Part D	Problems 17-27 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 59 points consisting of 21 E-, 20 C- and 18 A-points.

Level requirements for test grades
E: 14 points
D: 23 points of which 7 points on at least C-level
C: 30 points of which 12 points on at least C-level
B: 39 points of which 6 points on A-level
A: 46 points of which 10 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.

17. 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

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

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

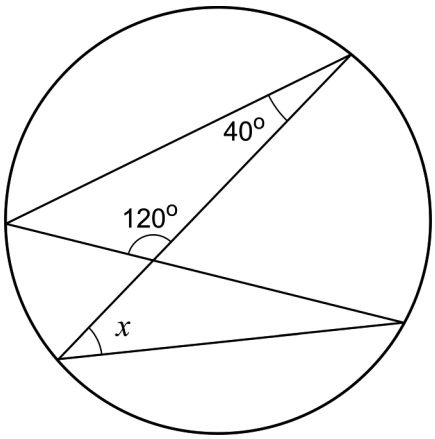
18. In an American football club, the height of the players is normally distributed with an average height of 187 cm and a standard deviation of 5 cm. The club has a total of 112 players.

Determine the number of players expected to be taller than 182 cm. (2/0/0)

19. 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)

20. Show that the angle x is $20°$.



(1/0/0)

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

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

They set up one model each for how the coffee cools down, where y is the temperature of the coffee in $°\text{C}$ and x is the number of minutes after the coffee has been poured.

Stina: $y = -4.4x + 95$

Lisa: $y = 95 \cdot 0.949^x$

Valeria: $y = 75 \cdot 0.933^x + 20$

Of the three models, Valeria's model is the one that best corresponds to reality.

a) The coffee is supposed to taste best if it has a temperature of $65\ °\text{C}$. Use Valeria's model and calculate the time it takes for the coffee to reach a temperature of $65\ °\text{C}$. (0/1/0)

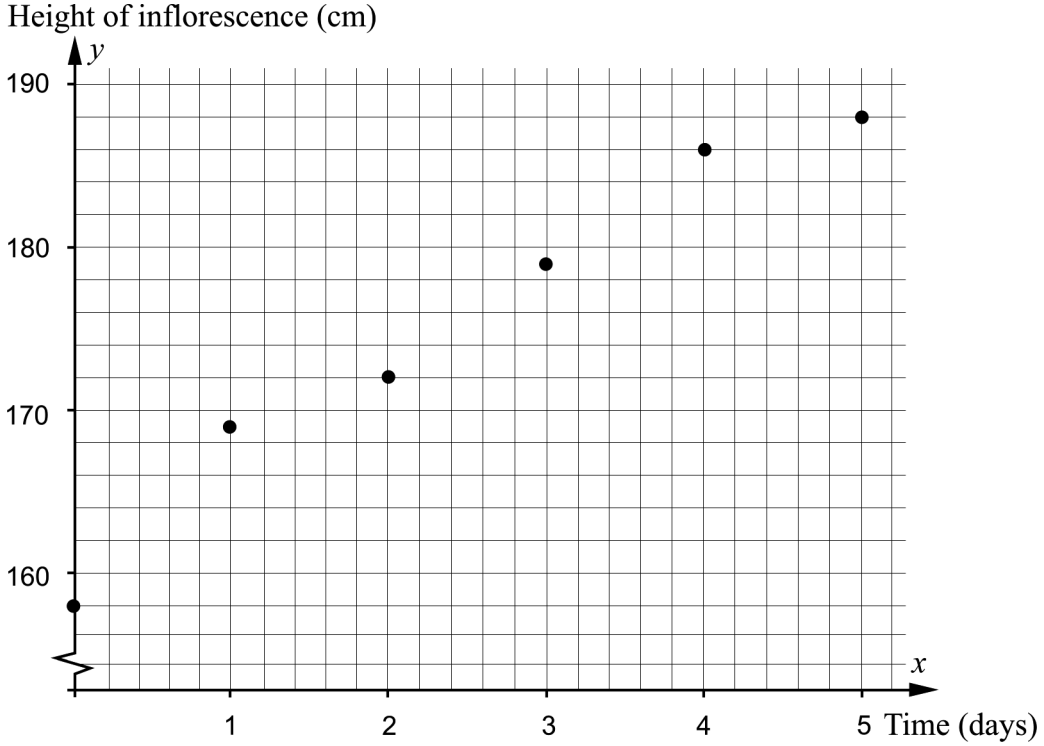
b) Neither Stina's nor Lisa's model corresponds to reality over time. Explain why. (0/1/0)

23. 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 six days. The table and the diagram below show the result 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	158
1	169
2	172
3	179
4	186
5	188

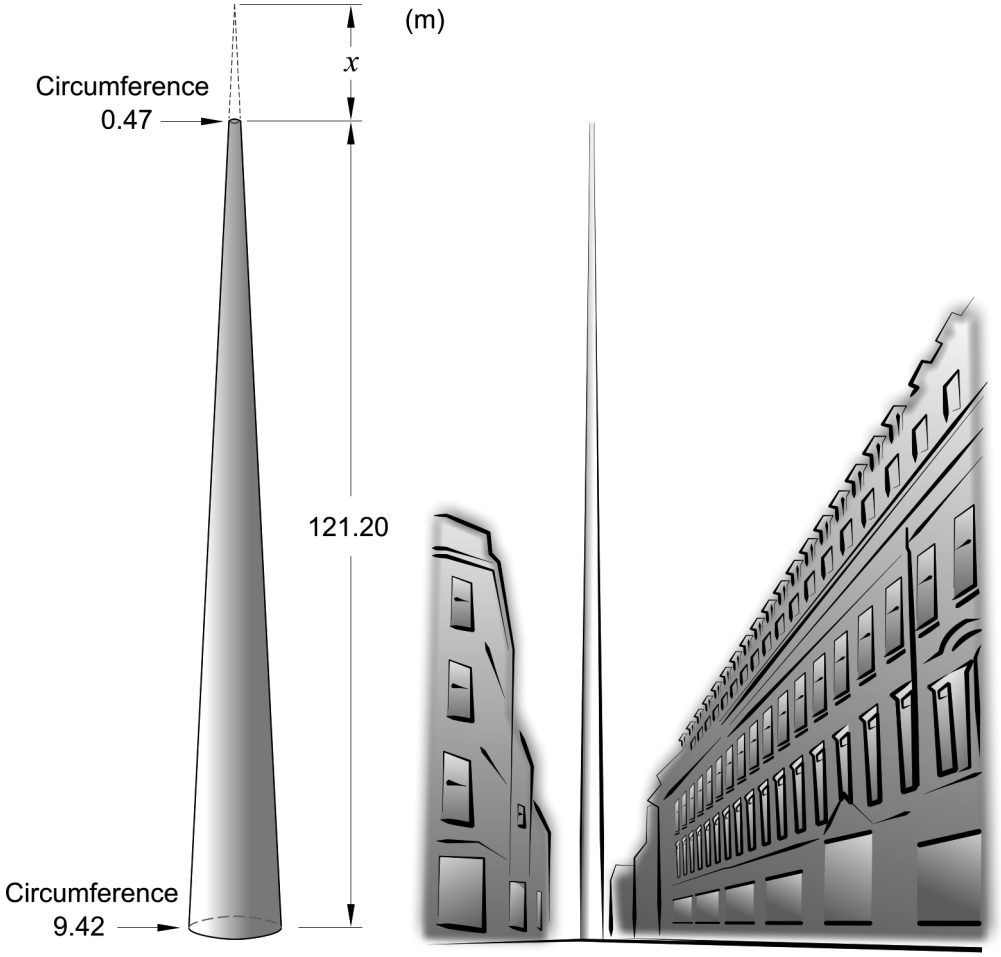
Picture: Gunvor Larsson



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

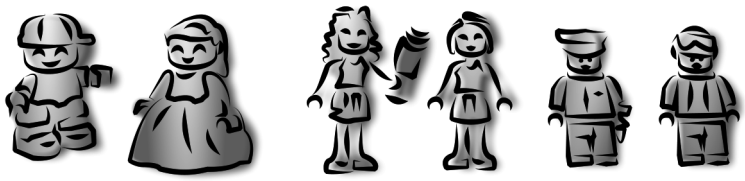
How tall would the inflorescence have been in the morning July 9, 2013, if it would have continued to grow at the same rate according to the linear relationship? (0/3/0)

24. The Monument of Light is a work of art in Dublin. It is made of stainless steel and has the shape of a cone where the tip has been cut off. The circumference of the work of art is 9.42 m at the ground and becomes narrower with a circumference of 0.47 m at the top, see figure.



Determine, by calculating x in the figure, how much higher the work of art would be if it would have a conical tip. (0/3/0)

25. In 1978, a well-known toy manufacturer started producing mini figures that represents people. According to the toy manufacturer's forecast there will be at least as many mini figures as there are people on earth in the year 2019.



In 1900 there were 1.65 billion and in 2010 there were 6.80 billion people on earth. Assume that the yearly percentage increase of the number of people on earth remains constant.

Assume that the number of produced mini figures each year has remained the same since the start in 1978 and until 2019 and that all the mini figures are still left.

Calculate the smallest number of mini figures that is produced each year if the toy manufacturer's forecast is valid. (0/0/3)

26. The birth weight of girls born in Sweden after 40 weeks pregnancy is assumed to be normally distributed with an average of 3400 grams and a standard deviation of 400 grams.

a) Which two of the statements A-E are correct for these girls?

A. In all, approximately 4.6% of the girls weigh either more than 4200 grams or less than 2600 grams.

B. None of the girls weighs more than 4600 grams.

C. Approximately 9.1% of the girls weigh more than 4000 grams.

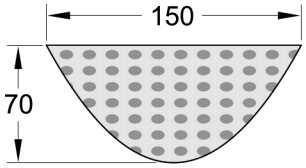
D. The number of girls with a weight of more than 3600 grams is approximately as large as the number of girls with a weight of less than 3200 grams.

E. A random sample test of the birth weight of 50 girls will always be normally distributed.

Only answer is required (0/0/1)

b) Choose one of the incorrect alternatives. Justify why that alternative is incorrect. (0/0/1)

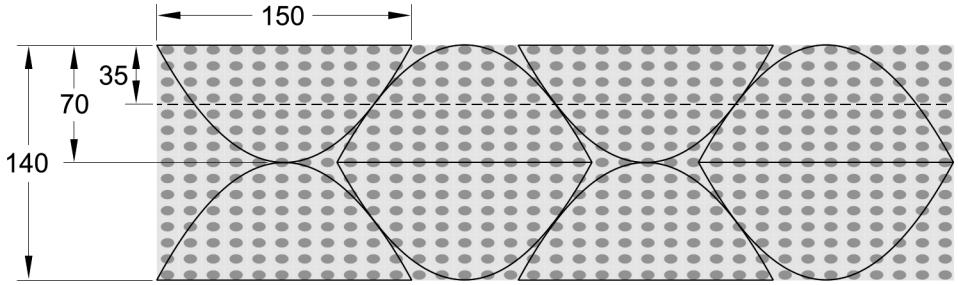
27. Ismael is going to make new curtains for eight windows at the recreation centre. Ismael wants to cut pieces of fabric where the lower edge should have the shape of a quadratic function. The widest part of each piece of fabric should be 150 cm and the highest height 70 cm, see figure 1.



(cm)

Figure 1

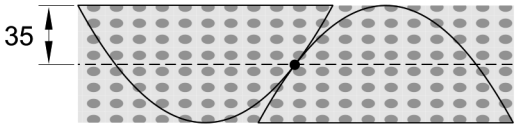
Ismael has found a fabric that is 140 cm wide. He wants to buy as little fabric as possible and is going to cut the eight pieces out of fabric according to figure 2 below.



(cm)

Figure 2

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



(cm)

Figure 3

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