Algorytm Huffmana

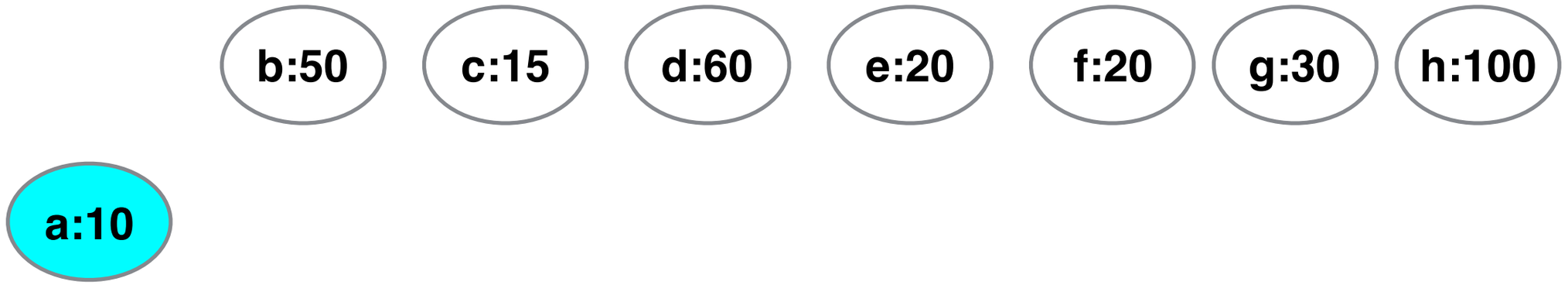
przykład: znaleźć kod Huffmana dla tekstu w którym występują litery a,b,c,d,e,f,g,h z następującymi ilościami wystąpień:

```
a:10
b:50
c:15
d:60
e:20
f:20
g:30
h:150
```

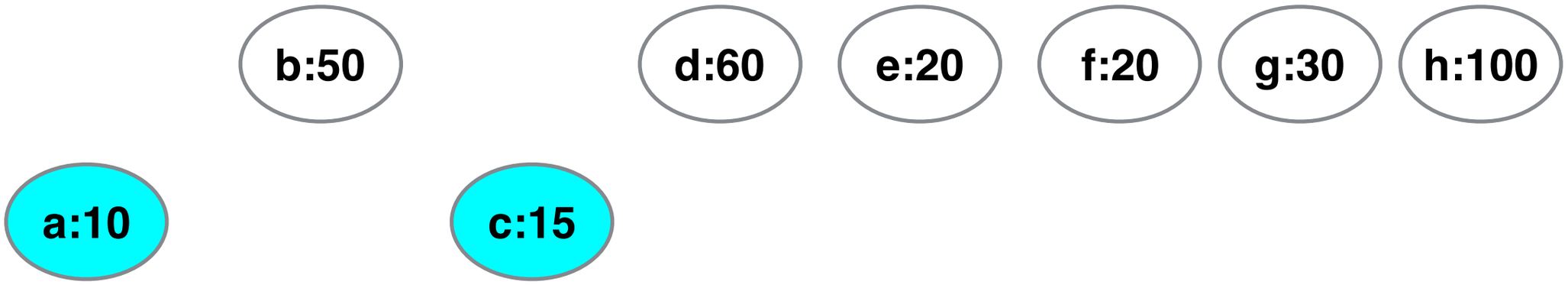
Pseudokod algorytmu

```
Huffman(C)
   zbuduj kolejkę Q zawierającą litery
                                alfabetu C
   for i = 2 to |C|
       x = ExtractMin(Q)
       y = ExtractMin(Q)
       utwórz nowy węzeł z
       z.left = x
       z.right = y
       z.f = x.f + y.f
       Insert(Q,z)
  return ExtractMin(Q)
```

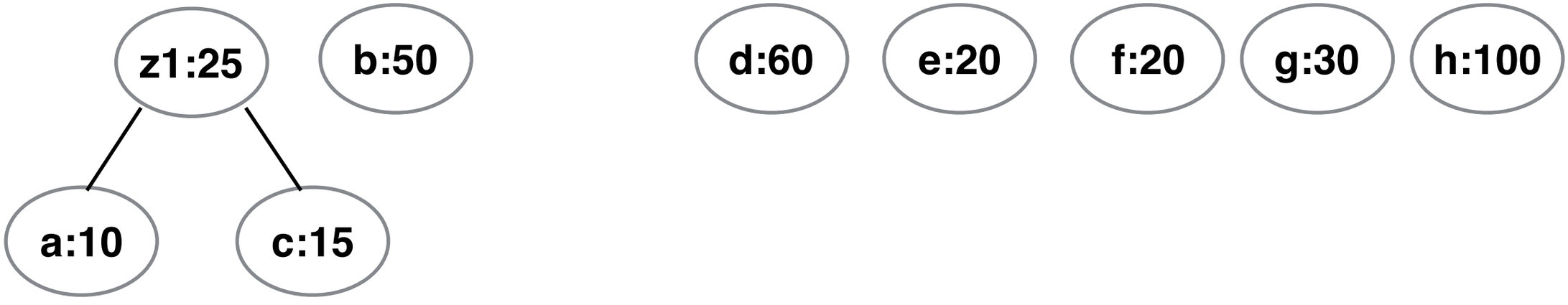
kolejka priorytetowa Q:



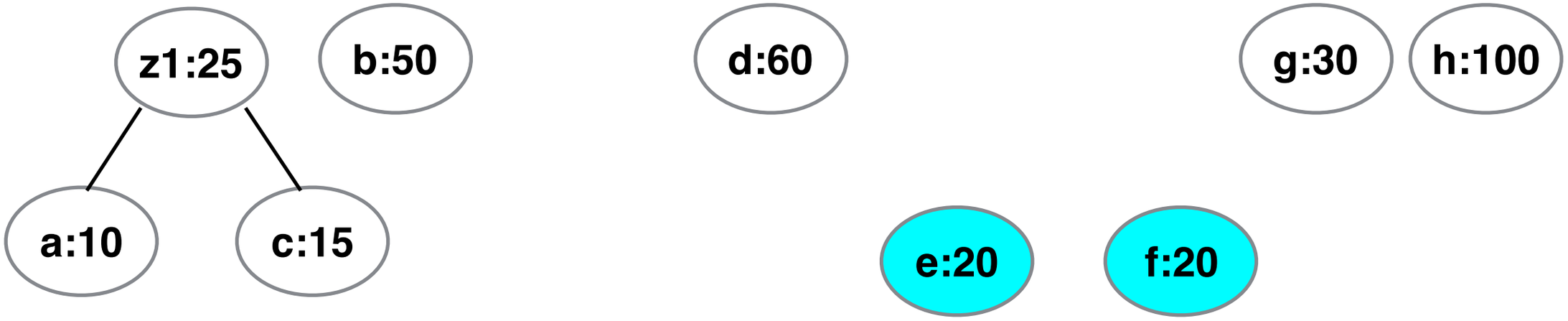

```
x = Extract-min(Q)
```



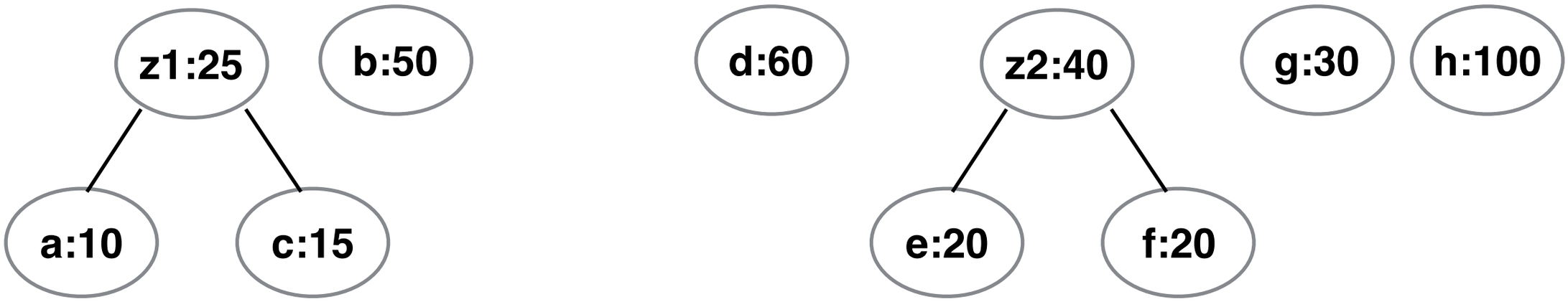

```
y = Extract-min(Q)
```




```
utwórz z
z.left = x
z.right = y
Insert(Q,z)
```




```
x = Extract-min(Q)
y = Extract-min(Q)
```

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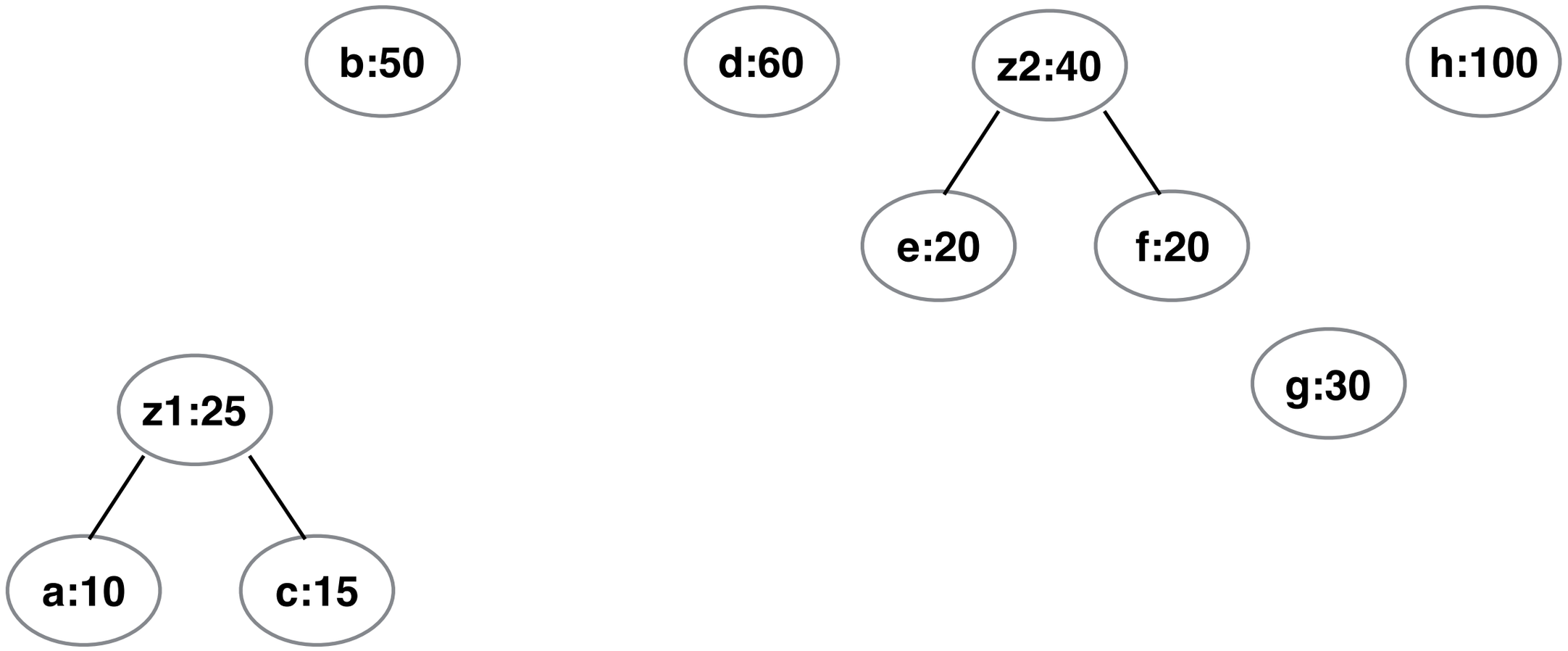
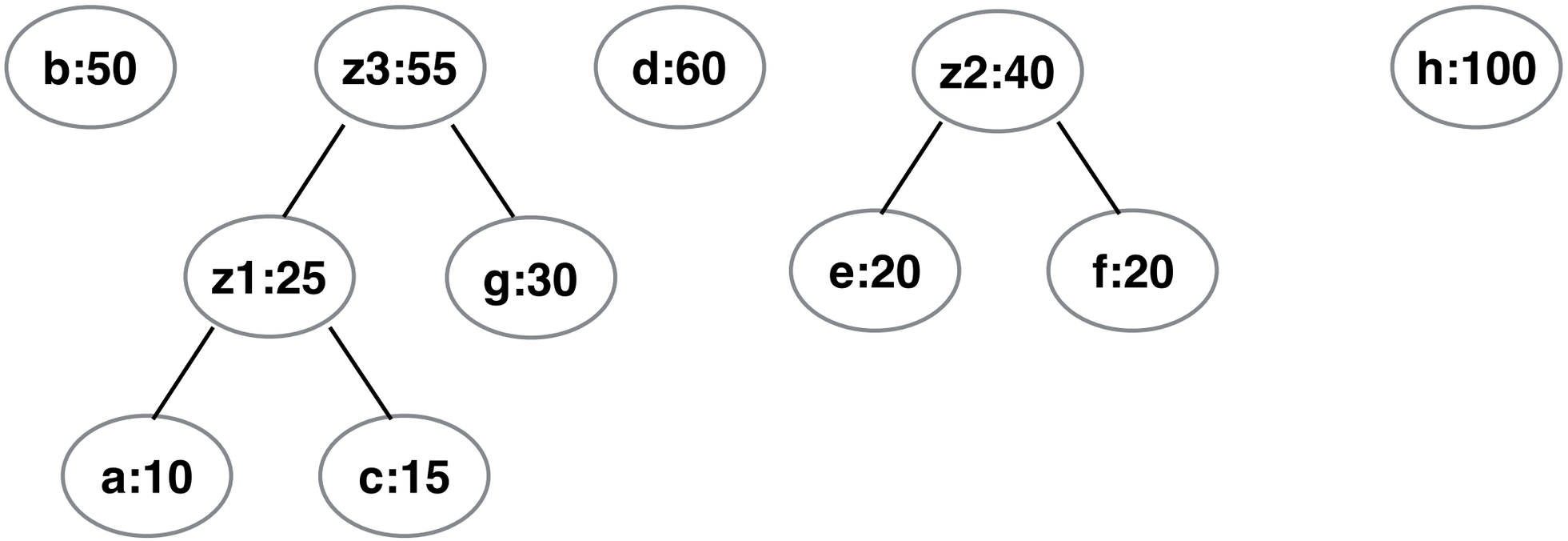
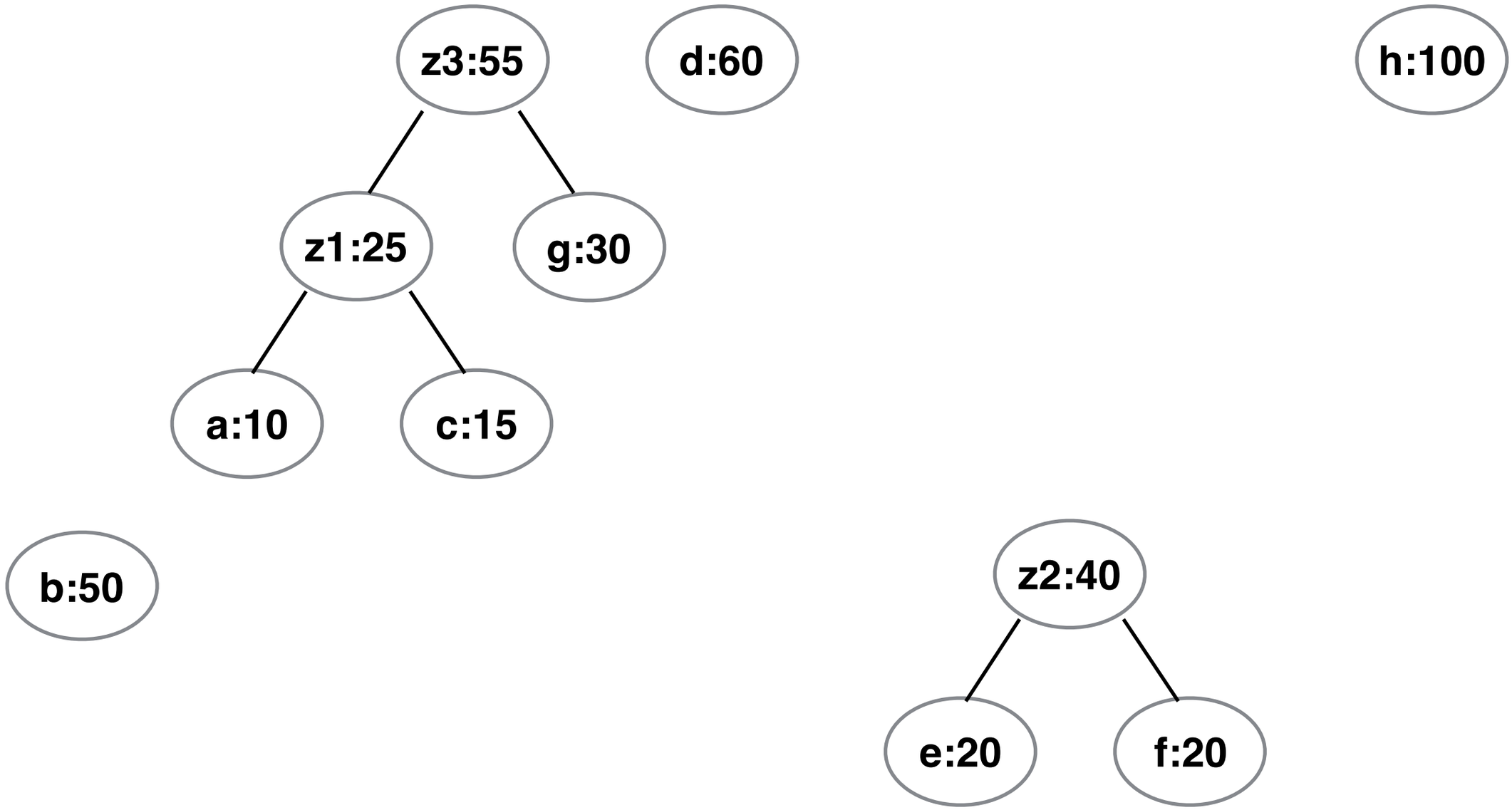
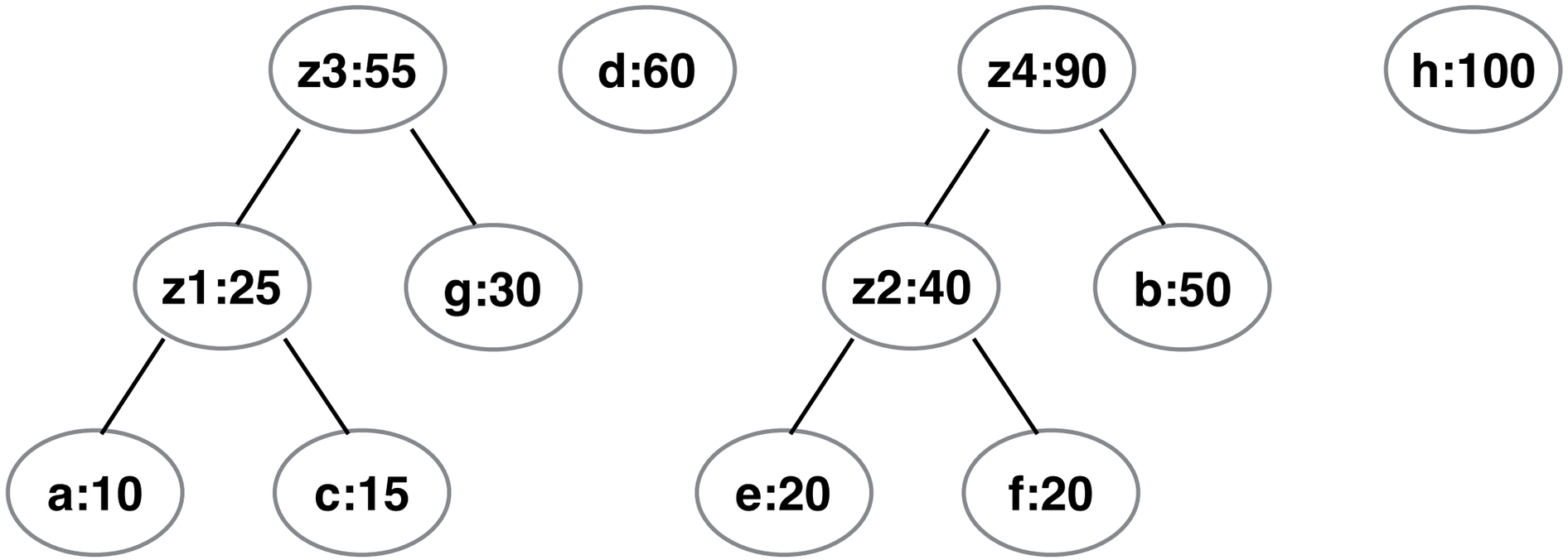
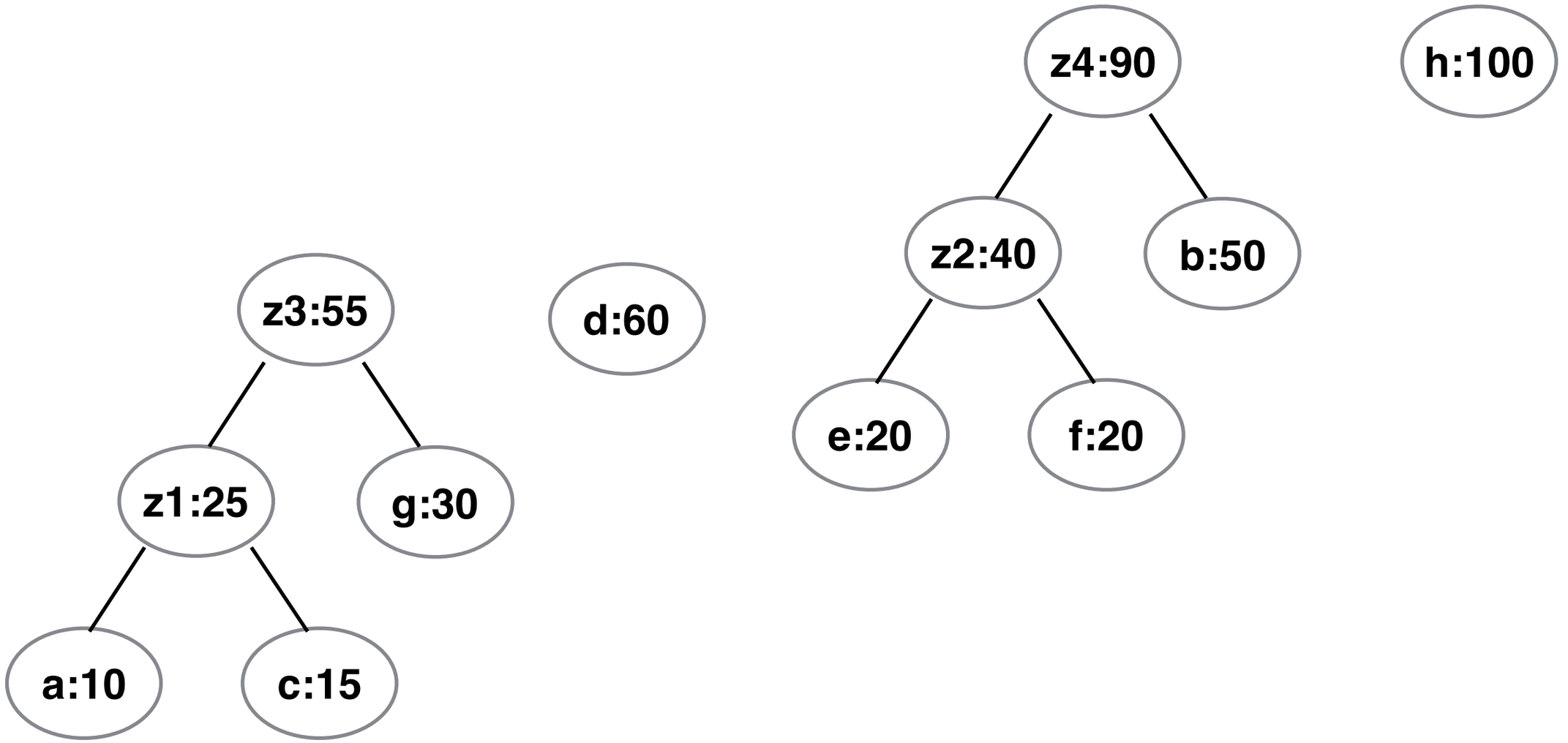
utwórz z
z.left = x
z.right = y
Insert(Q,z)
```

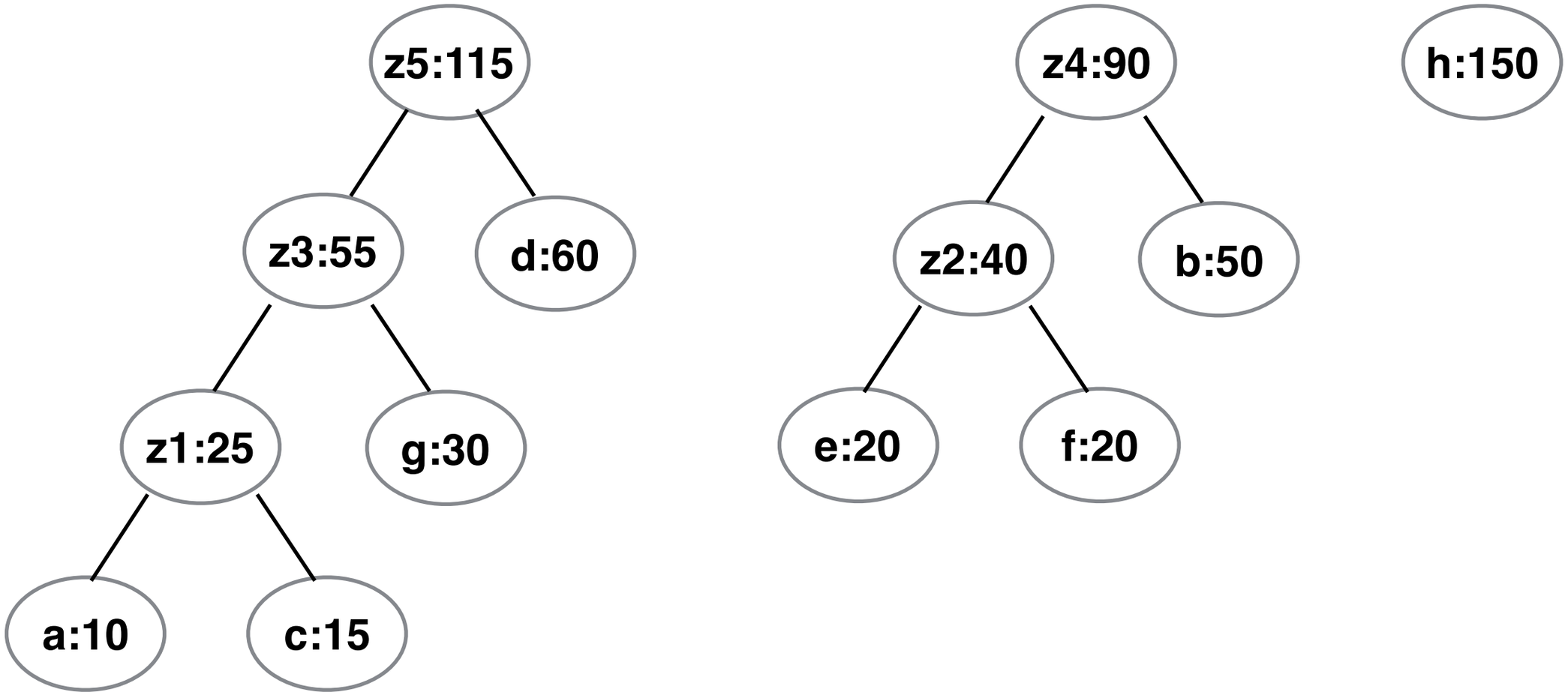

b:50
d:60
z2:40
h:100
e:20
f:20
g:30
z1:25
a:10
c:15


b:50
z3:55
d:60
z2:40
h:100
z1:25
g:30
e:20
f:20
a:10
c:15

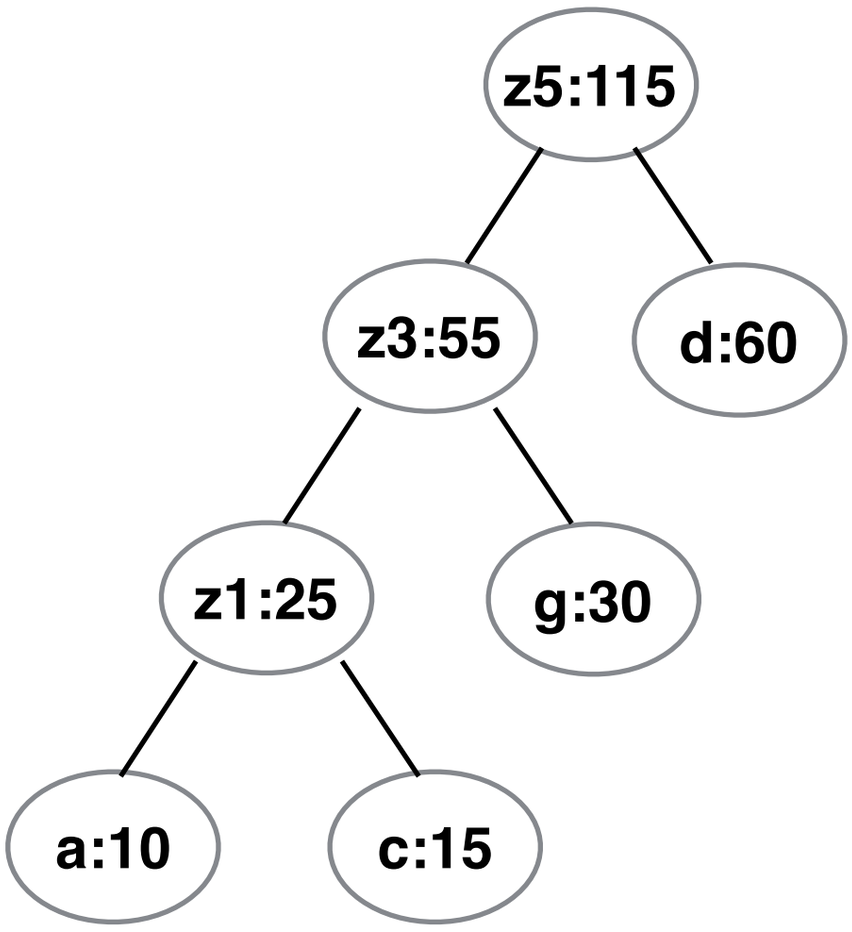

z3:55
d:60
h:100
z1:25
g:30
a:10
c:15
b:50
z2:40
e:20
f:20

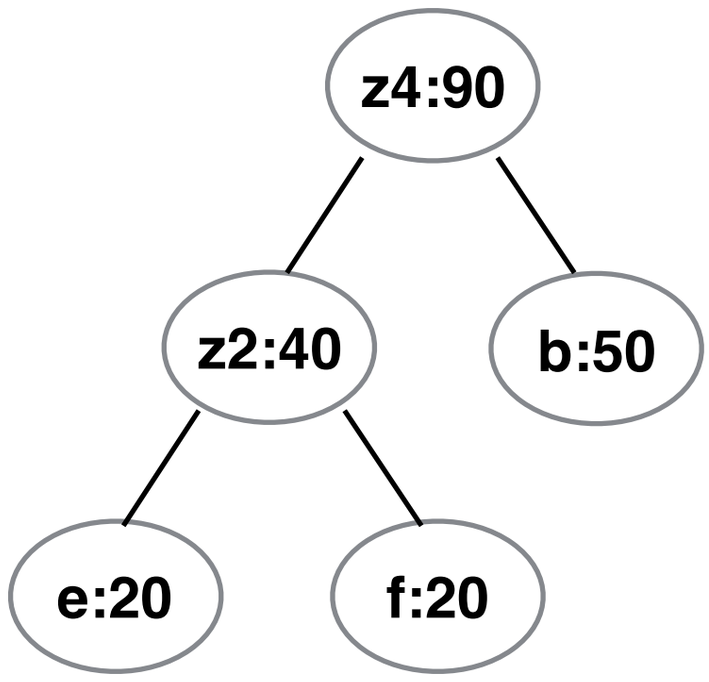

z3:55
d:60
z4:90
h:100
z1:25
g:30
z2:40
b:50
a:10
c:15
e:20
f:20

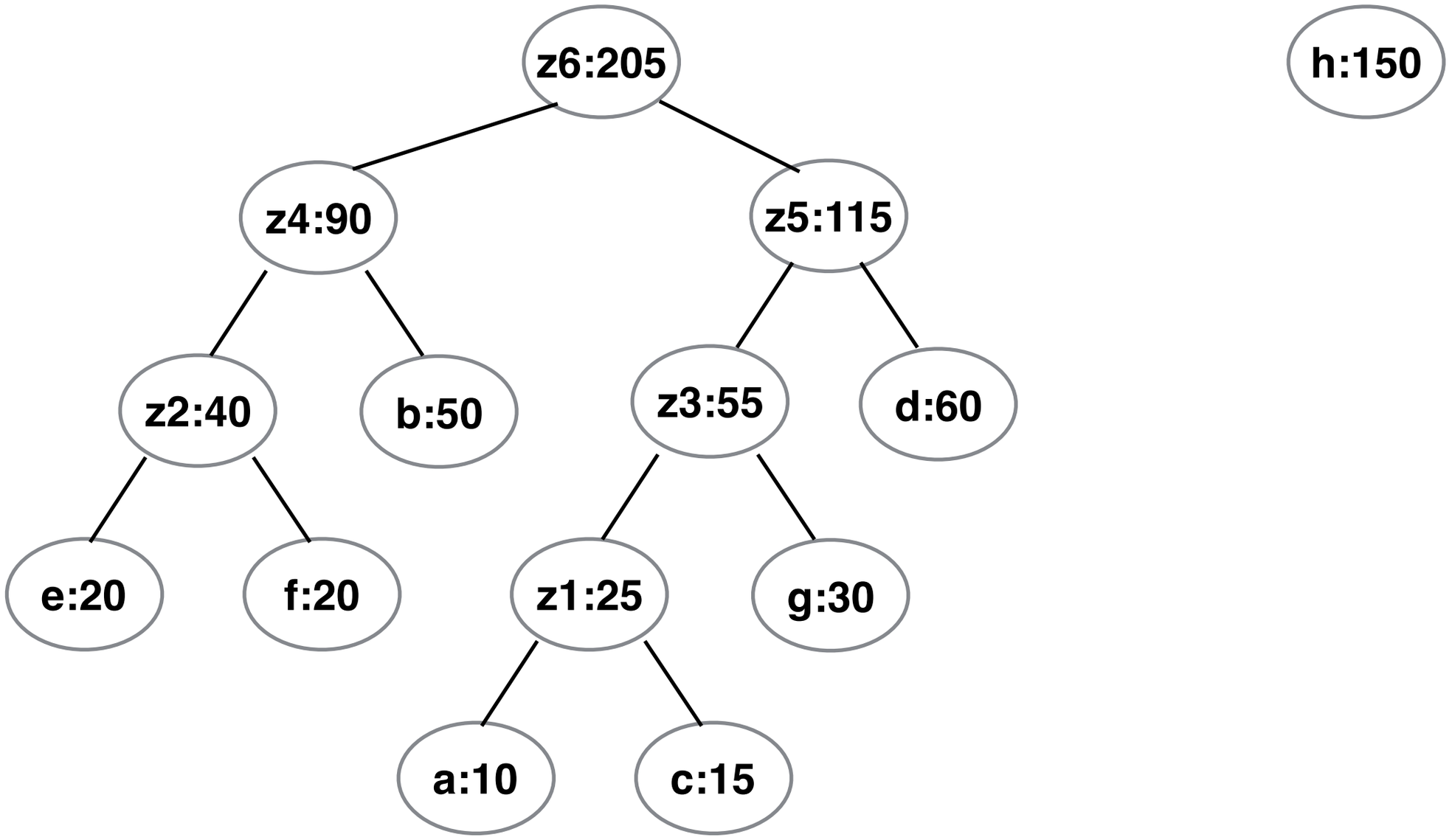

z4:90
h:100
z2:40
b:50
z3:55
d:60
e:20
f:20
z1:25
g:30
a:10
c:15

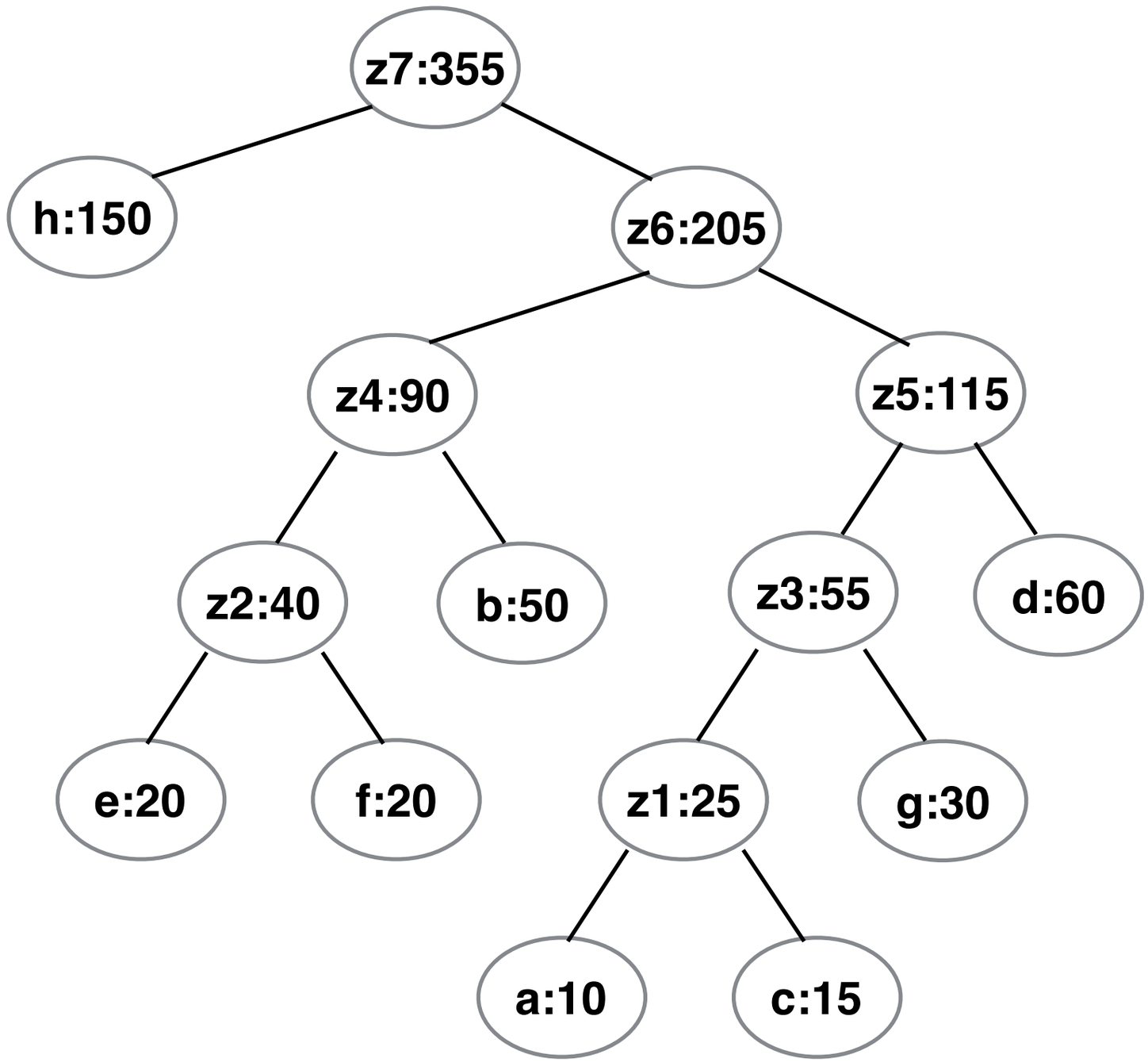

z5:115
z3:55
d:60
z1:25
g:30
a:10
c:15
z4:90
h:150
z2:40
b:50
e:20
f:20

h:150



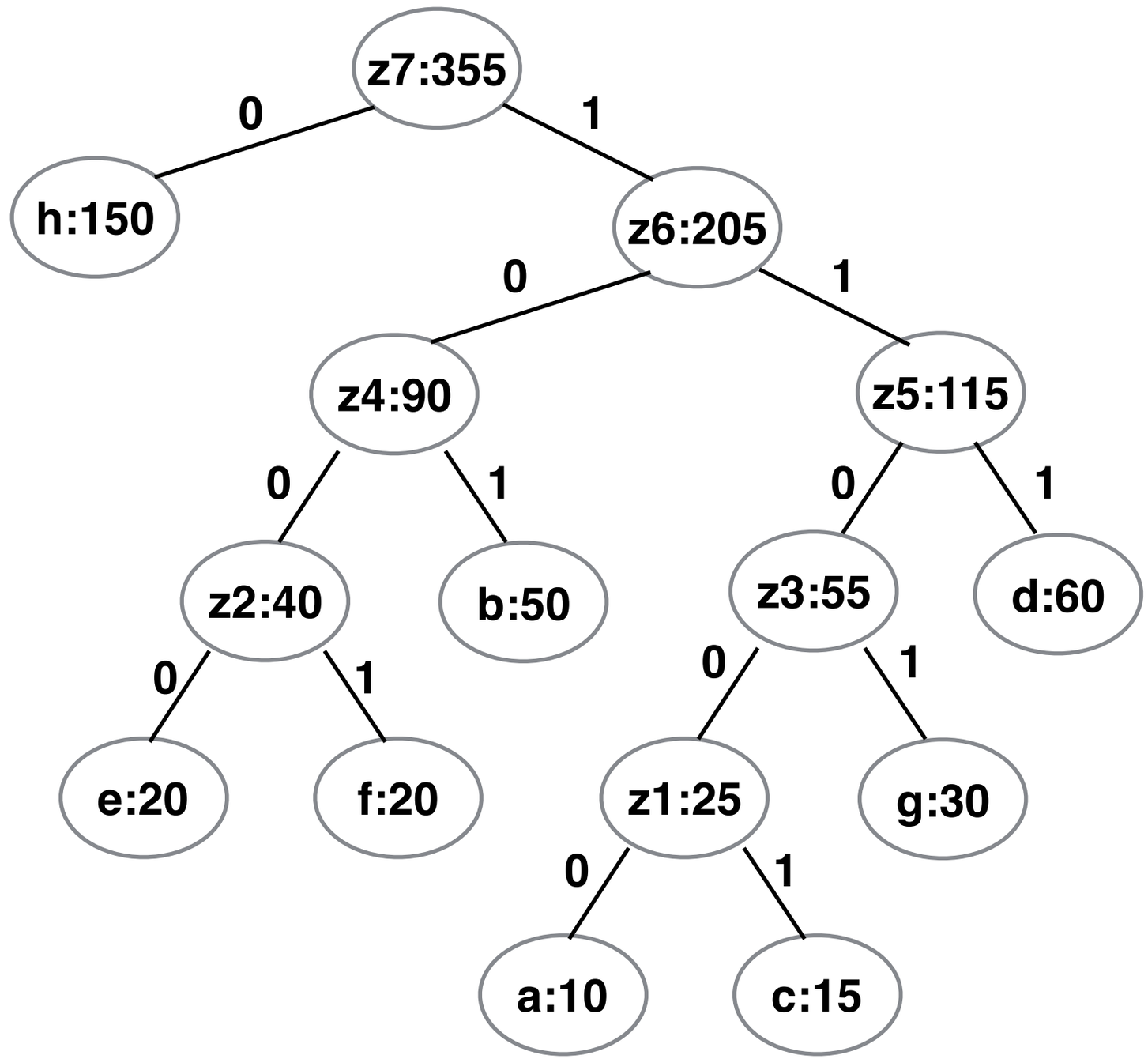



z6:205
h:150
z4:90
z5:115
z2:40
b:50
z3:55
d:60
e:20
f:20
z1:25
g:30
a:10
c:15


z7:355
h:150
z6:205
z4:90
z5:115
z2:40
b:50
z3:55
d:60
e:20
f:20
z1:25
g:30
a:10
c:15

kody

```
a:10   11000
b:50   101
c:15   11001
d:60   111
e:20   1000
f:20   1001
g:30   1101
h:150  0
```



kody

a:10 11000
b:50 101
c:15 11001
d:60 111
e:20 1000
f:20 1001
g:30 1101
h:150 0

Porównanie długości

kody o stałej długości 3:
355*3 = 1065 bitów

kod Huffmana:
10·5 + 50·3 + 15·5 +60·3 +
20·4 + 20·4 + 30·4 + 150·1 =
855

czyli kompresja do 80%