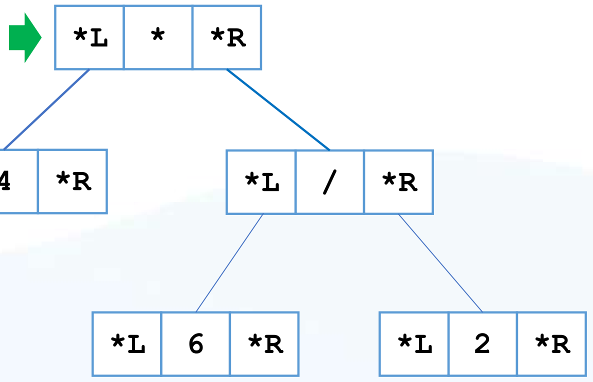
PROGRAM STUDI
TEKNIK INFORMATIKA
FAKULTAS ILMU KOMPUTER
UNIVERSITAS DIAN NUSWANTORO

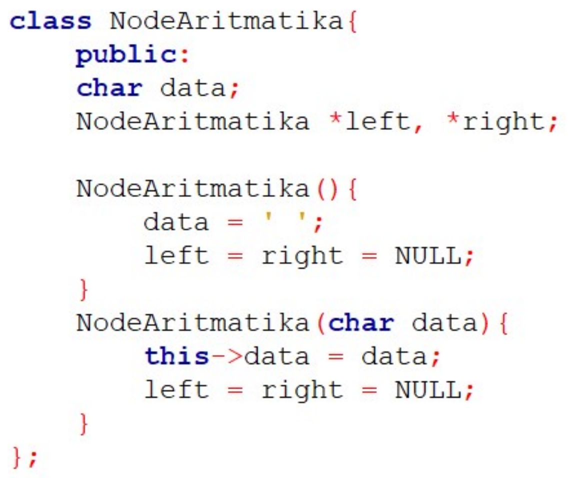
Mata Kuliah
Algoritma dan
Struktur Data



Tree Aritmatika

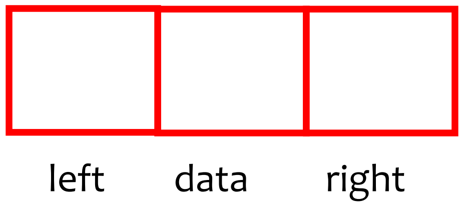
Tim Pengampu Mata Kuliah Algoritma dan Struktur Data

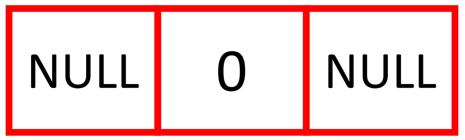
Class NodeAritmatika



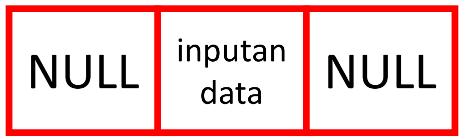
```
class NodeAritmatika{
    public:
    char data;
    NodeAritmatika *left, *right;

    NodeAritmatika(){
        data = ' ';
        left = right = NULL;
    }
    NodeAritmatika(char data){
        this->data = data;
        left = right = NULL;
    }
};
```

pointer right berisi alamat Node selanjutnya
pointer left berisi alamat Node sebelumnya





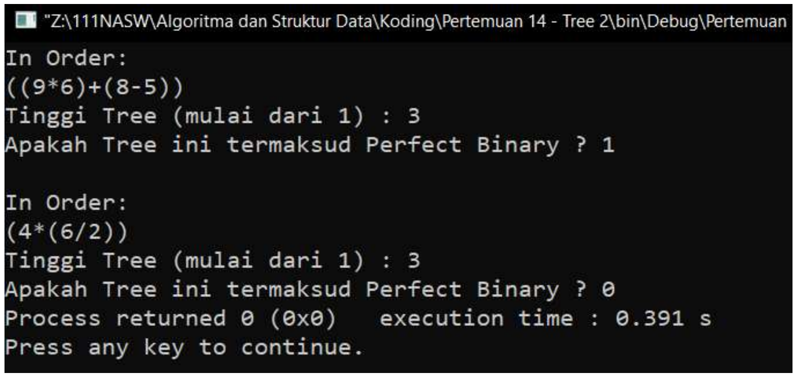
Konstruktor default



Konstruktor inputan
Data tergantung inputan

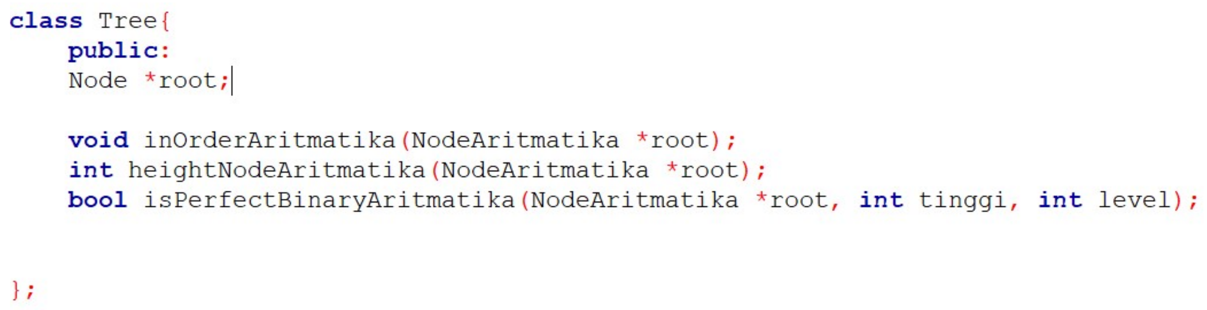
int main

```
/* representasi tree
        +
      /   \
     *     -
   / \    / \
  9   6  8   5  */
NodeAritmatika *root = new NodeAritmatika('+');
root->left = new NodeAritmatika('*');  root->right = new NodeAritmatika('-');
root->left->left = new NodeAritmatika('9'); root->left->right = new NodeAritmatika('6');
root->right->left = new NodeAritmatika('8'); root->right->right = new NodeAritmatika('5');
Tree T;
int tinggi;

cout << "In Order: " << endl; T.inOrderAritmatika(root);

tinggi = T.heightNodeAritmatika(root);
cout <<"\nTinggi Tree (mulai dari 1) : " << tinggi;

cout <<"\nApakah Tree ini termaksud Perfect Binary ? " <<
        T.isPerfectBinaryAritmatika(root, tinggi, 0);

/* representasi tree
        *
      /   \
     4     /
          / \
         6   2 */
NodeAritmatika *akar = new NodeAritmatika('*');
akar->left = new NodeAritmatika('4');  akar->right = new NodeAritmatika('/');
akar->right->left = new NodeAritmatika('6'); akar->right->right = new NodeAritmatika('2');
Tree pohon;
int tinggiPohon;

cout << "\n\nIn Order: " << endl; pohon.inOrderAritmatika(akar);

tinggiPohon = pohon.heightNodeAritmatika(akar);
cout <<"\nTinggi Tree (mulai dari 1) : " << tinggiPohon;

cout <<"\nApakah Tree ini termaksud Perfect Binary ? " << pohon.isPerfectBinaryAritmatika(akar, tinggiPohon, 0);
```



```
"Z:\111NASW\Algoritma dan Struktur Data\Koding\Pertemuan 14 - Tree 2\bin\Debug\Pertemuan
In Order:
((9*6)+(8-5))
Tinggi Tree (mulai dari 1) : 3
Apakah Tree ini termaksud Perfect Binary ? 1

In Order:
(4*(6/2))
Tinggi Tree (mulai dari 1) : 3
Apakah Tree ini termaksud Perfect Binary ? 0
Process returned 0 (0x0)   execution time : 0.391 s
Press any key to continue.
```

Class Tree



```
class Tree{
    public:
    Node *root;

    void inOrderAritmatika(NodeAritmatika *root);
    int heightNodeAritmatika(NodeAritmatika *root);
    bool isPerfectBinaryAritmatika(NodeAritmatika *root, int tinggi, int level);


};
```

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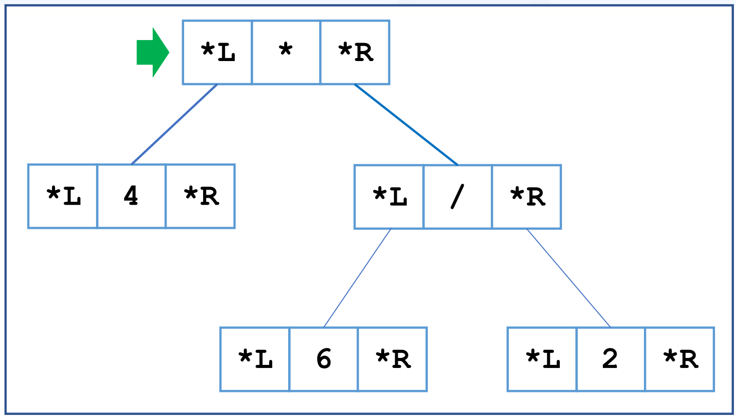
inOrderAritmatika(root) #1

```
void Tree::inOrderAritmatika(NodeAritmatika *root){
    if(root != NULL){
        if (root->left != NULL || root->right != NULL)
            cout << "(";
        inOrderAritmatika(root->left);
        cout << root->data;
        inOrderAritmatika(root->right);
        if (root->left != NULL || root->right != NULL)
            cout << ")";
    }
}
```

Cetak = (

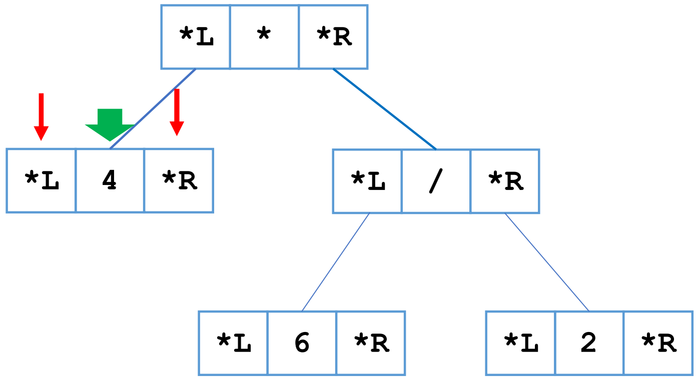
Cetak = (4*



```
void Tree::inOrderAritmatika(NodeAritmatika *root){
    if(root != NULL){
        if (root->left != NULL || root->right != NULL)
            cout << "(";
        inOrderAritmatika(root->left);
        cout << root->data;
        inOrderAritmatika(root->right);
        if (root->left != NULL || root->right != NULL)
            cout << ")";
    }
}
```

Cetak = (4

```
void Tree::inOrderAritmatika(NodeAritmatika *root){
    if(root != NULL){
        if (root->left != NULL || root->right != NULL)
            cout << "(";
        inOrderAritmatika(root->left);
        cout << root->data;
        inOrderAritmatika(root->right);
        if (root->left != NULL || root->right != NULL)
            cout << ")";
    }
}
```



```
void Tree::inOrderAritmatika(NodeAritmatika *root){
    if(root != NULL){
        if (root->left != NULL || root->right != NULL)
            cout << "(";
        inOrderAritmatika(root->left);
        cout << root->data;
```

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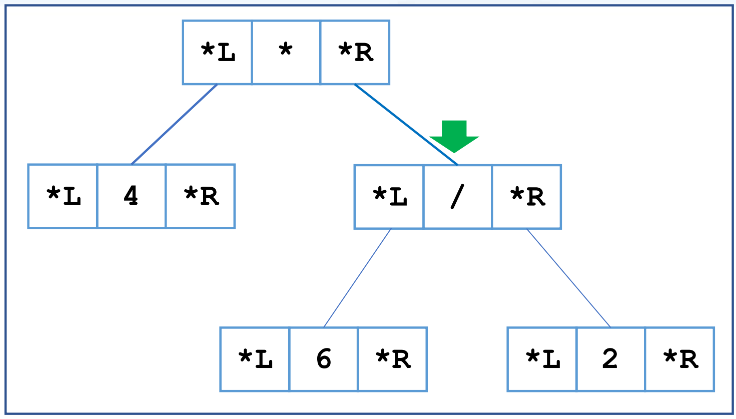
inOrderAritmatika(root) #2

```
void Tree::inOrderAritmatika(NodeAritmatika *root){
    if(root != NULL){
        if (root->left != NULL || root->right != NULL)
            cout << "(";
        inOrderAritmatika(root->left);
        cout << root->data;
        inOrderAritmatika(root->right);
        if (root->left != NULL || root->right != NULL)
            cout << ")";
    }
}
```

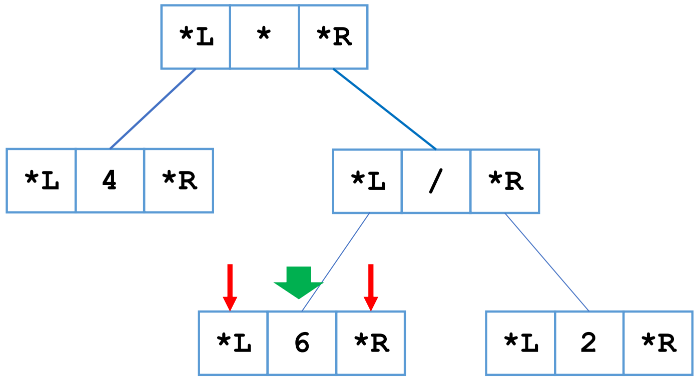
Cetak = (4*(

Cetak = (4*(6/



```
void Tree::inOrderAritmatika(NodeAritmatika *root){
    if(root != NULL){
        if (root->left != NULL || root->right != NULL)
            cout << "(";
        inOrderAritmatika(root->left);
        cout << root->data;
        inOrderAritmatika(root->right);
        if (root->left != NULL || root->right != NULL)
            cout << ")";
    }
}
```

Cetak = (4*(6



```
void Tree::inOrderAritmatika(NodeAritmatika *root){
    if(root != NULL){
        if (root->left != NULL || root->right != NULL)
            cout << "(";
        inOrderAritmatika(root->left);
        cout << root->data;
        inOrderAritmatika(root->right);
        if (root->left != NULL || root->right != NULL)
            cout << ")";
    }
}
```

```
void Tree::inOrderAritmatika(NodeAritmatika *root){
    if(root != NULL){
        if (root->left != NULL || root->right != NULL)
            cout << "(";
        inOrderAritmatika(root->left);
        cout << root->data;
```

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inOrderAritmatika(root) #3

```
void Tree::inOrderAritmatika(NodeAritmatika *root){
    if(root != NULL){
        if (root->left != NULL || root->right != NULL)
            cout << "(";
        inOrderAritmatika(root->left);
        cout << root->data;
        inOrderAritmatika(root->right);
        if (root->left != NULL || root->right != NULL)
            cout << ")";
    }
}
```

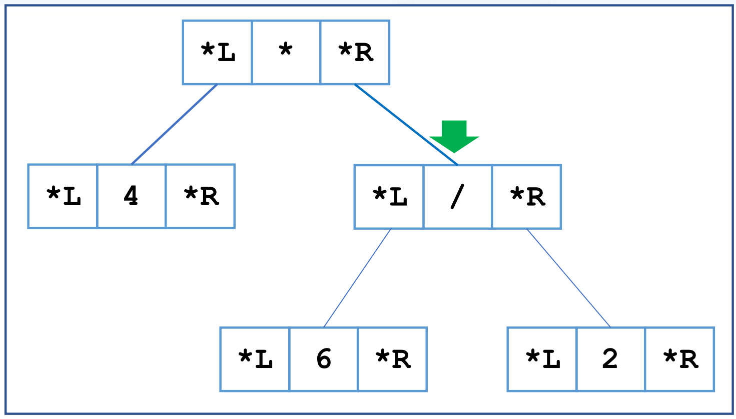
Cetak = (4*(6/2)

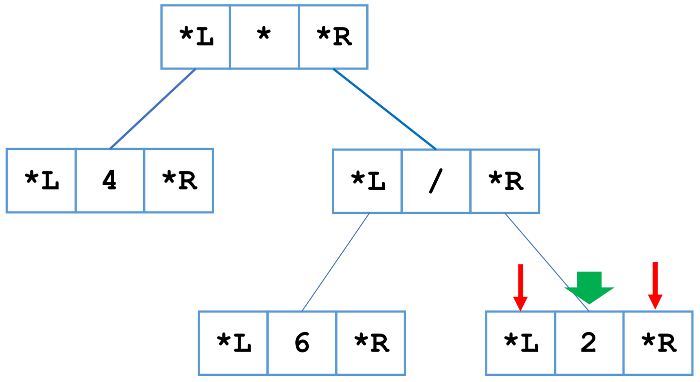
```
void Tree::inOrderAritmatika(NodeAritmatika *root){
    if(root != NULL){
        if (root->left != NULL || root->right != NULL)
            cout << "(";
        inOrderAritmatika(root->left);
        cout << root->data;
        inOrderAritmatika(root->right);
        if (root->left != NULL || root->right != NULL)
            cout << ")";
    }
}
```

Cetak = (4*(6/2

```
void Tree::inOrderAritmatika(NodeAritmatika *root){
    if(root != NULL){
        if (root->left != NULL || root->right != NULL)
            cout << "(";
        inOrderAritmatika(root->left);
        cout << root->data;
        inOrderAritmatika(root->right);
        if (root->left != NULL || root->right != NULL)
            cout << ")";
    }
}
```

```
void Tree::inOrderAritmatika(NodeAritmatika *root){
    if(root != NULL){
        if (root->left != NULL || root->right != NULL)
            cout << "(";
        inOrderAritmatika(root->left);
        cout << root->data;
```

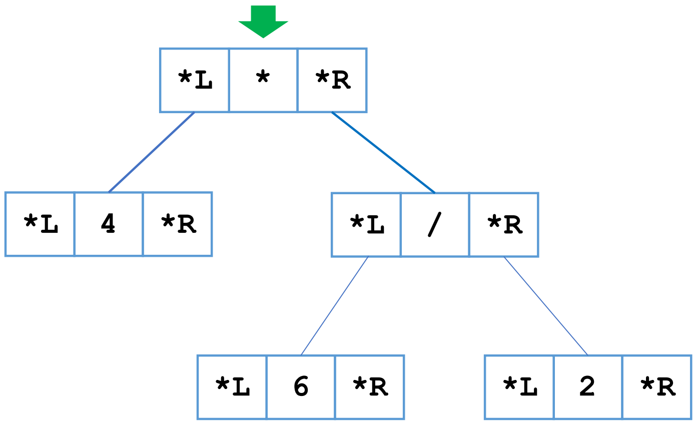




inOrderAritmatika(root) #4

```
void Tree::inOrderAritmatika(NodeAritmatika *root){
    if(root != NULL){
        if (root->left != NULL || root->right != NULL)
            cout << "(";
        inOrderAritmatika(root->left);
        cout << root->data;
        inOrderAritmatika(root->right);
        if (root->left != NULL || root->right != NULL)
            cout << ")";
    }
}
```

Cetak = (4*(6/2))



heightNodeAritmatika

```
int Tree::heightNodeAritmatika(NodeAritmatika *root){
    if(root == NULL){
        return 0;
    }else{
        int leftH=leftH=heightNodeAritmatika(root->left);
        int rightH= leftH=heightNodeAritmatika(root->right);

        return 1+max(leftH, rightH);
    }
}
```

Sama seperti heightNode

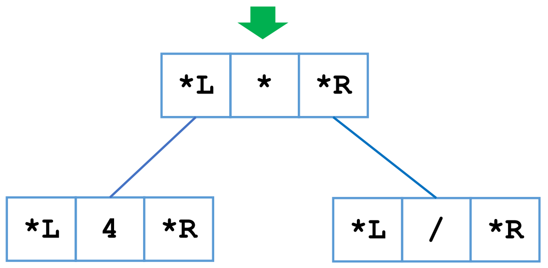
isPerfectBinaryAritmatika(root, 2, 0) output true #1

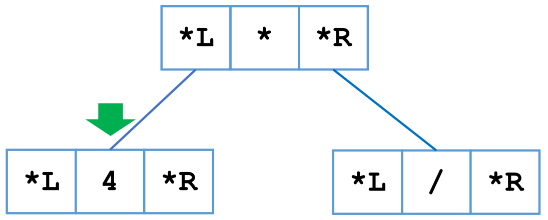
```
bool Tree::isPerfectBinaryAritmatika(NodeAritmatika *root, int tinggi, int level){
    if (root == NULL)
        return true;

    if (root->left == NULL && root->right == NULL)
        return (tinggi == level+1);

    if (root->left == NULL || root->right == NULL)
        return false;

    return isPerfectBinaryAritmatika(root->left, tinggi, level+1) &&
           isPerfectBinaryAritmatika(root->right, tinggi, level+1);
}
```

true &&

isPerfectBinaryAritmatika(root->left, 2, 1)

```
bool Tree::isPerfectBinaryAritmatika(NodeAritmatika *root, int tinggi, int level){
    if (root == NULL)
        return true;

    if (root->left == NULL && root->right == NULL)
        return (tinggi == level+1);   return (2==1); return true

    if (root->left == NULL || root->right == NULL)
        return false;

    return isPerfectBinaryAritmatika(root->left, tinggi, level+1) &&
           isPerfectBinaryAritmatika(root->right, tinggi, level+1);
}
```





isPerfectBinaryAritmatika(root, 2, 0) output true #2

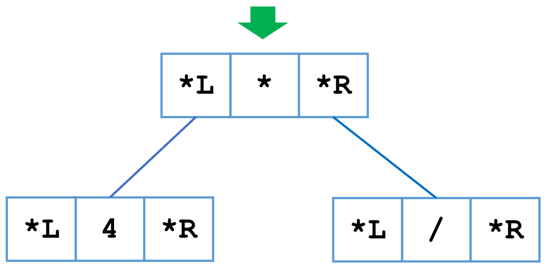
```
bool Tree::isPerfectBinaryAritmatika(NodeAritmatika *root, int tinggi, int level){
    if (root == NULL)
        return true;

    if (root->left == NULL && root->right == NULL)
        return (tinggi == level+1);

    if (root->left == NULL || root->right == NULL)
        return false;

    return isPerfectBinaryAritmatika(root->left, tinggi, level+1) &&
           isPerfectBinaryAritmatika(root->right, tinggi, level+1);
}
```

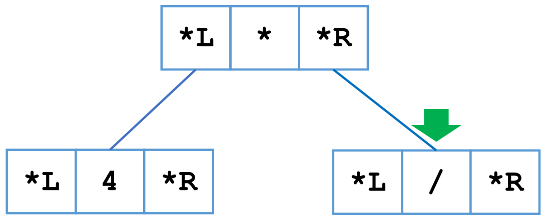
true && true

return true

isPerfectBinaryAritmatika(root->right, 2, 1)

```
bool Tree::isPerfectBinaryAritmatika(NodeAritmatika *root, int tinggi, int level){
    if (root == NULL)
        return true;

    if (root->left == NULL && root->right == NULL)
        return (tinggi == level+1);  return (2==1); return true

    if (root->left == NULL || root->right == NULL)
        return false;

    return isPerfectBinaryAritmatika(root->left, tinggi, level+1) &&
           isPerfectBinaryAritmatika(root->right, tinggi, level+1);
}
```





isPerfectBinaryAritmatika(root, 2, 0) output false #1

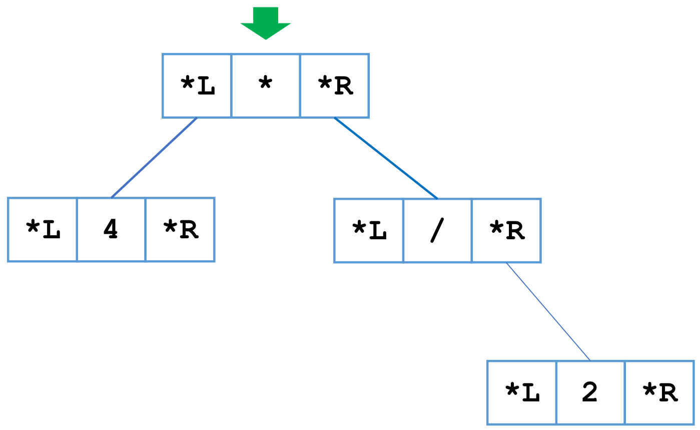
```
bool Tree::isPerfectBinaryAritmatika(NodeAritmatika *root, int tinggi, int level){
    if (root == NULL)
        return true;

    if (root->left == NULL && root->right == NULL)
        return (tinggi == level+1);

    if (root->left == NULL || root->right == NULL)
        return false;

    return isPerfectBinaryAritmatika(root->left, tinggi, level+1) &&
           isPerfectBinaryAritmatika(root->right, tinggi, level+1);
}
```

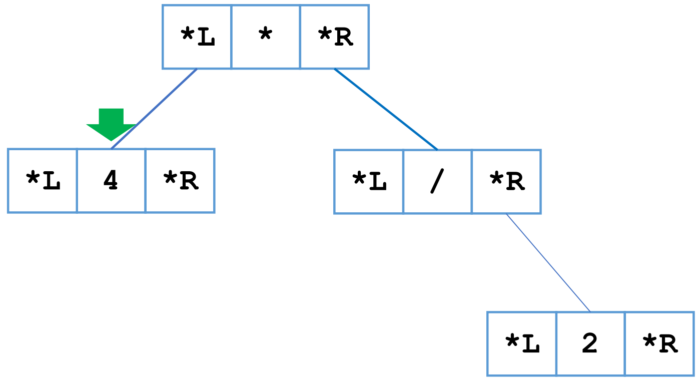
true &&

isPerfectBinaryAritmatika(root->left, 2, 1)

```
bool Tree::isPerfectBinaryAritmatika(NodeAritmatika *root, int tinggi, int level){
    if (root == NULL)
        return true;

    if (root->left == NULL && root->right == NULL)
        return (tinggi == level+1);

    if (root->left == NULL || root->right == NULL)
        return false;

    return isPerfectBinaryAritmatika(root->left, tinggi, level+1) &&
           isPerfectBinaryAritmatika(root->right, tinggi, level+1);
}
```

return (2==1); return true





isPerfectBinaryAritmatika(root, 2, 0) output false #2

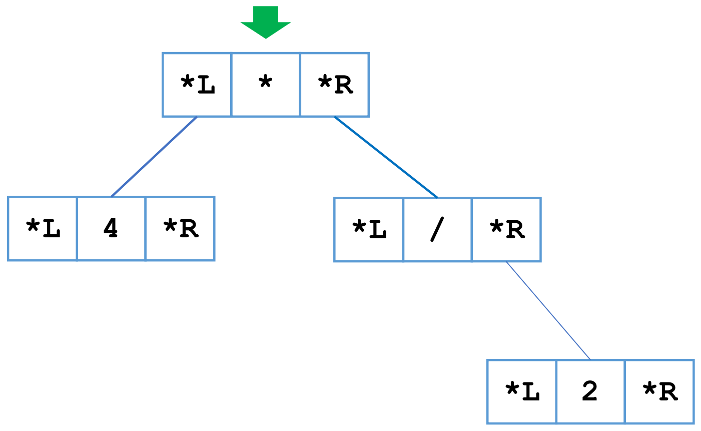
```
bool Tree::isPerfectBinaryAritmatika(NodeAritmatika *root, int tinggi, int level){
    if (root == NULL)
        return true;

    if (root->left == NULL && root->right == NULL)
        return (tinggi == level+1);

    if (root->left == NULL || root->right == NULL)
        return false;

    return isPerfectBinaryAritmatika(root->left, tinggi, level+1) &&
           isPerfectBinaryAritmatika(root->right, tinggi, level+1);
}
```

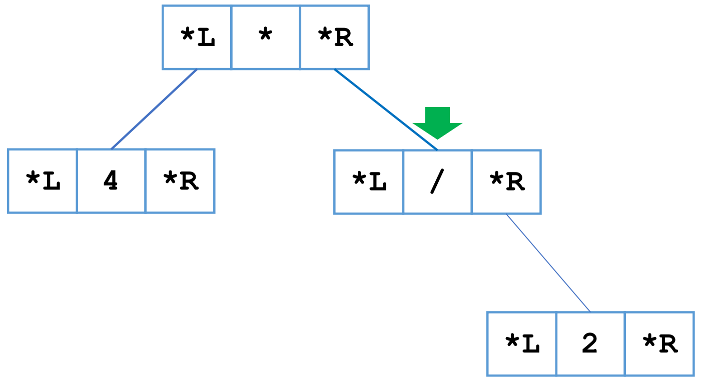
true && false

return false

isPerfectBinaryAritmatika(root->right, 2, 1)

```
bool Tree::isPerfectBinaryAritmatika(NodeAritmatika *root, int tinggi, int level){
    if (root == NULL)
        return true;

    if (root->left == NULL && root->right == NULL)
        return (tinggi == level+1);

    if (root->left == NULL || root->right == NULL)
        return false;                          return false

    return isPerfectBinaryAritmatika(root->left, tinggi, level+1) &&
           isPerfectBinaryAritmatika(root->right, tinggi, level+1);
}
```





Referensi

Utama:

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2. Introduction to the Design and Analysis of Algorithms 3rd Edition, Anany Levitin, Pearson, 2011
3. Data Structures and Algorithms in C++, Michael T. Goodrich, Roberto Tamasia, David M. Mount, John Wiley & Sons, 2011

Pendukung:

1. Data Structures and Algorithms in C++ 4th Edition, Adam Drozdek, Cengage Learning, 2013

TERIMA KASIH

ANY QUESTIONS?