Part D	Problems 17-24 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 57 points consisting of 20 E-, 20 C- and 17 A-points.

Level requirements for test grades
E: 13 points
D: 21 points of which 6 points on at least C-level
C: 28 points of which 11 points on at least C-level
B: 37 points of which 6 points on A-level
A: 45 points of which 10 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.

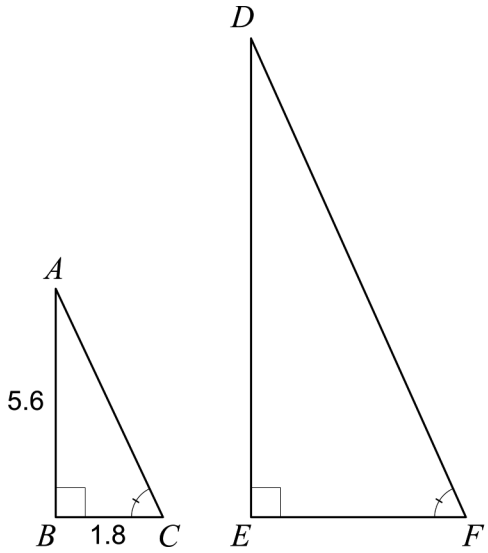
Name: _____

Date of birth: _____

Educational programme: _____

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

17. In a right-angled triangle *ABC,* side *AB* is 5.6 cm and side *BC* 1.8 cm. The triangle *DEF* is similar to the triangle *ABC*. The side *EF* is twice as long as the side *BC*, see figure.



How many times larger is the area of triangle *DEF* than the area of triangle *ABC*? (2/0/0)

18. Edvin and Svante are going to produce mobile phone covers. They have calculated and concluded that they can produce a maximum of 350 boxes of mobile phone covers. Each box contains 10 mobile phone covers. They write down models for revenues and costs, see below.

The revenue I SEK for x number of sold boxes: $I(x) = 650x$

The cost K SEK for producing x number of boxes: $K(x) = x^2 + 80x + 1000$

The profit V SEK is given by the difference between the revenue I SEK and the cost K SEK:

$V(x) = 650x - (x^2 + 80x + 1000)$

Assume that Edvin and Svante sell all the boxes they produce. Determine how many boxes they have to produce in order to maximise the profit $V(x)$. (2/0/0)

19. The petrol price a customer pays when filling up consists, among other things, of the pre-tax fuel price, fuel duty and the fuel companies' additional charge for things like personnel costs.

A simplified model to describe the fuel companies' additional charge is given by

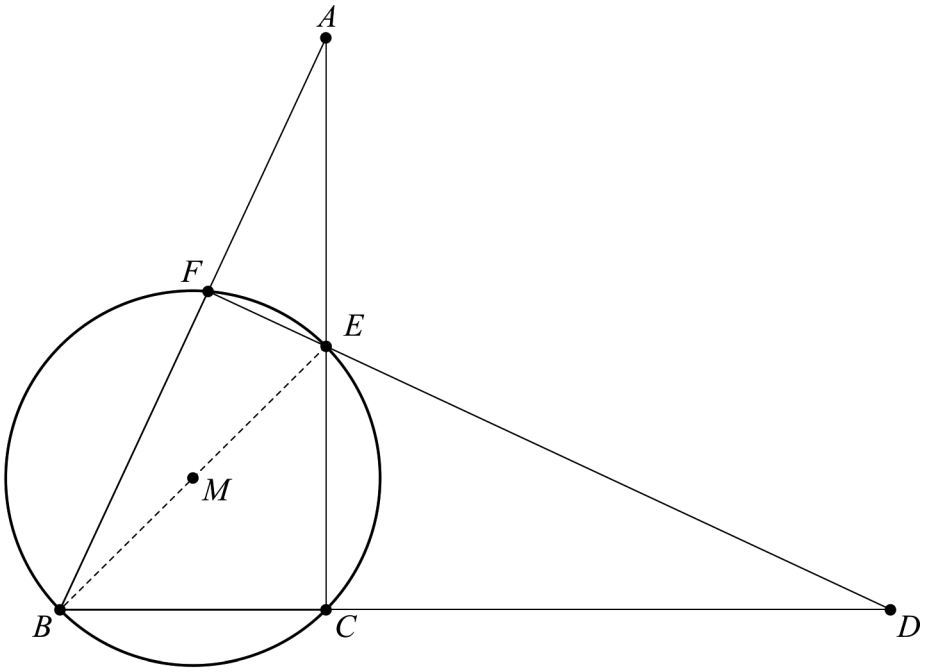
$f(x) = 0.80 \cdot 1.104^x$

where $f(x)$ is the fuel companies' additional charge in SEK/litre and x is the number of years after January 1, 2008.

Determine, according to this model, in what year the fuel companies' additional charge reached 1.50 SEK/litre. (2/0/0)

20. Determine the constant a so that a straight line that passes through the points (a, a^2) and $(-2, 3.19)$ has the gradient 4.2 (0/2/0)

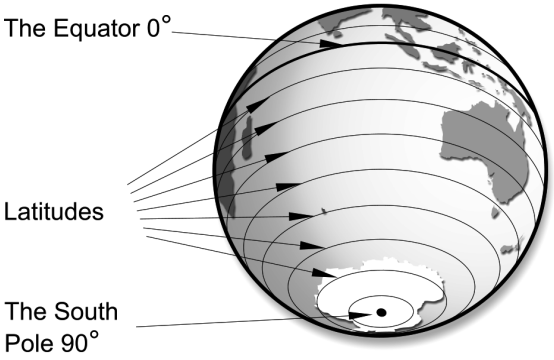
21. The figure shows a circle with centre *M* and two triangles *ABC* and *BDF*. The line segment *BE* is the diameter of the circle.



a) Show that the triangles *ABC* and *BDF* are similar. (0/2/0)

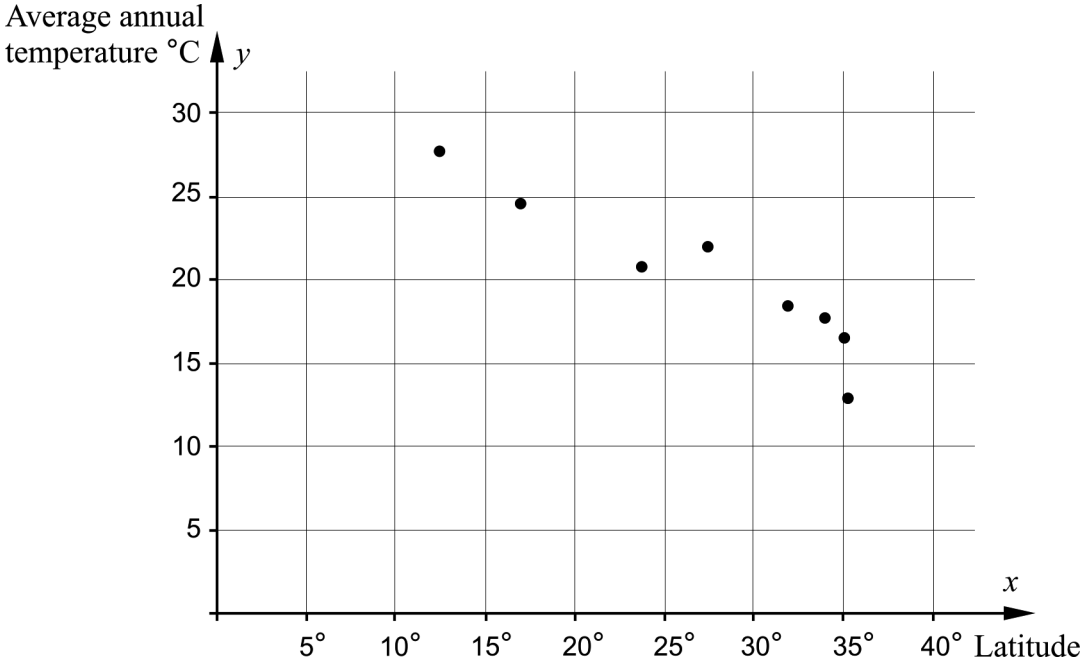
b) The length of the line segment *BD* is 13.8 cm and *BF* is 5.6 cm. The length of *BC* and *CE* are equal. Calculate the length of the line segment *AB* if the diameter of the circle is 6.0 cm. (0/3/0)

22. A certain position in north-south direction is expressed by latitudes. Latitudes has been decided to be $0°$ at the Equator and $90°$ north at the North Pole and $90°$ south at the South Pole.



The table and the diagram show the latitude and average annual temperature for some cities in Australia.

City	Latitude x	Average annual temperature °C y
Darwin	12.40°	27.8
Cairns	16.88°	24.6
Alice Springs	23.80°	20.7
Brisbane	27.40°	21.9
Perth	31.95°	18.3
Sydney	33.86°	17.6
Adelaide	35.10°	16.6
Canberra	35.30°	12.8



Find a linear relation between the cities' average annual temperatures, y °C, and latitude, x degrees. (0/2/0)

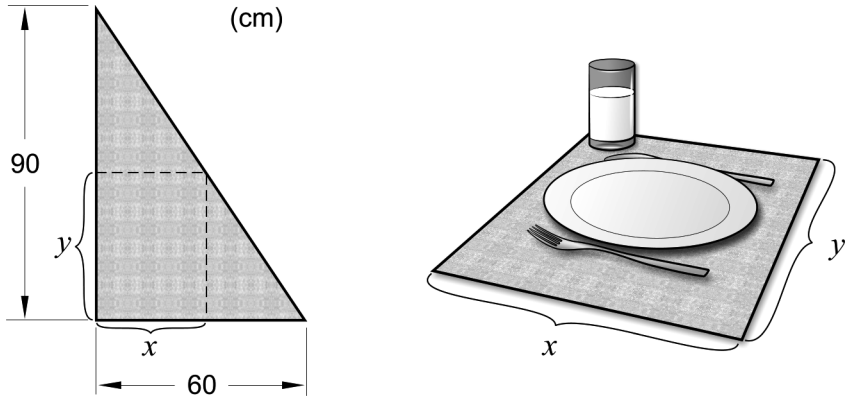
23. Laila reads the atmospheric pressure on her barometer every day. The first day each month she notes down the value.

After one year she calculates the mean value of her 12 noted values to 1013 hPa (hectopascal) and the standard deviation to 11.8 hPa. The two following months she notes down the atmospheric pressure 1011 hPa and 1015 hPa.

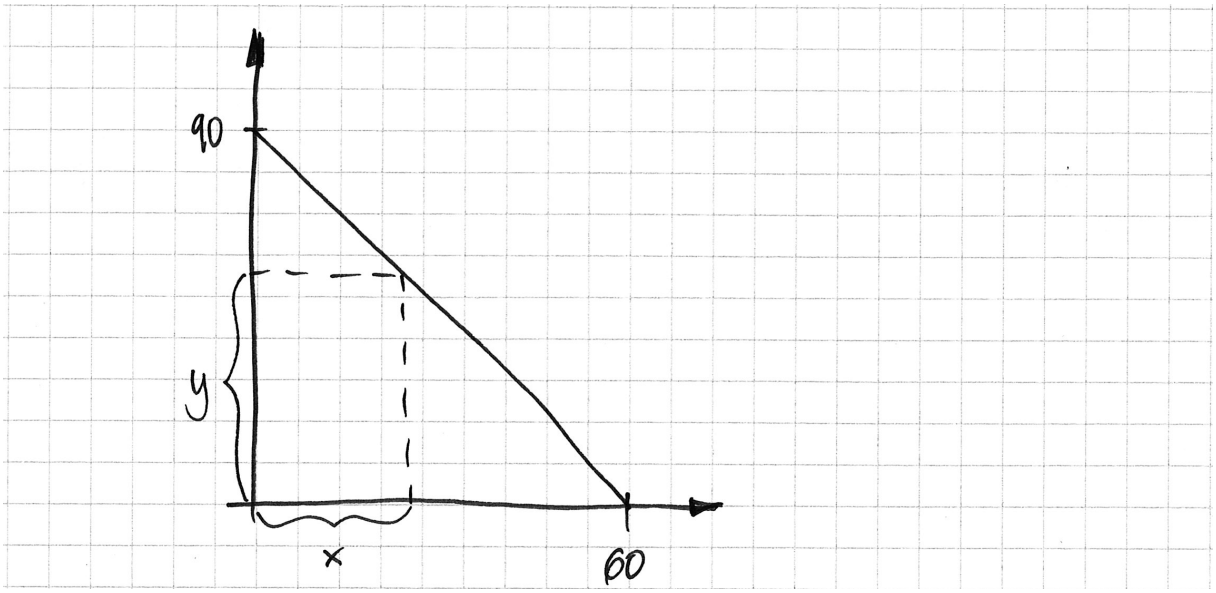
a) How does the mean value of the atmospheric pressure change when the two new values are added? Justify your answer. (1/0/0)

b) Calculate the standard deviation for all 14 noted values of the atmospheric pressure. (0/0/2)

24. Kim is going to make placemats from left-over pieces of fabric from a factory. He finds out that the pieces of fabric have the shape of a right-angled triangle with the base 60 cm and the height 90 cm. From these pieces of fabric Kim will cut rectangular placemats with the width x and the length y, see figure.



Kim wants to investigate how to cut in order to make the area of the placemats as large as possible. He draws a piece of fabric into a coordinate system, see figure.



Calculate the width x and the length y that will give the largest area for a placemat. (0/0/3)