Part B	Problems 1-10 which only require answers.
Part C	Problems 11-19 which require complete solutions.
Test time	120 minutes for Part B and Part C together.
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 54 points consisting of 22 E-, 18 C- and 14 A-points.

Level requirements for test grades
E: 14 points
D: 22 points of which 6 points on at least C-level
C: 28 points of which 10 points on at least C-level
B: 36 points of which 5 points on A-level
A: 43 points of which 8 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.

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 resources are not allowed. *Only answer is required*. Write your answers in the test booklet.

1. A straight line is drawn in the coordinate system.
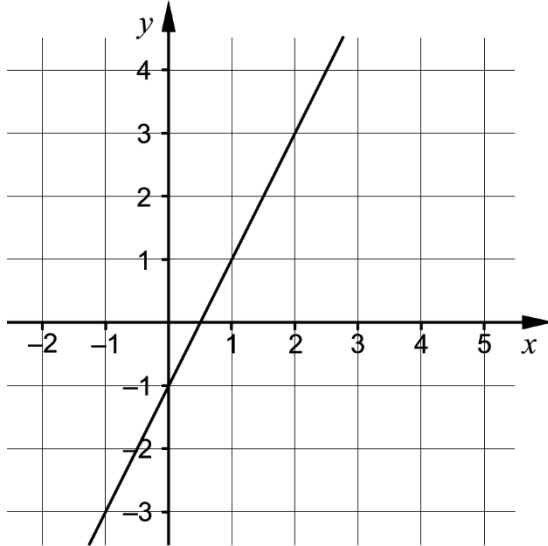
    Which of the alternatives A-F shows the equation of the drawn line?

    A. $y = -2x + 0.5$

    B. $y = 2x - 1$

    C. $y = -2x - 1$

    D. $y = 2x + 0.5$

    E. $y = 0.5x - 1$

    F. $y = -x + 2$ _____ (1/0/0)

2. Calculate $f(4)$ if $f(x) = x^2 + 3x$ _____ (1/0/0)

3. The straight line $y = 5x + m$ passes through
    the point $(3, 25)$
    Write down the value of the constant m. _____ (1/0/0)

4. Simplify $(y-6)^2 +12y$ as far as possible. _____ (1/0/0)

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

6. Draw a line from each of the boxes to the correct statement. (1/0/0)

$$x^2 + \frac{2x}{3} - 78$$

The content of the box shows a function.

$$f(x) = x^2 + \frac{2x}{3} - 78$$

The content of the box shows an expression.

$$x^2 + \frac{2x}{3} = 78$$

The content of the box shows an equation.

7. The picture shows three figures consisting of dots. The figures are formed according to a pattern. More figures can be formed according to the same pattern.
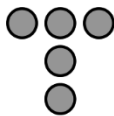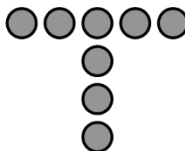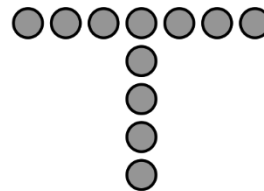
Figure 1   Figure 2   Figure 3

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

b) Find an expression for the number of dots in Figure n. _____ (0/1/0)

8. At Carina's farm there is a quadratic paddock where the side length is 40 metres. In one corner of the paddock she is planning to build a separate paddock for her injured horse. The separate paddock will have the shape of a square. In the remaining part of the paddock, coloured grey in the figure, she keeps her healthy horses.

Carina wants to know the area of the remaining part of the paddock and so she denotes one side of the separate paddock x. See figure.
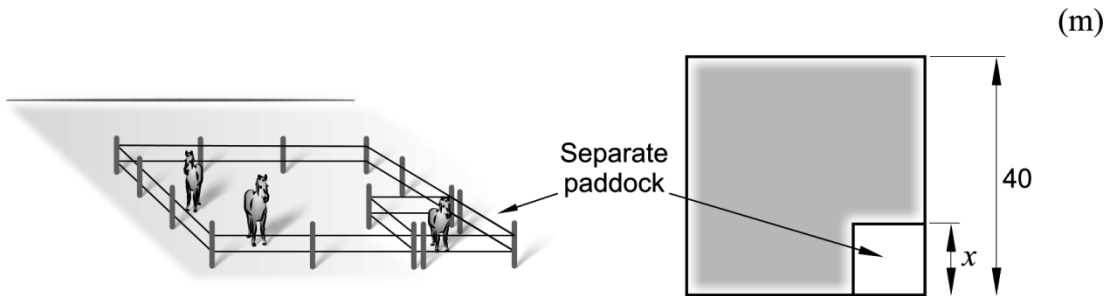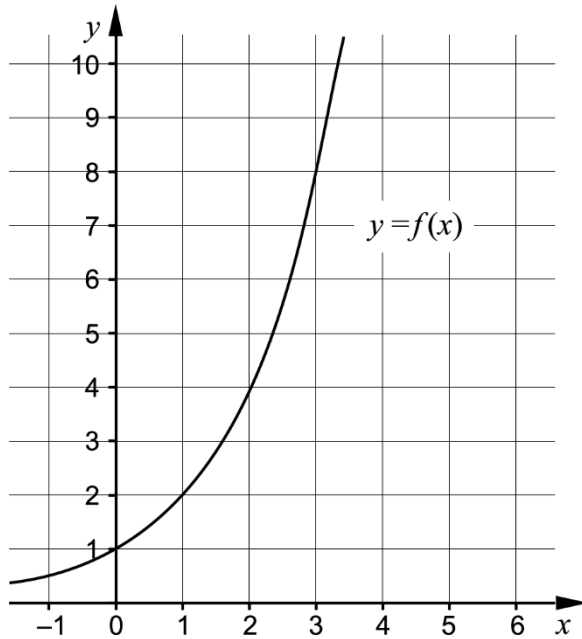

Which two of the alternatives A-E describes the area of the remaining part of the paddock?

A. $(40-x)^2$

B. $(40-x)(40+x)$

C. $(40+x)^2$

D. $(40-x)^2 - x^2$

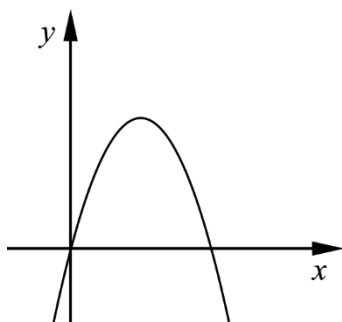E. $40^2 - x^2$ _____ (0/1/0)

9. The figure shows the graph of the function $f(x) = 2^x$ where $y = f(x)$

a) Use the graph to determine $f(2.5)$ _____ (1/0/0)

b) Use the graph and solve the equation $9 = 3 \cdot 2^x$ _____ (1/0/0)

10. The figure shows the graph of the quadratic function f where $y = f(x)$
The graph passes through the origin and has a line of symmetry at $x = 7$

a) Determine the zeros of the function f _____ (1/0/0)

It holds for another function g that $g(x) = 2 \cdot f(x)$

b) For what value of x does it hold that
$g(x) < f(x)$? _____ (0/0/1)

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

11. Solve the equation $x^2 - 12x + 11 = 0$ algebraically. (2/0/0)

12. Solve the simultaneous equations $\begin{cases} x + 2y = 14 \\ 2x - y = 3 \end{cases}$ algebraically. (2/0/0)

13. One of the solutions to the equation $x^4 = 16$ is $x = 2$
    Write down another solution. Justify your answer. (1/0/0)

14. Tony is going to make a floral wedding arch. He uses the quadratic function
    $y = 2x - x^2$ as a model for the floral arch.
    y is the height of the floral arch above the table top in metres.
    x is the distance in metres along the table, measured from the floral arch's
    left attachment point to the table.
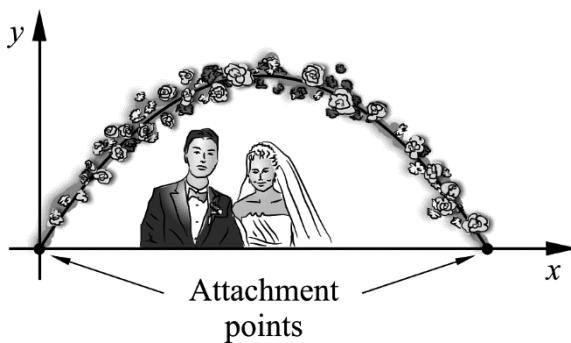

    a) Calculate the distance between the floral arch's two attachment points. (1/0/0)

    b) Calculate the maximum height between the table top and the floral arch. (0/1/0)

15. It holds for the function f that $f(x) = x^2 - 2ax + 3$ where a is a constant. Determine a so that $f(-3) = 0$ (0/2/0)

16. The figure shows the straight line $y = -0.1x + 6$ and an isosceles triangle coloured in grey. The base of the triangle is on the x-axis and one of its sides on the straight line. One of the corners of the triangle is at the origin, see figure.
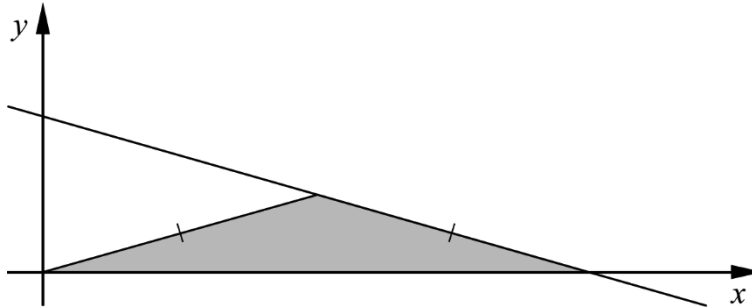
Calculate the area of the grey coloured triangle.   (0/3/0)

17. Solve the equation $9^{\frac{x}{3}} + 9^{\frac{x}{3}} + 9^{\frac{x}{3}} + 9^{\frac{x}{3}} = 12$ (0/1/1)

18. In a mathematics textbook it reads that:

"If the difference between two numbers is 1 then the difference between the square of the larger number and the square of the smaller number is always equal to the sum of the numbers."

Show that the statement is true for *all* such numbers.   (0/0/2)

19. For a straight line, $y = f(x)$, it holds that:

- $f(1) = 8$

- $f(x+2) = f(x) + 6$

Find the equation of the straight line.   (0/0/2)