Part D	Problems 16-24 which require complete solutions.
Test time	120 minutes.
Resources	Digital 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 54 points consisting of 22 E-, 19 C- and 13 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 8 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 and show how you use your digital resources.

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 resources are allowed. Do your solutions on separate sheets of paper.

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16. In a building there are 40 flats with a total of 90 rooms. The flats have either 2 rooms or 3 rooms. To calculate how many flats there are with 2 rooms and 3 rooms respectively, the following equations can be set up

$$\begin{cases} x + y = 40 \\ 2x + 3y = 90 \end{cases}$$

   a) What does x represent in the equations? (1/0/0)

   b) Solve the simultaneous equations and write down how many flats there are with 2 rooms and 3 rooms respectively. (2/0/0)

17. The graph of a quadratic function passes through the point $P(0, 4)$ and has either a maximum or a minimum at the point $Q(2, -1)$.

   Determine whether the point Q is a maximum or a minimum. Justify your answer. (1/0/0)

18. The table below shows two cases A and B with two corresponding statements, statement 1 and statement 2.

| Case	Statement 1	Statement 2
A	The triangle ABC is right angled.	Pythagoras' theorem is valid for the triangle ABC.
B	Samir lives in Sweden.	Samir lives in Stockholm.

   In both case A and case B, write down whether the logical equivalence ($\Leftrightarrow$) holds between statement 1 and statement 2.

   Justify your answer both for case A and for case B. (2/0/0)

19. The length of a rectangle is 10 cm longer than its width. Determine the lengths of the rectangle's sides if its area is 80 cm^2. (2/1/0)

2

20. Stina, Lisa and Valeria investigate how coffee cools down in a room where the temperature is 20 °C. They pour coffee which has a temperature of 95 °C. After five minutes, the temperature of the coffee is 73 °C.

They set up one model each for how the coffee cools down, where y is the temperature of the coffee in °C and x is the number of minutes after the coffee has been poured. Stina, Lisa and Valeria use drawing software to draw graphs of the functions representing the three models, see below.
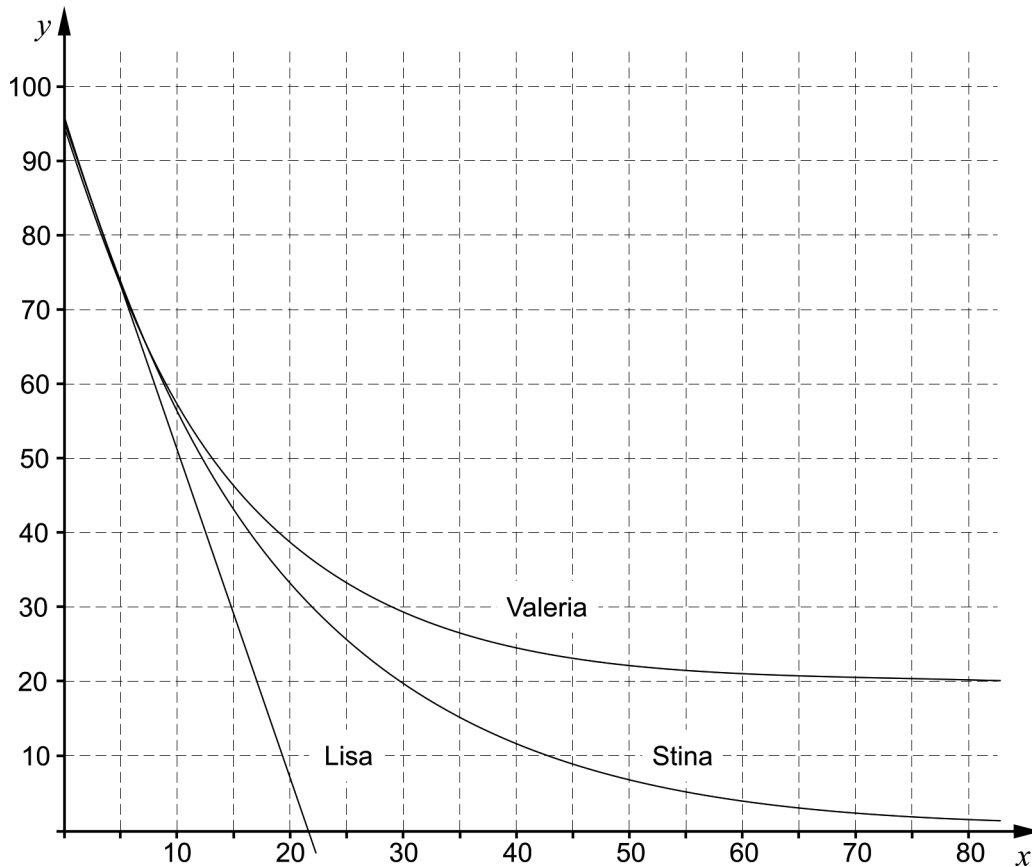
a) Only one model corresponds to how the coffee cools down in reality. Determine which of the models it is and justify your answer. (0/1/0)

Assume that Valeria's model is represented by the function f where $y = f(x)$ and Stina's model by the function g where $y = g(x)$

b) Interpret what $f(30) - g(30)$ means in this context. (0/1/0)

21. The sum of two numbers is 51. Determine the two numbers if their product is 152.96. (0/3/0)

22. The titan arum, *Amorphophallus titanum*, is a carnivorous plant with one of the largest inflorescences in the world which can be up to three metres high. The titan arum is a native plant of West Sumatra, Indonesia.

One specimen of the plant can be found at the Bergius Botanic Garden in Stockholm where it bloomed in July 2013. The height of the inflorescence was measured every morning for a number of days. The table below shows some values where y is the height of the inflorescence in cm and x is the time in days after July 2, 2013.

| Time x days	Height of inflorescence y cm
0	160.0
2	171.8
4	183.6

Picture: Gunvor Larsson

Assume that there is a linear relationship between the height of the inflorescence and the time.

How tall would the inflorescence have been in the morning July 9, 2013, if it would have continued to grow at the same rate according to the linear relationship? (0/2/0)

23. Mikaela is going to make a concrete dish. The dish should be circular with an outer diameter of 400 mm. The dish should have two compartments, separated by a partition wall with a thickness of 10 mm. The dish should have an outer edge with a thickness of 10 mm.

Partition wall

Outer edge
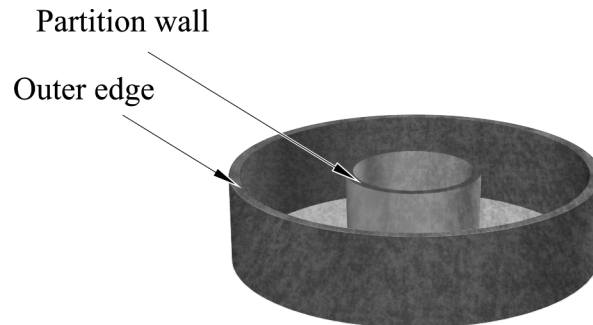
Mikaela creates a simple sketch of what the dish should look like from above.

(mm)

Compartment 1

Compartment 2

400

10

10
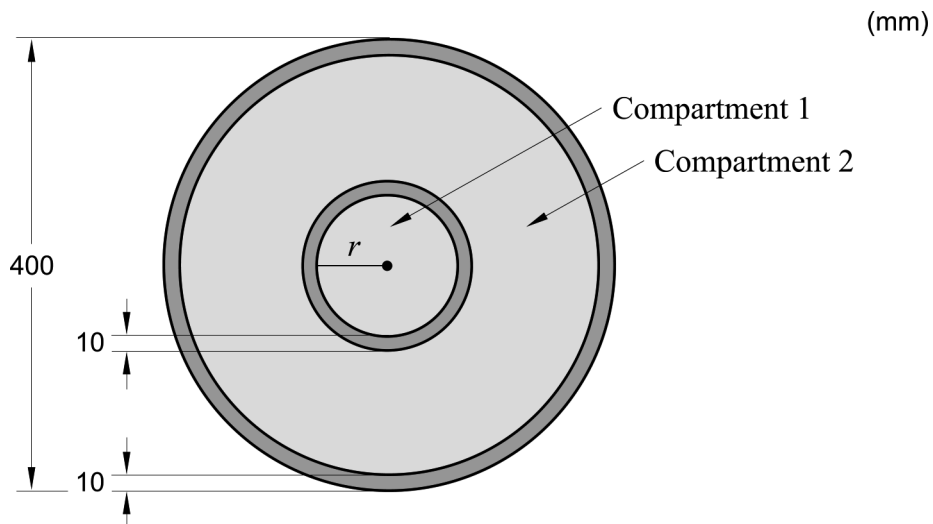
What should the inner radius *r* be in order for the two compartments to have the same area? (0/0/3)

24. Ismael is going to make new curtains for eight windows at the recreation centre. Ismael wants to cut pieces of fabric where the lower edge should have the shape of a quadratic function. The widest part of each piece of fabric should be 150 cm and the highest height 70 cm, see figure 1.
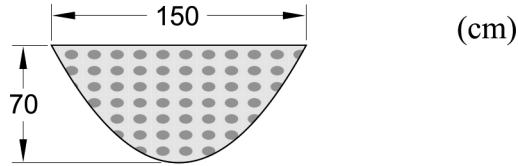
Figure 1

Ismael has found a fabric that is 140 cm wide. He wants to buy as little fabric as possible and is going to cut the eight pieces out of fabric according to figure 2 below.
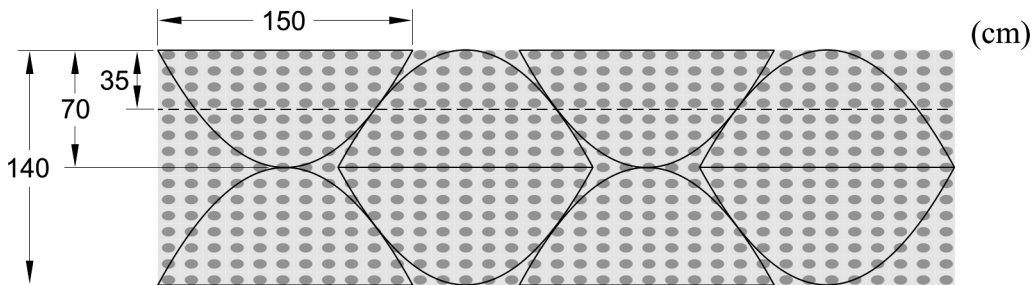
Figure 2

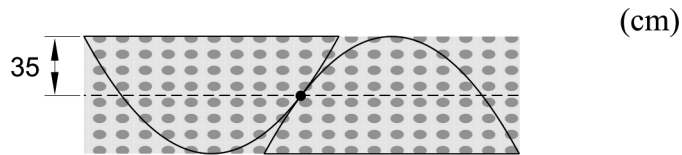Two adjacent pieces of fabric touch at a point 35 cm from the upper edge of the fabric, see figure 3.

Figure 3

Calculate how many metres of fabric Ismael will have to buy. (0/0/4)