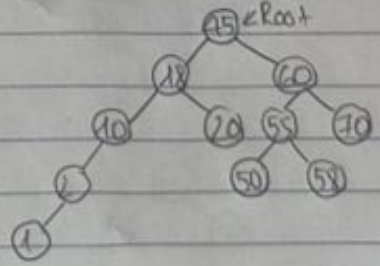
+) Xét 58 ta có: 58 > 45, 58 < 60, 58 > 55



+) Xét 70 ta có: 70 > 45, 70 > 60



+) Xét 50 ta có: 50 > 45, 50 < 60, 50 < 55



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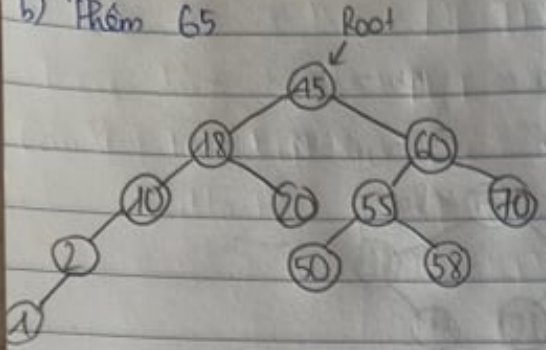
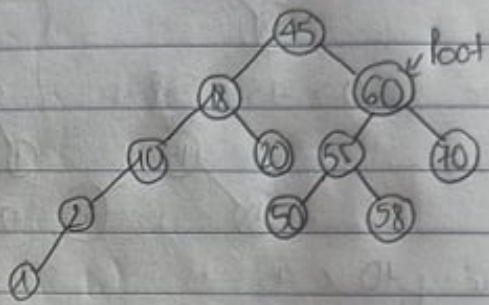
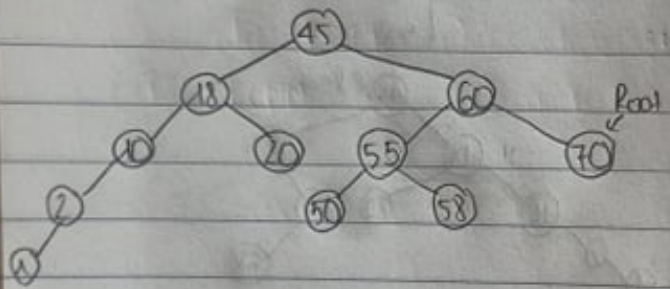
b) Thêm 65



Vì 45 < 60 nên Root = Root → right

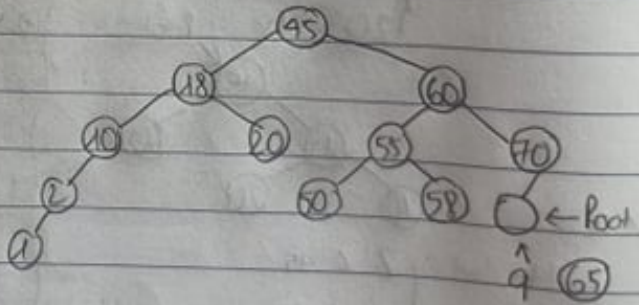


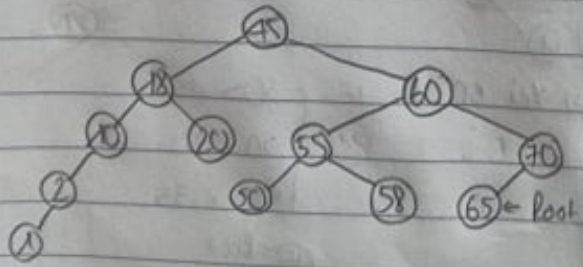
Vì 60 < 65 nên Root = Root → right



Vì 70 > 65 nên Root : Root → left

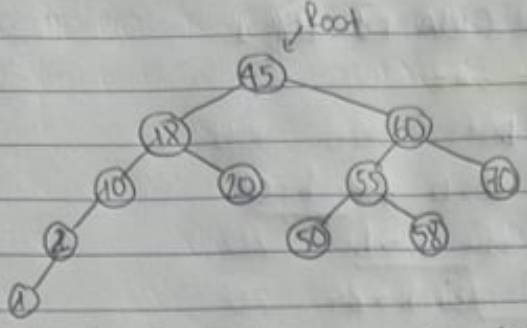
Cần Root → infor = 9



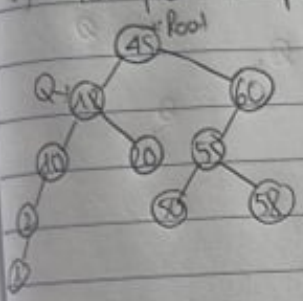


Date . . . No.

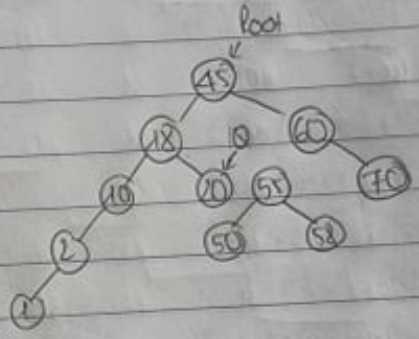
- Xoá 45



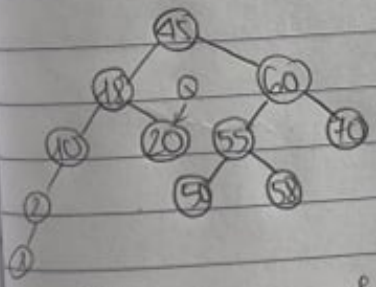
- Tìm phần tử 45 ta có Root → value = 45 (stop)
  Ta có 45 là gốc
- Tìm phần tử phải cùng của cây con trái của gốc



Q = Root → left

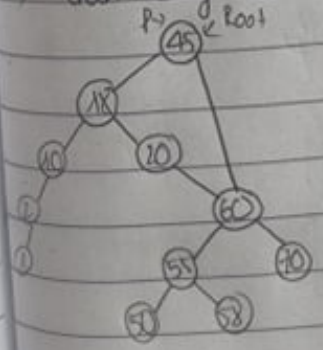


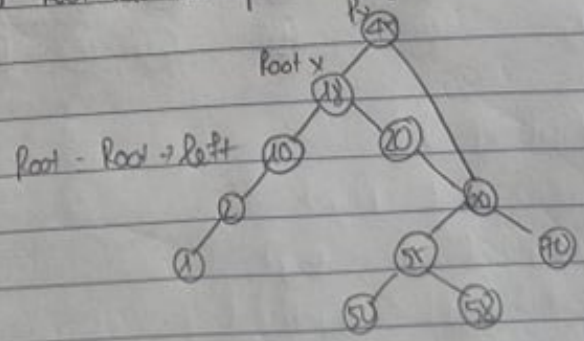
Q = Q → right

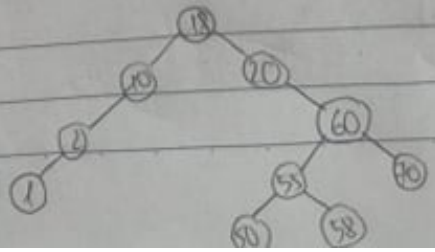


Q → right = NULL (stop)

- Gán cây con phải của Root vào nút phải cùng







delete P;

HONG HA