

<b>Part D</b>	Problems 15-23 which require complete solutions.
<b>Test time</b>	120 minutes.
<b>Resources</b>	Digital resources, formula sheet and ruler.

**Level requirements**

The test consists of three written parts (Part B, Part C and Part D). Together they give a total of 53 points consisting of 22 E-, 18 C- and 13 A-points.

Level requirements for test grades

E: 14 points

D: 22 points of which 6 points on at least C-level

C: 29 points of which 10 points on at least C-level

B: 37 points of which 4 points on A-level

A: 43 points of which 7 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 thought and, where necessary, draw figures and show how you use your digital resources.

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

Name: _____
Date of birth: _____
Educational programme: _____

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

15. Find the equation of the straight line that passes through the points (4, 3) and (6, 7) (2/0/0)

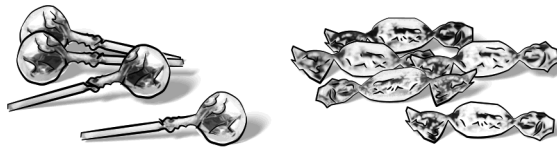
16. Anna and Stina buy sweets. Anna buys 4 lollies and 12 toffees and pays SEK 32. Stina buys 2 lollies and 4 toffees and pays SEK 13.

“How much is a lolly and a toffee, respectively?” wonders Anna.  
 “We can find out by solving simultaneous equations,” says Stina.

Stina writes down the following simultaneous equations.

$$\begin{cases} 4x + 12y = 32 \\ 2x + 4y = 13 \end{cases}$$

- a) What do  $x$  and  $y$  mean in this context? (1/0/0)
- b) Solve the simultaneous equations and determine the price of a lolly and a toffee, respectively. (2/0/0)



17. A straight line with gradient  $k = 3.5$  passes through the point (2, 5). Does the line also pass through a point with the  $y$ -coordinate  $-500$ ? Justify your answer. (0/1/0)

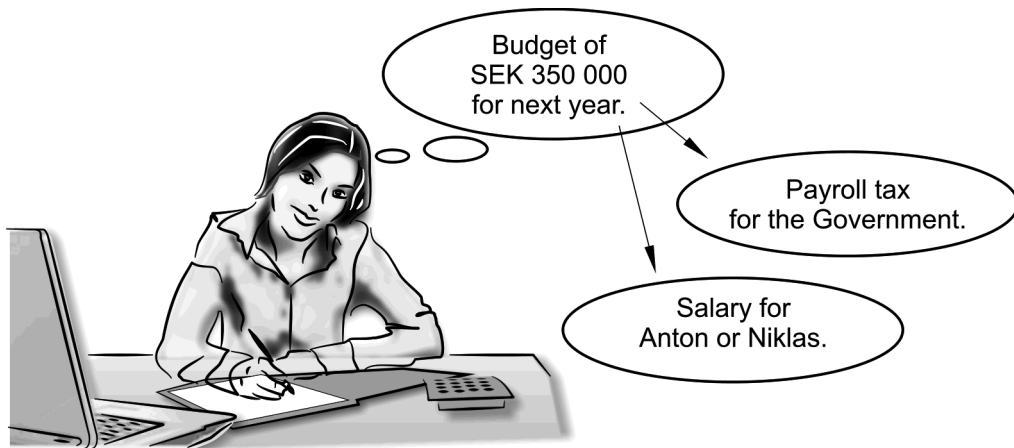
18. Hjördis is a plumber and runs her own business. She's got more work than she can manage and needs to employ a new person. In her budget for next year she plans to set aside SEK 350 000 to cover both salary and payroll tax for the new employee.

The size of the payroll tax depends on the age of the employee and the monthly salary. See table.

Age	Payroll tax
Age 26 and younger	15.49% of the salary
Age 27 – 65	31.42% of the salary
Age 66 and older	10.21% of the salary

After interviews, Hjördis has decided to employ Anton or Niklas.

Anton who is 24 years old has asked for a monthly salary of SEK 25 000. Niklas who is 28 years old has asked for a monthly salary of SEK 24 000.



- a) Calculate the total cost that Hjördis will have to pay for salaries and payroll taxes for Anton and Niklas respectively. Can Hjördis employ either of them and still be within her budget of SEK 350 000 for next year? (2/0/0)
- b) Hjördis's business has a turnover of SEK 2 000 000 per year. With a new employee in the company, her goal is to double the turnover in three years. By what percentage must the turnover increase every year on average? (0/2/0)

19. Determine the constants  $a$  and  $b$  so that the simultaneous equations  $\begin{cases} y = ax + 1 \\ a = y - 3x \end{cases}$  have solutions  $x = 3$  and  $y = 2b$  (0/2/0)

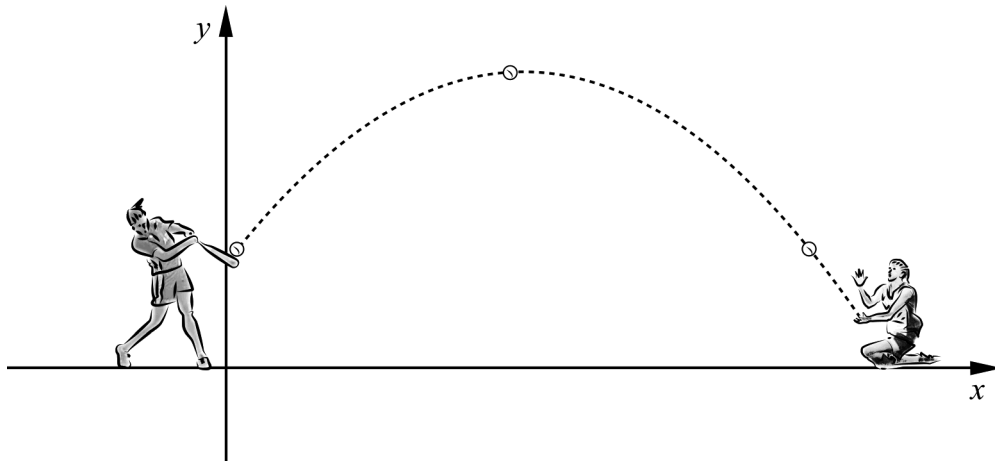
20. Adelina and Linda are practising rounders. Adelina hits the ball with a bat and Linda practises catching fly balls, that is catching the ball before it hits the ground.

On one occasion, the trajectory of the ball can be described by the function

$$y = -0.10x^2 + 2x + 1$$

$y$  is the ball's height above the ground.

$x$  is the distance, in metres, along the ground from where the ball was hit.

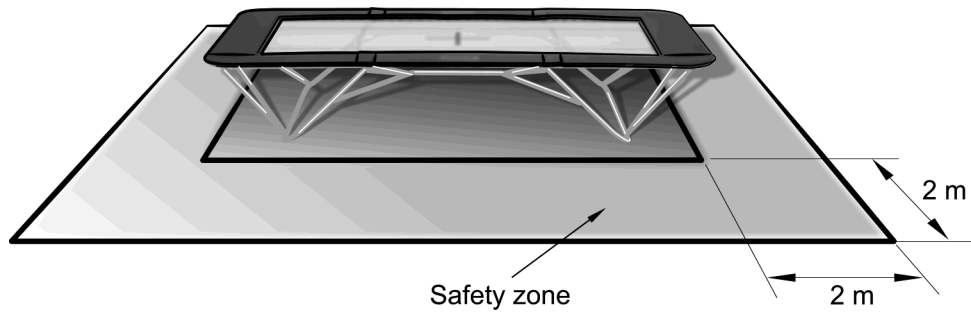


- How far from where the ball was hit is Linda if she catches the ball 0.80 m above the ground? (0/3/0)

21. It holds for the function  $f$  that  $f(x) = x^2$   
Find all values of  $a$  so that  $f(2a) = a$  (0/2/0)

22. It holds for the numbers  $x$  and  $y$  that  $x^2 + 2xy + y^2 = 9$   
Show algebraically that all solutions to the relation can be described by two straight lines. (0/1/1)

23. The company “Lexelius Jump and Bounce” sells rectangular trampolines. On every trampoline, the long side is twice as long as the short side. The company recommends that there is a 2.0 m wide safety zone around the trampoline and that the area of the safety zone should be at least three times as large as the area of the trampoline.



Calculate the dimensions of a trampoline that has a 2.0 m wide safety zone and where the area of the safety zone is three times as large as the area of the trampoline.

(0/0/4)