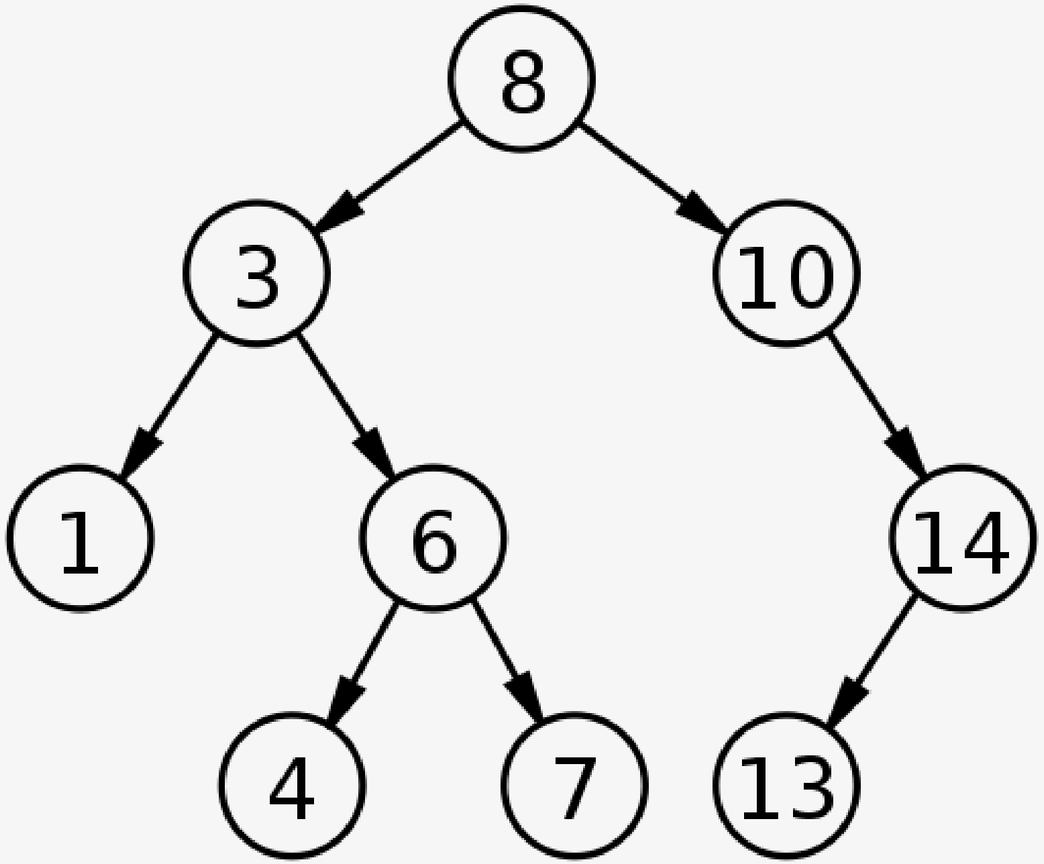
Styczeń, 2022

BINARNE DRZEWO POSZUKIWAŃ

Magda Szafrańska

Algorytmy, AHNS w Radomiu
Prowadzący dr hab. Filip Rudziński

Binary
Search
Tree



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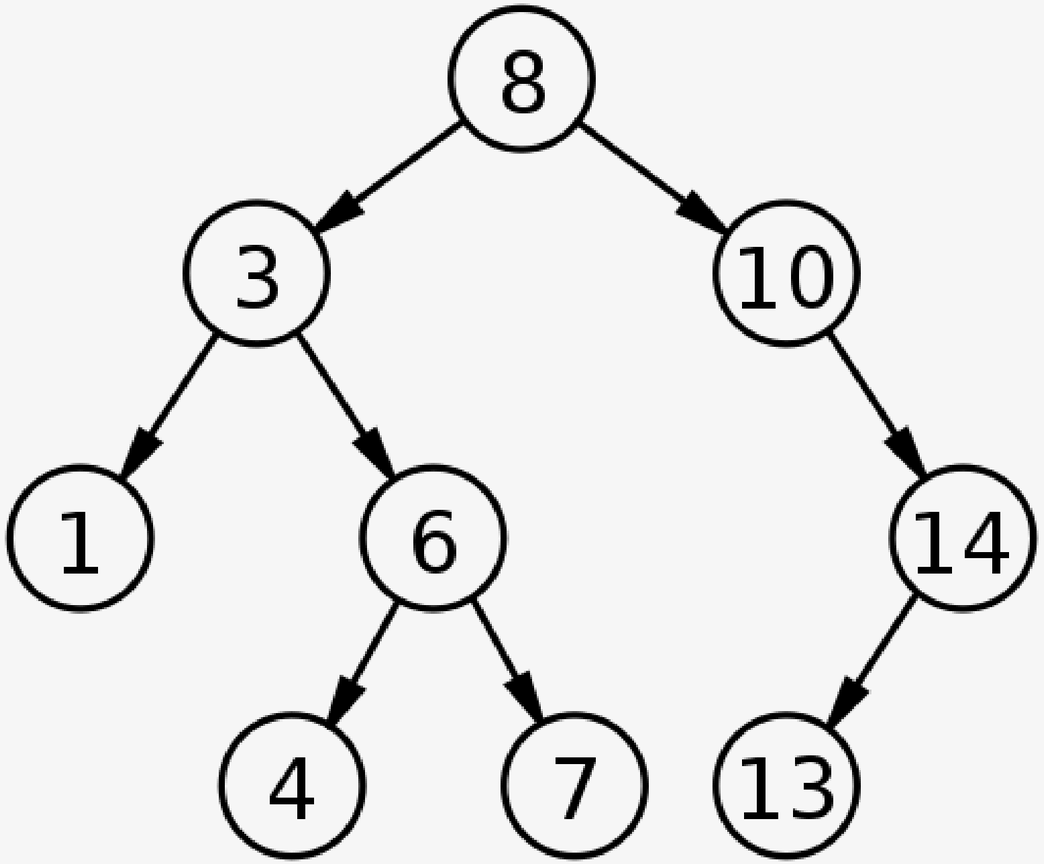

węzły/ wierzchołki (ang. NODES)

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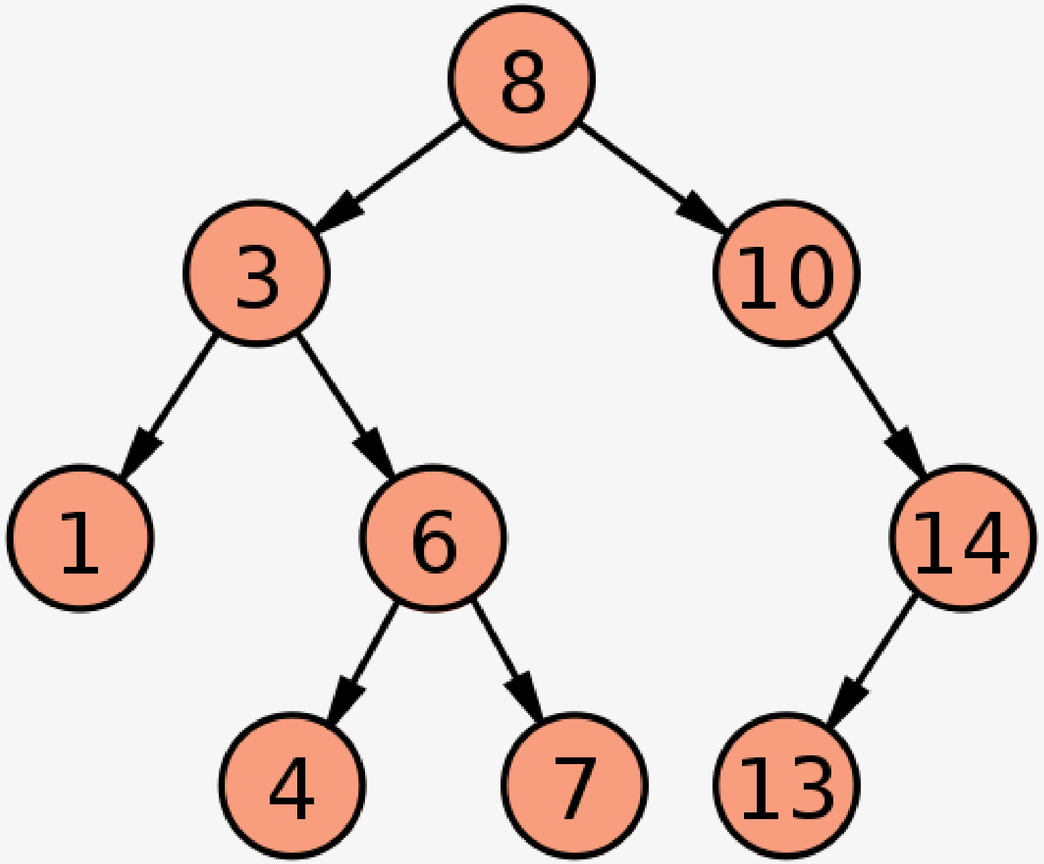

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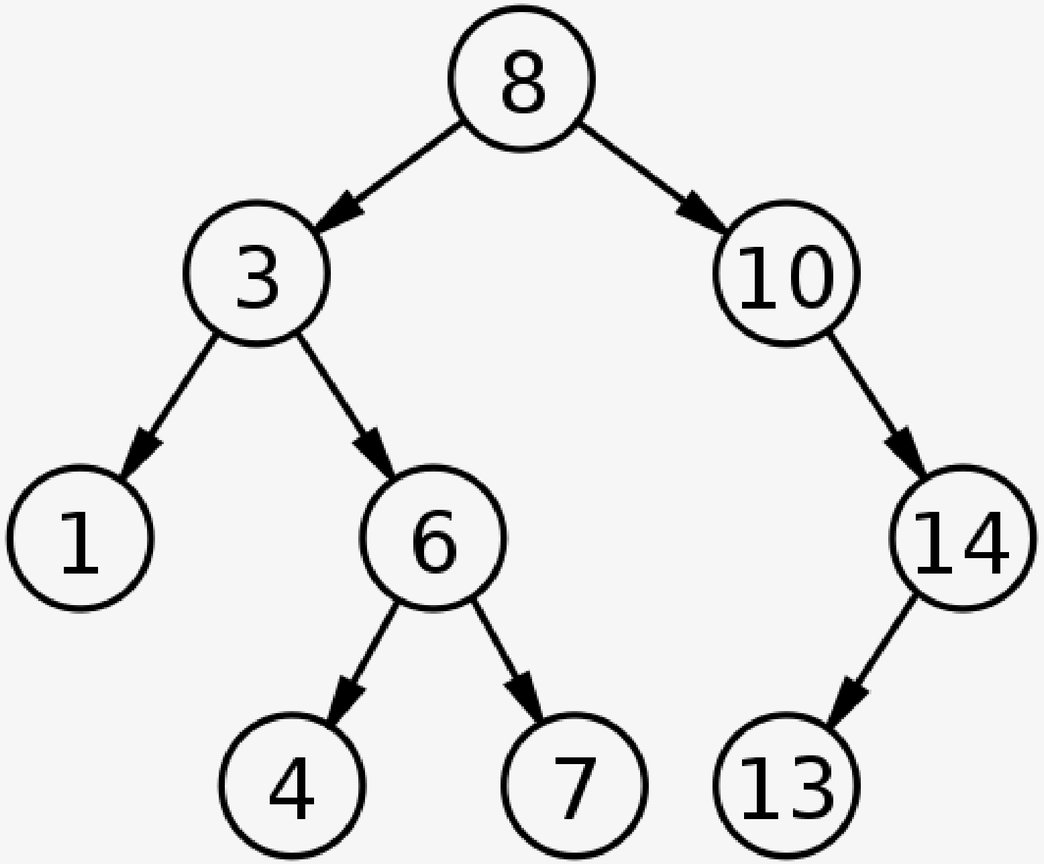

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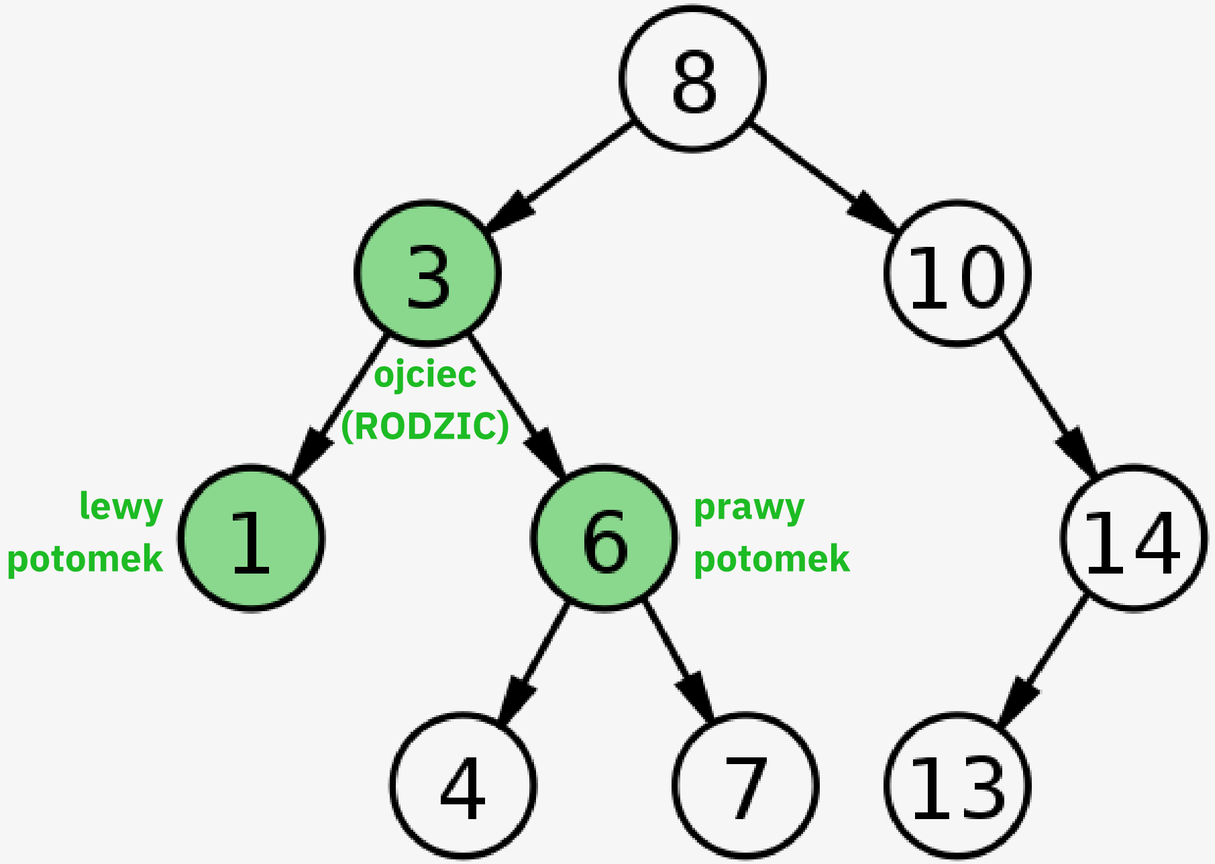

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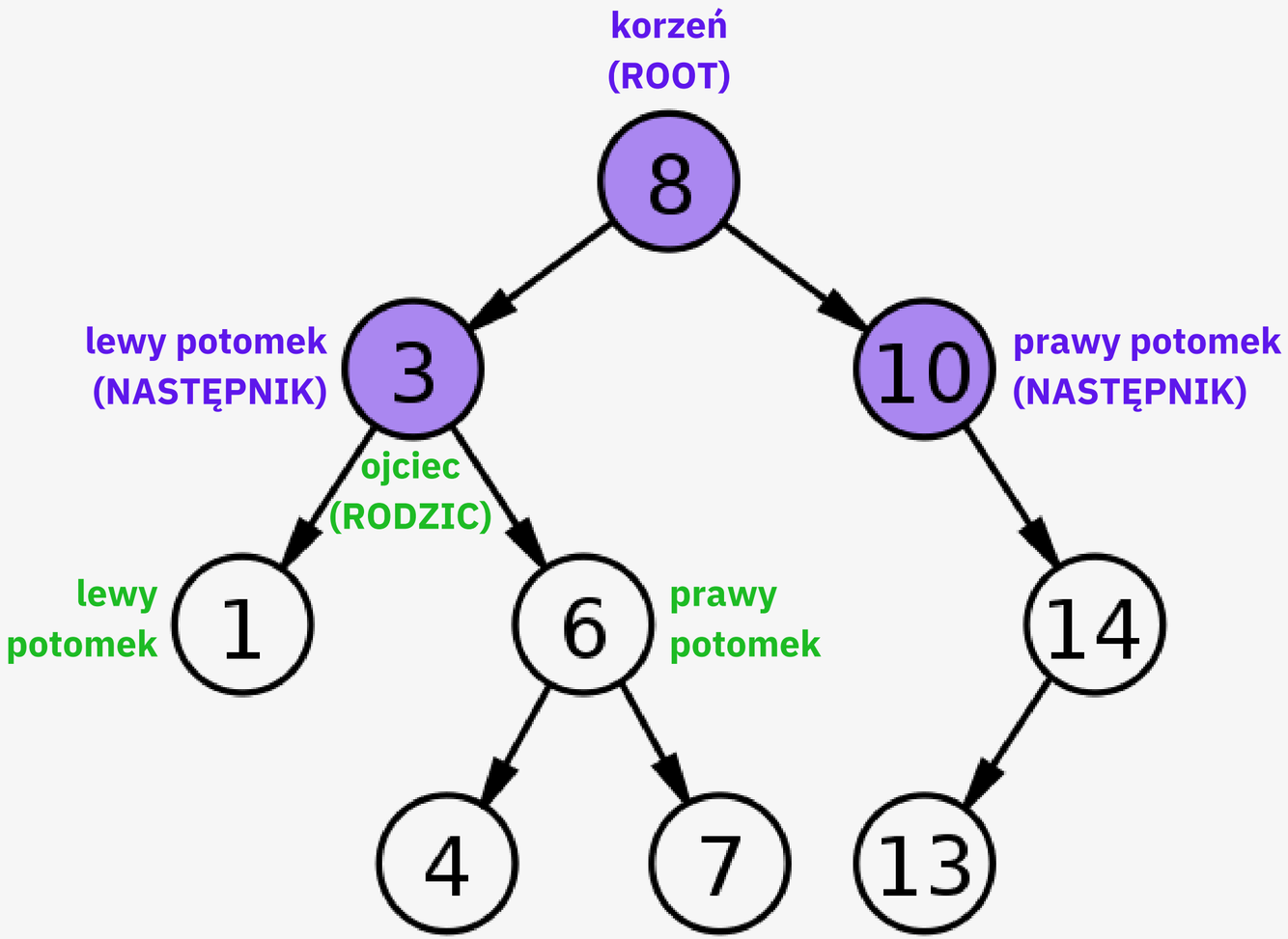

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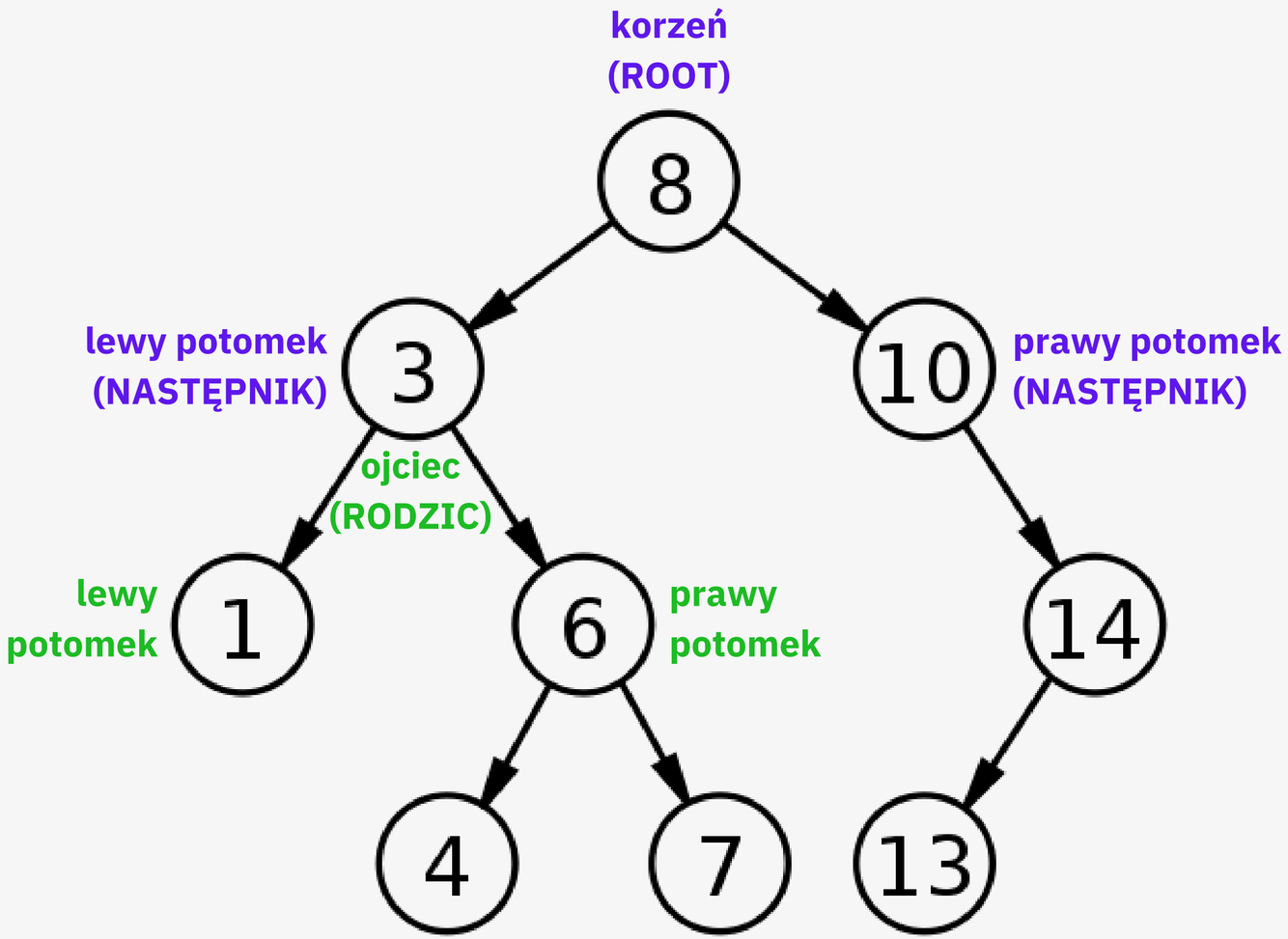

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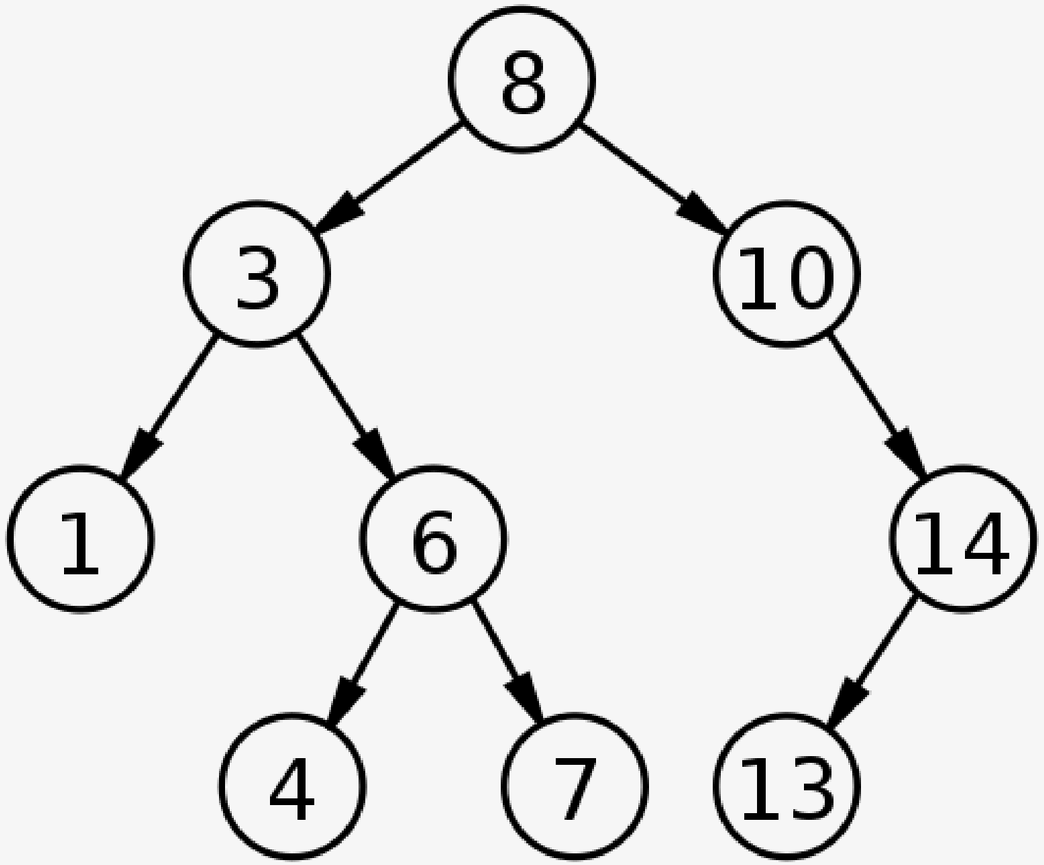
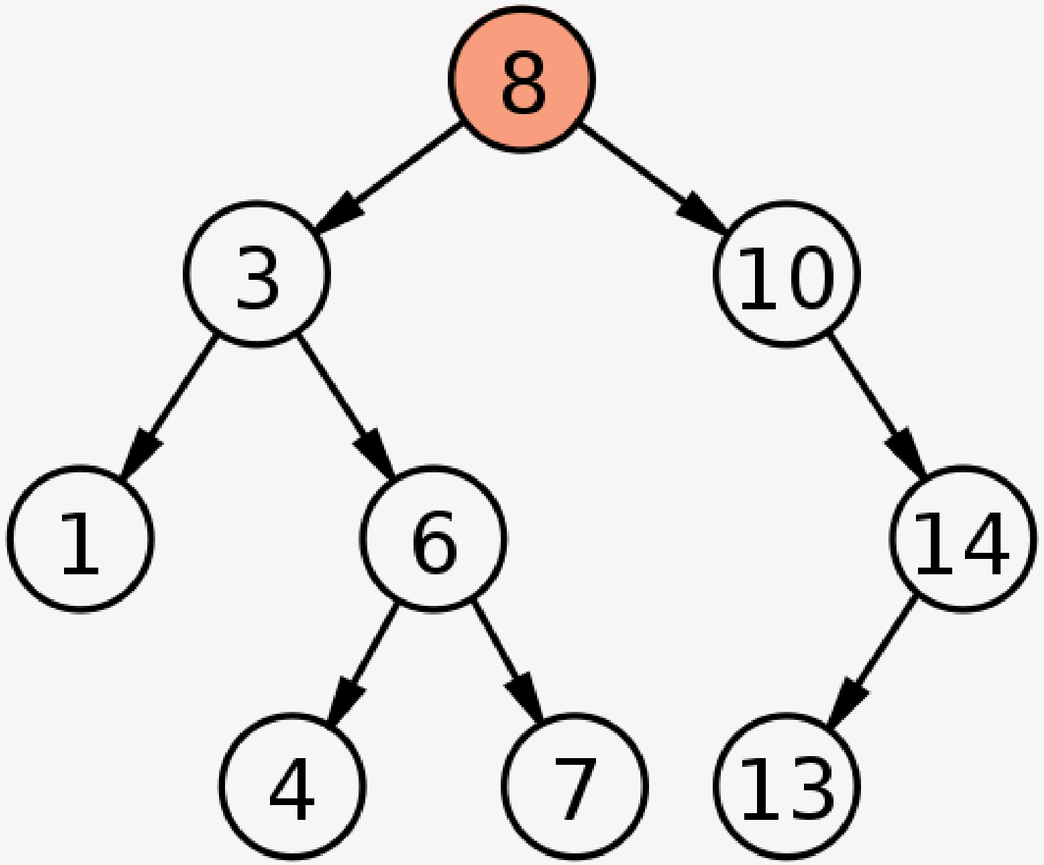


Reguła drzewa binarnego

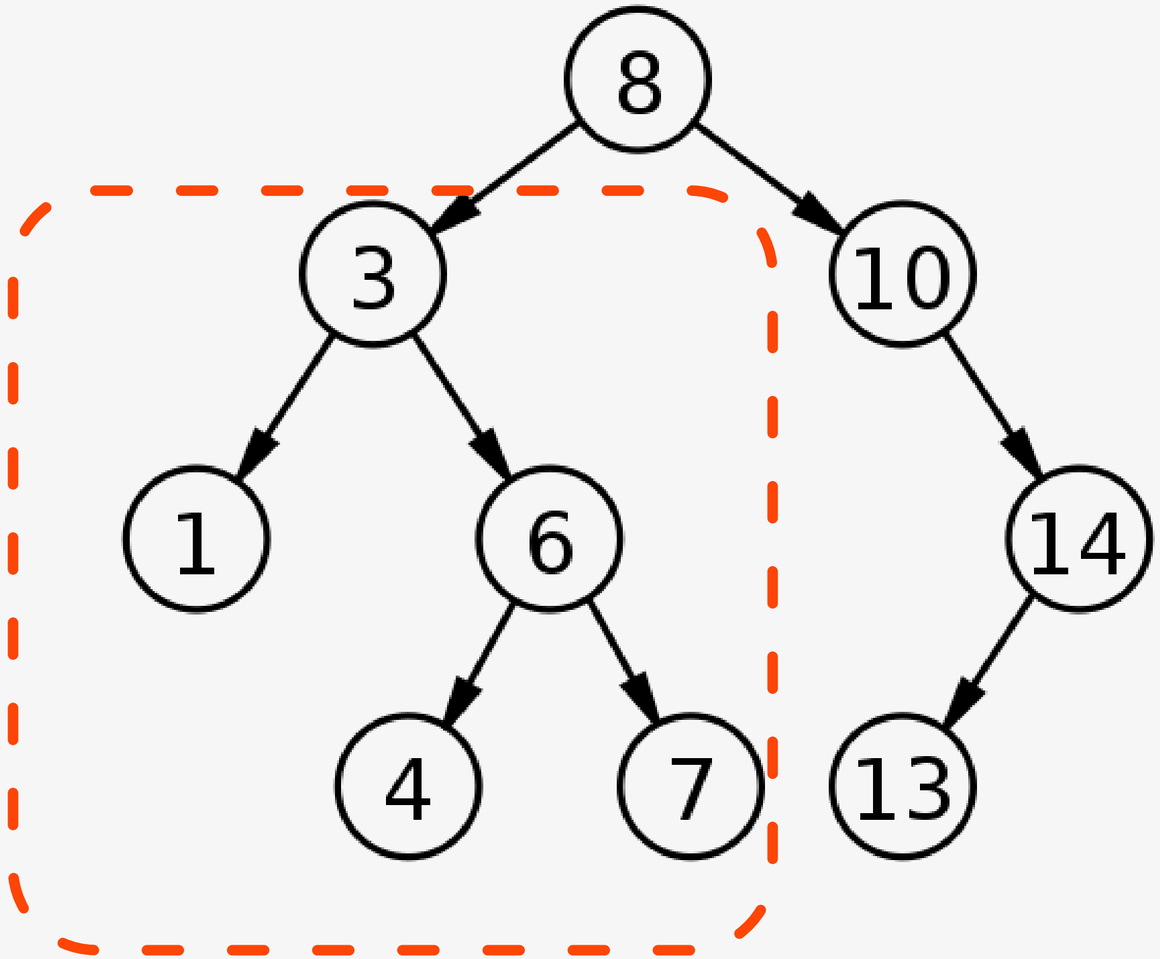
Binary
Search
Tree



Reguła drzewa binarnego

1. Pierwsza wartość trafia do **korzenia**.

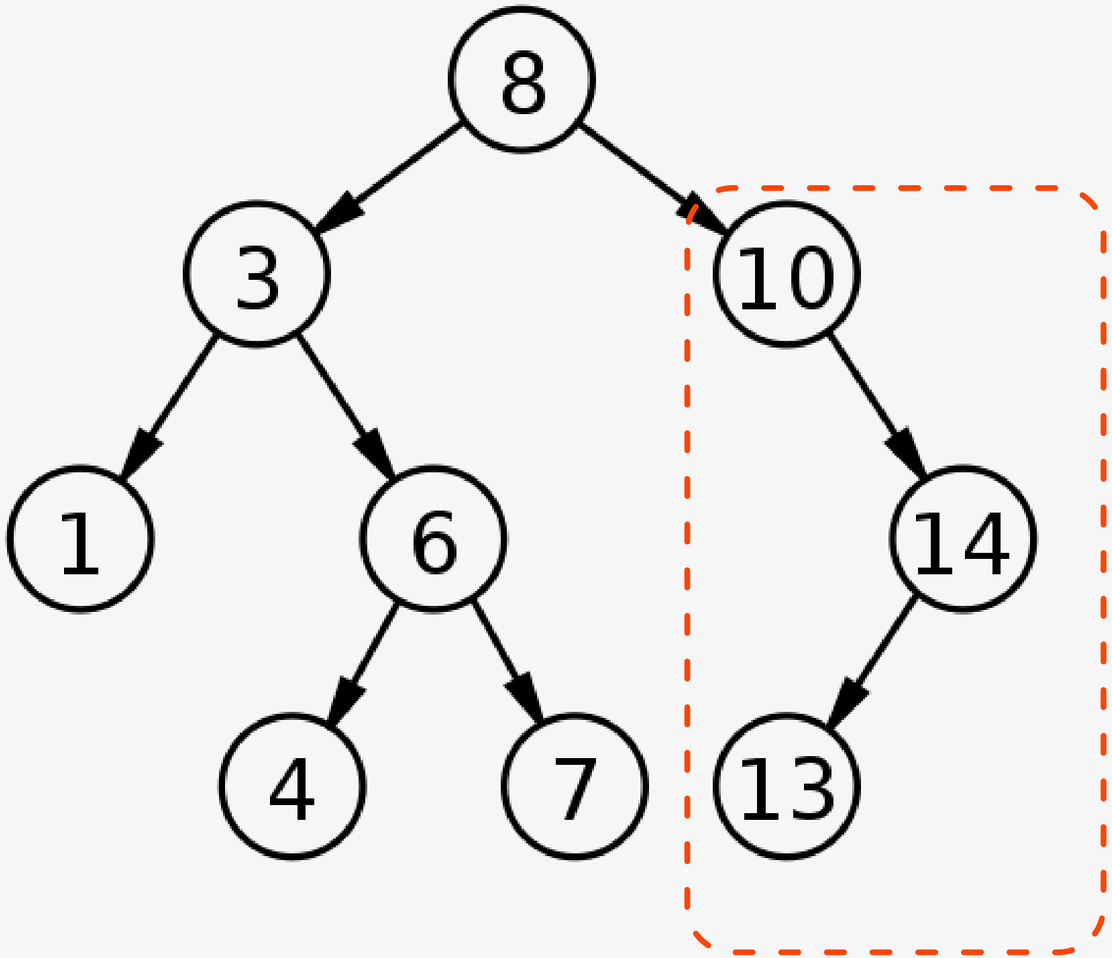
Binary
Search
Tree



Reguła drzewa binarnego

1. Pierwsza wartość trafia do korzenia.
2. Mniejsze elementy **na lewo**.

Binary
Search
Tree



Reguła drzewa binarnego

1. Pierwsza wartość trafia do korzenia.
2. Mniejsze elementy na lewo.
3. Większe **na prawo**.

Binary
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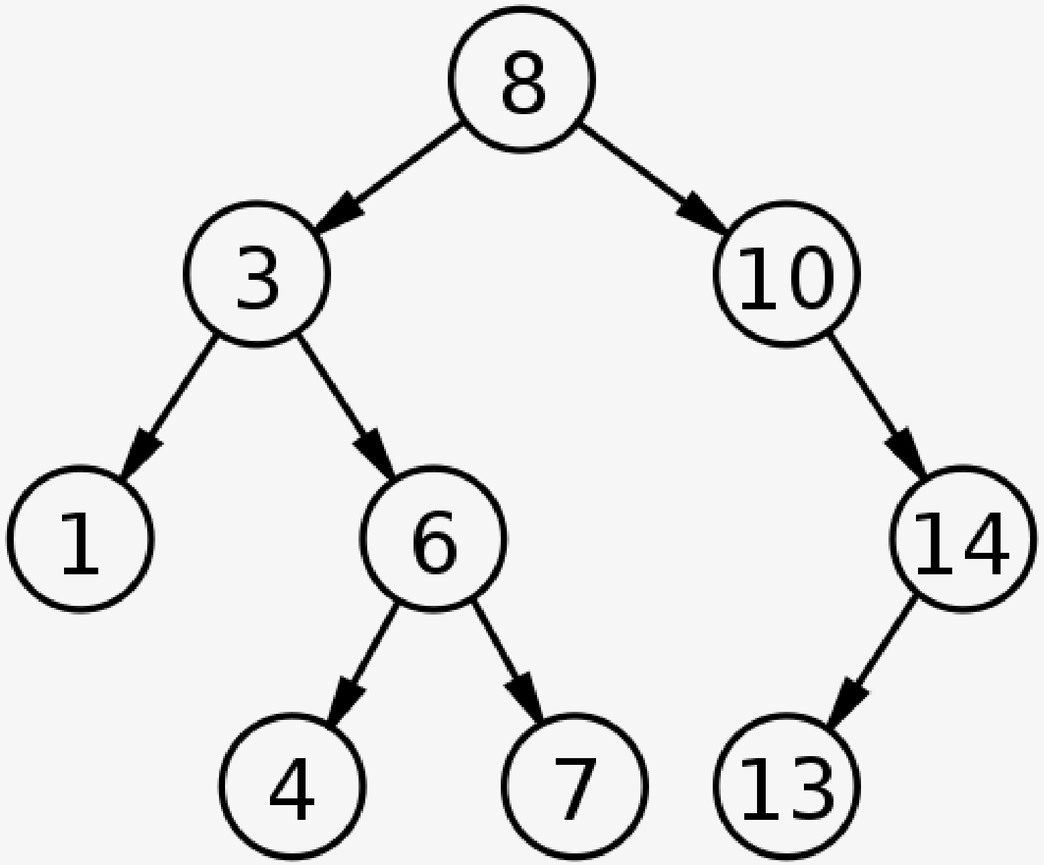

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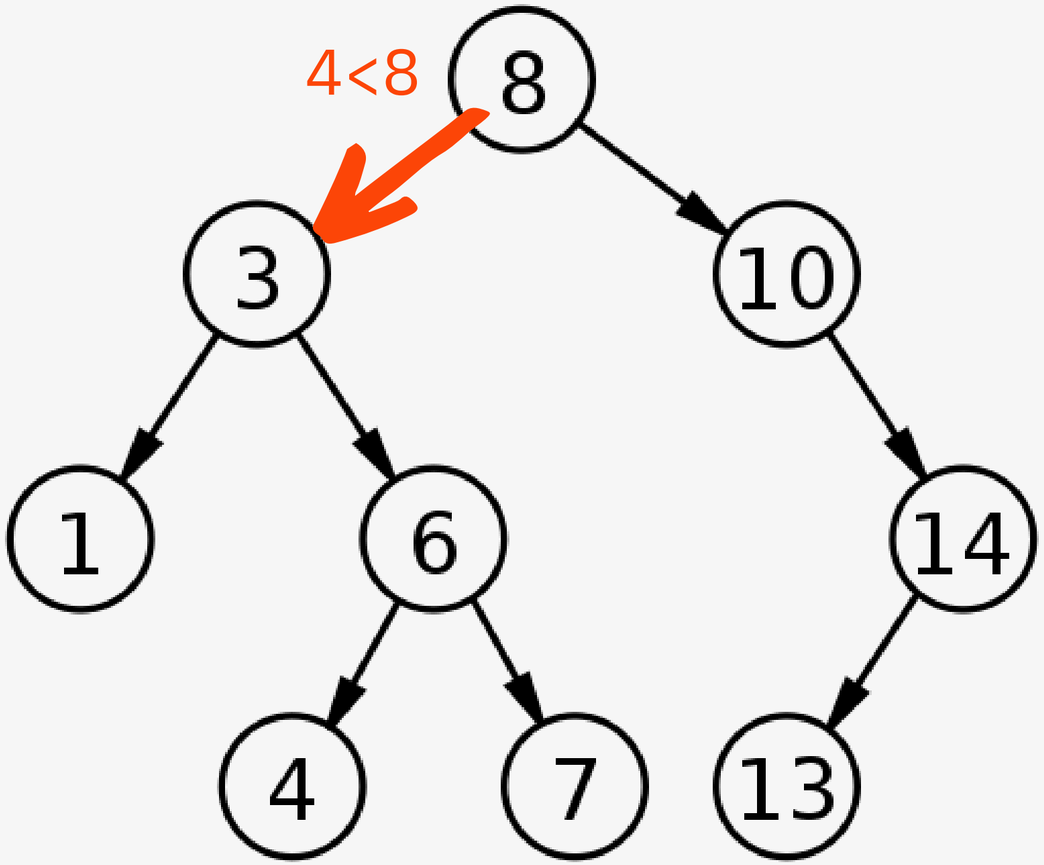

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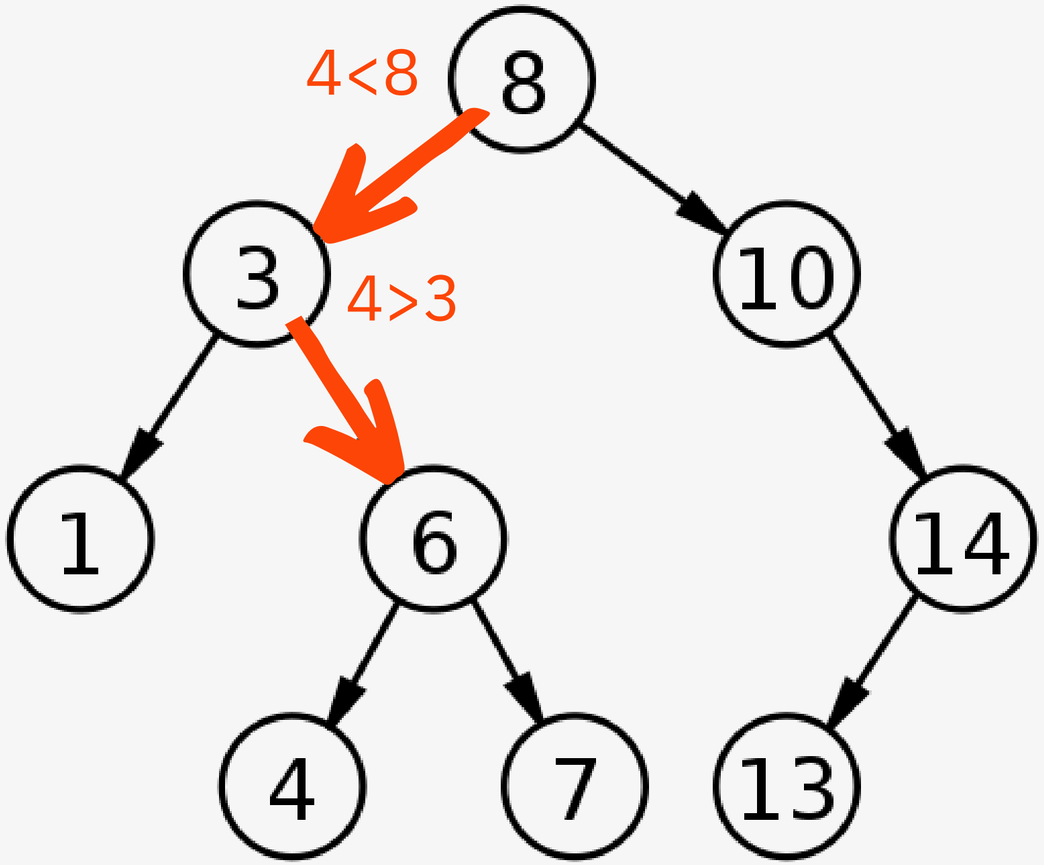

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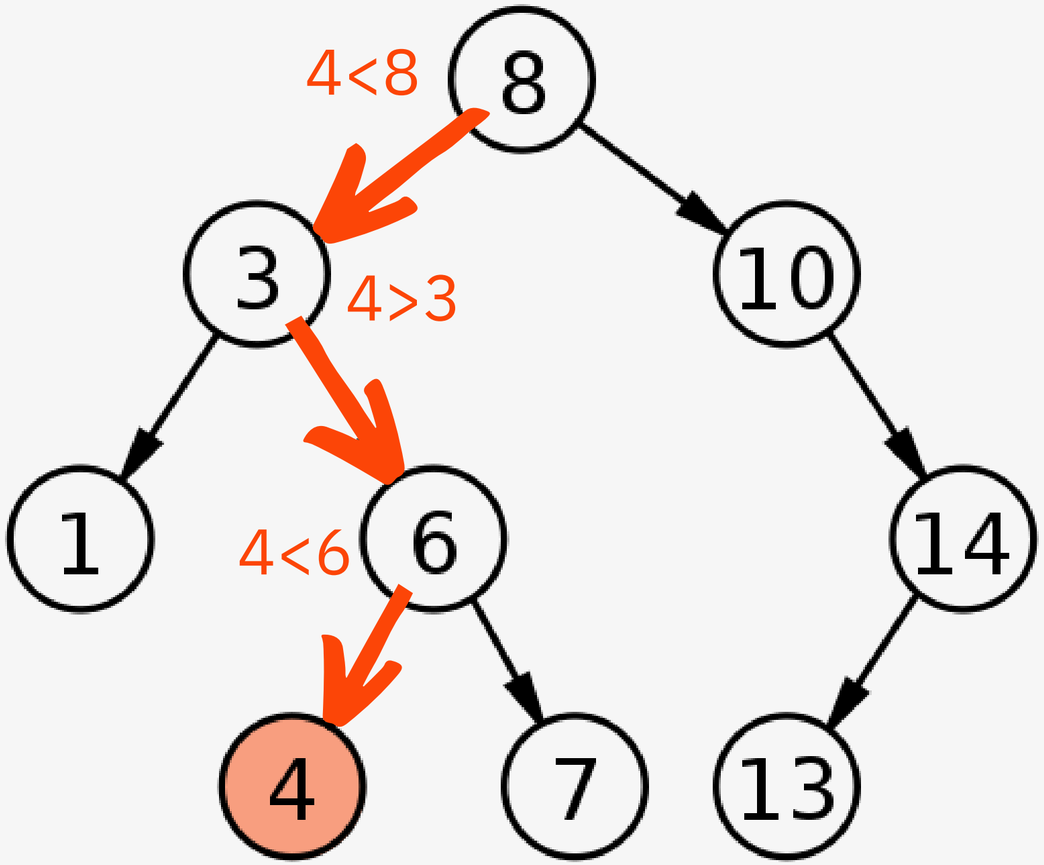

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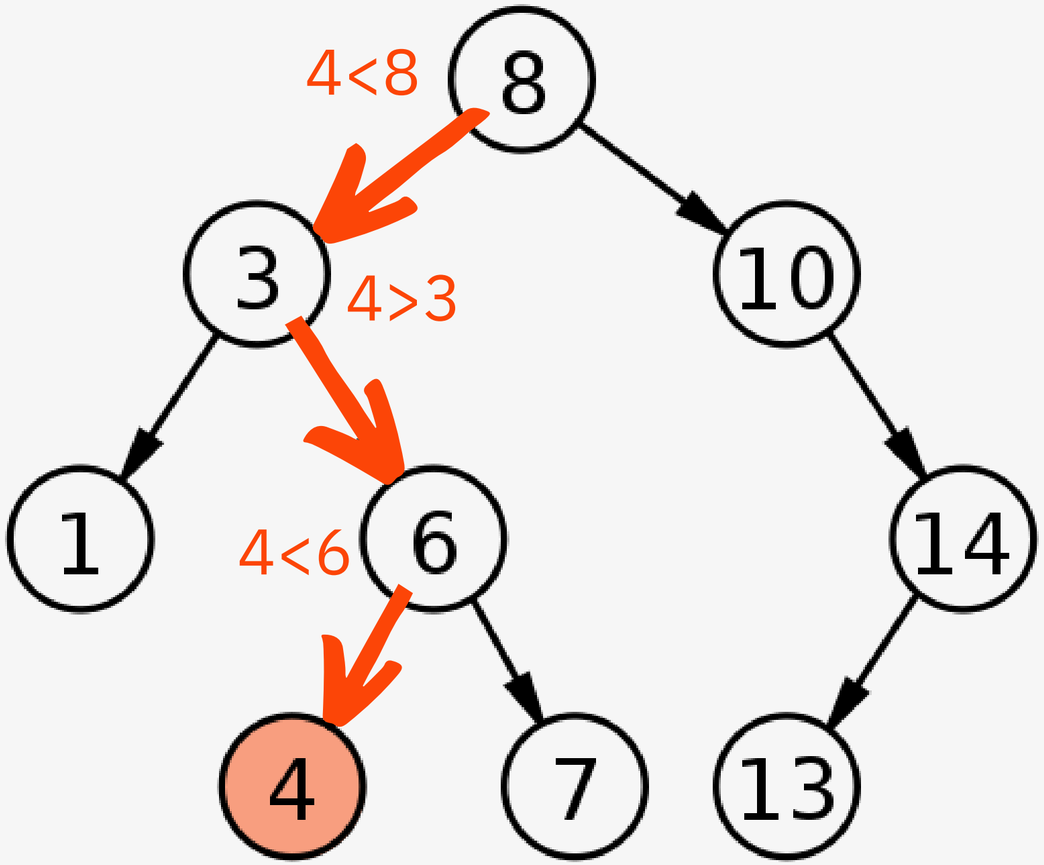
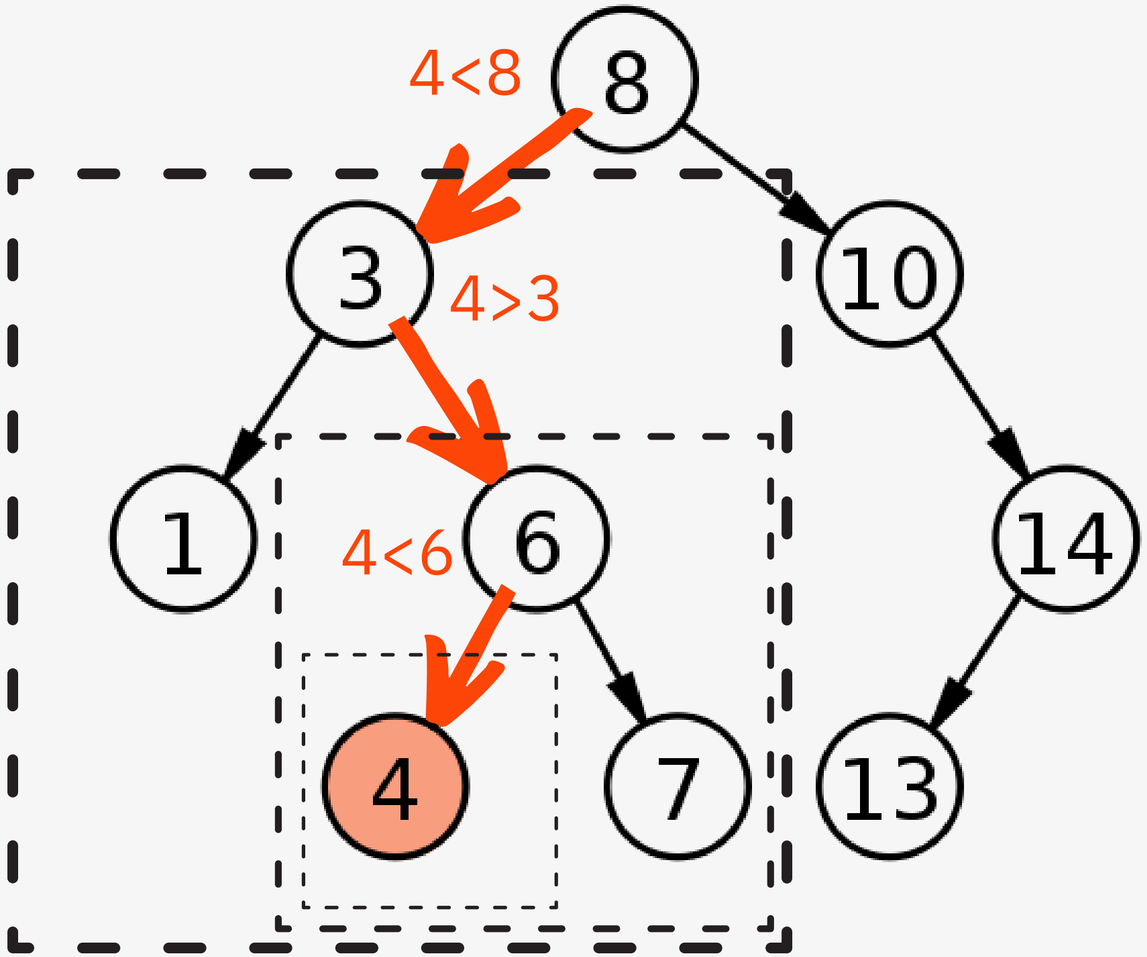


Reguła drzewa binarnego

“Dziel i zwyciężaj”

Binary
Search
Tree



Reguła drzewa binarnego

“Dziel i zwyciężaj”

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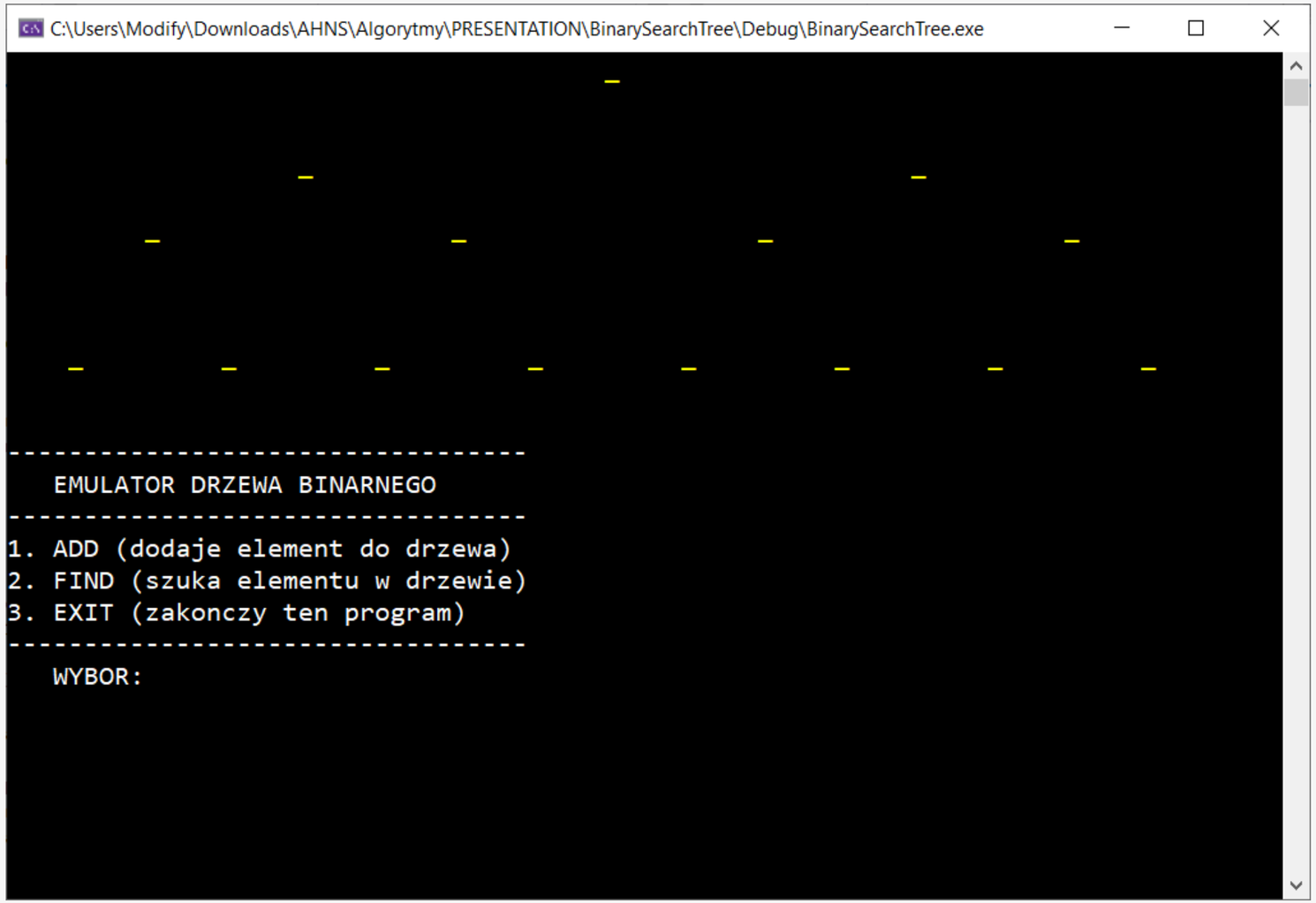


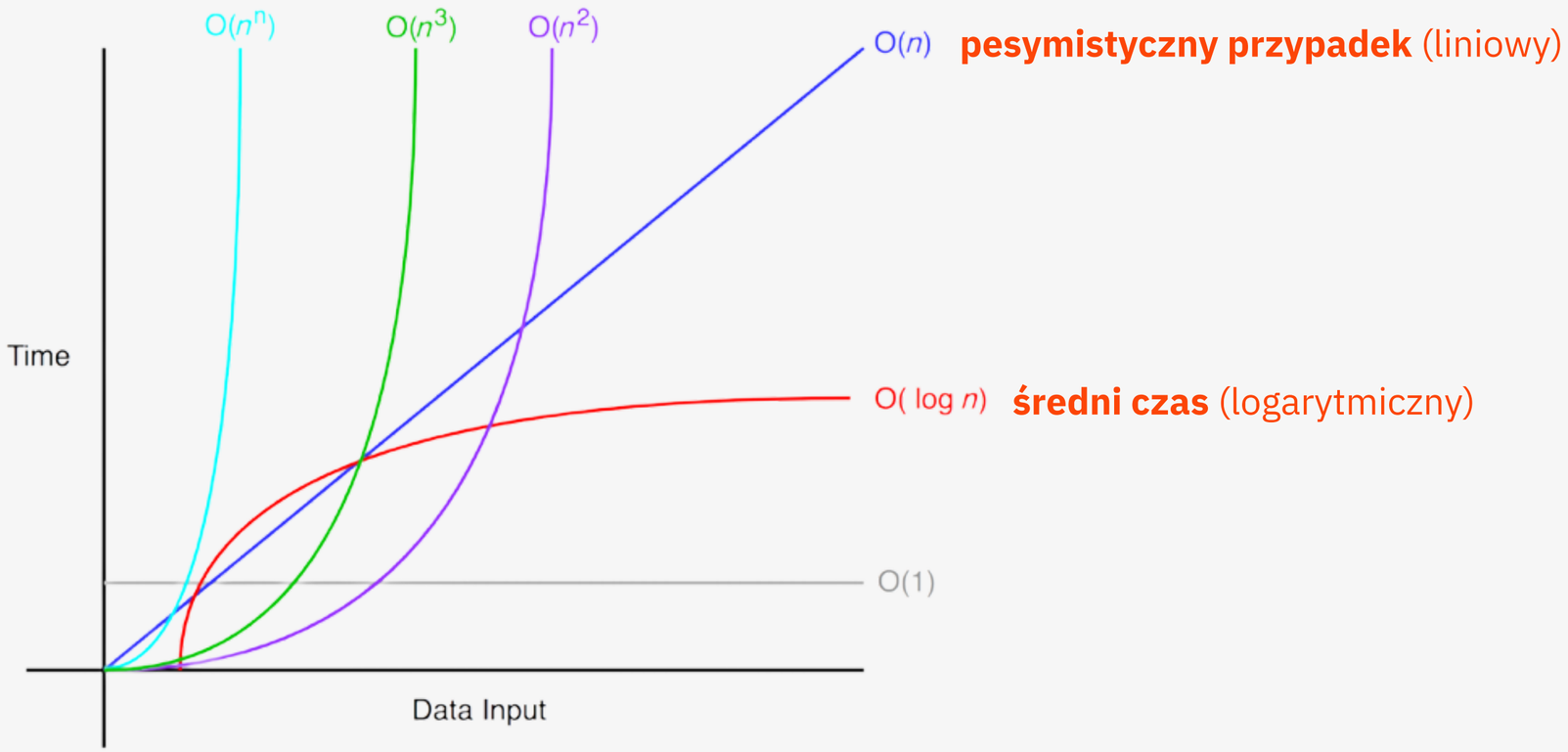
Dodawanie elementu

```
47  void add()
48  {
49      int choosen_number;
50      cout << "Jaka liczbe dodac do drzewa: ";
51      cin >> choosen_number;
52
53      // ----- empty tree -----
54      if (empty_array[1] == true)
55      {
56          root = &data_array[1];
57          *root = choosen_number;
58          empty_array[1] = false;
59      }
60      else
61      // ----- not empty tree -----
62      {
63          bool found_place = false;
64          int node_nr = 1;
65
66          while (found_place == false)
67          {
68              if (empty_array[node_nr] == true)
69              {
70                  found_place = true;
71                  data_array[node_nr] = choosen_number;
72                  empty_array[node_nr] = false;
73
74              }
75              else if (choosen_number < data_array[node_nr])
76              {
77                  // ----- put to the LEFT -----
78                  node_nr = 2 * node_nr;
79              }
80              else
81              {
82                  // ----- put to the RIGHT -----
83                  node_nr = 2 * node_nr + 1;
84              }
85              if (node_nr > 15)
86              {
87                  cout << "Potrzebne byloby wieksze drzewo!";
88                  Sleep(3000);
89                  found_place = true;
90              }
91          }
92      }
93  }
```

Szukanie elementu

```
95  void find()
96  {
97      int number;
98      cout << "Jaka liczbe znalezc w drzewie: ";
99      cin >> number;
100
101     bool found = false;
102     int node_of_the_number = 1;
103
104     while (found == false)
105     {
106         if (number == data_array[node_of_the_number])
107         {
108             cout << "Znaleziono liczbe w wezle nr: " << node_of_the_number;
109             Sleep(3000);
110             found = true;
111         }
112         else if (number < data_array[node_of_the_number])
113         {
114             // ----- go to the LEFT -----
115             node_of_the_number = 2 * node_of_the_number;
116         }
117         else
118         {
119             // ----- go to the RIGHT -----
120             node_of_the_number = 2 * node_of_the_number + 1;
121         }
122         if (node_of_the_number > 15)
123         {
124             cout << "Nie znaleziono!";
125             Sleep(3000);
126             found = true;
127         }
128     }
129 }
```

Złożoność wyszukiwania elementu w BST



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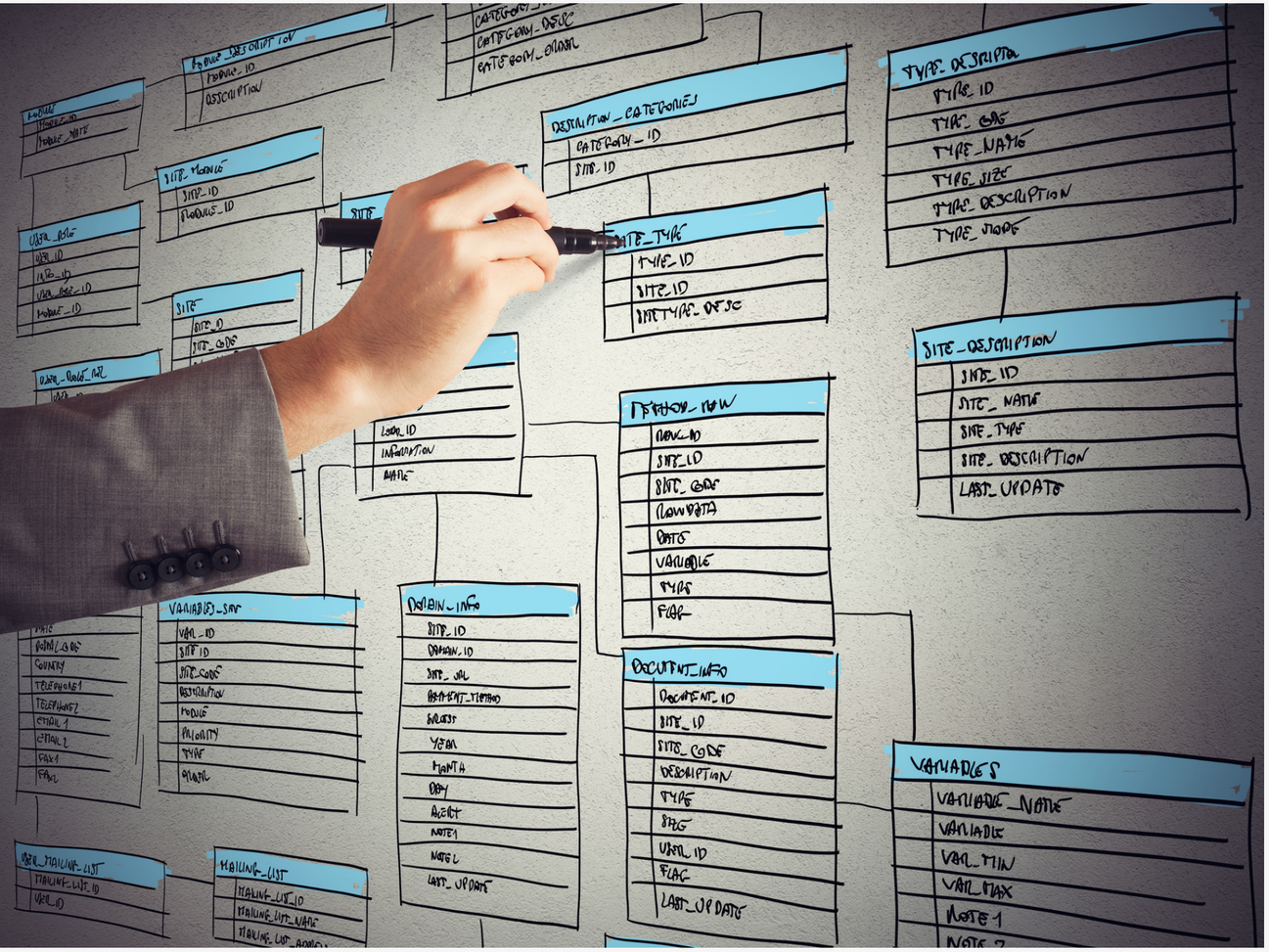

Zastosowanie

Specjalny rodzaj BST: B-drzewa

Struktury drzewiaste: bazy danych

Szybkie wyszukiwanie elementów

Źródła

1. Bhargava Aditya Y.: “Algorytmy, Ilustrowany przewodnik”: Wydawnictwo Helion, 2017, str. 203-206. ISBN 978-83-283-3445-8
2. Zelent M.: “Struktury danych: stos, kolejka, lista, drzewo binarne“ [online] https://miroslawzelent.pl/kurs-c++/struktury-danych-stos-kolejka-lista-drzewo-binarne/ [dostęp: 24 stycznia 2022]