

Part D	Problems 17-24 which require complete solutions.
Test time	120 minutes.
Resources	Digital resources, formula sheet and ruler.

Level requirements

The test consists of an oral part (Part A) and three written parts (Part B, Part C and Part D). Together they give a total of 63 points of which 24 E-, 21 C- and 18 A-points.

Level requirements for test grades

E: 17 points

D: 25 points of which 7 points on at least C-level

C: 32 points of which 12 points on at least C-level

B: 42 points of which 6 points on A-level

A: 50 points of which 11 points on A-level

The number of points you can have for a complete solution is stated after each problem. You can also see what knowledge level(s) (E, C and A) you can show in each problem. For example (3/2/1) means that a correct solution gives 3 E-, 2 C- and 1 A-point.

For problems labelled “*Only answers required*” you only have to give a short answer. For other problems you are required to present your solutions, explain and justify your train of thoughts and, where necessary, draw figures and show how you use your digital resources.

Write your name, date of birth and educational program on all the sheets you hand in.

<p>Name: _____</p> <p>Date of birth: _____</p> <p>Educational program: _____</p>
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Part D: Digital resources are allowed. Do your solutions on separate sheets of paper.

17. Find the equation of the straight line that passes through the points (1, 7) and (5, 15) (2/0/0)

18. At Floda weather station the outside temperature is measured every hour. The measurements during one night in October, can according to a simplified model, be described by the quadratic function

$$f(x) = 0.5x^2 - 3.75x + 6$$

where $f(x)$ represents the temperature expressed in °C and x represents the number of hours after midnight (at 00:00).

- a) Calculate $f(2)$ (1/0/0)
- b) Interpret what $f(4) = -1$ means in this context. (0/1/0)
- c) At what time does the lowest temperature occur according to the model? (0/2/0)
19. The table shows the price list for two different mobile phone subscriptions:

Subscription All-prat		Subscription Prata-på	
Subscription fee	SEK 299 / month	Subscription fee	SEK 199 / month
Data rates (down)	10 Mbit/s	Surfing speed	Up to 3 Mbit/s
Data rates (up)	4.6 Mbit/s	Surfing volume 1	Free within Sweden
Free surf/month	10 GB/month		
Talk rate	SEK 0.29 / minute	Talk rate	SEK 0.69 / minute

Victor wants to compare the two subscriptions and investigate the monthly cost.

- a) Write the monthly cost as a function of the call time x minutes for subscription All-prat and Prata-på respectively. (2/0/0)
- b) Help Victor investigate which subscription is the cheapest one depending on the length of his call time during one month. (1/2/0)

20. At the start of 2004, Niklas bought a flat for SEK 635 000. He sold it 7 years later for SEK 1 115 000.
- a) Assume that the increase in value was exponential during that period of time. Calculate the yearly percentage increase in value for the flat. (0/2/0)
- b) What would be the value of the flat at the start of 2020 if the increase in value continued at the same pace? (0/2/0)



21. Lisa says to Melker:

- Think of a number between -100 and 100 .
- Square the number.
- Subtract your original number 18 times.
- Add 50.

Lisa: Which number did you get?

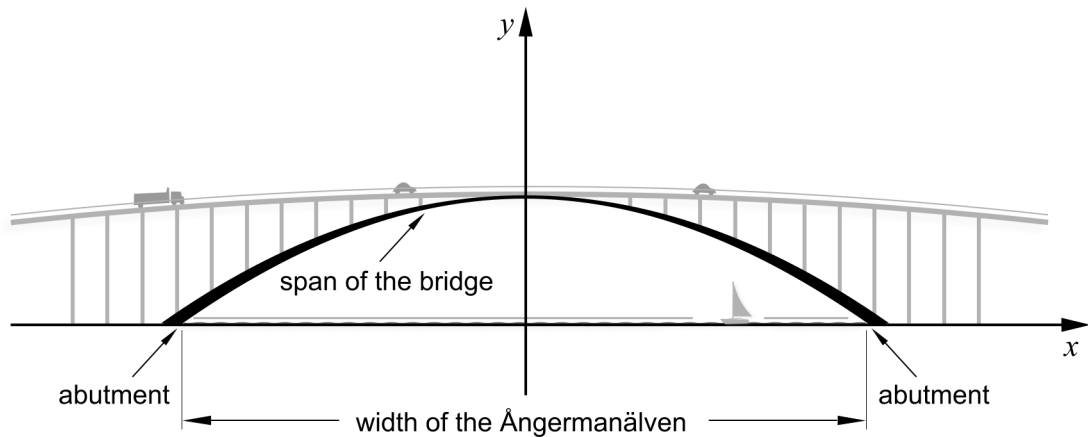
Melker: I got 5

Lisa: Did you think of 15?

Melker: No.

What number did Melker think of? (Assuming that he has calculated correctly.) (0/0/2)

22. The Sandö bridge is a bridge crossing the Ångermanälven river. The bridge was built in 1943 and was until 1964 the world's longest single-span concrete arch bridge.



The shape of the arch can be described by the quadratic function $y = h(x)$ where

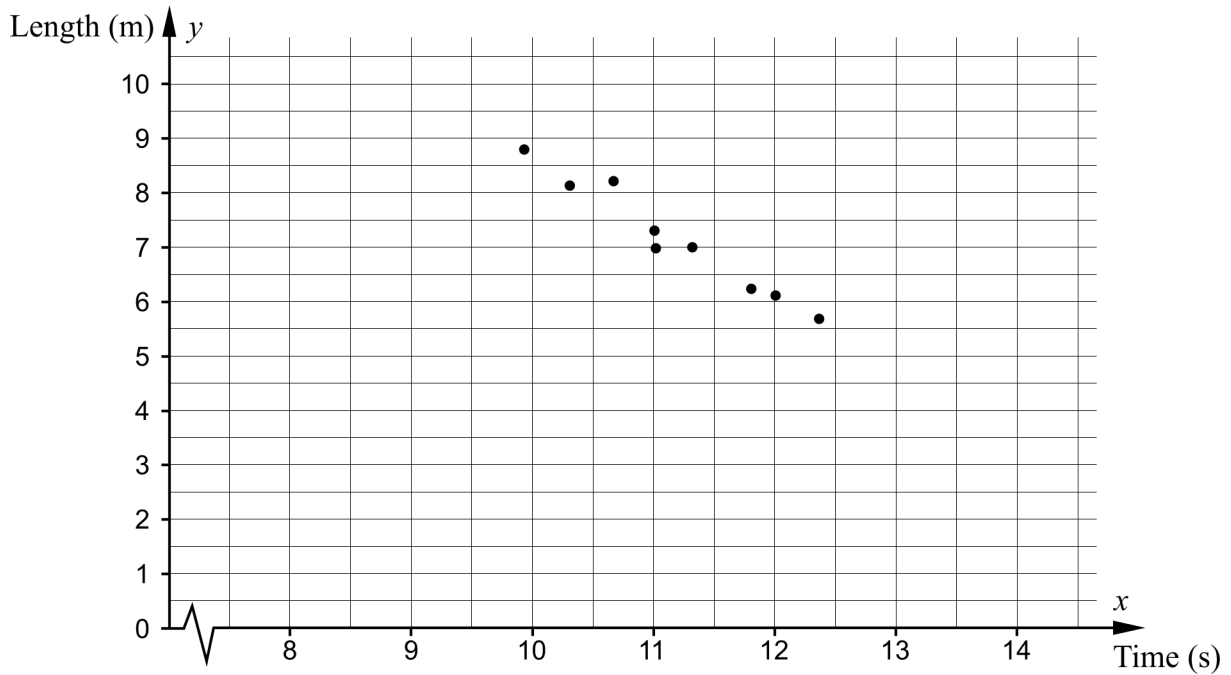
$$h(x) = -0.0023x^2 + 40$$

$h(x)$ is the height above the water in metres.

x is the distance in metres from the middle of the bridge along the surface of the water.

- a) How high above the water are the cars when they pass the highest point of the bridge? *Only answer required* (1/0/0)
- b) A 15-metre-high sailing boat is going to pass under the bridge. How close to one of the bridge abutments can the boat pass? (0/0/3)

23. Nine people competing in both the long jump and the 100 metres present their best results. These results are marked in the diagram below. The diagram shows that there seems to be a linear relationship between the length of a jump and the time on the 100 metres.

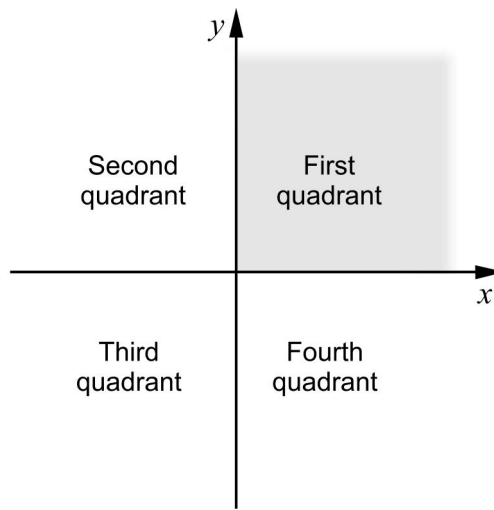


- a) Draw a straight line that, as good as possible, shows the relation between the length of a jump and the time on the 100 metres. Determine the equation of this line on the form $y = kx + m$ (0/2/0)

The relationship can be seen as a model of how the length of a jump depends on the time of a 100-metre race.

- b) Usain Bolt holds the world record on the 100 metres with a time of 9.58 seconds. How far would Usain Bolt be able to jump in the long jump according to this model? (1/0/0)
- c) Give your comments on whether there is any limitation to the model. (0/1/0)

24. The two straight lines $y = ax - 2$ and $y = x - 1$, where a is a constant, intersect in the first quadrant.



Investigate the possible values of the constant a .

(0/1/2)