

Part D	Problems 16-23 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 58 points consisting of 20 E-, 20 C- and 18 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: 44 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.

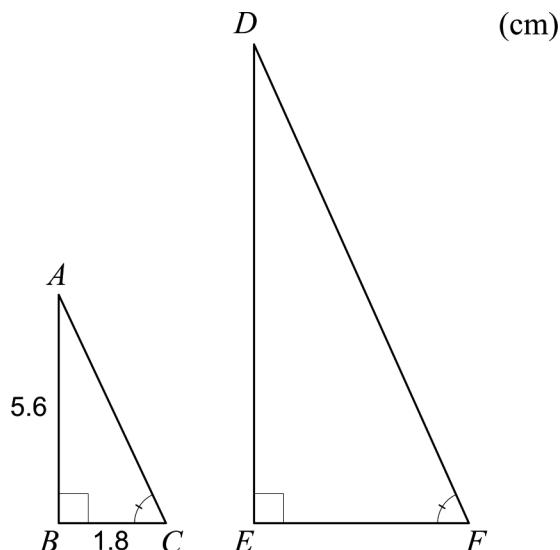
Name: _____

Date of birth: _____

Educational programme: _____

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

16. 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)

17. 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)

18. 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

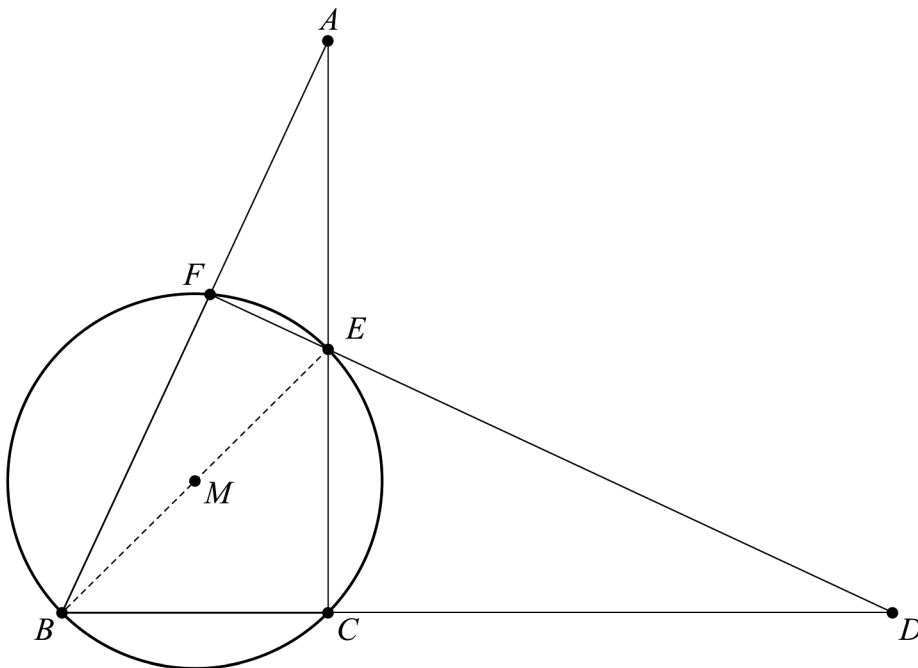
$$f(x) = 0.80 \cdot 1.104^x$$

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)

19. 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)

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



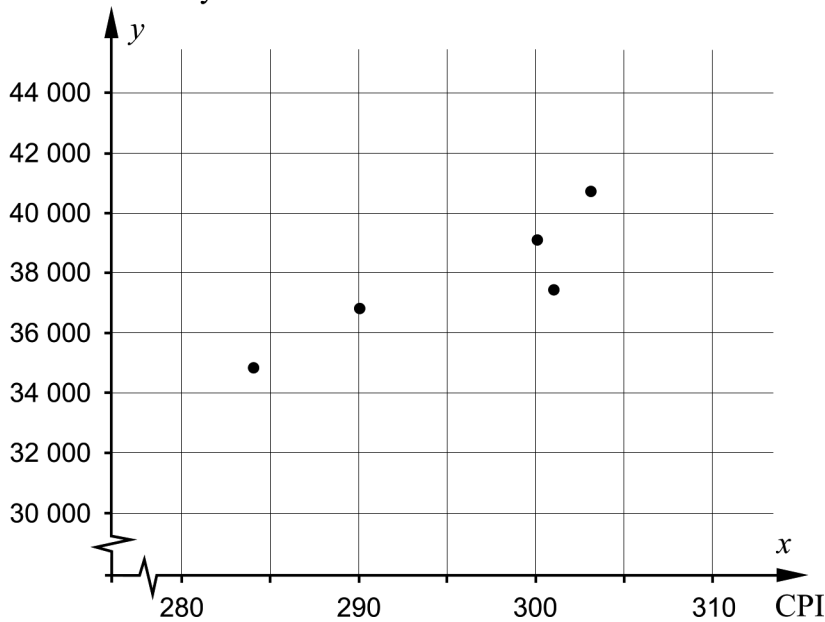
- a) Show that the triangles ABC and BDF are similar. (0/2/0)
- b) The length of the line segment BD is 13.8 cm and BF is 5.6 cm. The length of BC and CE are equal. Calculate the length of the line segment AB if the diameter of the circle is 6.0 cm. (0/3/0)

21. The table and the diagram show the relation between the maximum study allowance per term at full-time studies and the consumer price index (CPI) for the years 2006 to 2010. The maximum study allowance is denoted SEK y and the CPI x .

Year	CPI x	Maximum study allowance SEK y
2006	284	34840
2007	290	36820
2008	301	37460
2009	300	39100
2010	303	40700

CPI (Consumer Price Index) is based on the price trend for all kinds of goods and services. The CPI regulates the size of pensions, study allowance, alimonies etcetera.

Maximum study allowance in SEK



- a) Find a linear relation between the maximum study allowance, y , and CPI, x . (0/2/0)
- b) Which of the values A – G is a reasonable correlation coefficient for the relation between the maximum study allowance and the CPI? *Only answer is required*

- A. -1.89
- B. -0.89
- C. -0.25
- D. 0
- E. 0.25
- F. 0.89
- G. 1.89

(0/1/0)

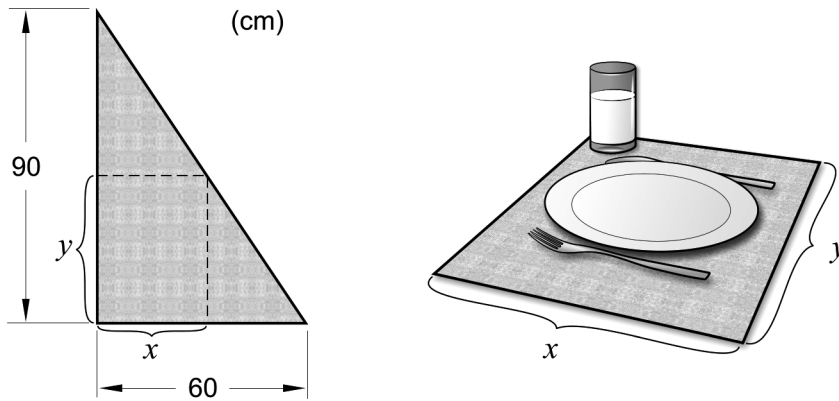
22. Mikaela goes skiing several times a week in a lighted ski trail. Once a week she writes down how long it takes to ski 4 km.



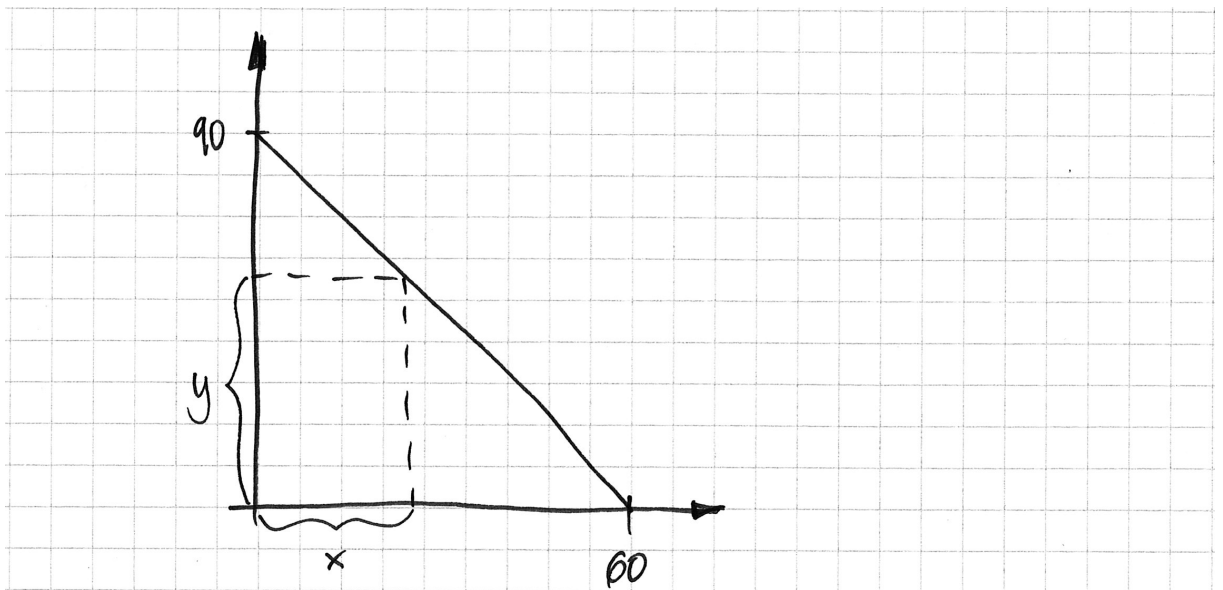
After 12 weeks she calculates the mean value of her 12 times to 24.5 minutes and the standard deviation to 0.29 minutes. The two following weeks she notes down the times 24.0 minutes and 25.0 minutes.

- a) How does the average of Mikaela's times change when the two new times are being added? Justify your answer. (1/0/0)
- b) Calculate the standard deviation for all Mikaela's 14 times. (0/0/2)

23. 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)