Part B	Problems 1-11 which only require answers.
Part C	Problems 12-16 which require complete solutions.
Test time	120 minutes for part B and C together.
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 63 points of which 24 E-, 21 C- and 18 A-points.

Level requirements for test grades
E: 17 points
D: 25 points of which 7 points on at least C-level
C: 32 points of which 12 points on at least C-level
B: 42 points of which 6 points on A-level
A: 50 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.

Write your name, date of birth and educational program on all the sheets you hand in.
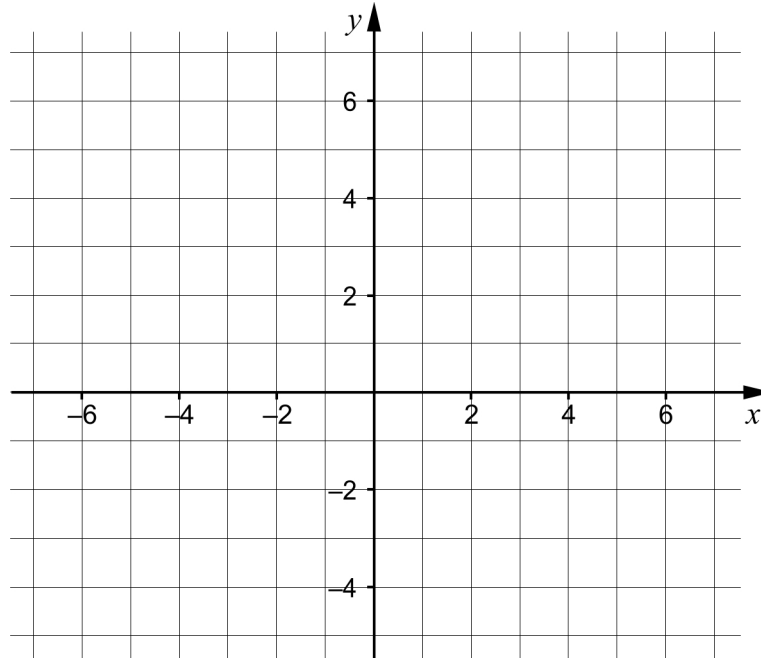
Name: _____

Date of birth: _____

Educational program: _____

Part B: Digital resources are not allowed. Only answer is required. Write your answers in the test booklet.

1.

a) Draw the line $y = 2x + 1$ in the coordinate system. (1/0/0)

b) Give an example of an equation of another line
that is parallel to the line in task a). _____ (1/0/0)

2. Hanna is going to order beads from the internet site Fina-Pärlan. A packet of beads costs SEK 15. A flat fee for postage and packing is added to every order.

a) Hanna orders 5 packets of beads and pays SEK 125. How much was the fee for postage and packing?

_____ (1/0/0)

b) Find an expression for the total cost if Hanna orders x packets of beads.

_____ (1/0/0)
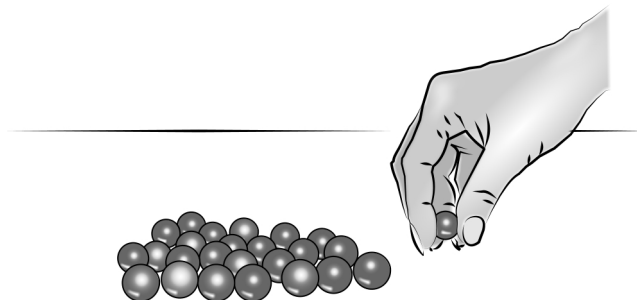
3. Simplify $(x+3)^2 - x^2$ as far as possible. _____ (1/0/0)

4. Calculate $25^{1/2}$ _____ (1/0/0)

5. Solve the equation $x^2 - 4x = 0$ _____ (1/0/0)

6. What expression should be within the brackets in order for the equality to be true?

$x^2 - 16 = (x-4) \cdot ($ $)$ _____ (0/1/0)

7. Three figures consisting of dots are shown below. The figures are formed according to a pattern. More figures can be formed according to the same pattern.
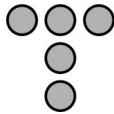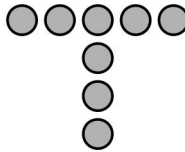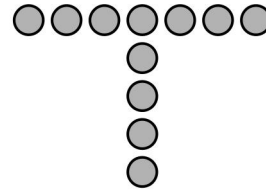

Figure 1   Figure 2   Figure 3

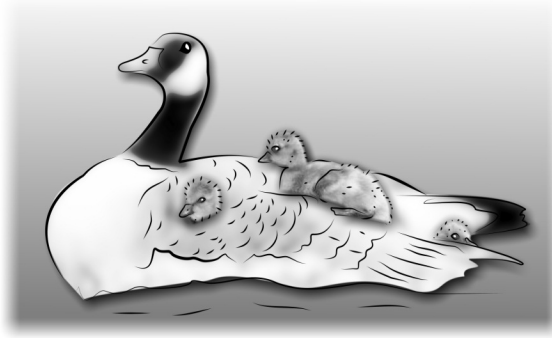a) How many dots would there be in Figure 4? _____ (1/0/0)

b) Find an expression for the number of dots in Figure n.

_____ (0/1/0)

8. What should be written in the box in order for the linear system of equations

$$\begin{cases} 2x + 5y = 35 \\ \square x + 3y = 21 \end{cases}$$ to have an infinite number of solutions?

_____ (0/0/1)

3

9.

The Canada Goose was introduced into Sweden in the 1930s. The population has increased ever since. Every year, at the same time, there is a survey of the number of Canada Geese. The growth of the population can be described by an exponential model.

The diagram below shows the number of Canada Geese K as a function of time t years, where $t = 0$ corresponds to the year 1977.
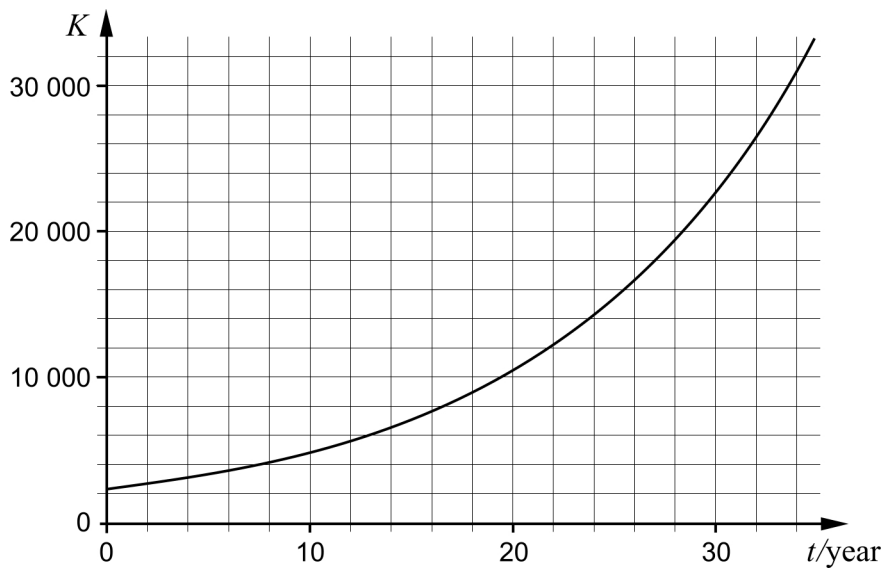
a) Use the graph and determine an approximate value of $K(22)$

_____ (1/0/0)

b) Use the graph to determine in which year the number of Canada Geese reached 26 000

_____ (0/1/0)

10. It holds for the function f that:

- $f(-2) = 3$

- $f(x) = 0$ for $x = 4$

- The domain of the function is $-3 \leq x \leq 4$

- The range of the function is $0 \leq f(x) \leq 5$
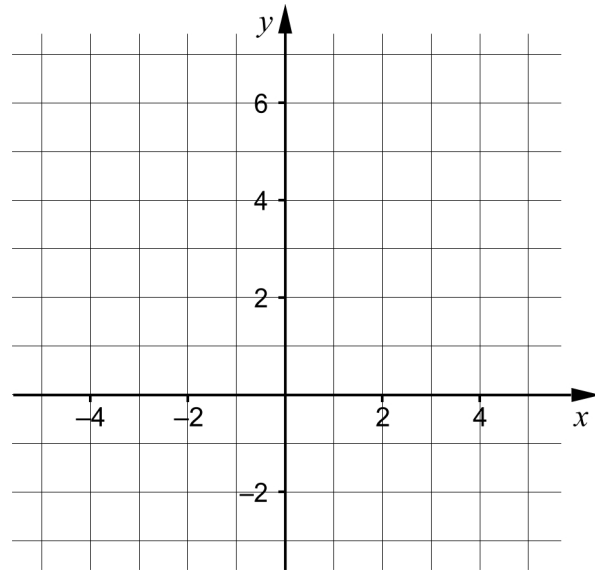
Draw a possible graph of the function f in the coordinate system.   (0/2/1)

11. Simplify the expression $3^{\frac{n}{2}-1} + 3^{\frac{n}{2}-1} + 3^{\frac{n}{2}-1}$ as far as possible.
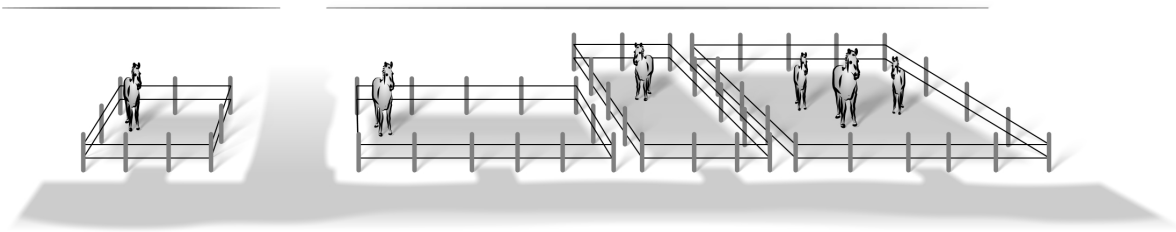
_____ (0/0/1)

Part C: Digital resources are not allowed. Do your solutions on separate sheets of paper.

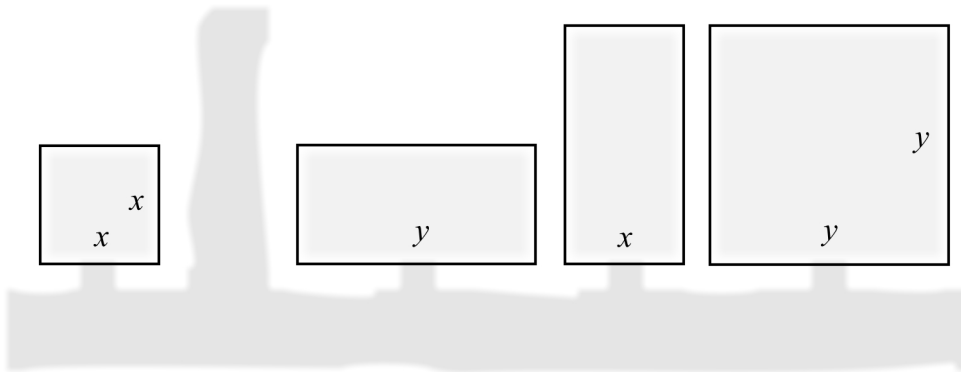**12.** Solve the equation $x^2 + 2x - 24 = 0$ algebraically. (2/0/0)

13. Solve the simultaneous equations $\begin{cases} 4y + x = 20 \\ y - 2x = -13 \end{cases}$ algebraically. (2/0/0)

14. The figure show four pastures that are quadratic and rectangular respectively with side lengths x and y metres.

Below is a sketch of the pastures seen from above.

(m)

The horses will be moved into a new common pasture. The new pasture is quadratic and the area is equal to the total area of all the four original pastures combined.

Find a simplified expression for the length of the side of the new pasture. (0/1/1)

15. Elin and Sanna are discussing a mathematical problem with two propositions, *P* and *Q*, where
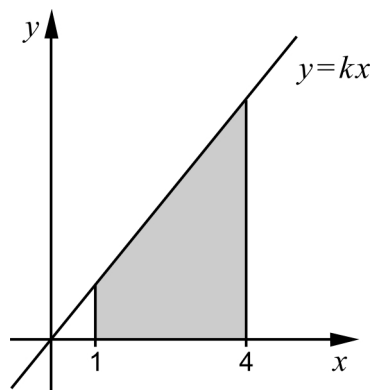
$$P : x > 2$$
$$Q : x^2 > 4$$

Elin claims that: "For these propositions, it holds that $P \Rightarrow Q$"
Sanna replies: "No, I think it is the other way round, $Q \Rightarrow P$"

Who is right? Justify your answer. (0/1/0)

16. A region is bounded by the *x*-axis, the lines $x = 1$ and $x = 4$ and the straight line $y = kx$ where $k > 0$

Calculate the gradient *k* algebraically so that the area of the region is exactly 10 area units. (0/0/4)