Part I	Problems 1-10 which only require answers.
Part II	Problems 11-15 which require complete solutions.
Test time	120 minutes for part I and II together.
Resources	Formula sheet and ruler.

Level requirements

The whole test consists of Part I, Part II, Part III and an oral part and the maximum score is 76 points of which 28 E-, 24 C- and 24 A-points.

Level requirements for test grades
E: 18 points
D: 29 points of which 8 points on at least C-level
C: 38 points of which 15 points on at least C-level
B: 50 points of which 8 points on A-level
A: 61 points of which 14 points on A-level

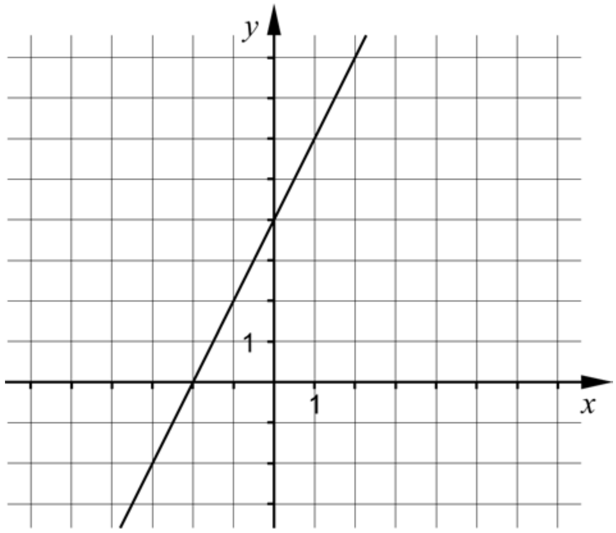
The number of points you can have for a complete solution or an answer is stated after each problem. You can also see what knowledge levels (E, C and A) you can show in each problem. For example (3/2/1) means that a correct solution gives 3 E-, 2 C- and 1 A-point.

For problems where *Only answers are required* you only have to give a short answer. For other problems it is required that you 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.

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

1.



a) Find the equation to the straight line in the figure. ____________________ (1/0/0)

b) Draw a straight line with gradient $k = -1$ in the coordinate system. (1/0/0)

2. Simplify the expression $(x+5)(x-5)+25$ as far as possible.

________________________ (1/0/0)

3. Solve the equations

a) $x(x+7)=0$ ________________________ (1/0/0)

b) $\lg x = 3$ ________________________ (1/0/0)

c) $2^3 \cdot 2^x = 2^{2x}$ ________________________ (0/1/0)

4. Which of the following equations A-E has non-real solutions?

A. $x^2 = 16$

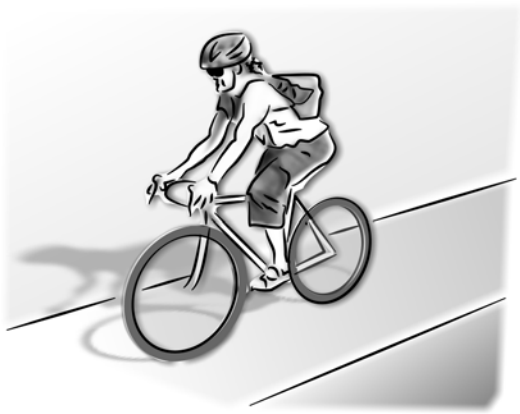
B. $x^2 + 6 = 0$

C. $x^2 = 0$

D. $x^2 - \sqrt{5} = 0$

E. $x^2 - \frac{9}{4} = 0$ _______________________(1/0/0)

5. It's 7 km by bike from Anna's home to her school. She usually bikes at a speed of 0.35 km/min. Write down a function that states the distance left *y* km before she reaches her school when she has been cycling for *x* minutes.



_______________________(0/1/0)

6. It holds for a quadratic function that:

- The function has a zero at $x = 4$
- The function has its maximum value at $x = 1$

For which value of *x* does the function have its second zero?

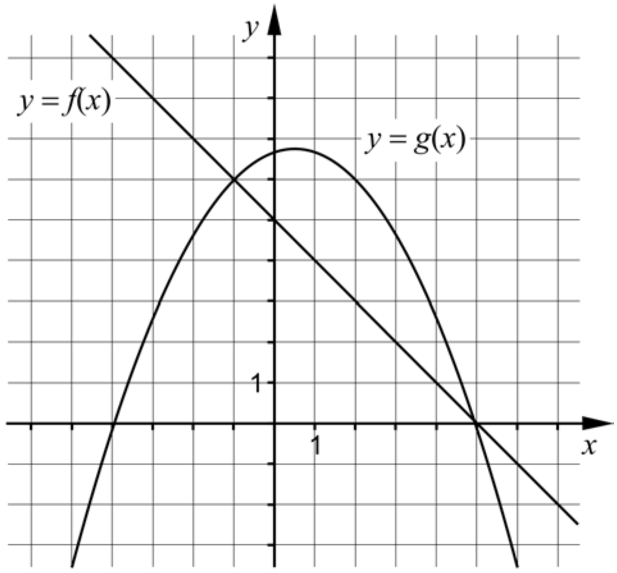
_______________________(0/1/0)

7. Simplify the following expressions as far as possible.

a) $2\lg x - 0{,}5\lg x^2$ ______________________ (0/1/0)

b) $(xy - y)^2 \cdot y^{-2}$ ______________________ (0/0/1)

8. The coordinate system shows the graphs of the linear function $y = f(x)$ and the quadratic function $y = g(x)$



Use the figure and answer the questions.

a) Find $g(2)$ ______________________ (1/0/0)

b) For what values of x is it true that $f(x) < g(x)$? ______________________ (0/2/0)

c) Write down the equation of a straight line that *does not* intersect any of the graphs to the functions.

______________________ (0/0/1)

9. In the beginning of year 2011, Matilda bought a computer for SEK 10000. The value of the computer can be described by $V(t) = 10000 \cdot 0.60^{t}$ where *V* is the value of the computer in SEK and *t* is the time in years after the purchase.

a) What is the yearly percentage decrease of the value of the computer?

_______________________(1/0/0)

b) Write down a new function that shows the value of the computer *V* in SEK as a function of time *t*, where the time *t* now will be counted in *months* after the purchase.

_______________________(0/0/1)

10. A simultaneous equations consist of two equations where each equation contains two variables *x* and *y*.

a) One of the equations is $3x + 2y = 12$
Give an example of what the second equation might look like if there are no solutions to the simultaneous equations.

_______________________(0/0/1)

b) One of the equations is still $3x + 2y = 12$
Give an example of what the second equation might look like if the only solution to the simultaneous equations is $\begin{cases} x = 2 \\ y = 3 \end{cases}$

_______________________(0/0/1)

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

11. Solve the simultaneous equations $\begin{cases} 2x - y = -9 \\ 5x + 2y = 0 \end{cases}$ algebraically. (2/0/0)

12. Solve the equations algebraically.

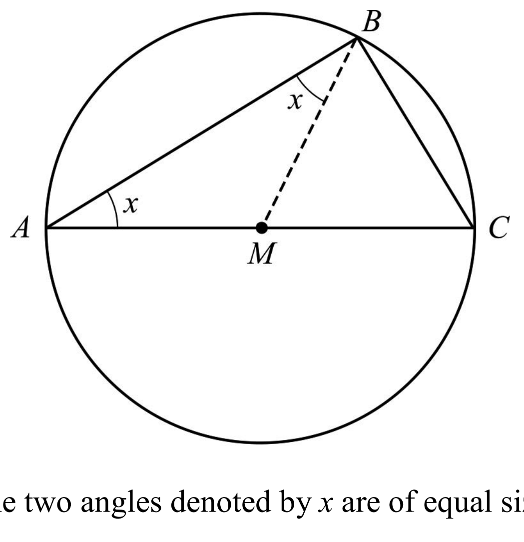
a) $x^2 - 4x - 45 = 0$ (2/0/0)

b) $\sqrt{35 - 2x} = x$ (0/3/0)

13. Thales of Miletus was a Greek mathematician who lived 2600 years ago. He formulated a theorem with the following meaning:

Every triangle inscribed in a circle has a right angle if one of the sides of the triangle is a diameter of the circle.

The triangle *ABC* is inscribed in a circle in such a way. Side *AC* is a diameter of the circle. The point *M* is the midpoint of the line segment *AC*. The figure also shows the line segment *BM*.



a) Explain why the two angles denoted by x are of equal size. (1/1/0)

b) Show, without using the inscribed angle theorem, that Thales' theorem is correct. (0/2/2)

14. a is a constant in the equation $x^2 - (a-1)^2 = 0$
Solve the equation and simplify the answer as far as possible. (0/0/2)

15. There is a point *P* on the line $y = 2x - 5$ in the first quadrant. The distance between the point *P* and the origin is 10 length units. Find the *x*-coordinate of the point *P*. Give an exact answer. (0/0/4)