

Part D	Problems 15-23 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 66 points of which 26 E-, 22 C- and 18 A-points.

Level requirements for test grades

E: 19 points

D: 28 points of which 7 points on at least C-level

C: 35 points of which 13 points on at least C-level

B: 45 points of which 6 points on A-level

A: 53 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.

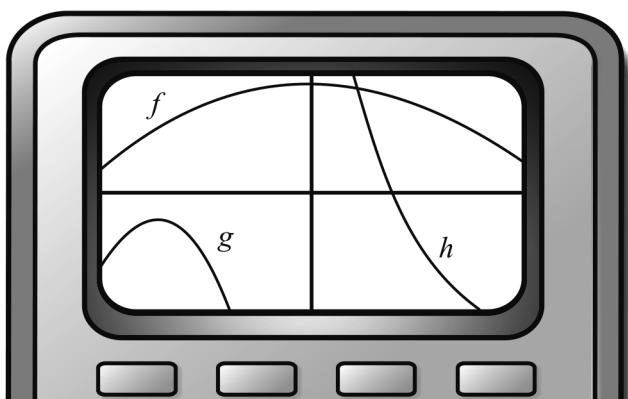
For problems labelled “*Only answer required*” you only have to give a short answer. For other problems you are required to present your solutions, explain and justify your train of thoughts and, where necessary, draw figures and show how you use your digital resources.

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. Write your solutions on separate sheets of paper.

15. Find the equation to the straight line that passes through the points (2, 5) and (6, 17) (2/0/0)
16. Solve the equation $x^3 = 320$ *Only answer required* (1/0/0)
17. Petter is going to determine the number of zeroes of three quadratic functions f , g and h . He has used a graphic calculator to draw the functions. The picture shows the display of the graphic calculator.



Petter says: “I’ll have to change the settings of the axes so I can see more of the graphs.”

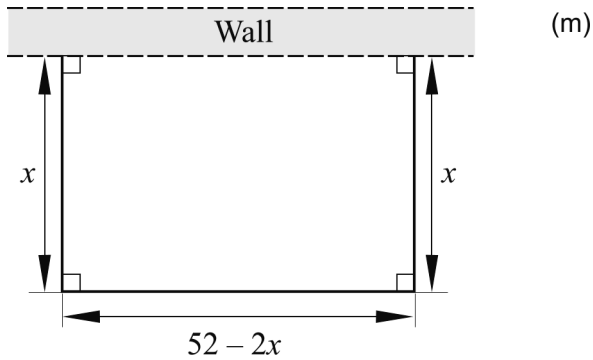
Petter’s teacher John says: “You don’t have to do that, you can already see how many zeroes each of the quadratic functions has.”

Write down the number of zeroes to each of the functions f , g and h and explain how you can determine this with help from the given picture. (2/1/0)

18. Ellen and Irma are having a movie night and buy soft drinks and sweets. Ellen pays SEK 86 for two soft drinks and four bags of sweets. Irma buys three soft drinks and two bags of sweets and pays SEK 68.

Calculate the price of a soft drink and a bag of sweets respectively. (0/3/0)

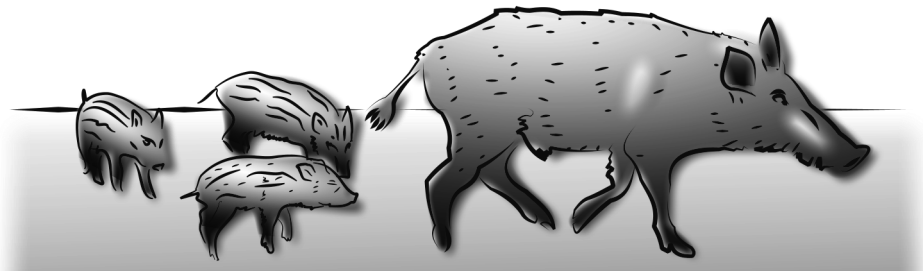
19. A rectangular pasture is to be built against a wall. There are 52 metres of fencing which will have to cover three of the sides since the fourth side is constituted by the wall. See figure.



Write down an expression for the area and determine the dimensions the pasture should have in order for its area to be as large as possible. (1/3/0)

20. The population of wild boar has lately doubled every three years. The number of wild boar can be described by an exponential model $y = 15000 \cdot 2^{\frac{x}{3}}$ where y is the number of wild boar and x is the number of years after the year 2000.

- a) How many wild boar were there in the year 2010 according to the model? (1/0/0)
- b) What is the yearly percentage increase in the wild boar population according to the model? (0/2/0)



21. The ozone layer that surrounds the Earth protects us from UV-radiation. The thickness of the ozone layer is measured in Dobson Unit (DU).

Since the 1980s the Swedish Meteorological and Hydrological Institute measures the ozone layer's thickness over different places in Sweden, among them Norrköping. The measurements from 1st June to 31st December 2008 can, according to a simplified model, be described by the quadratic function

$$f(x) = 0.0052x^2 - 1.4x + 378, \quad 0 \leq x \leq 210$$

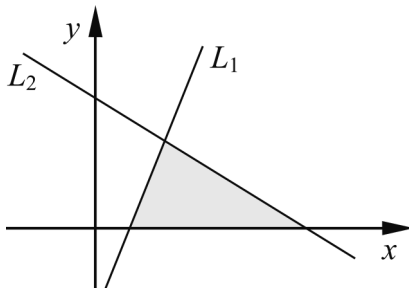
where $f(x)$ is the ozone layer's thickness in the unit DU and x is the number of days after 1st June.

- a) Calculate $f(0)$ and describe how $f(0)$ can be interpreted in this context. (1/1/0)

When meteorologists talk about ozone holes, what they really mean are areas where the ozone layer's thickness is less than 220 DU. Therefore, it is not really a hole but a thinner ozone layer.

- b) Did a hole appear in the ozone layer over Norrköping during the period 1st June to 31st December 2008? Justify your answer. (0/1/1)

22. The figure shows a coordinate system containing the two lines L_1 and L_2 . Line L_1 has the equation $y = 2x - 2$ and line L_2 has the equation $y = kx + m$. The lines intersect at the point $(3, 4)$ and together with the positive x -axis they form a triangle with the area 12 au.



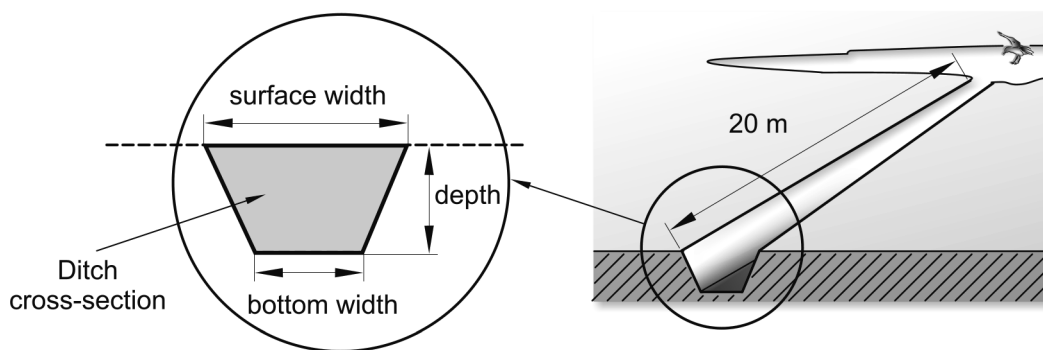
- Determine the equation of line L_2 (0/0/3)

23. Sonya and Bert are digging a 20-metre ditch along one of their property boundaries. They plan to take the earth they dig up to the recycling centre. They know they will have to pay a fee to the recycling centre if they leave a volume of more than 10 cubic metres of earth.

Bert: – I wonder how large ditch we can dig without having to pay a fee to the recycling centre?

Sonya: – I have read that a good ditch should have the same bottom width as depth. The ditch surface width should be 0.5 m longer than the bottom width.

Bert: – If I draw a sketch of the cross sectional area of such a ditch we can then calculate how big the ditch can be without us having to pay the fee.



What are the largest dimensions such a ditch can have if the ditch has a length of 20 metres and if Sonya and Bert will not have to pay a fee to the recycling centre?

(0/0/4)