

Mathematics

Oral Part

1c

Elevens namn och klass/grupp

Teacher material – for copying

Teacher instructions: Version 1 – Burning candles

Task 1 (Diagrams B–E)

Questions for individuals

Hand out the sheet with the four diagrams B–E (Task 1). Let the pupils study the diagrams for a short while and then distribute the diagrams so that each of the pupils takes responsibility for one of the diagrams. Ask each of the pupils to compare the graphs in his/her diagram and describe the similarities and differences between the length of the candles and their burning lifetime.

- Compare the graphs and describe similarities and differences between the candles.

Suggestions for follow-up questions if they have not arisen in the presentations:

- How long does it take for Candle A to finish burning if the candle gets 6 cm shorter every hour (the dotted line graph)?
- About how long does it take for candle B to burn out?
- About how long is candle D from the start?
- How long was the candle not burning according to diagram E?

Task 2 (Diagrams B–E)

Is introduced using a short common task and then followed by individual tasks.

Common task

The grey dotted line graph in all the diagrams can be described with a formula. Ask the pupils to work together to determine a formula for the graph for Candle A. Let the pupils think together for a short time about making an equation and then agree on a suggestion e.g. $L = 18 - 6t$, where L is the length and t is the time in hours. If the pupils cannot make a formula, give it to them.

- Make an equation for the graph for Candle A.

Question for individuals

By making use of the equation for candle A the pupils are to try to determine an equation for their own diagram and explain their suggestion.

- Which equation (formula/expression) can describe the candle length and burning time for the other candle in your diagram?

Task 3 (Graph F–L)

Questions for individuals or for discussion

Choose between distributing graphs F–L among the pupils and giving them individual tasks or alternatively only choosing one or several of the graphs F–L and letting them have a group discussion. The chosen graph or graphs from graphs F–L should be presented for the pupils.

- Can the graph/graphs describe how a candle's length changes when it burns?

Let the pupils discuss this and ask them to explain their conclusions by describing what happens with the length of the candles and maybe giving suggestions for possible function expressions.

Suggestions for follow-up questions if they have not arisen in the presentations:

- What form might the candles described in graphs H–L have?
- Graph H and I have certain similarities but also describe important differences.
- Can graph F represent a function?

Teacher instructions: Version 2 – Pumping water out of pools

Task 1 (Diagram B–E)

Questions for individuals

Hand out the sheet with the four diagrams B–E (Task 1). Let the pupils study the diagrams for a short while and then distribute the diagrams so that each of the pupils takes responsibility for one of the diagrams. Ask each of the pupils to compare the graphs in his/her diagram and describe the similarities and differences between how the pools are emptied.

- Compare the graphs and describe similarities and differences between how the pools are emptied.

Suggestions for follow-up questions if they have not arisen in the presentations:

- How long does it take to empty Pool A that contains 15 000 liters if it is emptied at a rate of 300 liters per minute (the dotted line graph)?
- About how long does it take to empty Pool B?
- About how many liters of water were in Pool D at the start?
- At what rate is the water pumped out of Pools B–D?
- How long was the pump turned off according to diagram E?

Task 2 (Diagrams B–E)

Is introduced using a short common task and then individual tasks.

Common task

The grey dotted line graph in all the diagrams can be described with a formula. Ask the pupils to work together to determine a formula for the graph for Pool A. Let the pupils think together about making an equation for a short time and then agree on a suggestion e.g. $V = 15\,000 - 300t$, where V is the volume and t is the time in minutes. If the pupils cannot make a formula, give it to them.

- Make an equation for the graph for Pool A.

Questions for individuals

Using an equation for the grey dotted line graph the pupils are to try to determine an equation for "their own diagram" and explain their suggestion.

- What equation (formula/expression) can describe how the other pool in your diagram is emptied?

Task 3 (Graphs F–L)

Questions for individuals or for discussion

Choose between distributing graphs F–L among the pupils and giving them individual tasks or alternatively only choosing one or several of the graphs F–L and letting them have a group discussion. The chosen graph or graphs from graphs F–L should be presented for the pupils.

- Can the graph/graphs describe how the water volume in a pool changes with time?

Let the pupils discuss this and ask them to explain their conclusions by describing what happens and maybe giving suggestions for possible function expressions for some of the graphs.

Suggestions for follow-up questions if they have not arisen in the presentations:

- Graph H and I have certain similarities but also describe important differences.
- Can graph K represent a function?

Teacher instructions: Version 3 – Phone call costs for various cell phone providers

Task 1 (Diagrams B–E)

Questions for individuals

Hand out the sheet with the four diagrams B–E (Task 1). Let the pupils study the diagrams for a short while and then distribute the diagrams so that each of the pupils takes responsibility for one of the diagrams. Ask each of the pupils to compare the graphs in his/her diagram and describe the similarities and differences between the phone costs for the different providers.

- Compare the graphs and describe the similarities and differences between the costs for a telephone call for the different providers.

Suggestions for follow-up questions if these have not appeared during the presentations:

- What might the opening fee be for Provider C/D?
- To whom would you recommend Provider E?
- What might the charge per minute be for Providers B–E?
- Is it possible to mark 1 minute on the horizontal axis?

Task 2 (Diagrams B–E)

Is introduced using a short common task and then individual tasks.

Common task

The grey dotted line graph in all the diagrams can be described with an equation. Ask the pupils to determine a formula together for the graph for Provider A. Let the pupils think about the equation for a short time and then they should reach a common result together, e.g. $K = 69 + 59t$ where K is the cost in öre and t is the length of the call in minutes. If the pupils cannot arrive at an equation, give it to them.

- Make an equation for the graph for Provider A.

Questions for individuals

Using the equation for the grey dotted line graph the pupils should try to find an equation for their own diagram and explain their suggestion.

- What equation (expression/formula) can describe the cost for the other provider in your diagram?

Task 3 (Graphs F–L)

Individual or group discussion questions

Choose between distributing graphs F–L among the pupils and giving them individual questions, or instead, choosing one or several of the graphs F–L and discussing them together within the group. The chosen graph or graphs from graphs F–L should be presented for the pupils.

- Could the graph/graphs describe the costs for a telephone call?

Let the pupils discuss this and ask them to explain their conclusions by describing what determines the cost for a telephone call and possibly make suggestions for possible function expressions for some of the graphs.

Suggestions for follow-up questions if they have not arisen in the discussions:

- What is the meaning of Graph G starting at 0?
- Graph H and I have certain similarities but also show important differences.
- In graph K some circles are filled in while others are not. Why?
- Can Graph K represent a function?
- Suppose that the cost per minute in Graph G is 2 kr/min. Draw the graph for Provider A in the same diagram.
- Suppose we want to draw a graph that describes multiple calls with the same provider (eg. Provider A). How would such a graph look like?

Student material – for copying

Information for pupils

Here we provide a description of the oral part of the national test. The test is carried out in groups consisting of 3–4 pupils sitting around a table together with their teacher. The implementation is similar to that for the oral test part in Grade 9.

- Each of you will get a sheet of paper with diagrams and a described situation. For a few minutes you can study this and think it through. Your teacher will tell you in what order you and your classmates will make presentations.
- Each of you will then get one of the diagrams, and will make a presentation for this one. You will describe the diagram and explain your answer. After each presentation your classmates can ask questions and make additional comments.
- When everyone has made their presentations of their diagrams the group will get some new questions to deal with.
- Your performance during the oral test will be assessed with respect to the abilities you demonstrate and to what extent you
 - use and describe the meaning of the concepts involved and the relationships between these
 - use and apply mathematical models
 - show mathematical reasoning, evaluate and develop your own reasoning and that of others
 - express yourself orally and use mathematical language.

Remember that you have opportunity to demonstrate your knowledge both in your own presentation and in the discussion after your classmates' presentations. Your performance on this oral part will then be combined with a number of E-, C- and A- points. The result on the oral test part is then combined with the results on the written test parts.

Version 1 – Burning candles

The graphs in the diagrams show the length of different candles. The grey dotted line graph in the diagrams shows Candle A, which is 18 cm long and gets 6 cm shorter per hour when the candle is burning.

The solid line graph shows in a similar way how another candle burns down.

Diagram B

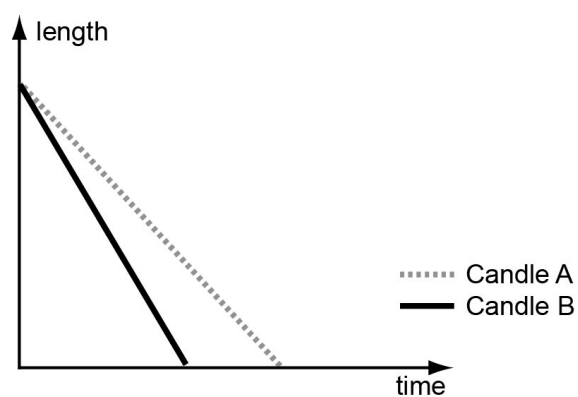


Diagram C

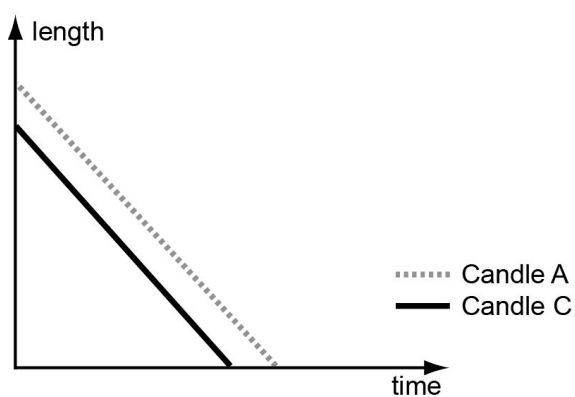


Diagram D

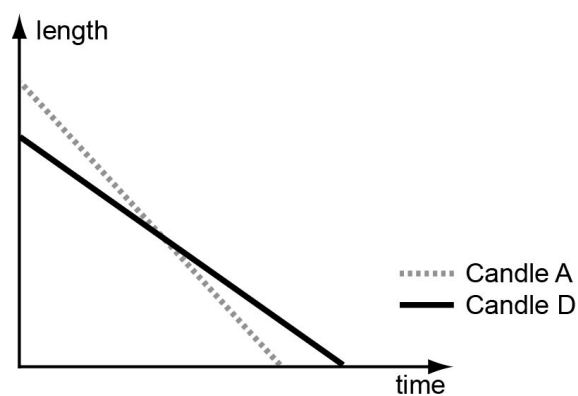
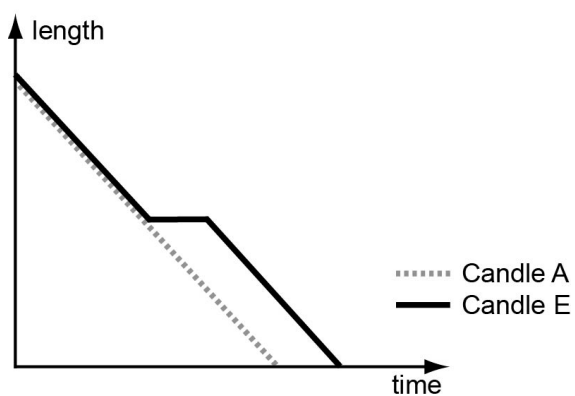
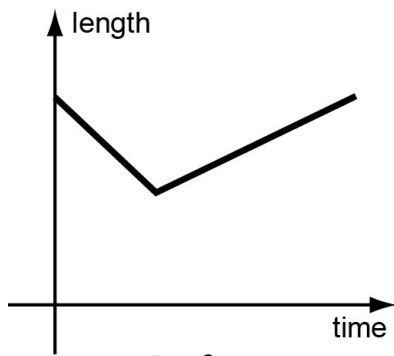


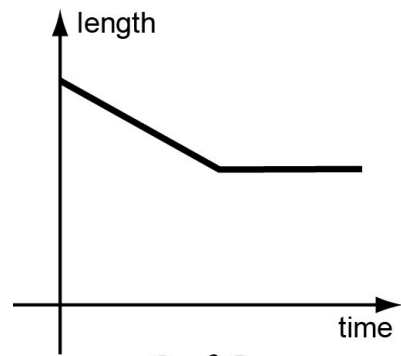
Diagram E



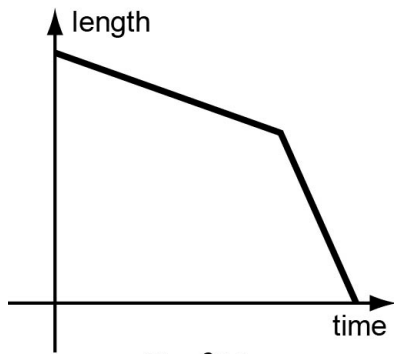
Version 1 – Graphs



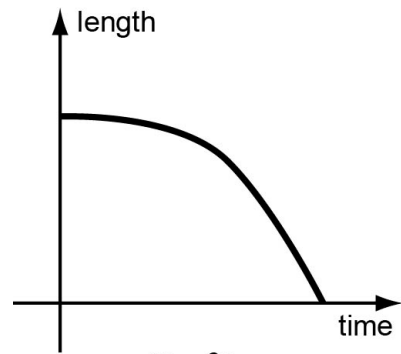
Graf F



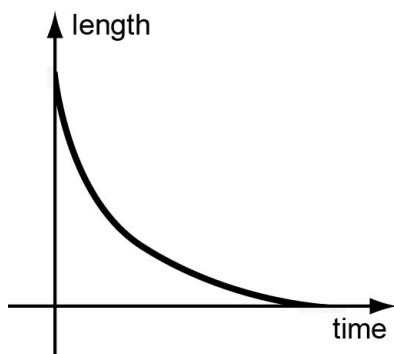
Graf G



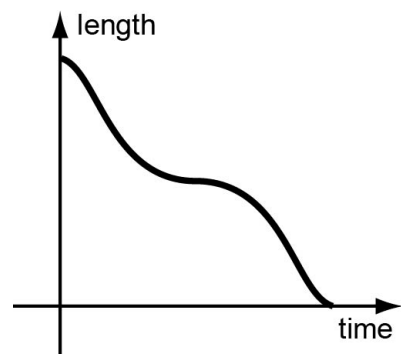
Graf H



Graf I



Graf K



Graf L

Version 2 – Pumping water out of pools

The graphs in the diagrams show the volume of water in different pools. The grey dotted line graph in the diagrams shows Pool A, which contains 15 000 liters of water and where the water in the pool is pumped out at a rate of 300 liters per minute.

The solid line graph shows in a similar way how another pool is emptied.

Diagram B

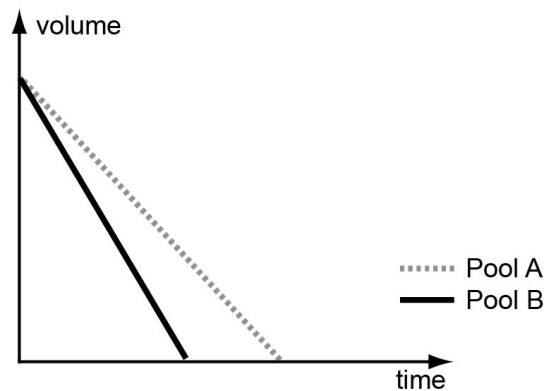


Diagram C

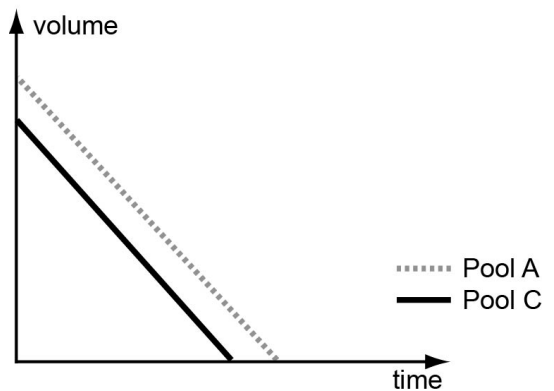


Diagram D

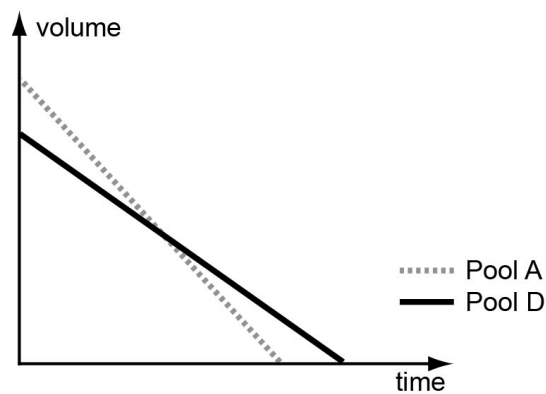
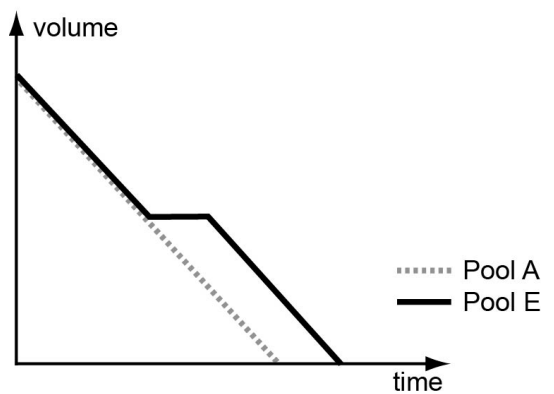
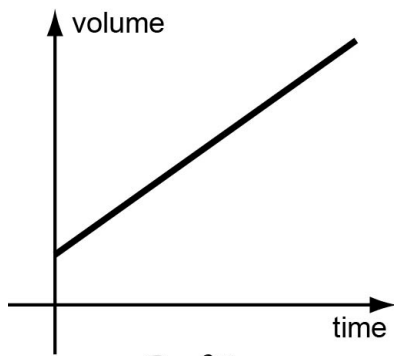


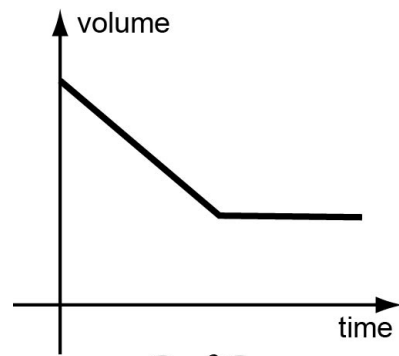
Diagram E



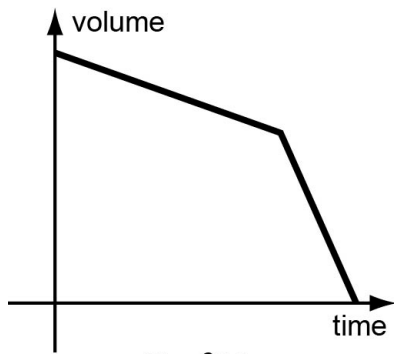
Version 2 – Graphs



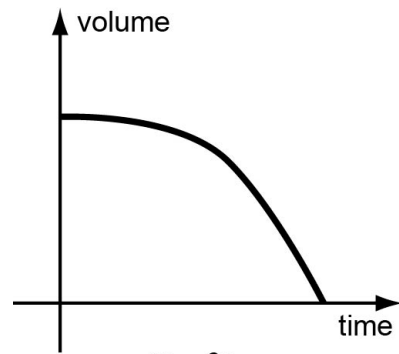
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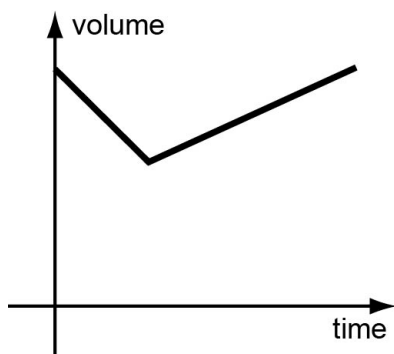
Graf G



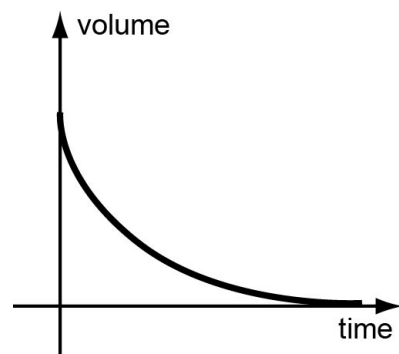
Graf H



Graf I



Graf K



Graf L

Version 3 – Phone call costs for various cell phone providers

The graphs in the diagrams show the cost for one telephone call for different providers. The grey dotted line graph in the diagrams shows Provider A, which has an opening fee of 69 öre and in addition a minute cost of 59 öre per minute.

The solid line graph shows the cost for a phone call for some other provider.

Diagram B

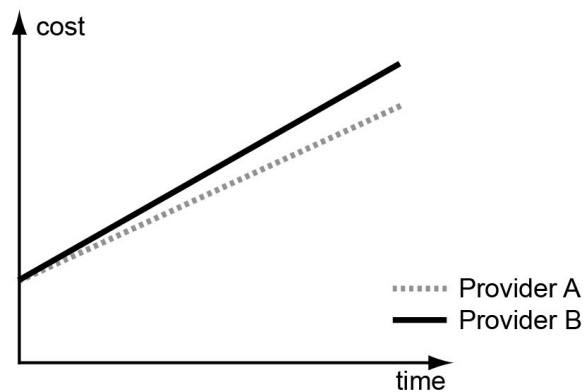


Diagram C

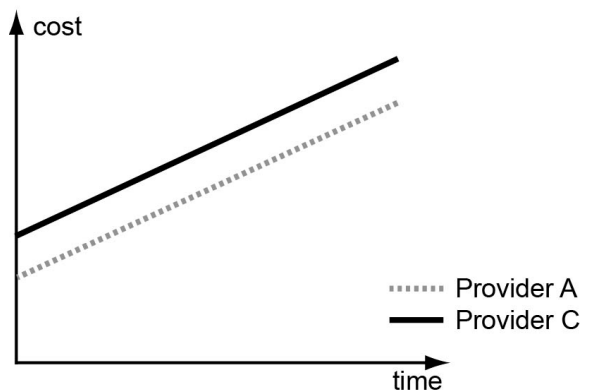


Diagram D

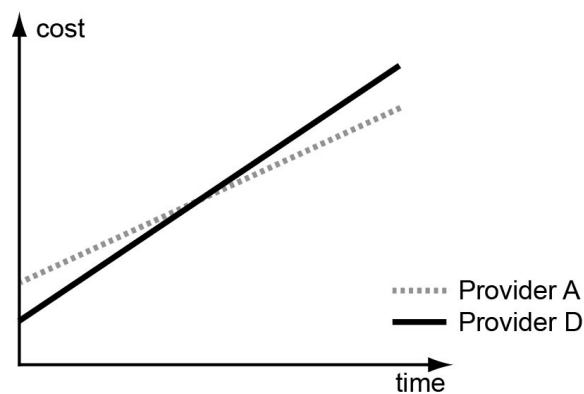
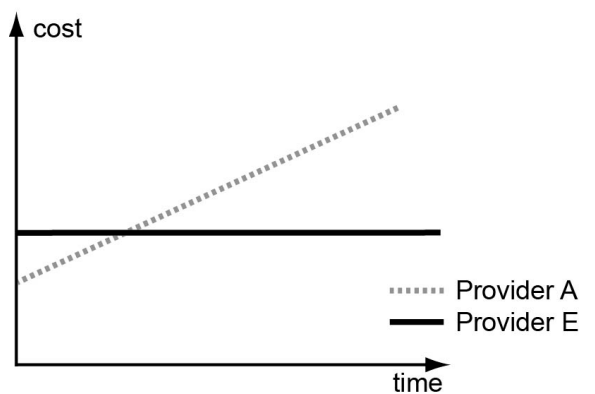
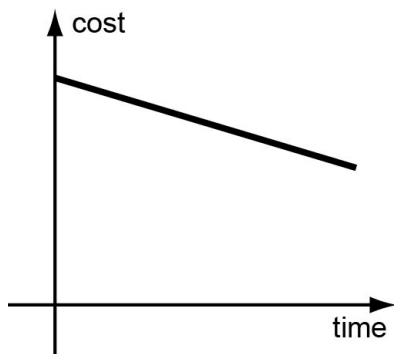


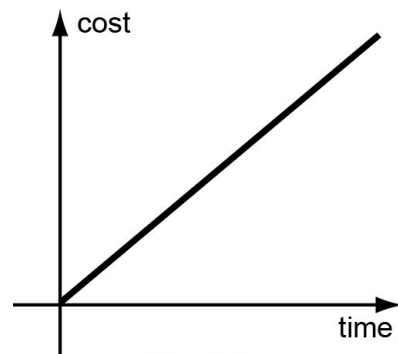
Diagram E



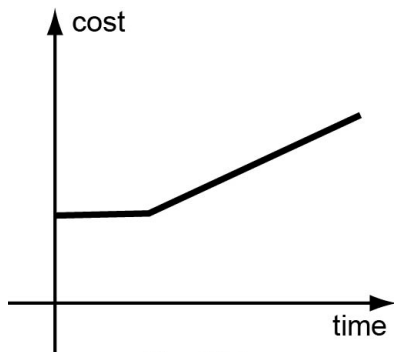
Version 3 – Graphs



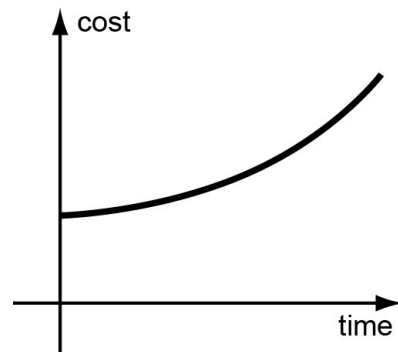
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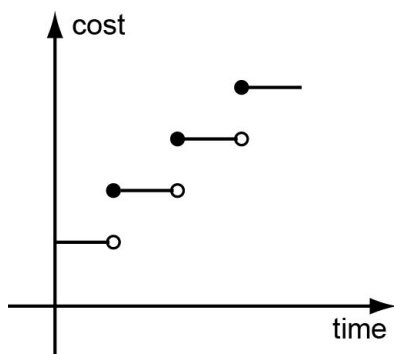
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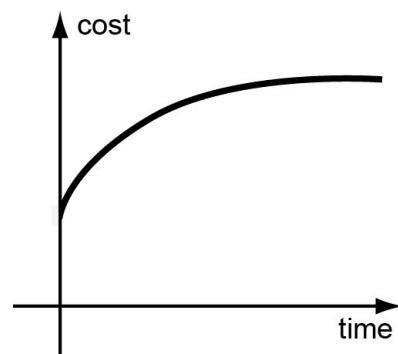
Graf H



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