Part B	Problems 1-7 which only require answers.
Part C	Problems 8-14 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 an oral part (Part A) and three written parts (Part B, Part C and Part D). Together they give a total of 66 points of which 26 E-, 22 C- and 18 A-points.

Level requirements for test grades
E: 19 points
D: 28 points of which 7 points on at least C-level
C: 35 points of which 13 points on at least C-level
B: 45 points of which 6 points on A-level
A: 53 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 answer 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.
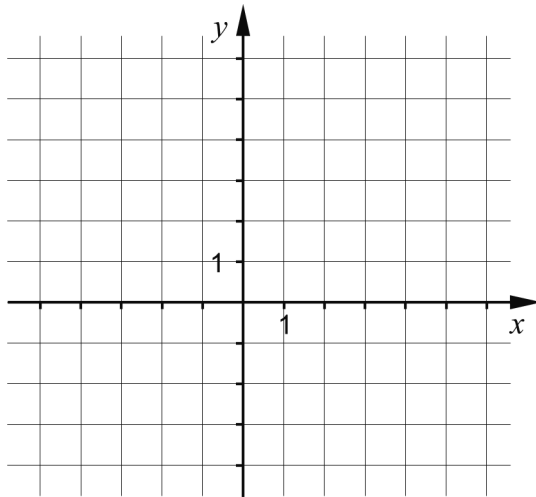
Name: _____

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 straight line passes through the point (2, 3) and has a gradient $k = 2$

    a) Draw the line in the coordinate system below.   (1/0/0)

    The equation of the line can be written in the form $y = kx + m$.

    b) What is the *m*-value of the line?   _____ (1/0/0)

2. Suggest what might be inside the brackets in order for the equality to be true.
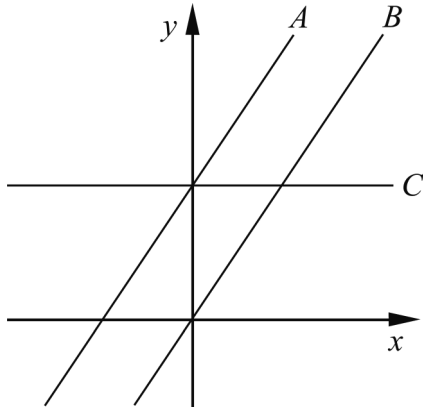
    $(\quad) \cdot (\quad) = x^2 - 9$

    The variable *x* should exist in both brackets. $(\quad) \cdot (\quad)$
    _____ (1/0/0)

3. Simplify the expression $8y + (4 - y)^2$ as far as possible.

    _____ (1/0/0)

4. The figure shows three straight lines A, B and C.
The equation of line A is $y = 1.5x + 3$

The lines A and B are parallel.

a) Write down the equation of line B. _____ (1/0/0)

Line C is parallel to the x-axis.

b) Write down the equation of line C. _____ (1/0/0)

5. Solve the equations.

a) $x^2 - 100 = 0$ _____ (1/0/0)

b) $3^{2x} \cdot 9^x = 3^4$ _____ (0/1/0)

6. Which of the symbols A-C fits best between the two circled propositions below?
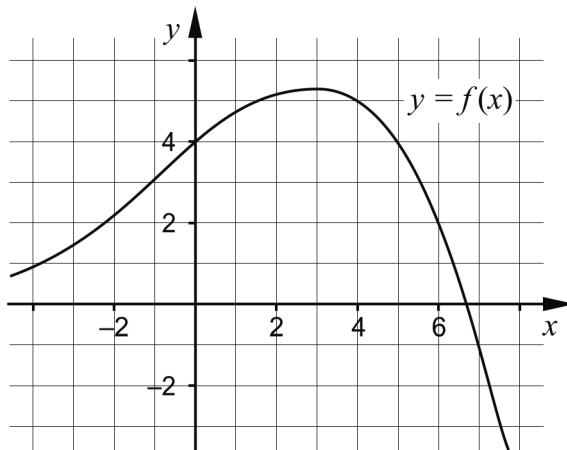
A. $\Rightarrow$

$f(x) = 3x + 3$

B. $\Leftrightarrow$

C. $\Leftarrow$

The graph of the function f is a straight line
and
$f(0) = 3$

_____ (0/1/0)

7. The figure shows the graph of a function f where $y = f(x)$.

a) Use the graph to determine a if $f(a) = -1$ _____ (0/1/0)

b) Use the graph to determine $f(b)$ when $f(b-1) = 4$

_____ (0/0/2)

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

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

9. Facebook is a social network used in many parts of the world. The number of users was estimated at a number of points during the years 2007 and 2008.

   The result was plotted in a diagram where y is the number of users in millions and x is the time in months after January 1st 2007. See below.
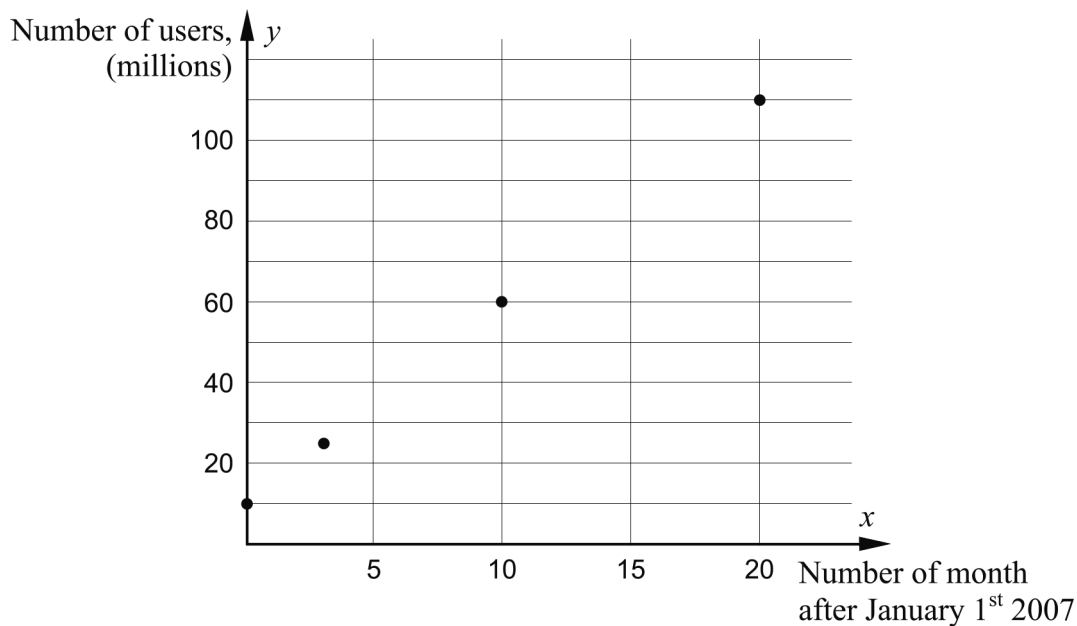
   a) Use the diagram to determine a relation for the number of users in the form $y = kx + m$ (2/0/0)

   On January 1st 2012 the number of users was estimated to be 840 million by Facebook.

   b) Use the relation from task a) and calculate the number of Facebook users on January 1st 2012. (1/0/0)

   c) Comment on how well the relation agrees with the estimation of the number of users on January 1st 2012. (1/0/0)

10. Solve the simultaneous equations $\begin{cases} 2x + y = 6 \\ 6x - 2y = 28 \end{cases}$ algebraically. (2/0/0)

5

11. Solve the equation $3x^2 - 4x - 29 = 2x + 16$ algebraically. (0/2/0)

12. It holds for the functions f and g that $f(x) = x^2 + a$ and $g(x) = -x^2 + b$.

The number of intersection points between the graphs of the functions depends on how the constants a and b are chosen.

Investigate how the number of intersection points depends on the choice of a and b. (0/2/1)

13. The figure shows the graph of two exponential functions f and g where $f(x) = a^x$ and $g(x) = b^x$.
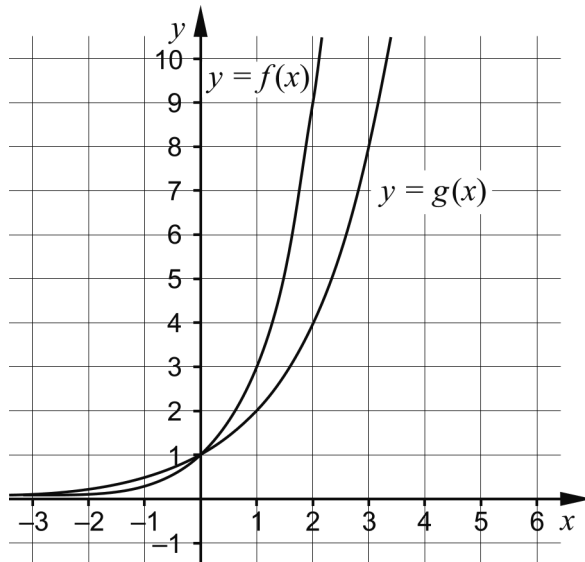
One of the graphs can be used to solve the equation $3 \cdot 2^x = 9$

a)   Investigate which of the graphs should be used to solve the equation $3 \cdot 2^x = 9$ (0/1/1)

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

14. A line L passes through the origin in a coordinate system. L intersects the line $y = 2x - 3$ at a point whose x-coordinate is greater than 50.

What are the possible equations of line L? Justify your answer. (0/0/3)