Part B	Problems 1-8 which only require answers.
Part C	Problems 9-14 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 three written parts (Part B, Part C and Part D). Together they give a total of 55 points consisting of 22 E-, 19 C- and 14 A-points.

Level requirements for test grades
E: 13 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: 37 points of which 4 points on A-level
A: 44 points of which 7 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: _____

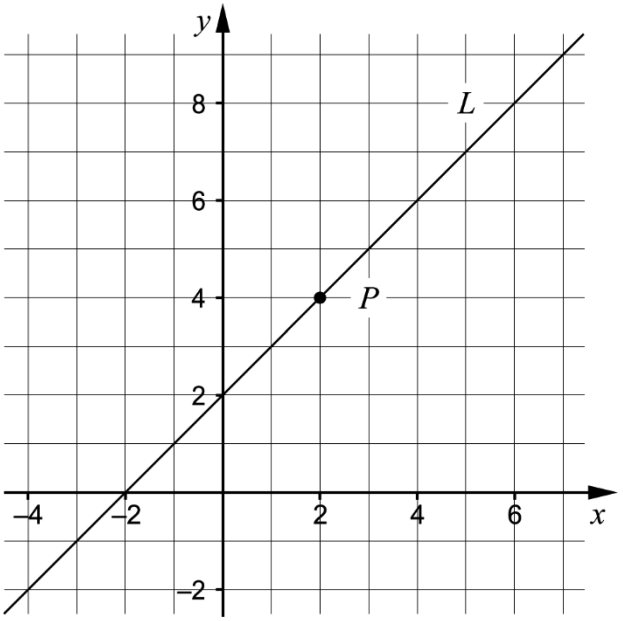
Part B: Digital resources are not allowed. *Only answer is required*. Write your answers in the test booklet.

1. Write down the expression that is missing in the brackets in order for the equivalence to be true.

$(\quad) \cdot (x-5) = x^2 - 25$

_____ (1/0/0)

2. The coordinate system shows a straight line L and a point P on the line.

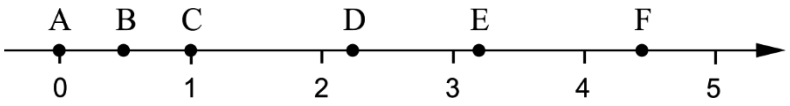


a) Write down the equation of the straight line L. _____ (1/0/0)

b) Write down the equation for another straight line which together with the line L forms a linear system with solution at point P.

_____ (1/0/0)

3. Six points A – F are marked on the number line.



Each number below corresponds to a point marked on the number line.

☐ 99^0 ☐ $\sqrt{5}$ ☐ 2^{-1} ☐ $10^{\frac{1}{2}}$ ☐ 2.1^2

Match each of the numbers with a point on the number line by writing the correct letter A – F at the right number. (2/0/0)

4. Two of the alternatives A – E represent an equation. Which two?

A. $a^2 + b^2$

B. $x^2 + 6x - 5 = 2$

C. $x^2 - 2x - 9$

D. $20 + 50x$

E. $3x + 5x - 10 = 16$ _____ (1/0/0)

5. Solve the equations. Give exact answers.

a) $x^{\frac{1}{3}} = 2$ _____ (1/0/0)

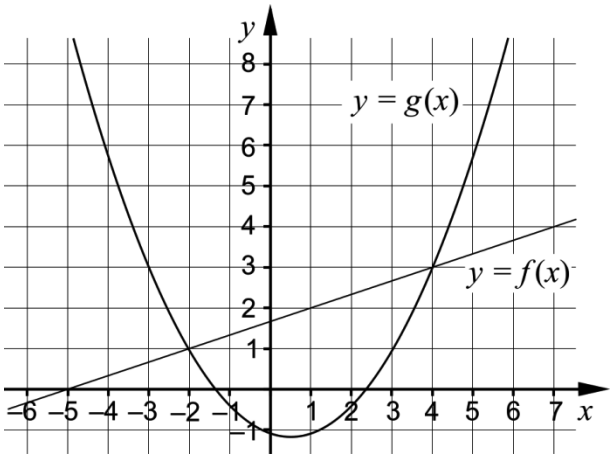
b) $3 \cdot 9^x + 3 \cdot 9^x + 3 \cdot 9^x = 27$ _____ (0/0/1)

6. During the year 1998, 44 million text messages were sent in Sweden. During the year 2012, 16 514 million text messages were sent. Assume that the yearly percentage increase in the number of text messages has been the same during the whole period of time.

Denote the yearly percentage change *a*. Write down an equation that can be used to calculate *a*.

_____ (0/1/0)

7. The coordinate system shows the graphs of a straight line f and a quadratic function g.



Answer the question by using the graphs.

a) For what values of x does it hold that $g(x) < 3$? _____ (0/2/0)

b) For what values of x does it hold that $f(x) - g(x) = 0$?

_____ (0/0/1)

8. Simplify the following expressions as far as possible.

a) $(9a)^{\frac{1}{2}} \cdot 2a^2 \cdot (4a)^{\frac{1}{2}}$ _____ (0/1/0)

b) $\dfrac{x^{\frac{5}{6}}(x^{\frac{1}{3}}+1)(x^{\frac{1}{3}}-1)}{x^{\frac{1}{6}} \cdot x^{\frac{1}{3}}}$ _____ (0/0/1)

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

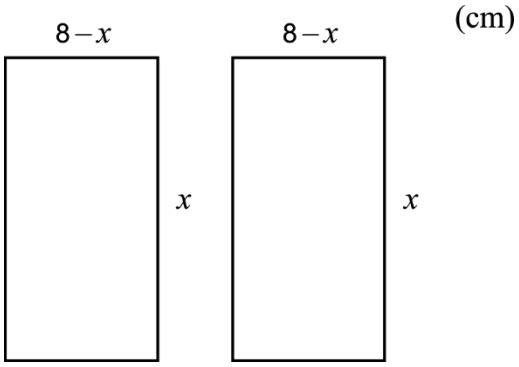
9. Solve the quadratic equation $x^2 - 6x + 5 = 0$ algebraically. (2/0/0)

10. Solve the simultaneous equations algebraically.

a) $\begin{cases} y - 2x = 5 \\ 2y - x = 4 \end{cases}$ (2/0/0)

b) $\begin{cases} (x+4)(y-2) = (x-5)(y+4) \\ 6y - x - 6 = 2x - y - 2 \end{cases}$ (0/2/0)

11. The figure shows two rectangles with side lengths x cm and $(8 - x)$ cm respectively.



Calculate the largest possible area the two rectangles can have together. (1/2/0)

12. Simplify the expression $\frac{a^2 - 2b}{4}$ as far as possible if $a = 2x + 1$ and $b = 2x - 1.5$ (0/2/0)

13. It holds for the quadratic function f that $f(x) = -0.5x^2 + bx - 2$

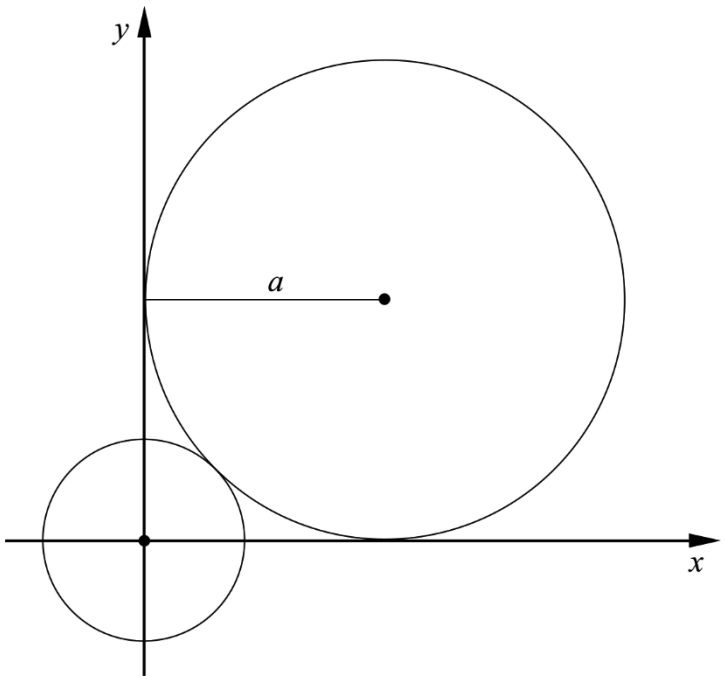
a) Show that the graph of f passes through the point $(0, -2)$, regardless of the value of b. (1/0/0)

b) Find the values of b where f has only one zero. (0/2/0)

It holds for another quadratic function g that $g(x) = -0.5x^2 + bx - c$

c) Determine the relation between b and c that must exist in order for g to have only one zero. (0/0/1)

14. A circle with radius a touches the positive coordinate axes. It also touches a smaller circle with centre in the origin. See figure.



Show that the radius of the smaller circle is $a(\sqrt{2} - 1)$ length units. (0/0/3)