Part D	Problems 18–28 which require complete solutions.
Test time	120 minutes.
Resources	Digital tools, formula sheet and ruler.

The test consists of three written parts (part B, C and D).
Together they give a total of 55 points consisting of 23 E-, 20 C- and 12 A-points.

Level requirements for test grades
E: 15 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 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 and show how you use your digital tools.

Write your name, date of birth and educational programme on all the sheets you hand in.

Name: _____

Date of birth: _____

Educational programme: _____

Part D: Digital tools are allowed. Several of the tasks require that you use digital tools to solve them. For the other tasks, it can be an advantage to use digital tools when solving the task. Write down your solutions on separate sheets of paper.

18. A straight line with equation $y = kx + m$ passes through the points (21, 45) and (74, 157).

   Determine k. Give your answer to at least one decimal place. (1/0/0)

19. Solve the equation $7^{\frac{x}{5}} = 1.3$ and give your answer to at least two decimal places. *Only answer is required* (1/0/0)

20. A quadratic function f is given by $f(x) = 3x^2 + 5x + 7$
    Give an example of a point that lies on the graph of f.
    Only answer is required (1/0/0)

21. The picture shows the Municipal Asphalt Plant in New York.

    The outer edge of the front of the building can be described by the graph of the quadratic function f. The function f is given by $f(x) = -0.14x^2 + 3.92x$ where x and $f(x)$ are measured in metres and the x-axis is placed at ground level along the front of the building. See figure.
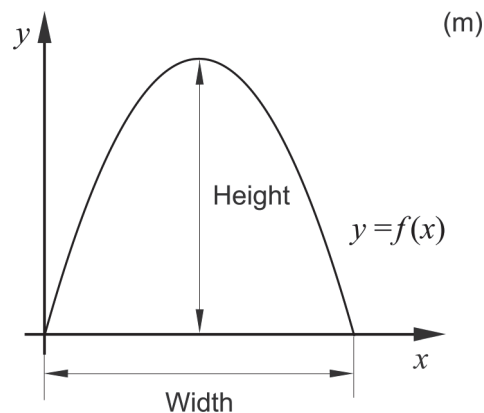
    Determine the width and height of the building. *Only answer is required* (2/0/0)

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22.

In the early 19th century, Sir Francis Beaufort created a scale to measure wind force at sea. The wind force is given by the Beaufort number B, which is an integer value.

Foto av GEORGE DESIPRIS

In January of 2019, the storm Alfrida hit large parts of Sweden. The top wind speed recorded was 35.2 m/s.

The connection between the wind speed v measured in m/s and the Beaufort number B is given by the formula

$$v = 0.8365 \cdot B^{1.5}$$

Calculate the Beaufort number B for the wind speed 35.2 m/s and round your answer to an integer. (2/0/0)

23. In the year 2018, the newspaper Times of India printed a story on the number of tigers in India having more than doubled since 2006.
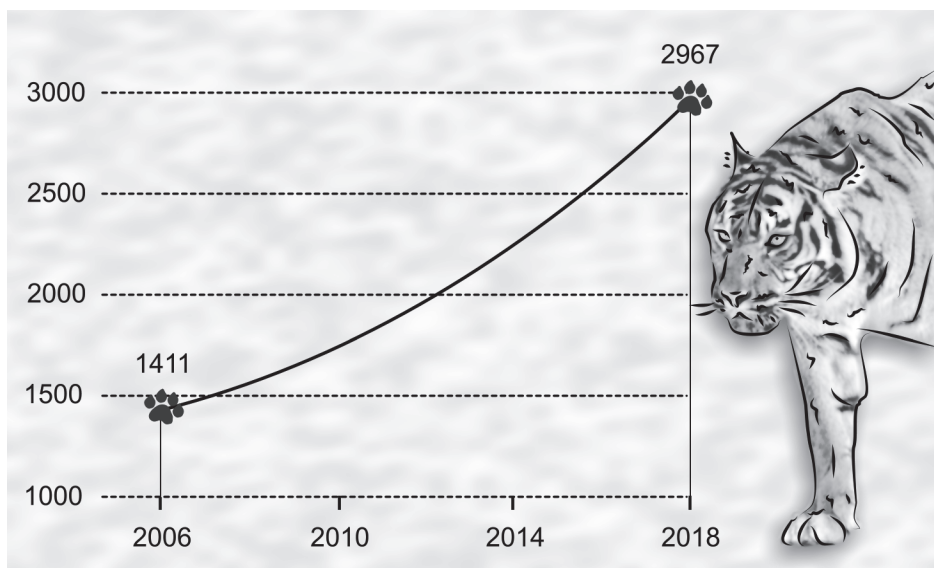

The newspaper claimed that there were 1411 tigers in India in 2006 and that there were 2967 tigers in 2018. Assume that the number of tigers was counted at the beginning of 2006 and at the beginning of 2018. Also assume that the annual rate of change in percent was constant during the time period, and that the rate of change will be the same after 2018 as well.

Determine in what year the number of tigers is expected to be 5000. (0/3/0)

24. Edith and Adrian drive the same route from Umeå to Hudiksvall. Adrian starts first and Edith starts when Adrian has already travelled 13 km. After a while, Edith passes Adrian. Adrian's average speed is 72 km/h until Edith passes him, and Edith's average speed is 81 km/h until she passes Adrian.
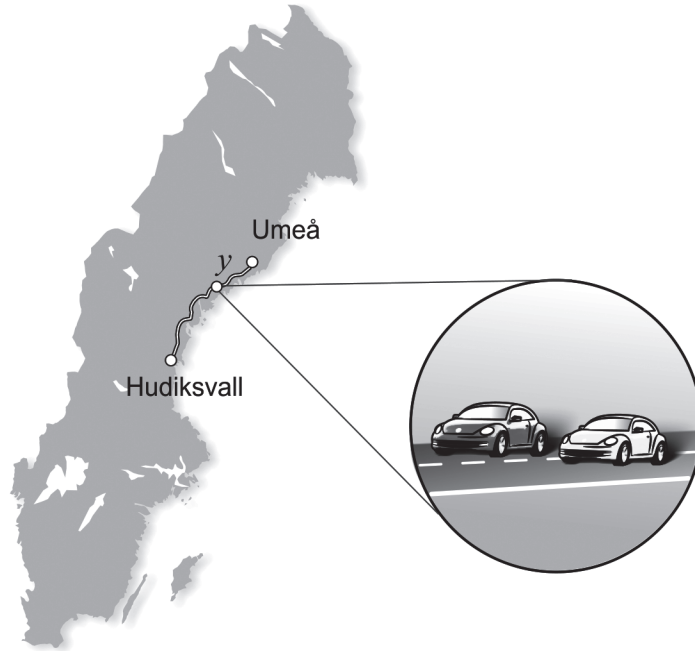
The partial system of equations can be used to find out how far Edith has travelled when she passes Adrian.

$$\begin{cases} y = 81x \\ ... \end{cases}$$

where y km is the distance Edith has travelled until she passes Adrian. See figure.

a)   Interpret what x means in this context.   (1/0/0)

When Edith passes Adrian, they have travelled a third of the distance between Umeå and Hudiksvall.

b)   Calculate the distance between Umeå and Hudiksvall.   (0/0/2)

25. The hourly wages of four people satisfy the following:

Mean: 210 SEK/h
Median: 200 SEK/h
Range: 80 SEK/h

Investigate the possible hourly wages for the person with the highest hourly wage.   (0/2/0)

26. The function f is given by $f(x) = x^2 - 6x + 4$

Solve the equation $f(x+3) = -2$ and give your answer to at least two decimal places. (0/2/0)

27. A straight line passes through the points P, Q and R.

The coordinates of the three points satisfy the following:

- $P(6, 11)$
- $Q(x < 6, \ y \geq 11)$
- $R(x > 6, \ y \leq 11)$

Investigate what values the slope of the line can have. (0/0/2)

28. The function f is given by $f(x) = \dfrac{x^2}{a}$ where a is a constant and $a > 0$

A line segment S is drawn from the point on the graph of the function where the x-coordinate is a to the point on the graph of the function where the x-coordinate is $2a$.

Determine the length of the line segment S in terms of a. (0/0/2)

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