

<b>Part D</b>	Problems 18–25 which require complete solutions.
<b>Test time</b>	120 minutes.
<b>Resources</b>	Digital resources, formula sheet and ruler.

The test consists of three written parts (part B, part C and part D). Together they give a total of 57 points consisting of 21 E-, 20 C- and 16 A-points.

- Level requirements for test grades
- E: 13 points
- D: 22 points of which 6 points on at least C-level
- C: 29 points of which 11 points on at least C-level
- B: 37 points of which 5 points on A-level
- A: 44 points of which 8 points on A-level

The number of points you can get for a complete solution is stated after each problem. You can also see what knowledge levels (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 is 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.**

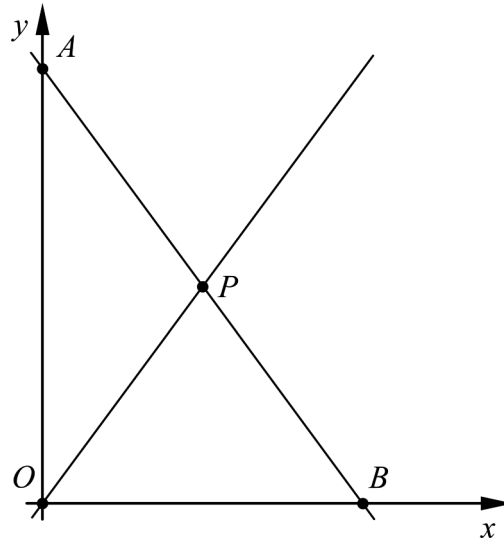
Name: _____
Date of birth: _____
Educational programme: _____

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

18. A straight line  $L$  passes through the two points  $(63, 125)$  and  $(114, 227)$ .

- a) Determine the equation of the line  $L$ . (2/0/0)
- b) Determine whether the point  $(87, 173)$  is the midpoint on the line segment between the points  $(63, 125)$  and  $(114, 227)$ . (1/0/0)

19. The figure shows the two straight lines  $y = 2x$  and  $y = -2x + 12$ . Together with the coordinate axes, the lines form two triangles  $OPA$  and  $OBP$ .

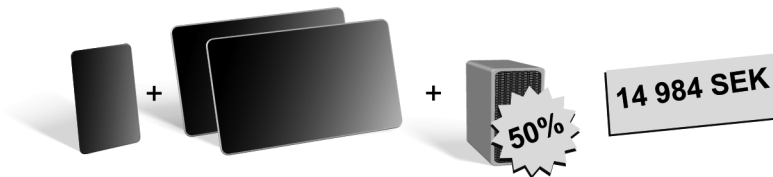


- a) Determine the coordinates of the point  $P$ . (1/0/0)
- b) Determine whether the triangles  $OPA$  and  $OBP$  have the same area. (2/0/0)

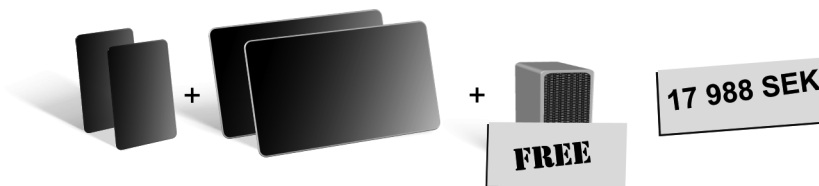
20. A family is planning to buy a cell phone, a tablet and a speaker. A cell phone, a tablet and a speaker cost, in total, 10 984 SEK in a certain store.



The salesperson offers a 50% discount on the speaker if the family buys one cell phone, two tablets and a speaker. The price with the discount would then be 14 984 SEK.



Another alternative offered by the salesperson is if the family buys two cell phones and two tablets, they will get a speaker for free. The total price for two cell phones and two tablets is 17 988 SEK.



Determine the regular price of a cell phone, a tablet and a speaker, respectively.

(2/1/0)

21. Philip sells popsicles on the beach. He receives a delivery of 320 popsicles each day.



One day, Philip sells all 320 popsicles for 10 SEK apiece. He wonders how much he can raise the price to earn more. It turns out that for each 1 SEK he raises the price, sales go down by 20 popsicles per day.

He formulates a function  $I(x)$  as a model for revenues in SEK during one day:  $I(x) = (10 + x)(320 - 20x)$

- a) Explain what  $x$  stands for in the function. (1/0/0)

Philip buys the 320 popsicles for 9 SEK apiece. He sells the popsicles at a price that is constant all day, and he has no other expenses apart from buying the popsicles. The popsicles he doesn't sell during the day can't be saved for the next day.

- b) Determine the price in SEK apiece for the popsicles that gives Philip the greatest possible profit per day, that is, the greatest difference between his revenue and expenses. (0/3/0)

22. The graph of an exponential function  $f$ , where  $y = f(x)$ , passes through the points  $(1, 3000)$  and  $(3, 6750)$ .

Determine the function  $f$ . (0/2/0)

23. There are many straight lines passing through the points  $(5, 3t)$  and  $(7, 4t)$ .

- a) The slope of one such line is 3. Ernst claims that in this case, 6 is the only possible value of  $t$ . Show that Ernst is right. (0/1/0)

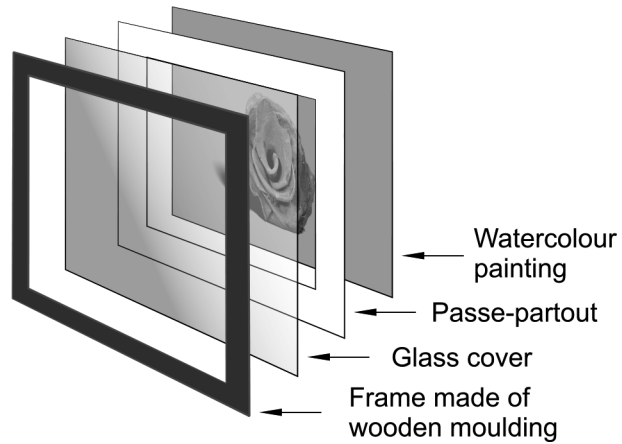
- b) Kersti claims that for such straight lines, it holds that the slope increases by 0.5 if  $t$  increases by 1. Show that Kersti is right. (0/1/0)

24. Calculate the exact value of  $x^2 + \frac{1}{x^2}$  when  $x + \frac{1}{x} = \frac{13}{3}$ . (0/0/2)

25. Lloyd wants to have a watercolour painting framed. He wants a frame made of wooden moulding, a glass cover and a passe-partout for the painting. There are wooden mouldings, glass and passe-partouts in different price ranges to choose from.

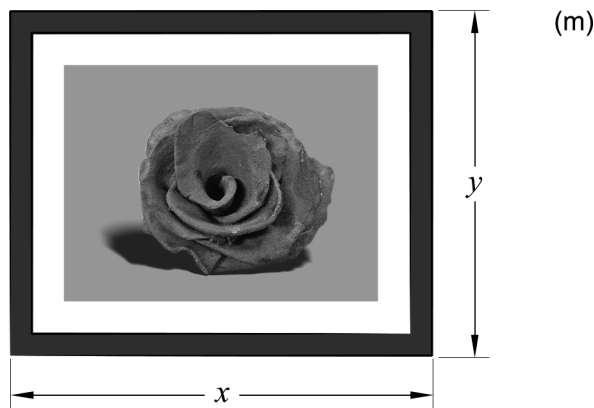
**Passe-partout:**

When framing a picture, a piece of cardboard, a passe-partout, is placed between the painting and the glass so that the painting will not be in direct contact with the glass.



Lloyd has two different offers for the framing, alternative A and alternative B. Both alternatives give the same outer dimensions for the finished framed painting. The table shows cost of materials, cost of labour and total cost.

Alternative	Cost of materials			Cost of labour SEK	Total cost SEK
	Wooden moulding SEK/m	Glass SEK/m <sup>2</sup>	Passe- partout SEK		
A	20	200	22.40	335	446.20
B	35	220	25.20	402	559.64



Lloyd wants to know how large the finished framed painting will be. He starts from the fact that  $x > y$  and begins his calculations by setting the total length of the wooden moulding to  $2x + 2y$  meters.

Depending on the shape of the wooden moulding, the dimensions of the glass cover will be different for the two alternatives. For alternative A the area of the glass cover is 80% of the total area of the finished framed painting  $xy \text{ m}^2$ . For alternative B the area of the glass cover is 90% of the total area of the finished framed painting  $xy \text{ m}^2$ .

Calculate the outer dimensions of the finished framed painting.

(0/0/4)