Part B	Problems 1–8 which only require answers.
Part C	Problems 9–15 which require complete solutions.
Test time	120 minutes for part B and part C together.
Resources	Formula sheet and ruler.

The test consists of three written parts (part B, C and D).
Together they give a total of 58 points consisting of 21 E-, 20 C- and 17 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 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 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.

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

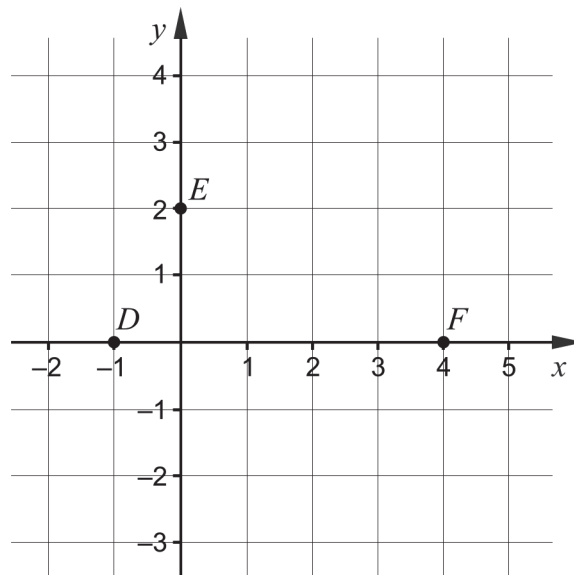Name: _____

Date of birth: _____

Educational programme: _____

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

---

1. Simplify the expressions as far as possible.

a) $(x+5)^2 - 10x$ _____ (1/0/0)

b) $(x+3)(x-3)+9$ _____ (1/0/0)

2. The graph of the quadratic function f, where $y = f(x)$, passes through the points $D(-1, 0)$, $E(0, 2)$ and $F(4, 0)$.

a) The function f can be written in the form $f(x) = ax^2 + bx + c$. Determine the constant c.

_____ (1/0/0)

b) The graph of the function f has a maximum point. Determine the x-coordinate of the maximum point.
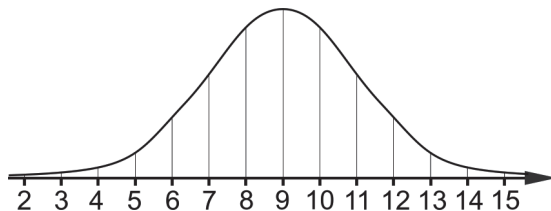
_____ (1/0/0)

3. Two statements about Lena are given below.

Lena lives in Europe.   [   ]   Lena lives in Sweden.

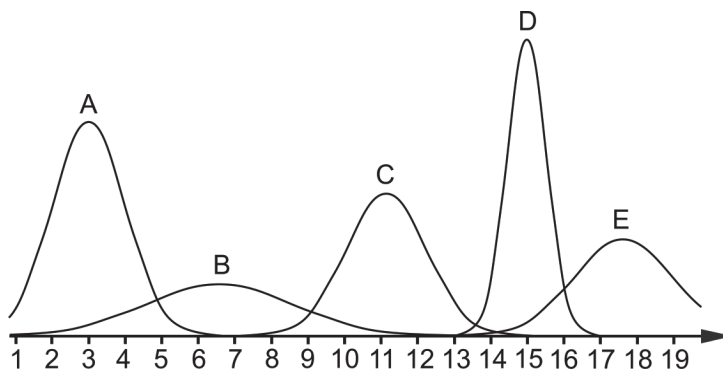Which symbol should be placed in the box between the two statements in order for the argument to be correct?
Choose between $\Leftrightarrow$, $\Rightarrow$ and $\Leftarrow$. _____ (1/0/0)

4. a) The figure shows a curve representing a normal distribution.

What is the mean of the normal distribution? _____ (1/0/0)

b) The figure shows five curves A–E representing normal distributions.

Which one of the curves A–E represents the normal distribution with the smallest standard deviation?

_____ (0/1/0)

5. a) In a coordinate system there is a point $Q(1, 0)$. Give an example of coordinates of the point P if the distance between P and Q is 5 length units.

_____ (1/0/0)

b) The point $M(1, \frac{3}{4})$ is the midpoint between the points $A(\frac{1}{2}, \frac{1}{4})$ and B.

Determine the coordinates of the point B. _____ (0/1/0)

6. Solve the equations and give exact answers, in the simplest form.
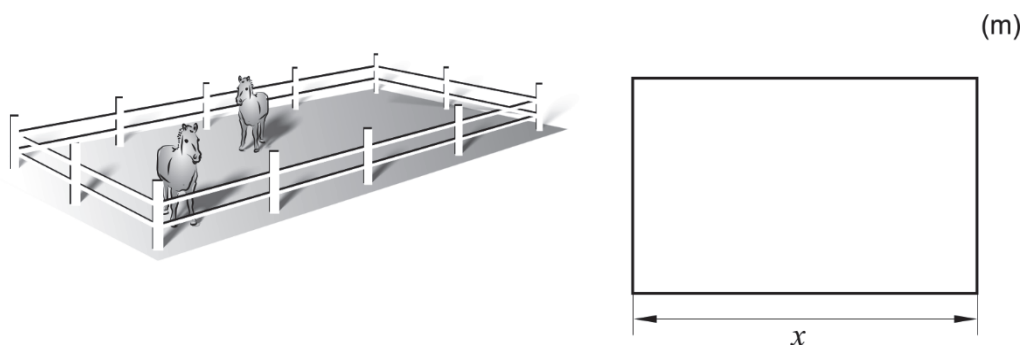
a) $5^x = 7$ _____ (1/0/0)

b) $3 - \sqrt{\sqrt{2x-5}} = 0$ _____ (0/1/0)

c) $\lg 200 - \lg 2 + 98 = 10^x$ _____ (0/1/0)

d) $(3x - 4)(4 - 3x) = -9x^2$ _____ (0/1/0)

e) $(5987 - x)^2 - 2(5987 - x) = 0$ _____ (0/0/1)

7. Bosse is building a rectangular paddock for his two horses, using 120 metres of fencing. The length of one side of the paddock is denoted by x.
See figure.

(m)

Write down the area A of the paddock as a function of x.

_____ (0/1/0)

8. There are many quadratic functions whose graph has the symmetry line $x = 3$

a) Give an example of such a function. _____ (0/1/0)

A parabola has the same shape as the graph of a quadratic function.
There are parabolas where $x = f(y)$, that is, the parabola is given by a quadratic function f that is a function of y instead of a function of x.

b) Give an example of an equation of a parabola with the symmetry line $y = 0$

_____ (0/0/1)

Part C: Digital tools are not allowed. Write down your solutions on separate sheets of paper.

9. Solve the quadratic equation $x^2 + 8x + 12 = 0$ algebraically. (2/0/0)

10. Emma and Sanna want to solve the system of equations $\begin{cases} x - y = 3.5 \\ 2x + y = 5.5 \end{cases}$

    a) There are many ways of solving a system of equations. Emma starts by solving for y in both equations and gets:

$$\begin{cases} y = x + 3.5 \\ y = -2x + 5.5 \end{cases}$$

        Has Emma correctly solved for y in the two equations?
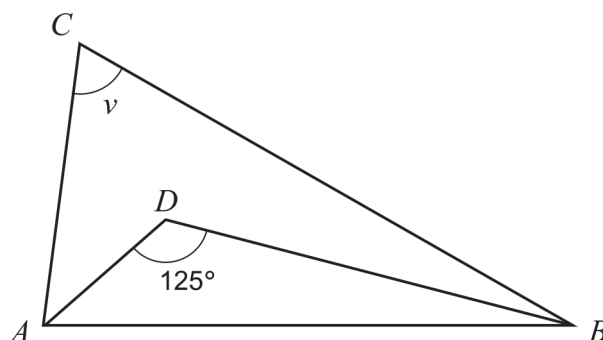   Justify your answer. (1/0/0)

    b) Sanna claims that $\begin{cases} x = 5 \\ y = 1.5 \end{cases}$ is a solution to the system of equations

        $\begin{cases} x - y = 3.5 \\ 2x + y = 5.5 \end{cases}$

        Is Sanna right? Justify your answer. (1/0/0)

11. In the triangle ABC, a bisector is drawn from A and B, respectively, so that the bisectors intersect in D. The bisectors form an angle of 125°. See figure.


Determine the angle v. (0/2/0)

12. Solve the system of equations $\begin{cases} 0.2x - 0.5y = 1.2 \\ x + y + 3.5 = 6 \end{cases}$ algebraically. (0/2/0)

13. Fiona is investigating two numbers whose difference is 1. She claims that the difference between the square of the larger number and the square of the smaller number is the same as the sum of the numbers.

Show that Fiona's claim is always correct for two numbers whose difference is 1. (0/2/0)

14. The figure shows the graph of an exponential function.
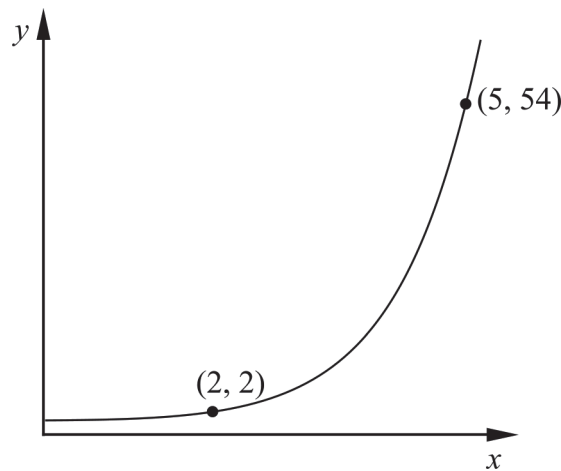
Determine the y-coordinate of the point of intersection between the graph of the function and the y-axis. Simplify your answer as far as possible and give an exact answer. (0/0/2)

15. Armand buys a rope in one store for 60 SEK. Another store sells the same type of rope, but there the rope costs 1 SEK more per metre. If Armand had bought the rope in the other store he would have gotten a rope that was two metres shorter for 60 SEK.

Determine how long the rope Armand bought was. Solution by trial and error is not acceptable. (0/0/3)