Part B	Problems 1-11 which only require answers.
Part C	Problems 12-17 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 57 points consisting of 21 E-, 20 C- and 16 A-points.

Level requirements for test grades
E: 14 points
D: 23 points of which 6 points on at least C-level
C: 30 points of which 11 points on at least C-level
B: 38 points of which 5 points on A-level
A: 45 points of which 9 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: _____

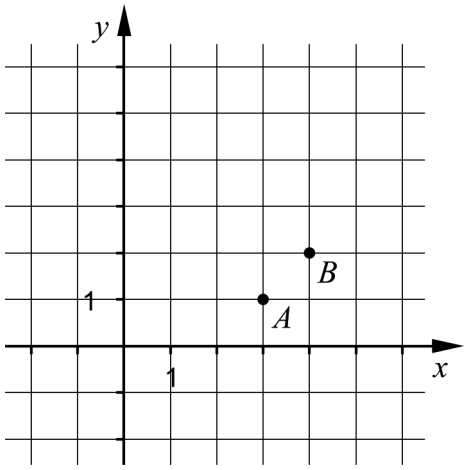
Date of birth: _____

Educational programme: _____

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

1. There are two points A and B in the coordinate system below. Write down the equation of the straight line that passes through these points.

_____ (2/0/0)



2. Solve the equations and give exact answers.

a) $11^x = 3$ _____ (1/0/0)

b) $\lg x = 5$ _____ (1/0/0)

3. Alva buys a number of shares for SEK 2000. She wonders how many years it will take before the value of her shares has doubled, if the value of the shares increases exponentially by 12% each year.

Which of the equations A-F, where x is the number of years after the purchase date, should Alva solve to be able to answer the following question correctly: "How many years does it take for the value of my shares to double?"

A. $2000 \cdot 0.12^x = 4000$

B. $2000 + 1.12x = 4000$

C. $2000 \cdot x^{0.12} = 4000$

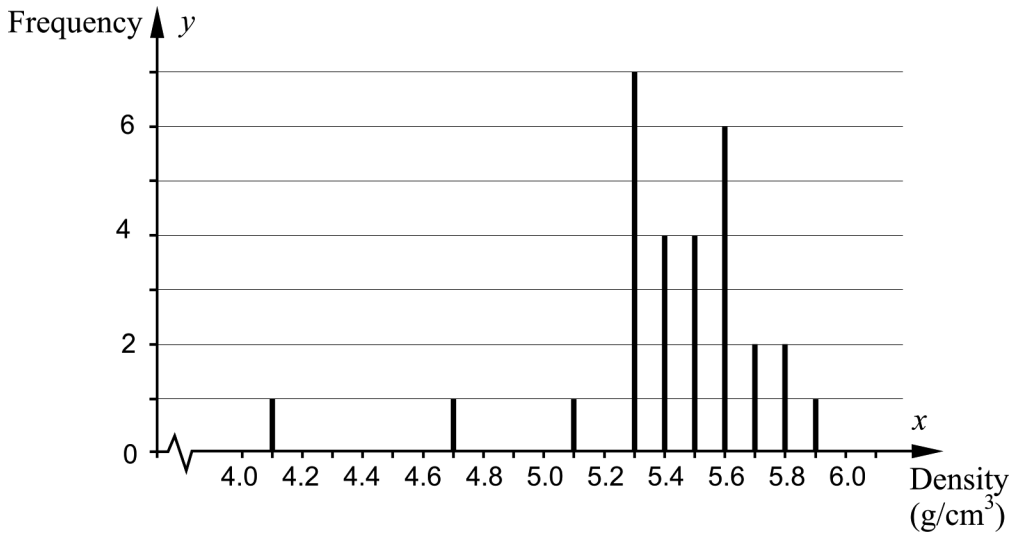
D. $2000 \cdot x^{1.12} = 4000$

E. $2000 \cdot 1.12^x = 4000$

F. $2000 + 0.12x = 4000$ _____ (1/0/0)

4. In 1798, the Englishman Henry Cavendish tried to determine the density of the Earth. He did a number of measurements and then calculated values of the density of the Earth.

The diagram below shows 29 of Cavendish's values of the density of the Earth.



a) Determine the range. _____ (1/0/0)

b) Determine the median. _____ (1/0/0)

c) The standard deviation for the values above is 0.35 g/cm^3.

In *one word*, state what happens with the size of the standard deviation if the two lowest values 4.1 and 4.7 are removed.

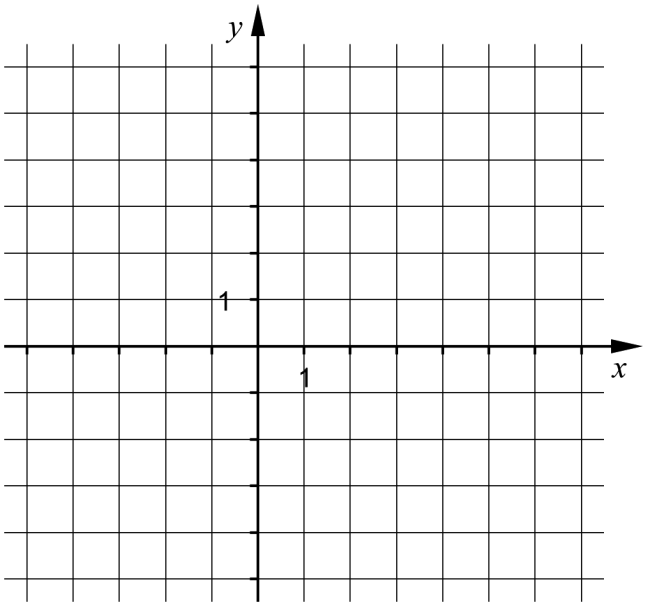
The standard deviation would be _____ (0/1/0)

5. Simplify the following expressions as far as possible.

a) $(x+5)^2-(5+x)(x+5)$ _____ (0/1/0)

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

6. In the function $y=ax^2+bx+c$ there are three constants *a*, *b* and *c*. In the coordinate system, sketch what the graph to the quadratic function $y=ax^2+bx+c$ might look like if there are two non-real roots to the equation $ax^2+bx+c=0$ (0/1/0)

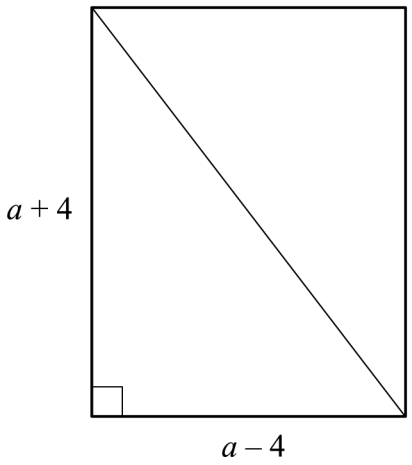


7. The solution to a set of linear equations is $\begin{cases} x=3 \\ y=1 \end{cases}$

The set of linear equations consists of two different equations that both contain the variables *x* and *y*. Give an example of such a set of linear equations.

_____ (0/1/0)

8. The figure below shows a rectangle where the diagonal has been drawn.



a) What values can a assume if the area of the rectangle should be larger than 18 cm^2? Give an exact answer.

_____ (0/1/0)

b) The length of the diagonal of the rectangle is given by the expression $\sqrt{(a+4)^2+(a-4)^2}$
Simplify the expression as far as possible.

_____ (0/1/0)

9. Factorize the expression $8x^3-18xy^2$ as far as possible.

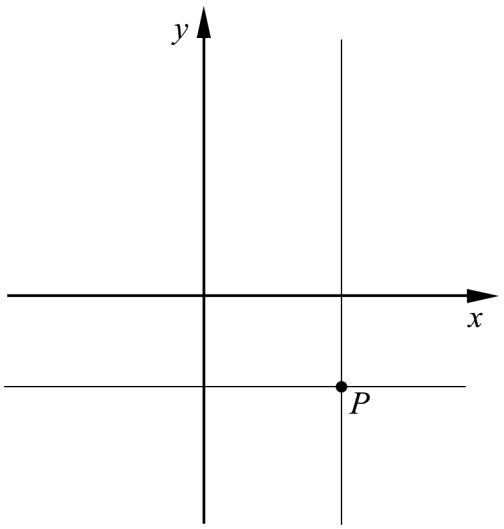
_____ (0/0/1)

10. Solve the equation $(x-\sqrt{3})^2-4(x-\sqrt{3})+3=0$ if you know that $t^2-4t+3=0$ has solutions $t_1=3$ and $t_2=1$ Give exact answers.

$x_1=$ _____

$x_2=$ _____ (0/0/1)

11. The figure shows the lines $x = a$ and $y = b$, where a and b are different constants, $a \neq 0$, $b \neq 0$. The lines intersect at point P in the fourth quadrant of the coordinate system.



Which of the lines A-D passes/pass through the point P?

A. $ax + by = 0$

B. $ax - by = 0$

C. $ay + bx = 0$

D. $ay - bx = 0$ _____ (0/0/1)

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

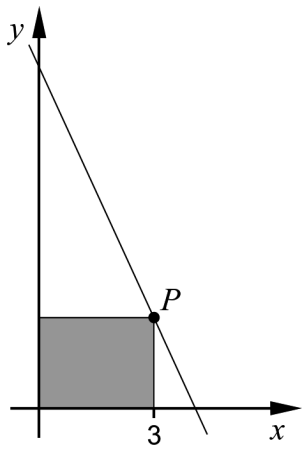
12. Solve the simultaneous equations $\begin{cases} x + 2y = 4 \\ 2x - 4y = 4 \end{cases}$ algebraically. (2/0/0)

13. Solve the equations algebraically.

a) $x^2 + 2x - 15 = 0$ (2/0/0)

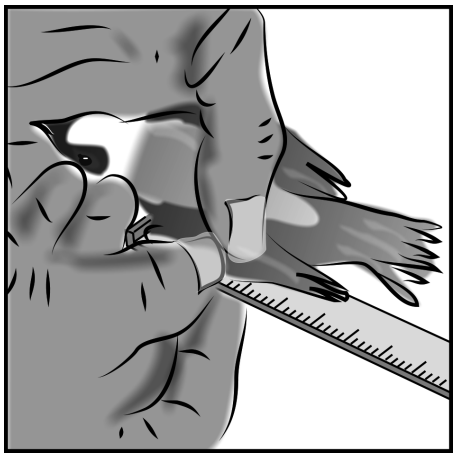
b) $x(x + 3) = x + 3$ (0/2/0)

14. A straight line has the equation $y = -2x + 8.15$ and passes through the point P with x-coordinate 3. The rectangle in the figure has one corner at point P and the opposite corner at the origin. Two of the sides of the rectangle lie on the positive coordinate axes.



Determine the area of the rectangle. (2/0/0)

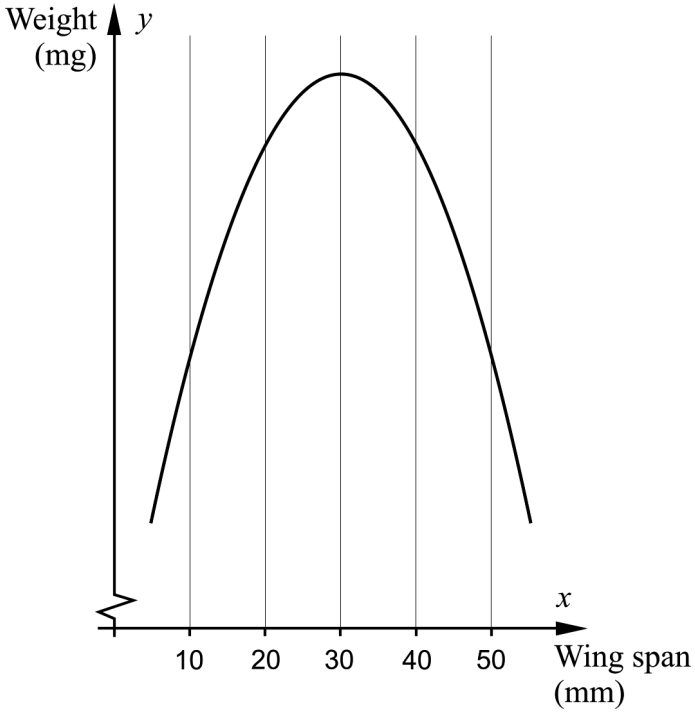
15. When ringing birds, the weight and wing span of the bird is often measured.



A number of birds of the species European Penduline Tit were ringed at the lake Tåkern in Östergötland. A biologist has been given access to data on the birds' weight and wing span and sets up the following model of the relation between weight and wing span:

$y = -6x^2 + 360x + 5000$

where y is the bird's weight in milligrams and x is the bird's wing span in millimetres.



a) Calculate the weight of a bird with a wing span of 10 mm. (1/0/0)

The biologist observes that there are birds with the same weight, even though they have different wing spans. One bird with a wing span of 20 mm weighs 9800 mg.

b) Use the graph to determine yet another wing span that corresponds to the weight 9800 mg. *Only answer is required* (1/0/0)

16. Two straight lines have the equations $y = 2x + a$ and $2y - x = b$, where a and b are constants.

Assume that the lines should always intersect at a point lying on the line $y = 3x$. Show what relationship there must be between a and b. (0/2/0)

17. In the equation $ax^2 - a^2x = -2$, a is a positive constant. Solve the equation and show what values of a that will give two different real roots. (0/0/3)