Part III	Problems 16-23 which require complete solutions.
Test time	120 minutes.
Resources	Digital 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 and show how you use your digital resources.

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

Part III: Digital resources are allowed. Write your solutions on separate sheets of paper.

16. Two similar rectangles have different measures. Rectangle *A* has sides 4 cm and 6 cm. Rectangle *B* has one side that is 12 cm.

    What possible measures can the other side of rectangle *B* have? (2/0/0)

17. A line L_1 is drawn through the points *A* and *B*.
    Another line L_2 is drawn through the points *C* and *D*.
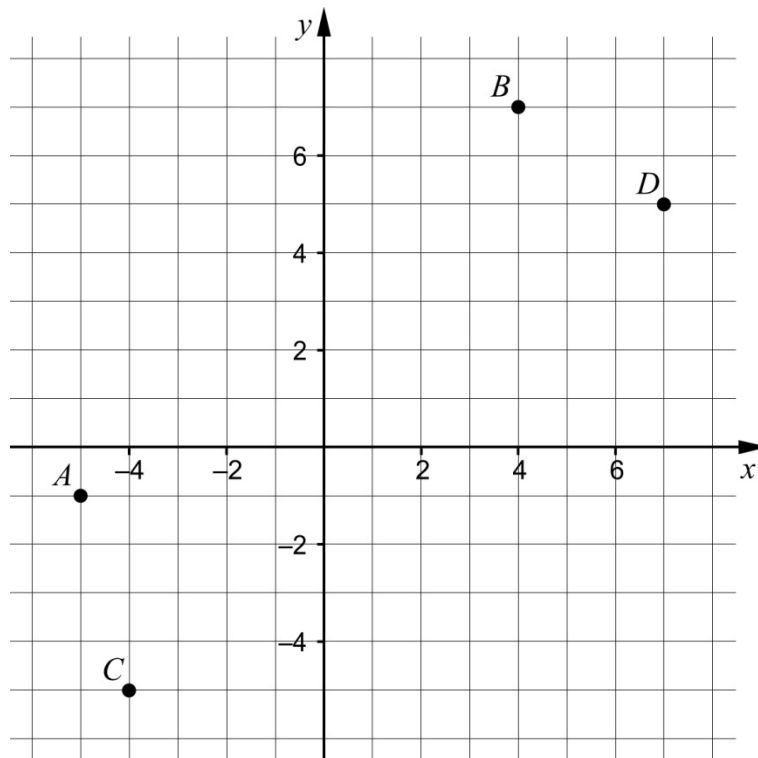
    Are the lines L_1 and L_2 parallel? Justify your answer. (3/0/0)

18. Marcus puts a roast in the oven at 14.30. The temperature inside the roast is then 16.5 °C.
    The temperature in the roast T °C then increases according to the function:
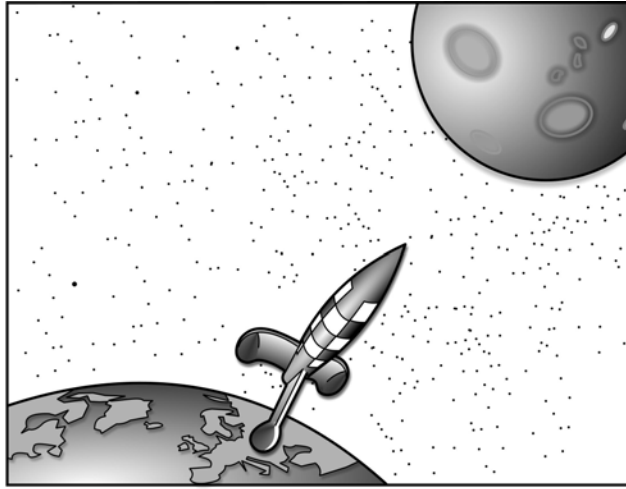
    $T(t) = 16.5 \cdot 1.0085^t$

    where *t* is the time in minutes. The roast is done when the meat thermometer shows 77 °C.

    Will the roast be ready at 18.00 when Marcus is having dinner guests? (2/0/0)

19. Hugo and Ilona are going to computer-simulate a space craft landing on the moon. They have one model each to describe the movement of the space craft towards the surface of the moon.

Hugo uses the model $h(t) = \dfrac{t^2}{90} - \dfrac{20t}{3} + 1000$ where h is the height in metres above the surface of the moon and t is the time in seconds from the moment the space craft starts its landing.

a) At what height above the moon does the space craft start its landing according to Hugo's model? (1/0/0)

b) Calculate $h(300)$ and interpret the result. (1/1/0)

Ilona uses the model $g(t) = 1000 - \dfrac{10t}{3}$ where g is the height in metres above the surface of the moon and t is the time in seconds from the moment the space craft starts its landing.

Compare the two models of how the space craft moves towards the surface of the moon from the moment the space craft starts its landing to the moment it has landed.

c) Describe two similarities in the models. (0/1/0)

d) Describe some difference between the models. (0/1/1)

20. A company fills tins with crushed tomatoes. According to the label, one tin contains 400 g of tomatoes. The weight of the tomatoes is normal distributed around the mean value 395 g and the standard deviation is 5.0 g.

a) How many percent of the tins can be expected to contain less than the 400 g stated on the label? (2/0/0)

The company does not want too many dissatisfied customers and is therefore planning to fill more tomatoes into the tins. They change the requirements so that at least 97.7 % of the tins must contain at least 400 g of tomatoes. The standard deviation is still assumed to be 5.0 g.

b) Calculate what mean value of the weight that corresponds to this new requirement. (0/3/0)

21. Alice and Moa are discussing mean value and median.

Alice claims that:
*"The mean value of three consecutive integers is always equal to the median of the numbers."*
Moa replies:
"No, that's not always true."

Who is right, Alice or Moa? Justify your answer. (1/1/1)

22. The table and diagram show the length and weight of ten men from the same work place.

Name	Length (cm)	Weight (kg)
Anders	187	90
Leif	183	85
Göte	190	85
Bengt	189	85
Per	190	95
Stig	191	93
Lennart	176	74
Torgny	182	81
Bertil	181	83
Ingemar	178	80
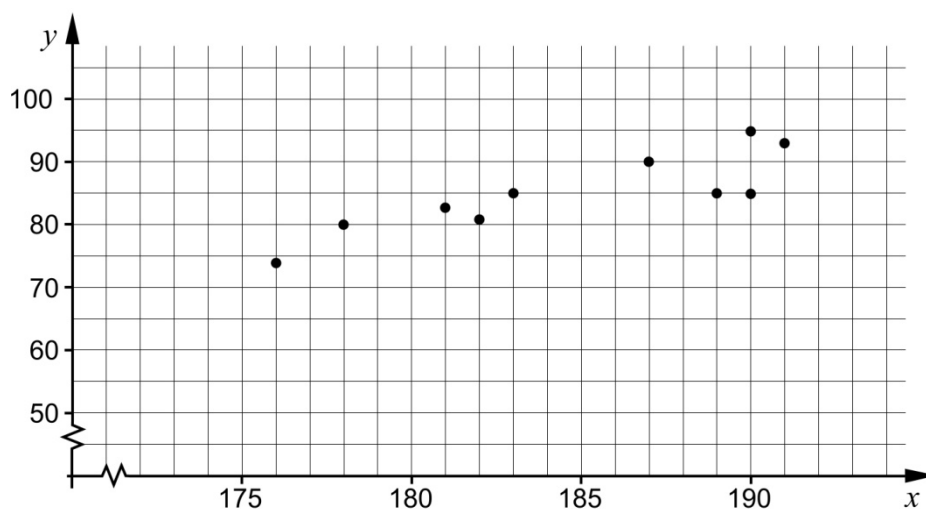
a) Find a linear relationship between the weight y kg and the length x cm.　　(0/1/0)

b) Use the linear relationship you found in a) as a starting point. Interpret what the gradient means in this context.　　(0/0/2)

23. A thin piece of string has a length of 24 m. The string can be shaped into different geometric figures.
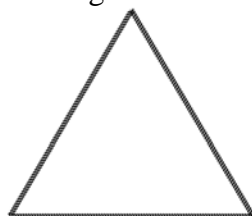

Figure 1　　　　　　　　Figure 2
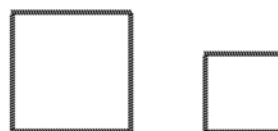
a) The whole piece of string is shaped into an equilateral triangle, see Figure 1. Calculate the area of the triangle.　　(0/3/0)

b) The piece of string is then divided into two parts of different lengths. A square is then formed out of each piece, see Figure 2. Investigate if it is possible that the two squares together can have an area of 17 m^2.　　(0/0/4)