Part B	Problems 1-9 which only require answers.
Part C	Problems 10-16 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 24 E-, 25 C- and 17 A-points.

Level requirements for test grades
E: 17 points
D: 27 points of which 8 points on at least C-level
C: 36 points of which 15 points on at least C-level
B: 45 points of which 6 points on A-level
A: 53 points of which 10 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.
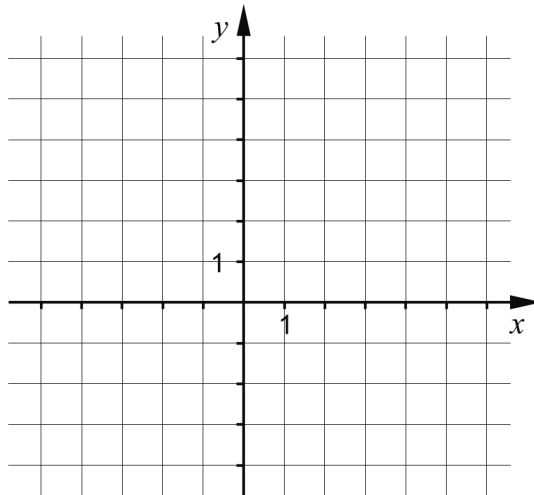
Write your name, date of birth and educational program on all the sheets you hand in.

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 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. Kajsa is a member of a theatre group and she is going to make a stop sign out of cardboard for a show. She searches on the Internet and finds out that the height of a stop sign is 90 cm but she cannot find anything on the length of a side. Kajsa then uses her mobile phone to find a picture of a stop sign. She measures the height of the sign and also one of the sides. See below.
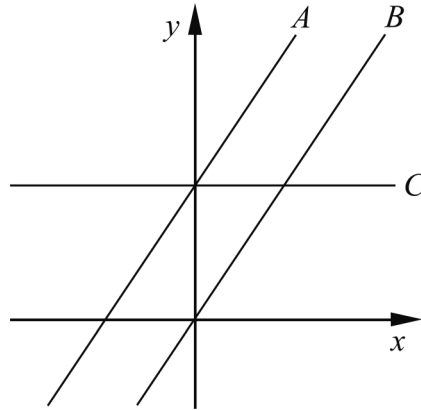
   (cm)
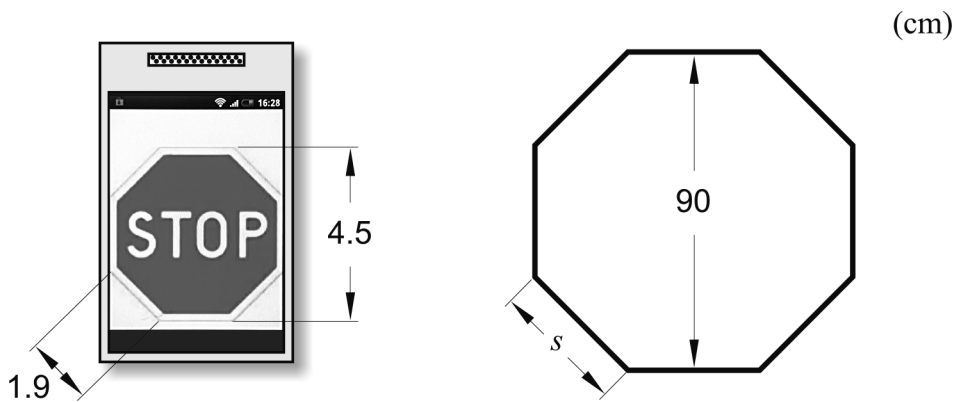
   What is the length of the side *s* of the stop sign in reality?

   _____ (1/0/0)

3

3. Write down a quadratic equation where one of the complex roots is $x = -3i$

_____ (1/0/0)

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

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 and give exact answers.

a) $10^x = 9$ _____ (1/0/0)

b) $\sqrt{x} = 10^{\lg 9}$ _____ (0/1/0)

6. Suggest what the brackets should contain in order for the equality to be true.
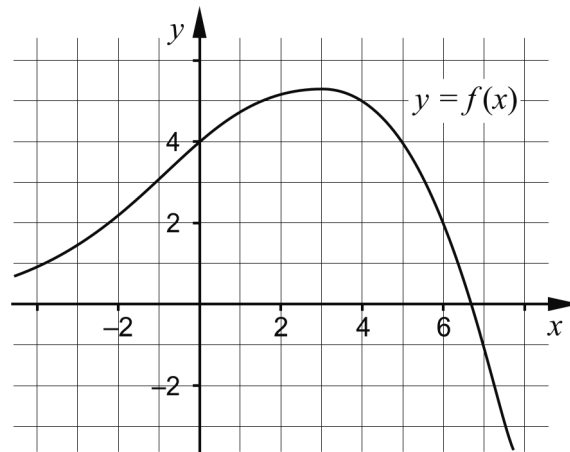
$(\qquad) \cdot (\qquad) = 4x^2 - 36$

The variable x must occur inside both brackets. $\underline{(\qquad) \cdot (\qquad)}$ (0/1/0)

7. Simplify the following expressions as far as possible.

   a) $8y + (4 - y)^2$ _____ (1/0/0)

   b) $\dfrac{3(x+3)^2 - 3(3+3x)}{3}$ _____ (0/1/0)

8. 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)

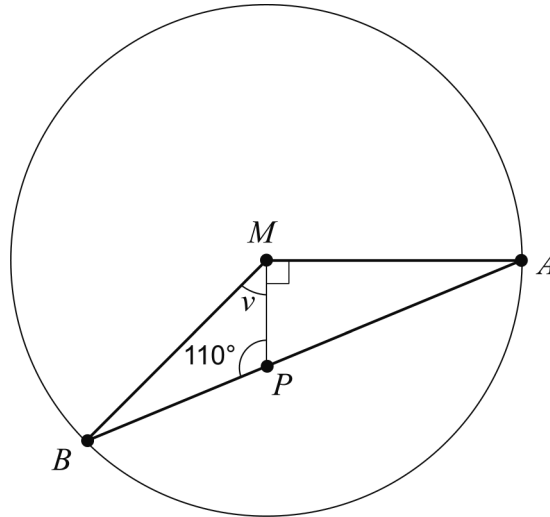   b) Use the graph to determine $f(b)$ when $f(b-1) = 4$

   _____ (0/0/2)

9. Determine for what values of x the inequality $x^2 > 3$ holds.

   _____ (0/1/1)

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

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

11. The triangle *ABM* is inscribed in a circle with centre *M*.
The point *P* lies on the line *AB*, see figure.

Determine the angle *v*. (1/1/0)

12. Determine the values of *x* where the graphs of the quadratic function
$f(x) = 3x^2 - 4x - 29$ and the line $g(x) = 2x + 16$ intersect. (0/3/0)

13. Solve the equation $\sqrt{5-x} + 3 = x$ algebraically. (0/3/0)

14. A machine produces screws. The lengths of the screws are normally distributed with a standard deviation of 0.20 mm.

Approximately 82% of the screws have lengths between 54.0 mm and 54.6 mm.

Determine the average length of the screws. (0/2/1)

15. 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 for the graphs 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)

16. Solve the simultaneous equations $\begin{cases} \lg x^3 - \lg y^{-2} = 13 \\ \lg x + \lg y = 5 \end{cases}$ (0/0/2)