

<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.

**Level requirements**

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: 14 points

D: 23 points of which 6 points on at least C-level

C: 30 points of which 11 points on at least C-level

B: 38 points of which 5 points on A-level

A: 45 points of which 9 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 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: \_\_\_\_\_

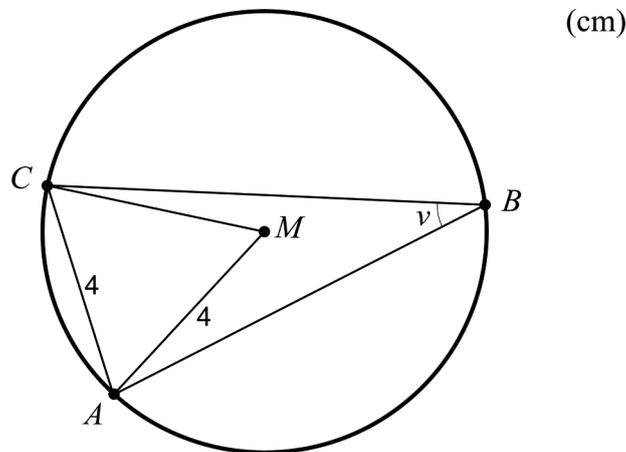
**Part D:** Digital resources are allowed. Do your solutions on separate sheets of paper.

18. In order to verify that all cinnamon buns produced at a bakery have approximately the same weight, the cinnamon buns are weighed. It turns out that the weight is normally distributed with the average weight 80 grams and the standard deviation 3 grams.



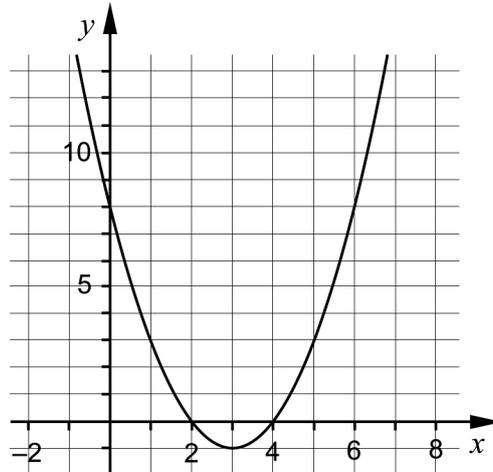
How many cinnamon buns can be expected to have a weight of more than 86 grams, if one day 400 cinnamon buns are produced? (2/0/0)

19. The point  $M$  is the centre of the circle in the figure below. The points  $A$ ,  $B$  and  $C$  are located on the boundary of the circle.



Determine the angle  $\nu$ . (2/0/0)

20. The figure below shows the graph of a quadratic function  $f$  where  $f(x) = ax^2 + bx + c$ , and where  $a$ ,  $b$  and  $c$  are constants.



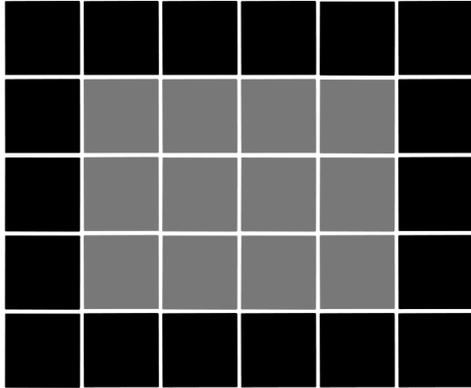
- a) Use the figure to determine the constant  $c$ . Justify your answer. (1/0/0)
- b) Which of the function values is the smallest,  $f(-5)$  or  $f(10)$ ? Justify your answer. (1/1/0)
21. In medicine, radioactive substances are used to investigate the body's inner organs, for example the kidneys. The radioactive substance used in the examination decays relatively fast. This means that the substance must be used immediately after it has been produced so that the activity does not decrease too much. Activity is decay per second and has the unit Becquerel (Bq).

It takes 8.0 hours for the activity to decrease exponentially from 11.5 MBq to 4.6 MBq.

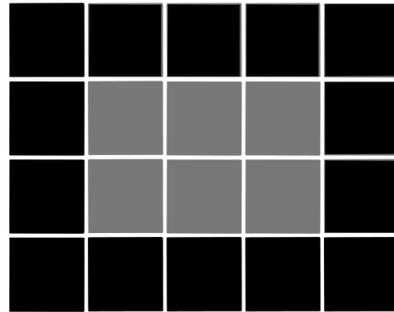
- a) By what percentage does the activity decrease per hour? (0/2/0)
- b) How large is the activity after one day if it was 11.5 MBq in the beginning? (0/1/0)

22. A tiler creates rectangular patios by laying quadratic tiles according to a certain pattern. He uses grey and black tiles, all of the same size.

The figure below shows patio A and patio B, created by the tiler. The total cost for the tiles in patio A is SEK 1422. For patio B, the total cost for the tiles is SEK 1000.



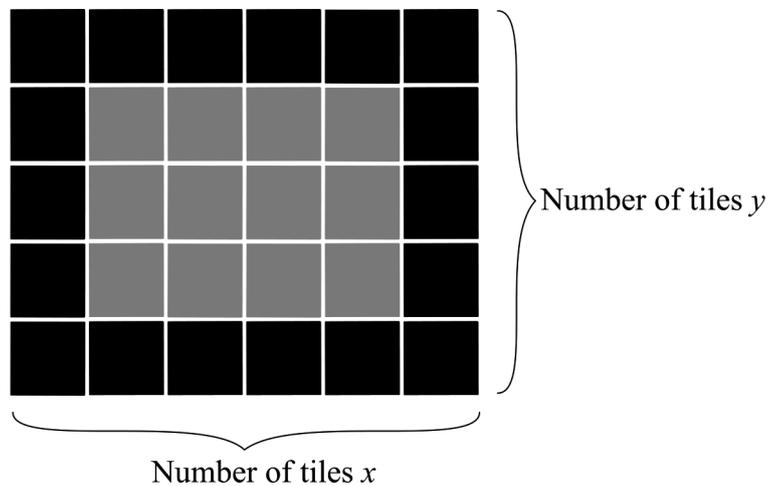
Patio A



Patio B

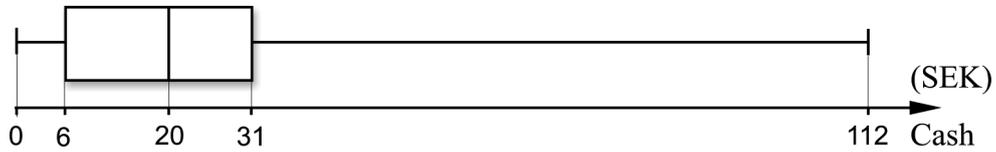
- a) Calculate the price of a grey and a black tile respectively. (0/3/0)

The tiler wants to be able to do a quick cost estimation for the tiles when patios are ordered. He denotes the number of tiles on one side of the patio  $x$  and the number of tiles on the other side of the patio  $y$ , see figure below.



- b) Show that the total cost of the tiles can be determined by the formula  $K_{tot} = 52x + 52y + 31.80xy - 104$  for all rectangular patios it is possible to create. The patios *always* contain both black and grey tiles so that the black tiles form a border. (0/0/2)

23. Demy and Oskar discuss how much money, in cash, youths their own age bring to school. They decide to do a survey in a class. Demy and Oskar hand out a note with the question “How much money did you bring today?” and get responses from all 19 students in the class. The results can be seen in the box plot below.

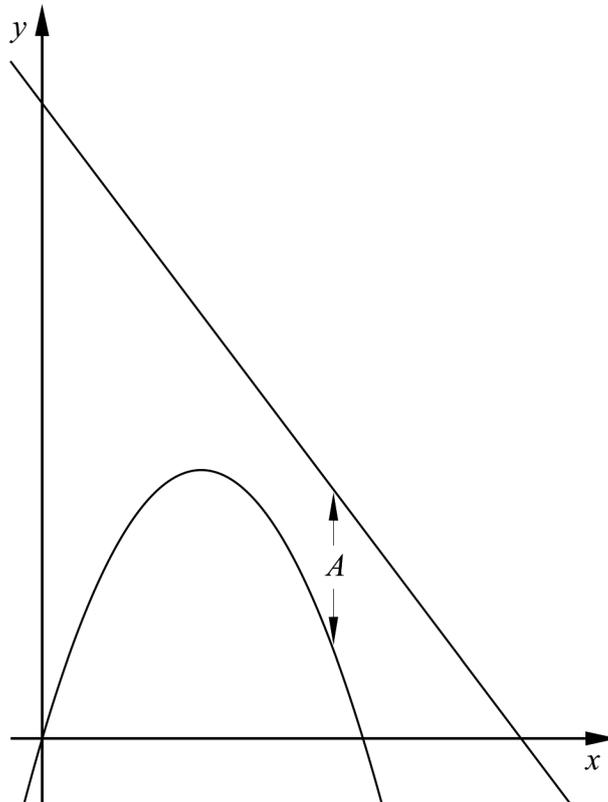


Investigate in which interval/s A-D the mean value  $M$  can be found. Justify your answer.

- A.  $0 \leq M < 6$
- B.  $6 \leq M < 20$
- C.  $20 \leq M < 31$
- D.  $31 \leq M \leq 112$

(0/2/1)

24. The figure below shows the graphs of two functions  $f$  and  $g$  where  $f(x) = -x^2 + 5x$  and  $g(x) = -2x + 15$



- a) The distance  $A$  between the curves in the  $y$ -direction depends on the value of  $x$ . Determine  $A$  as a function of  $x$ . (0/0/1)
- b) Determine the shortest distance between the curves in the  $y$ -direction. (0/0/2)

25. In an isosceles triangle, a line is drawn so that it divides the triangle into one triangle and one trapezium. The base of this new triangle constitutes one of the sides in the trapezium and has length 9.0 cm. The other two sides of the triangle are then both 8.0 cm. Calculate the length of the sides of the trapezium if the triangle and the trapezium have the same circumference. (0/0/4)