Part D	Problems 15–23 which require complete solutions.
Test time	120 minutes.
Resources	Digital resources, formula sheet and ruler.

The test consists of three written parts (Part B, Part C and Part D).
Together they give a total of 57 points consisting of 20 E-, 21 C- and 16 A-points.

Level requirements for test grades
E: 13 points
D: 22 points of which 7 points on at least C-level
C: 29 points of which 12 points on at least C-level
B: 37 points of which 5 points on A-level
A: 44 points of which 8 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 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. Write down your solutions on separate sheets of paper.

15. Determine the equation of two different straight lines that intersect at the point (1, 4). (2/0/0)

16. Sandor is going to start a business where he will make and sell macarons.

He assumes that he will be able to sell all the macarons he makes for SEK 5 each. When selling x macarons, Sandor makes SEK P.

a) Write down the relation for P as a function of x.
Only answer is required (1/0/0)

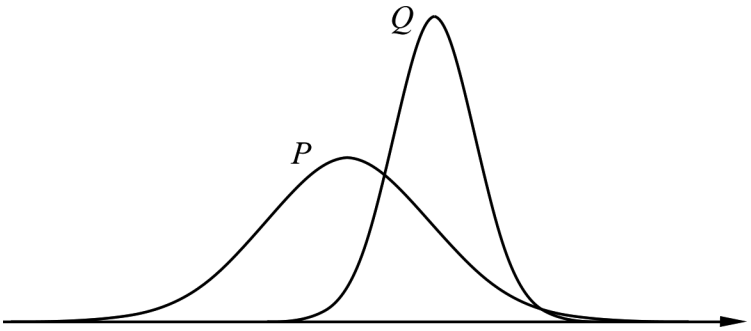
When Sandor starts his business he has to buy baking equipment at a cost of SEK 510. The ingredients for each macaron cost SEK 1.50. The function $K(x) = 1.5x + 510$ describes the total manufacturing cost when manufacturing x macarons.

b) Determine the minimum numbers of macarons Sandor has to sell in order to make a profit. (2/0/0)

17. The observations in a normally distributed data set have the mean value 250 and the standard deviation 5.

a) Show that 15.9% of the observations of the data set has a value greater than 255. (1/0/0)

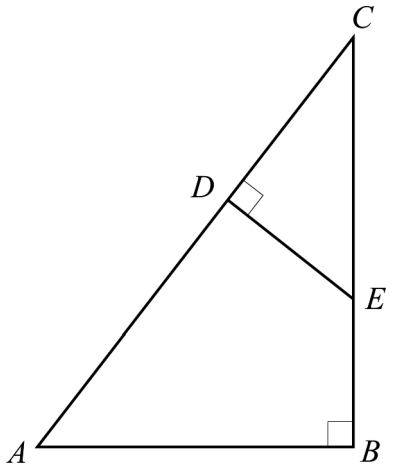
b) The figure shows two bell curves.



One of the curves shows the data set from the a)-task and the other a normally distributed data set with the standard deviation 10.

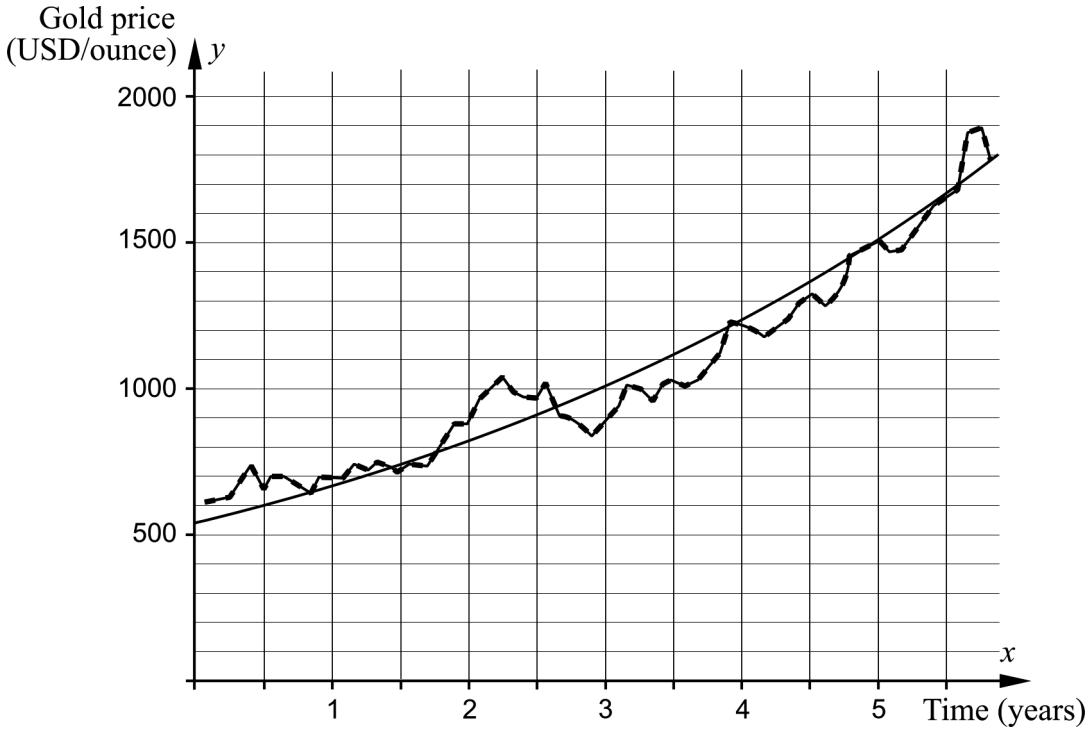
Determine which of the data sets can be seen in bell curve *Q*.
Justify your answer. (0/1/0)

18. In the figure below, the triangle *CDE* is drawn inside another triangle *ABC*. The distance *CD* has the length 4.0 cm, the distance *BC* has the length 9.0 cm and the distance *AB* has the length 6.0 cm.



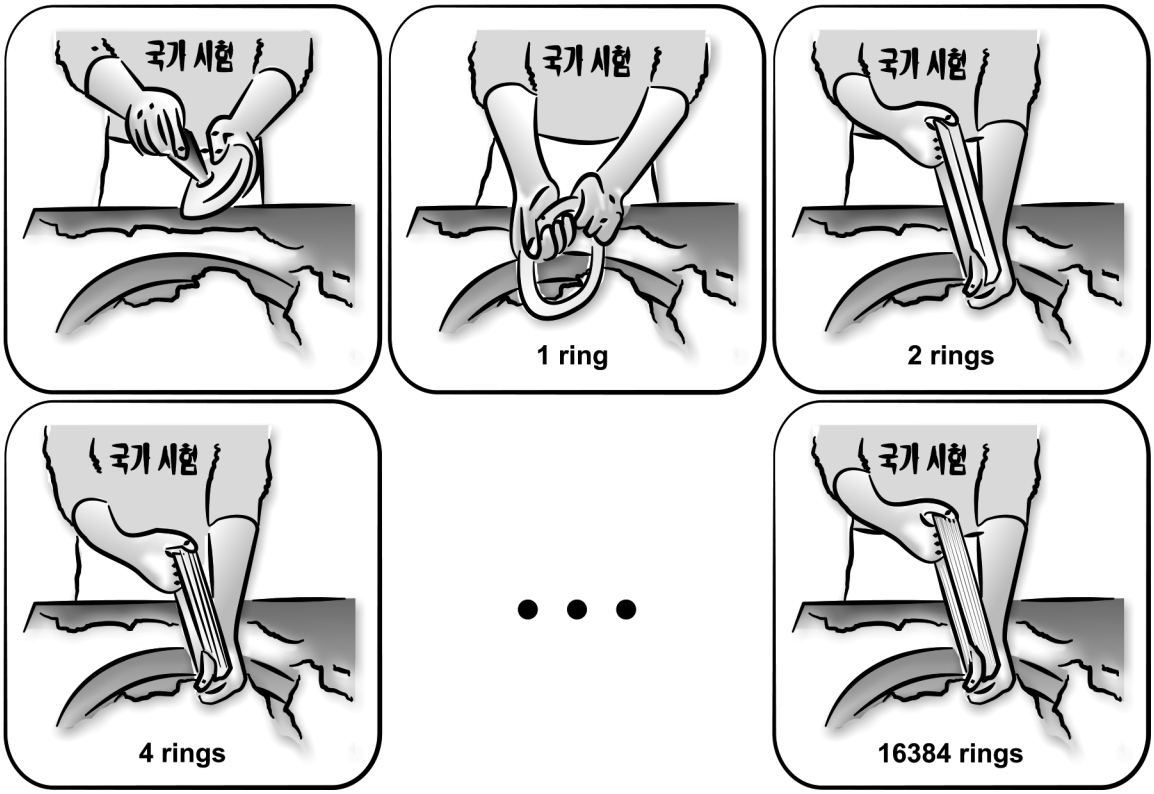
Calculate the length of the distance *CE*. (0/3/0)

19. The diagram shows the price trends of gold and the graph of an exponential function that has been adjusted to the values. The x-axis shows the time in years after January 1, 2006 and the y-axis shows the gold price in USD/ounce.



Determine the adjusted exponential function. (0/2/0)

20. The South Korean sweet Kkultarae is made from a piece of firm honey that is dipped into cornflour. A hole is made in the middle of the lump and the lump is then stretched into a ring. The ring is dipped into cornflour and then twisted and folded so that two rings are formed. The rings are twisted and folded yet another time so that four rings are formed, see figure.



The twists and folds are repeated until a bunch of 16 384 thin rings are formed. Determine how many times the number of rings has doubled, in total. (0/2/0)

21. Sanna makes bracelets from reindeer leather, tin thread and silver beads. She makes two different kinds of bracelets, see table.

Type of bracelet	Material consumption	Total material cost
 Bracelet with four strand braid	550 cm tin thread 25 cm reindeer leather	SEK 110.50
 Double bracelet with single braid and silver beads	350 cm tin thread 50 cm reindeer leather 20 silver beads	SEK 146

The silver beads cost SEK 3/piece. Calculate the cost in SEK/m for the tin thread and the cost in SEK/m for the reindeer leather. (0/3/0)

22. When replacing windows in an old brick building, wooden heads are needed above the rectangular windows. The upper edge of the heads have the same shape as the graph of a quadratic function, see figure 1.

The width of a head is 120 cm and the largest height is 30 cm, see figure 2.

Figure 1

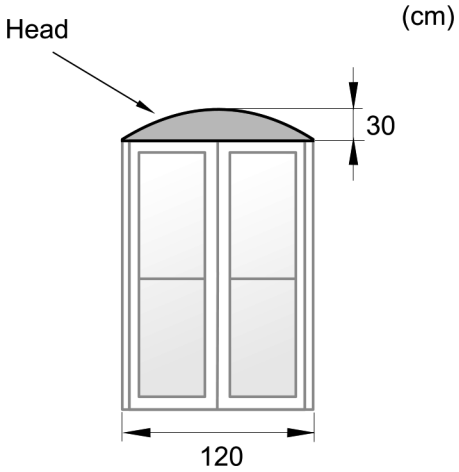


Figure 2

The woodworks which will make the wooden heads want to determine a quadratic function in order to make a model of the head.

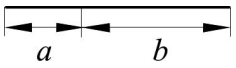
Determine a quadratic function that describes the upper edge of the head. (0/0/3)

23. There are different rules of thumb that are considered to give more beautiful pictures when arranging a photo. According to the rule of thirds, the motif should be placed one third from the edge of the picture, see figure 1.

The golden ratio is another rule of thumb that can be used for dividing the width of a picture into harmonic proportions, see the fact box and figure 2.

A distance is divided according to the golden ratio if the shorter section is to the longer section as the longer section is to the whole distance, that is:

$$\frac{a}{b} = \frac{b}{a+b}$$



Rule of thirds

Figure 1

Golden ratio

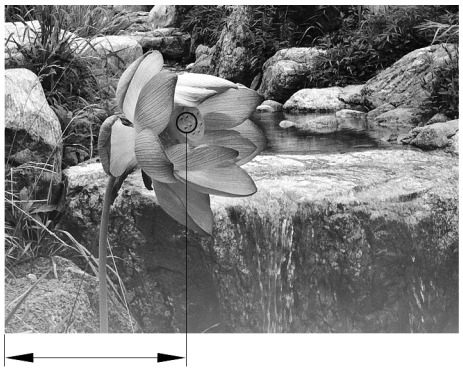


Figure 2

Determine where the motif should be placed, regardless of the size of the picture, if the golden ratio is used instead of the rule of thirds. (0/0/3)