Part D	Problems 17-25 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 73 points of which 27 E-, 27 C- and 19 A-points.

Level requirements for test grades
E: 18 points
D: 28 points of which 9 points on at least C-level
C: 37 points of which 16 points on at least C-level
B: 48 points of which 6 points on A-level
A: 57 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.

Name: _____

Date of birth: _____

Educational program: _____

Part D: Digital resources are allowed. Do your solutions on separate sheets of paper.

17. Karin buys a new computer. The value of the computer SEK V is assumed to decrease according to the model $V = 8000 \cdot 0.67^t$ where t is the number of years after the purchase.

How long does it take until the value of the computer has decreased to one fourth of the purchase value? (2/0/0)

18. At a factory, tins are filled with pea soup. The weight of each tin should be 400 grams. Every day, a random sample of 10 tins is taken to check the weight. One day the weights of the tins (in grams) were measured to the following:

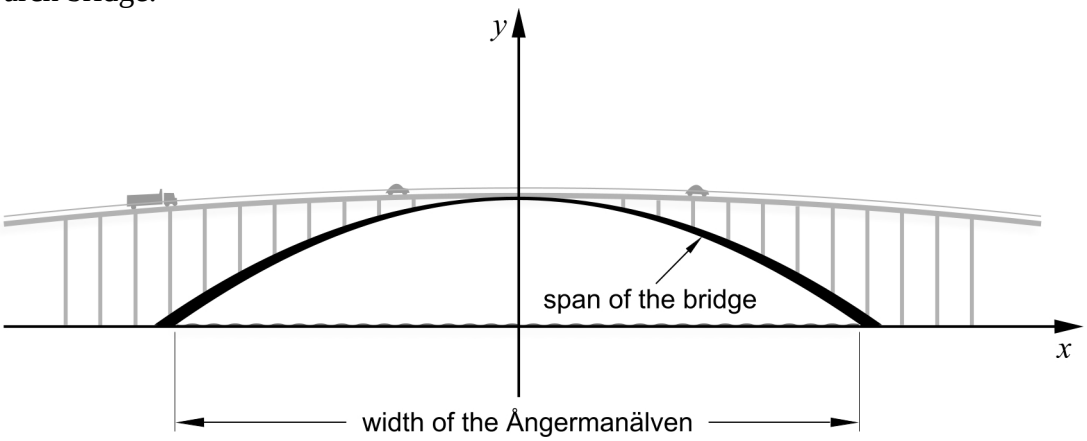
401	396	400	403	399	397	402	404	398	400

The factory requires that the standard deviation is no more than 2.5 grams.

a) Investigate whether the factory meets its requirement on this day. (2/0/0)

b) Describe what the standard deviation says about a statistical material. (1/1/0)

19. 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 h 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) Calculate the width of the Ångermanälven river under the bridge. (0/2/0)

20. A baker wants to calculate the cost for producing a chocolate ball. The cost includes a labour cost and the cost for the ingredients. A large chocolate ball that weighs 80 g is then produced at a cost of SEK 8.

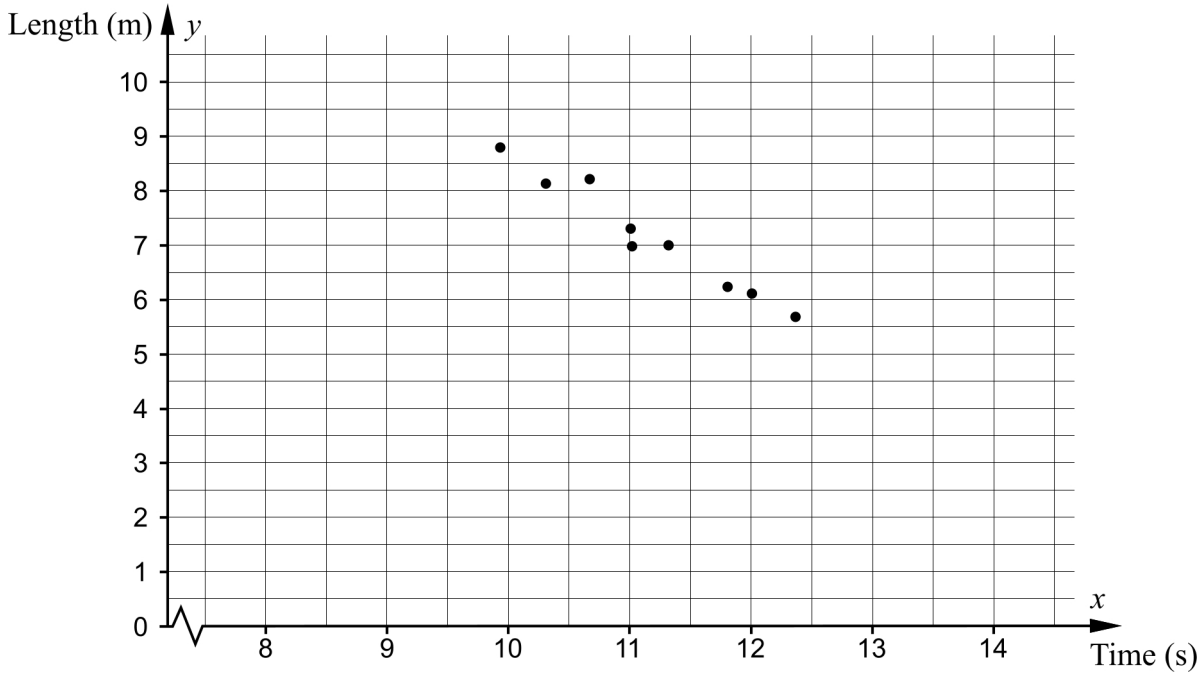
Many customers think that such a chocolate ball is too big. The baker has therefore also started producing small chocolate balls. A small chocolate ball weighs 45 g and is produced at a cost of SEK 6.

The baker assumes that the labour cost is the same for producing a large chocolate ball as for producing a small one.

Calculate the labour cost for one chocolate ball. (0/4/0)

21. Nine people competing in both the long jump and the 100 metres present their best results. These results are presented in the table below and also plotted in the diagram below.

100 metres Time (s)	**Long jump** Length (m)
9.92	8.79
10.3	8.13
10.66	8.21
11.00	7.30
11.01	6.98
11.31	7.00
11.80	6.23
12.00	6.11
12.36	5.69



There seems to be a linear relationship between the length of a jump and the time on the 100 metres.

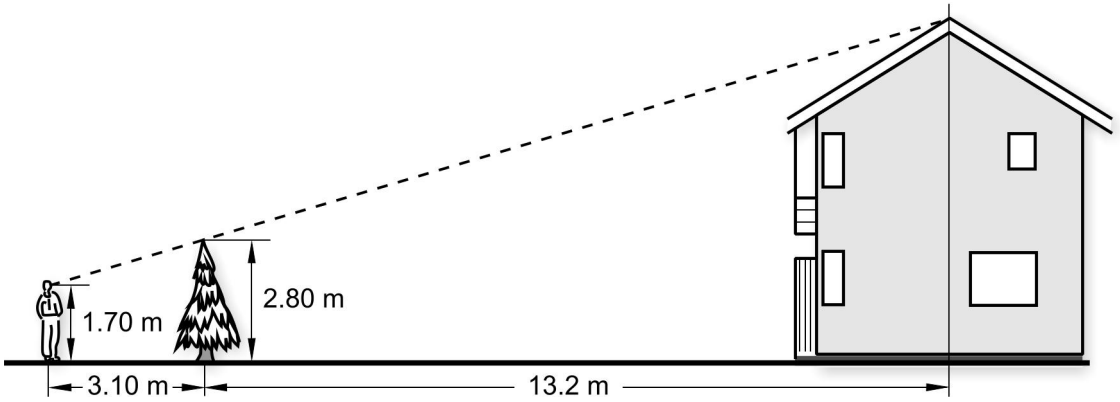
a) Adjust a straight line to the points and find the relationship for the line in the form $y = kx + m$ (0/2/0)

The linear 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)

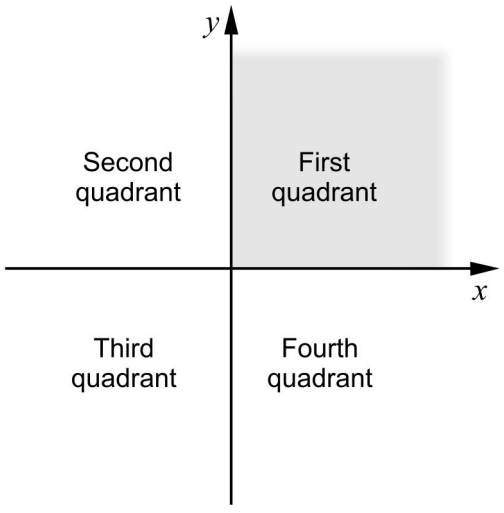
c) Give your comments on whether there is any limitation to the model. (0/1/0)

22. Rickard has been given the task of determing the height of a house. To be able to do this, he makes use of a fir tree in front of the house. Rickard stands so that he sees the tip of the fir tree coincide with the top of the roof. He puts a mark at his position. He then measures the required distances and writes them in the sketch below.



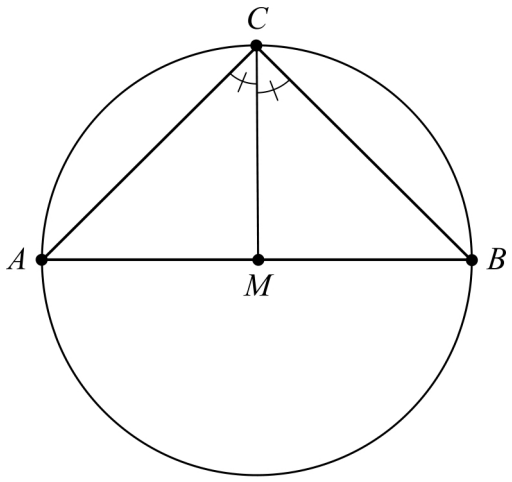
What is the height of the house? (0/4/0)

23. 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)

24. The figure shows a triangle *ABC* which is inscribed in a circle. The side *AB* passes through the centre of the circle, *M*. The angles *ACM* and *BCM* are equal.

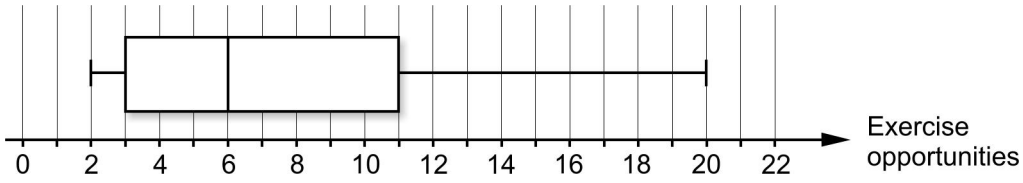


Show that the distance *CM* is perpendicular to the distance *AB*. (1/1/2)

25. In a statistical survey, 11 people were given the question:

”How many times during the last month have you exercised?”

The result of the survey was compiled with a box plot.



In what interval can the mean of the number of exercise opportunities be? (0/1/3)