

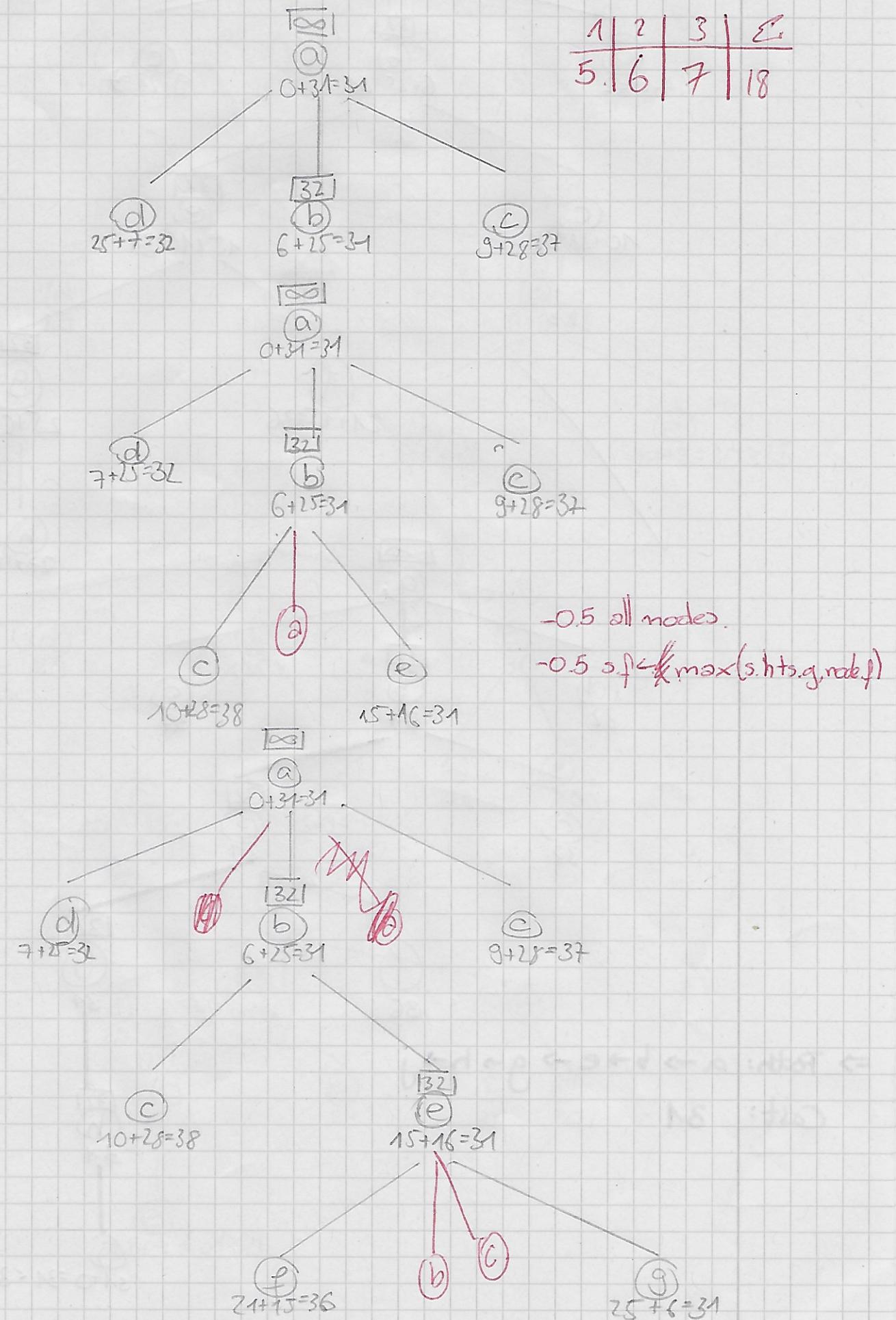
AI - Assignment 4

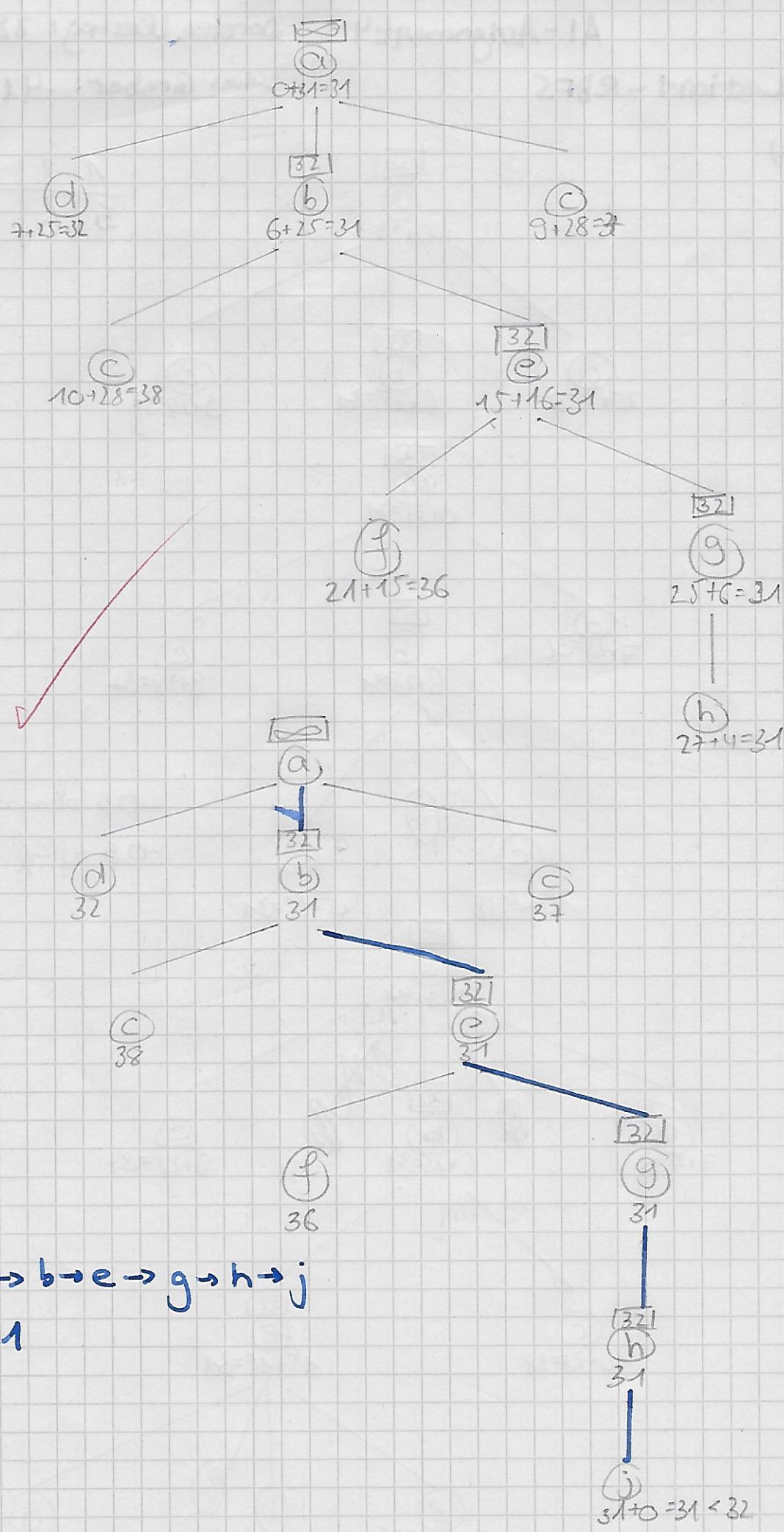
Dorothea Lleskaj: 3884087

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Question 1 - RBFS

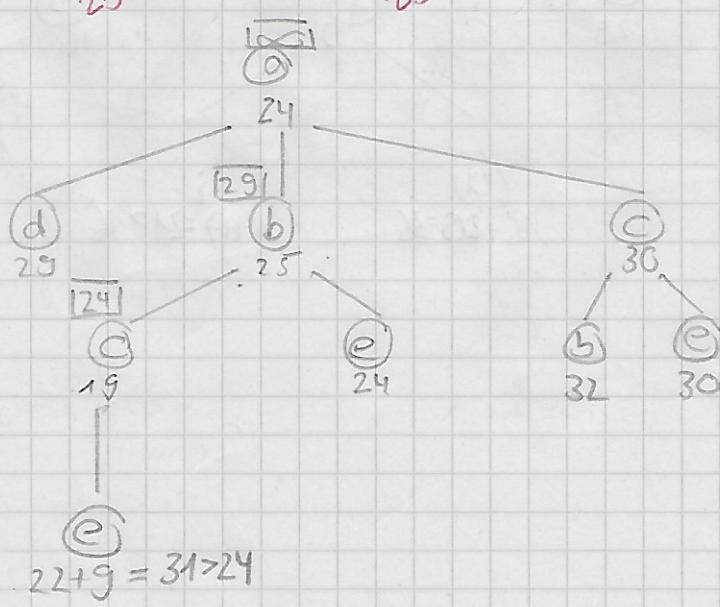
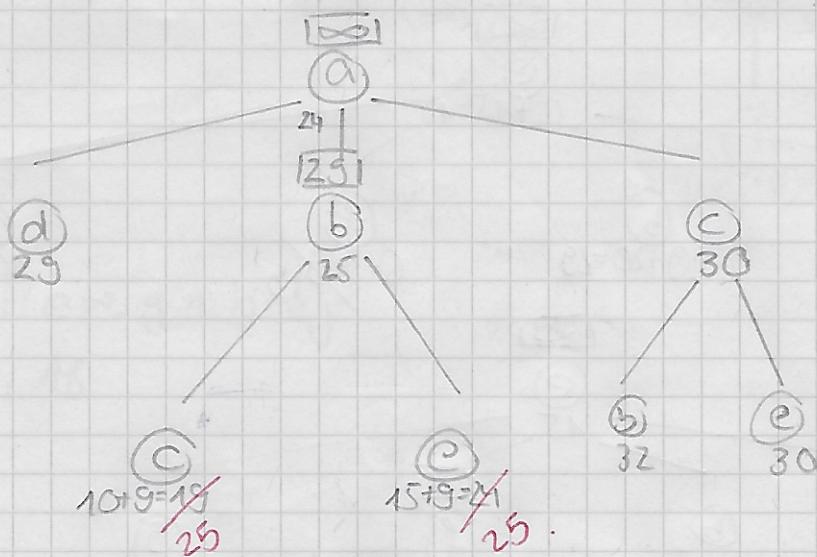
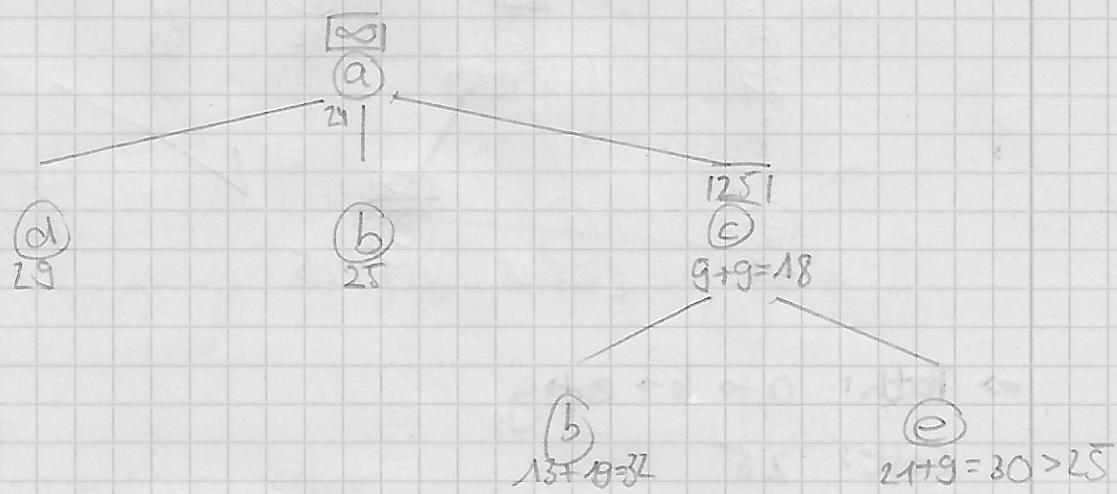
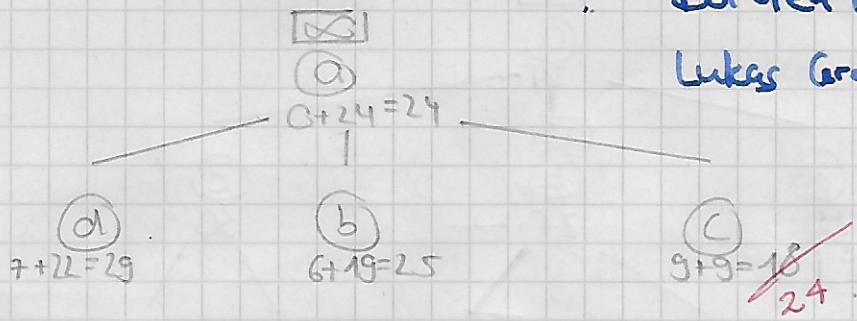
a)

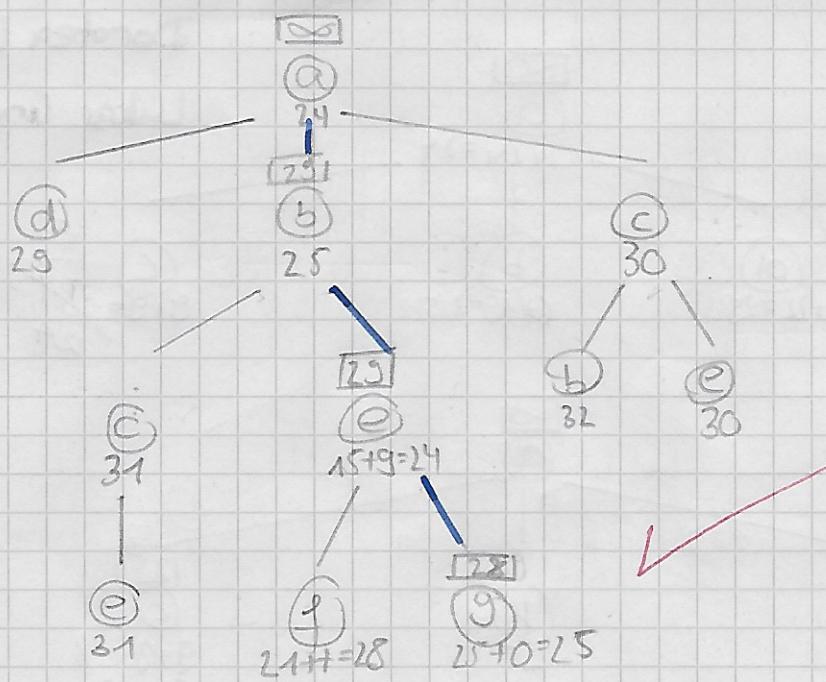




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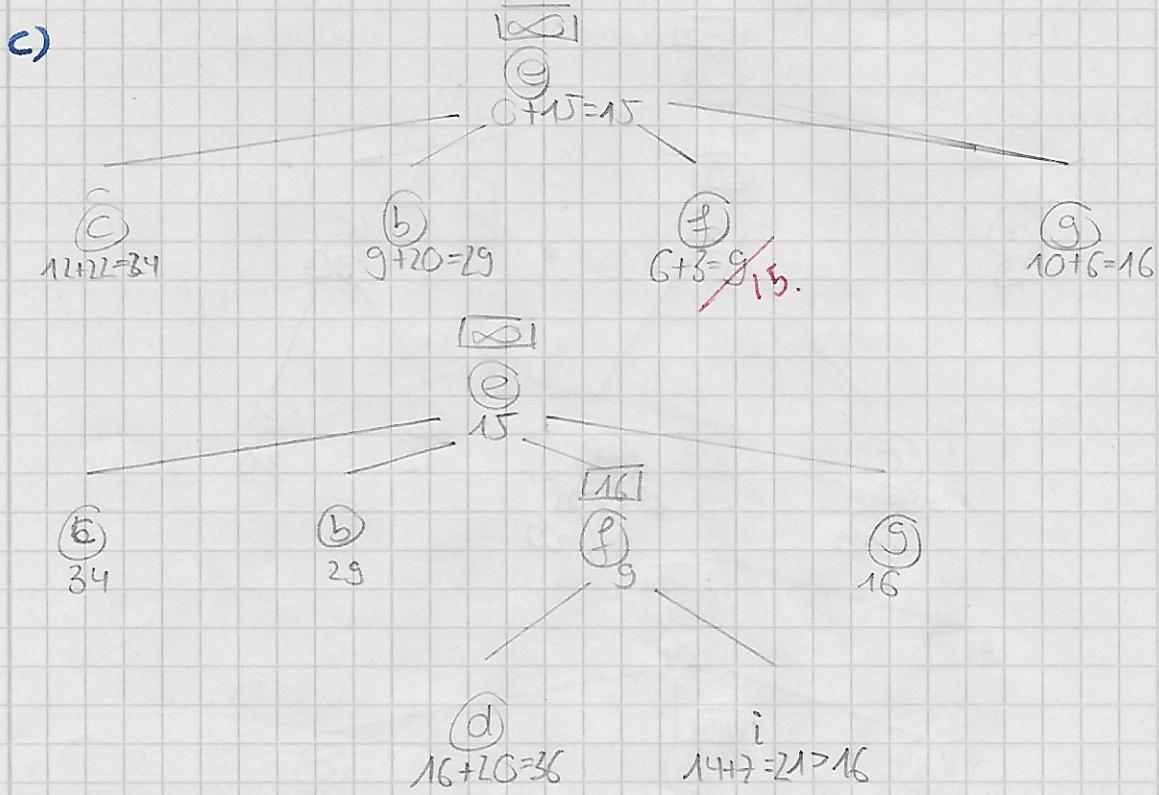
b)



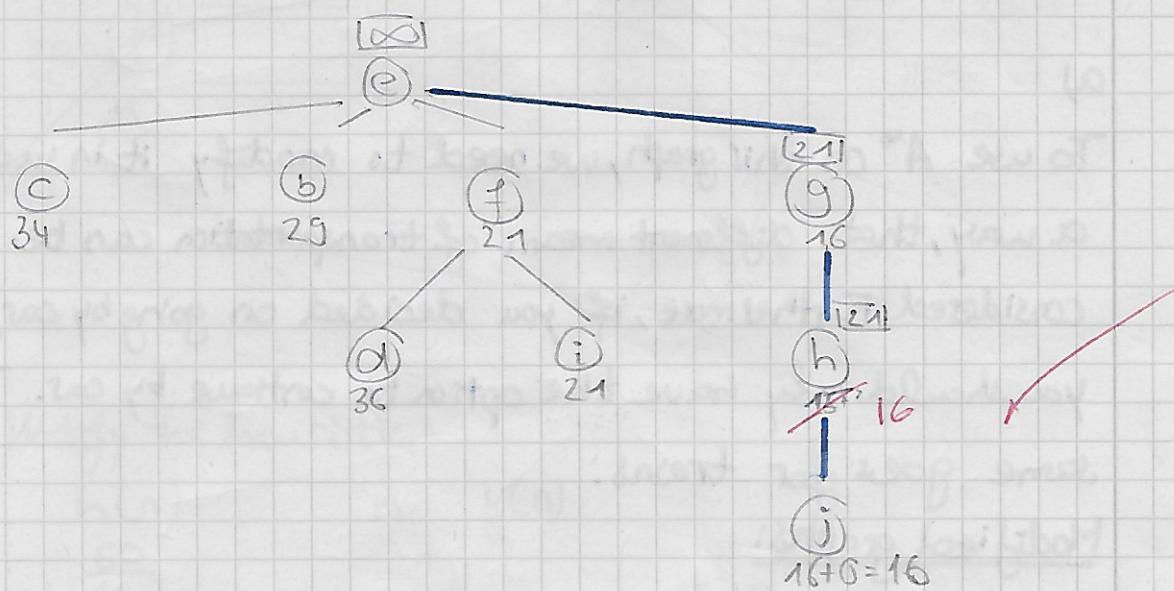
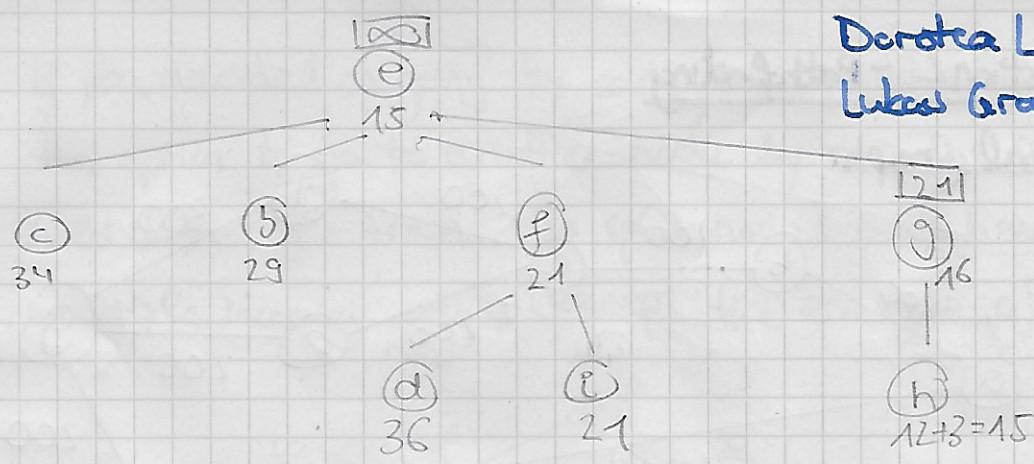


\Rightarrow Path: a \rightarrow b \rightarrow e \rightarrow g

Cost: 25



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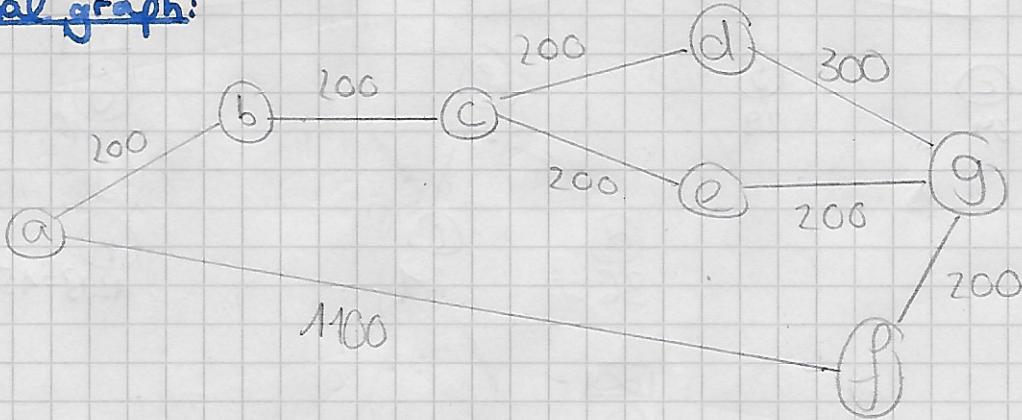


⇒ Path: e → g → h → j

Cst: 16

Question 2 - Pathfinding

Original graph:

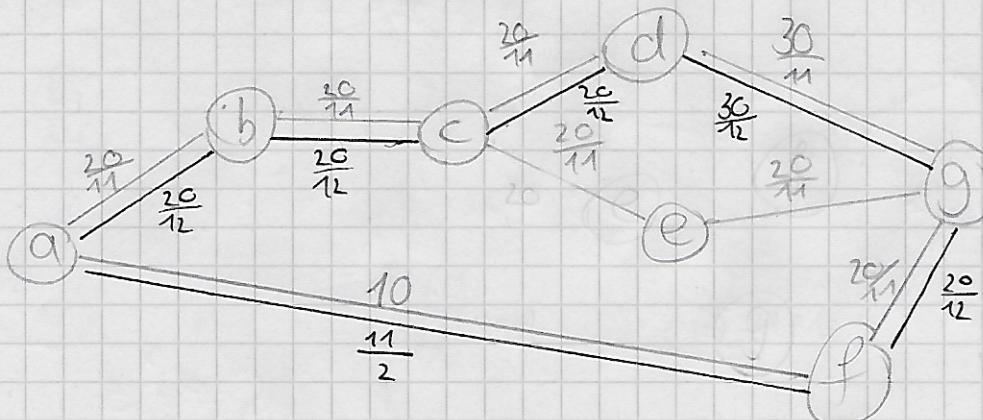


a)

To use A* on this graph, we need to modify it in such a way, that different means of transportation can be considered. Furthermore, if you decided on going by car, you should only have the option to continue by car. The same goes for trans.

Modified graphs:

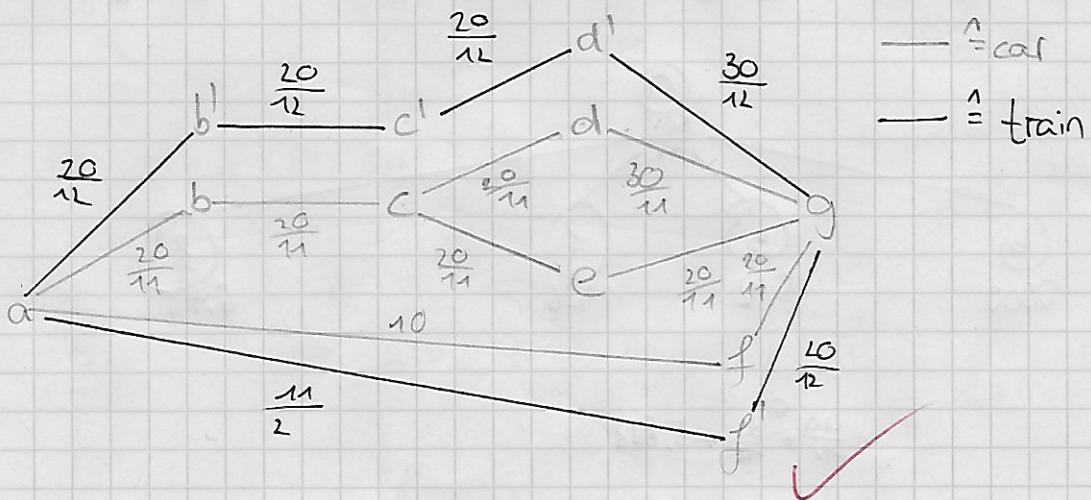
1.) Different means of transportation, should have different costs on edges. Value the edges with time: Divide distance by velocity.



— = car

— = train

2) If you decided on going by car, you should only have the option to go to another node by car. The same holds true for train. So split nodes that have multiple incoming edges (except the end node g).

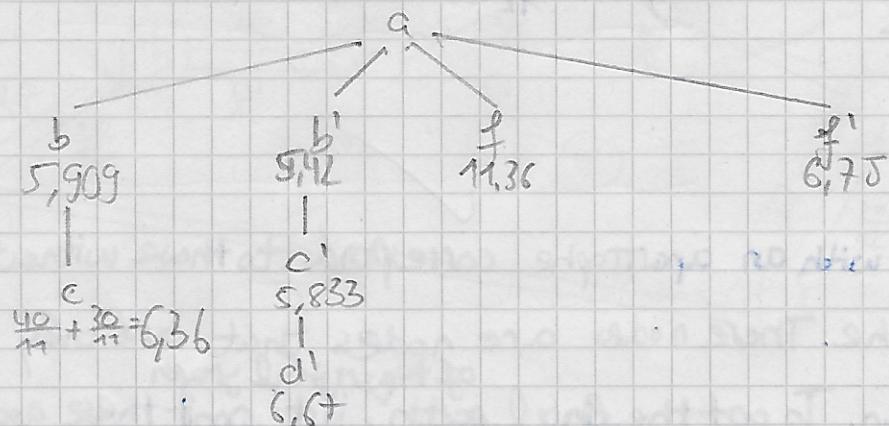
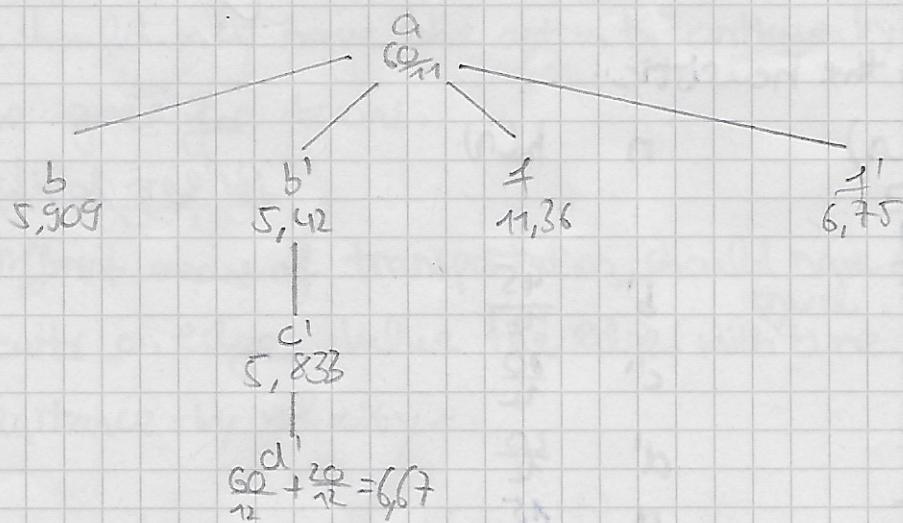
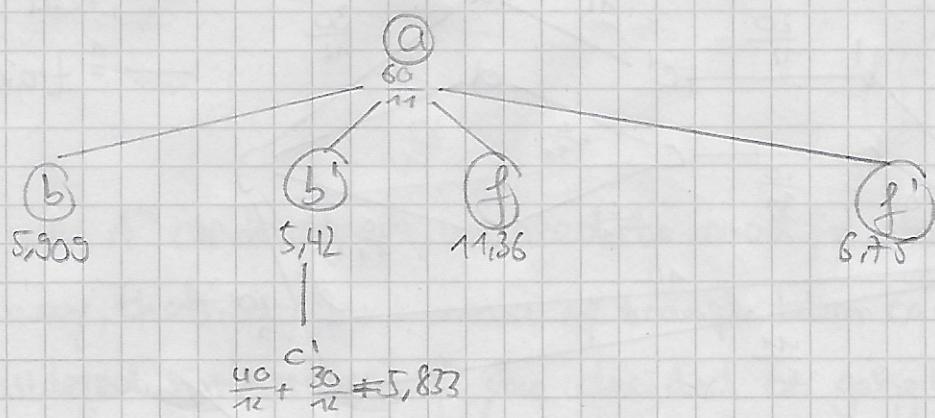
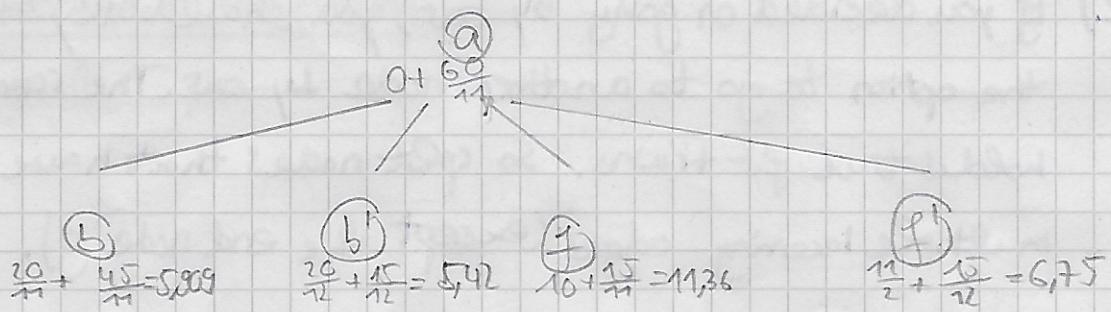


3) Modify the heuristic:

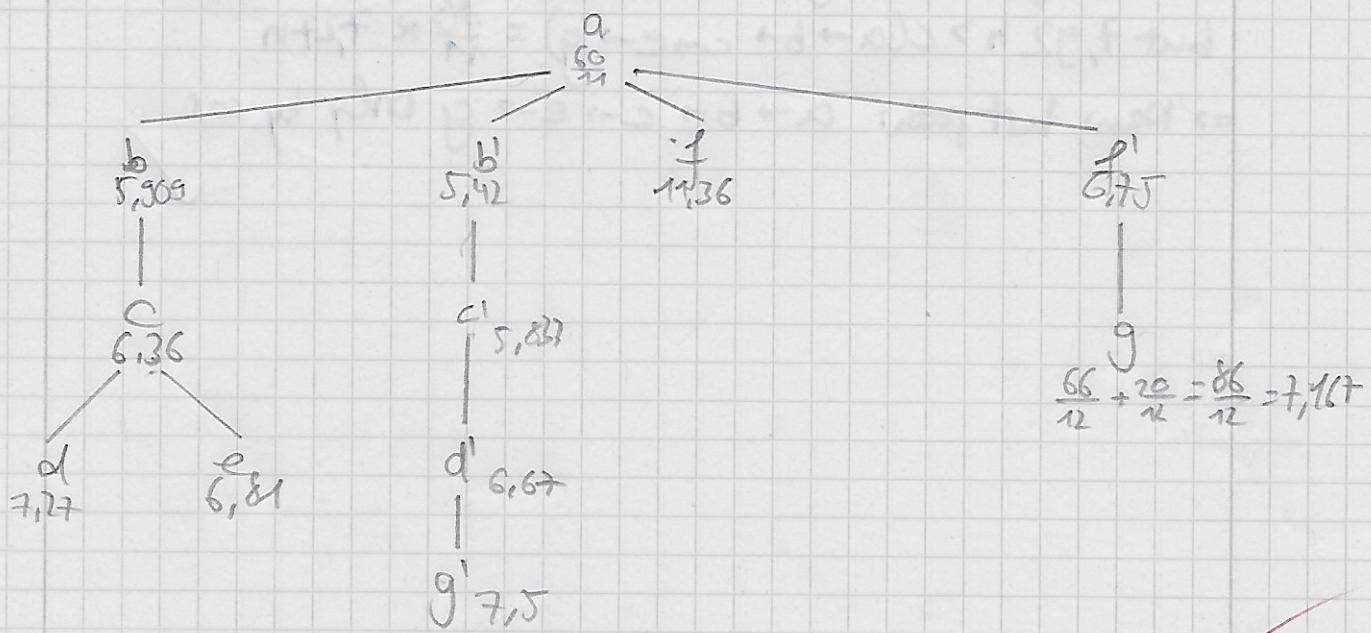
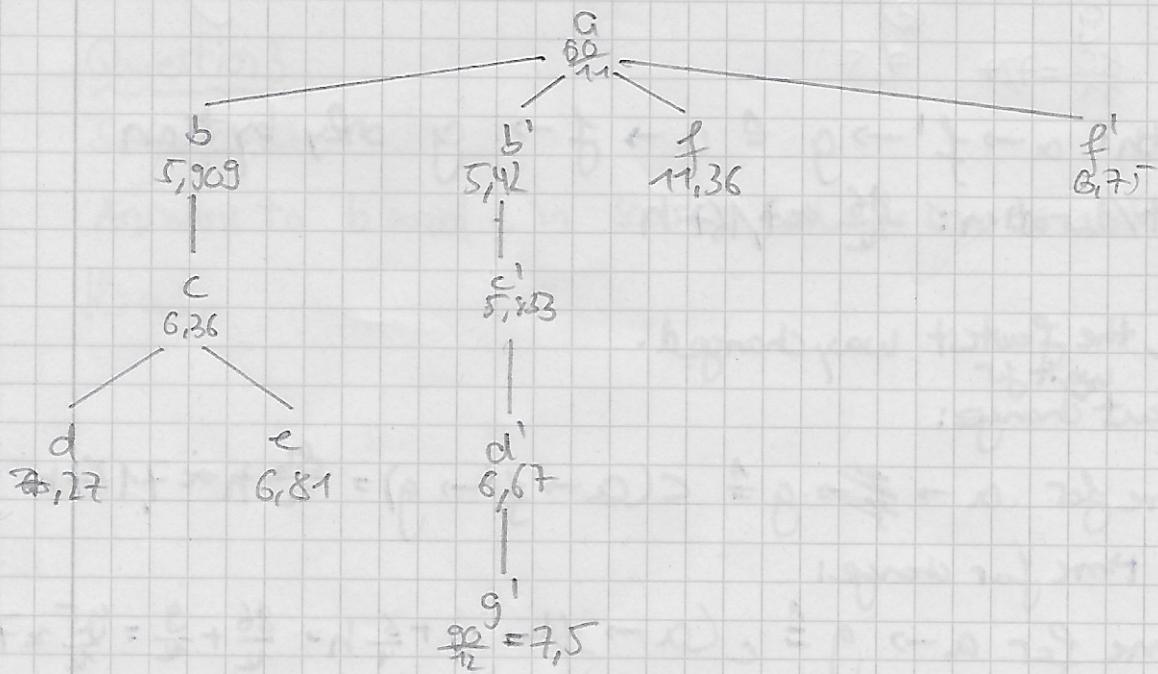
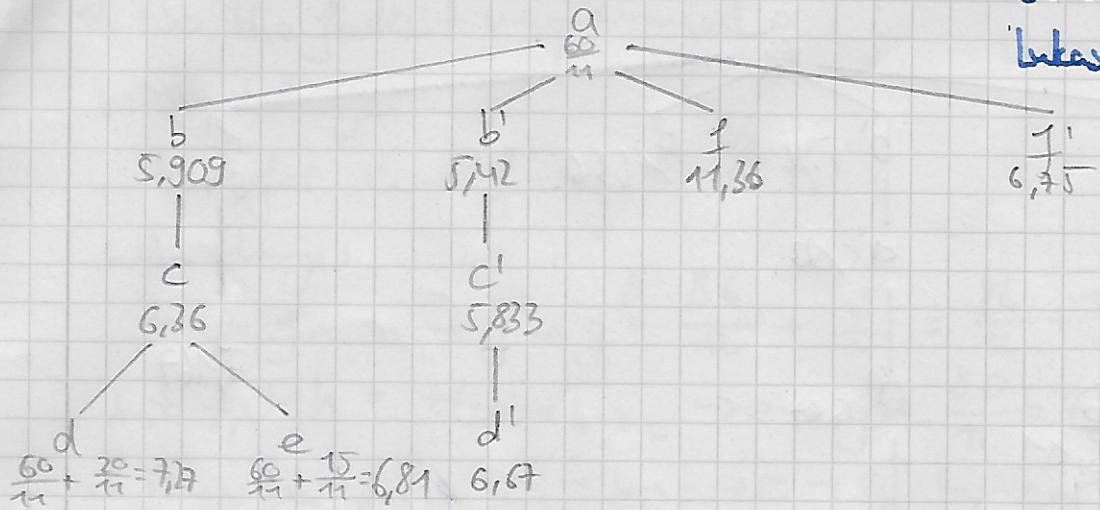
n	$h(n)$	n	$h(n)$
a	$\frac{60}{11}$		
b	$\frac{45}{11}$	b'	$\frac{45}{12}$
c	$\frac{30}{11}$	c'	$\frac{30}{12}$
d	$\frac{20}{11}$	d'	$\frac{10}{12}$
e	$\frac{15}{11}$	f'	$\frac{15}{12}$
f	$\frac{15}{11}$		
g	0		

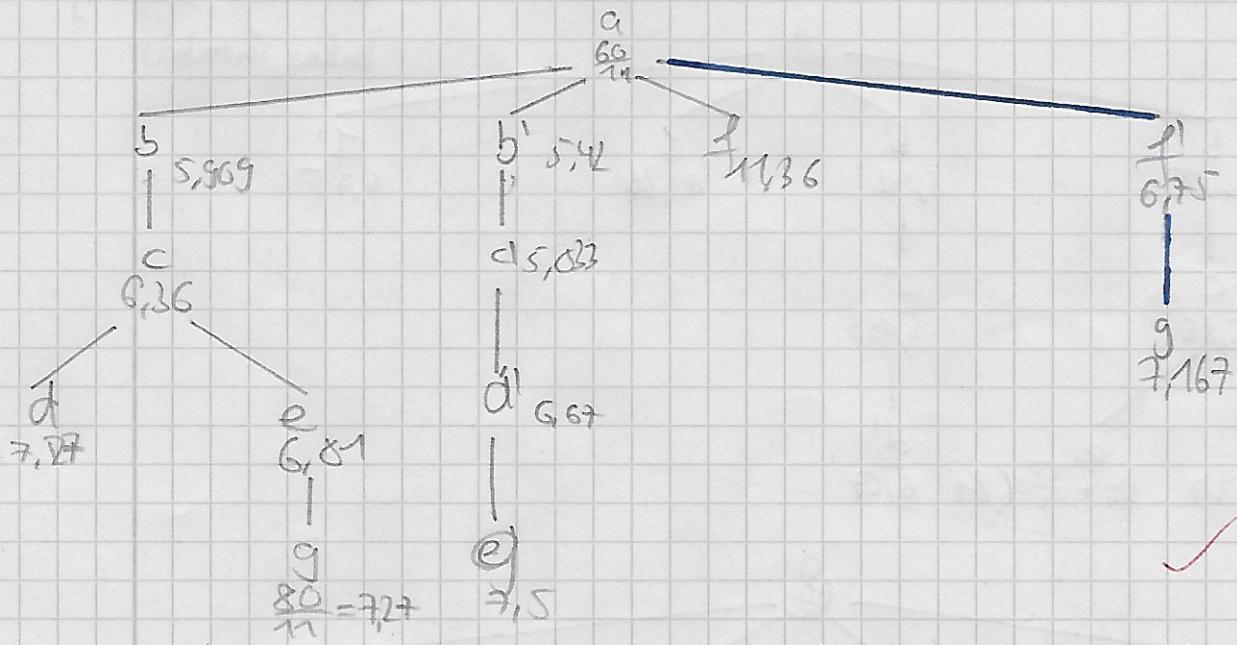
⇒ Nodes with an apostrophe correspond to those without an apostrophe. These nodes are nodes that are only reachable of the original graph by train. To get the final path, just omit these apostrophes.

b)



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\Rightarrow Path: $a \rightarrow f' \rightarrow g \stackrel{?}{=} a \rightarrow f \rightarrow g$ only by train
 cost/duration: $\frac{66}{11} \approx 7,167\text{ h}$

C) No, the fastest way changed.

Without change:

$$\text{time for } a \rightarrow \cancel{f} \rightarrow g \stackrel{?}{=} c(a \rightarrow f' \rightarrow g) = \frac{56}{11} h \approx 7,167\text{ h}$$

With time for change:

$$\text{time for } a \rightarrow g \stackrel{?}{=} c(a \rightarrow f' \rightarrow g) + \frac{3}{4} h = \frac{56}{11} + \frac{9}{4} = \frac{95}{11} \approx 7,92\text{ h}$$

$$\text{but } 7,92\text{ h} > c(a \rightarrow b \rightarrow c \rightarrow e \rightarrow g) = \frac{66}{11} \approx 7,27\text{ h}$$

\Rightarrow New best path: $a \rightarrow b \rightarrow c \rightarrow e \rightarrow g$ only by car

↳ No the fastest way charged.

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Without charge:

$$\text{time for } a \rightarrow f \rightarrow g \stackrel{?}{=} \frac{86}{12} h$$

With charge:

$$\text{time for } a \rightarrow f \rightarrow g \stackrel{?}{=} \frac{86}{12} + \frac{3}{4} = \frac{86}{12} + \frac{9}{12} = \frac{95}{12} \approx 7,92 h$$

$$\text{but } 7,91 h > t(a \rightarrow b \rightarrow c \rightarrow e \rightarrow g) = \frac{80}{11} \approx 7,27 h$$

\Rightarrow Best path: $a \rightarrow b \rightarrow c \rightarrow e \rightarrow g$ by car

Question 3

~~Source code~~

Answers to b and c in source code & source code is in
Klaus.