

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 62 points consisting of 24 E-, 23 C- and 15 A-points.

Level requirements for test grades

E: 14 points

D: 24 points of which 7 points on at least C-level

C: 33 points of which 13 points on at least C-level

B: 43 points of which 5 points on A-level

A: 51 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 answers 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.

16. Linnea is going to solve the following mathematical problem:

At a football match the spectators consisted of 7 times as many men as women. The total number of spectators was 2936.
How many men and women respectively were there?

Linnea writes down the following correct simultaneous equations to solve the problem:

$$\begin{cases} x = 7y \\ x + y = 2936 \end{cases}$$

- a) What does x represent in Linnea's simultaneous equations? (1/0/0)
- b) Solve Linnea's simultaneous equations and specify how many men and women respectively there were among the spectators. (2/0/0)
17. Benjamin has noticed that the volume of toiletries is given both in millilitres (ml) and in the American unit fluid ounces (fl oz).

Benjamin reads on a bottle of after shave and a bottle of shampoo and makes a table of values, see below.

	x (fl oz)	y (ml)
After shave	3.4	100
Shampoo	8.4	250

Benjamin claims that he can use the table of values and find a relation between the two volume units. He plots the values as two points in a coordinate system, and draws a line through them.

- a) Use the values in the table and determine the equation of Benjamin's line. Give your answer exactly in the form $y = kx + m$. (2/0/0)
- b) Use the equation in problem a) and calculate how many millilitres should be printed on a bottle of volume 4.0 fluid ounces. (1/0/0)
- c) There is an inconsistency in Benjamin's relation. Give an example of a volume x fluid ounces where Benjamin's relation does not work. Justify. (0/1/0)

18. The table below shows random samples for two different statistical materials.

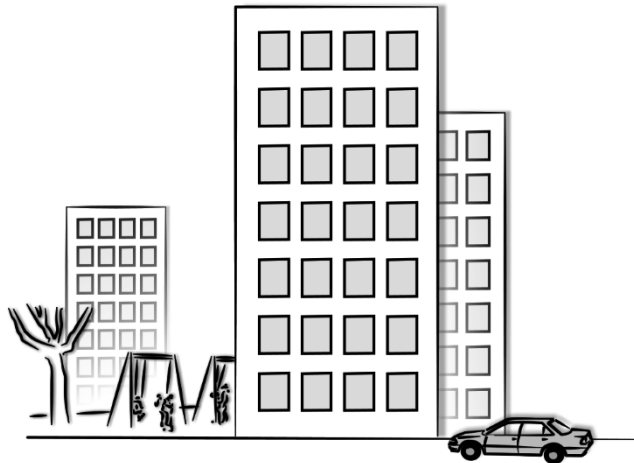
Random sample A	2	4	13	22	24
Random sample B	2	12	13	14	24

The mean and the median are 13, both for random sample A and random sample B.

a) Calculate the range and the standard deviation for the random samples A and B respectively. (2/0/0)

b) Explain the possible differences between the random samples A and B by using the different statistical measures. (1/0/0)

19. A cooperative flat was bought in June 2000 for SEK 850 000. In June 2011, it was sold at a price of SEK 1.6 million.

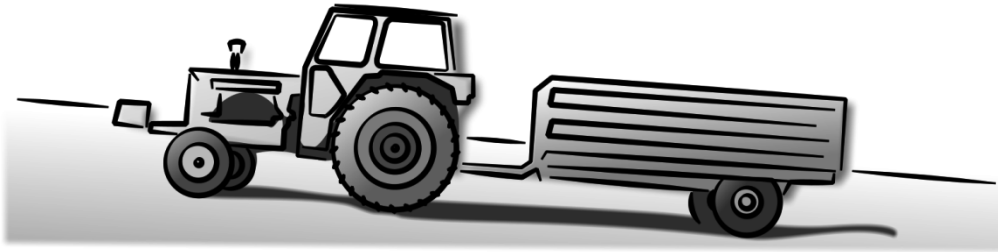


Assume that the yearly percentage increase has been of the same size during the whole period of time. Calculate the yearly percentage increase in value for the cooperative flat. (0/2/0)

20. It holds for a straight line that:

- the gradient $k > 0$
 - the line passes through the point $P(3, 5)$
- a) Investigate whether the line can pass through the point $(6, 4)$. (1/0/0)
- b) There are a number of points Q such that a line through P and Q has a positive gradient. Investigate what values the coordinates of Q , x and y , should have in order to satisfy the above conditions. (1/1/1)

21. The fuel consumption of a tractor depends, among other things, on the speed of the tractor.



Under certain conditions, the fuel consumption of a tractor can be described by the model

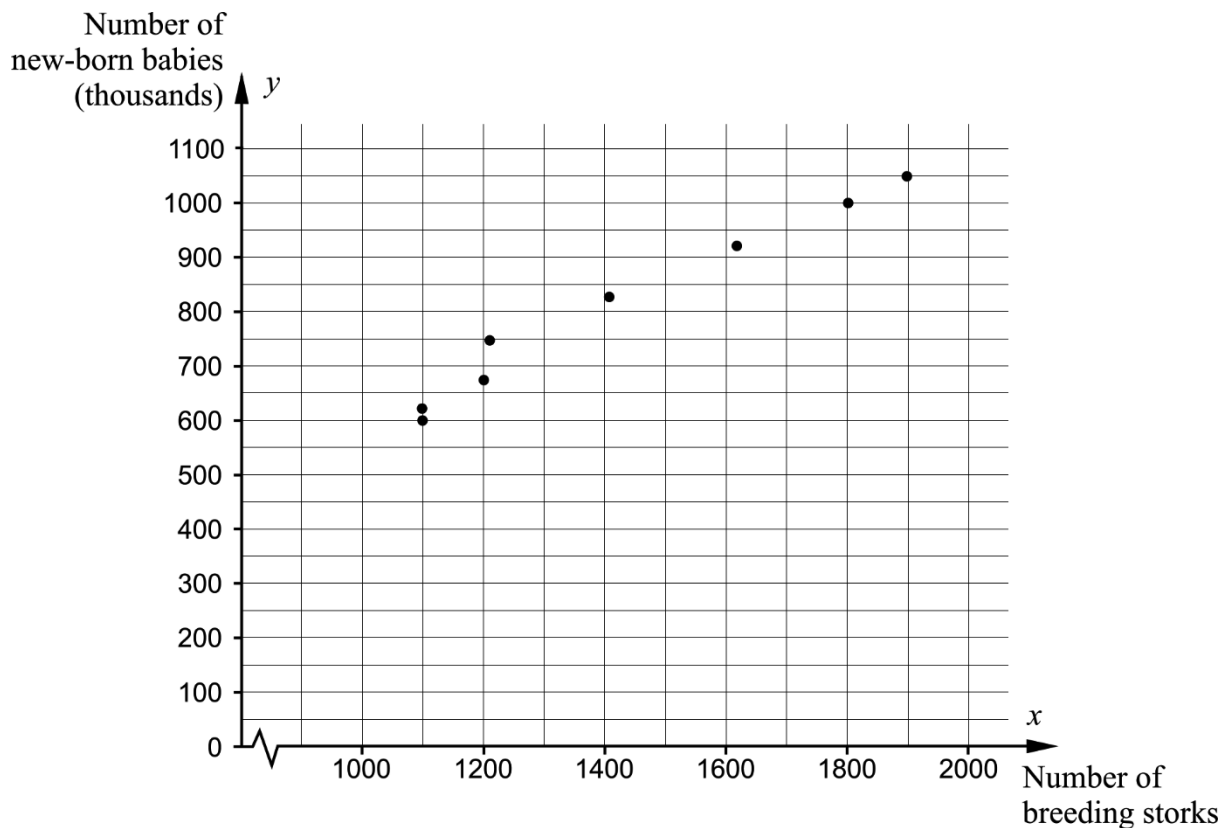
$$B(v) = 0.0010v^2 - 0.040v + 0.92 \quad v > 0$$

where B (litres/km) is the fuel consumption and v (km/h) is the speed of the tractor.

- a) Calculate the fuel consumption of the tractor at a speed of 10 km/h. (1/0/0)
- b) Determine the lowest fuel consumption the tractor can have according to this model. (0/2/0)

22. The table and diagram below show the number of breeding storks and the number of new-born babies in West Germany between the years 1965 and 1978.

Year	Number of breeding storks	Number of new-born babies (thousands)
1965	1900	1050
1966	1800	1000
1968	1610	920
1970	1405	825
1972	1208	750
1974	1200	675
1976	1100	620
1978	1100	600



a) Find a linear relation between the number of new-born babies in thousands, y , and the number of breeding storks, x . (0/2/0)

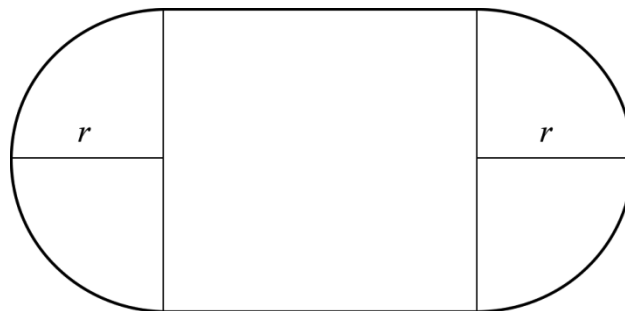
b) The correlation between x and y is 0.99. Simon comes to the conclusion that there is a strong causality between the number of new-born babies in thousands and the number of breeding storks in West Germany.

Is Simon right? Justify your answer. (0/1/0)

23. The figures below show a racecourse. The course where the horses run has a length of 800 m. The area bounded by the racecourse has the shape of one rectangle and two semi-circles and has an area of $43\,000\text{ m}^2$.



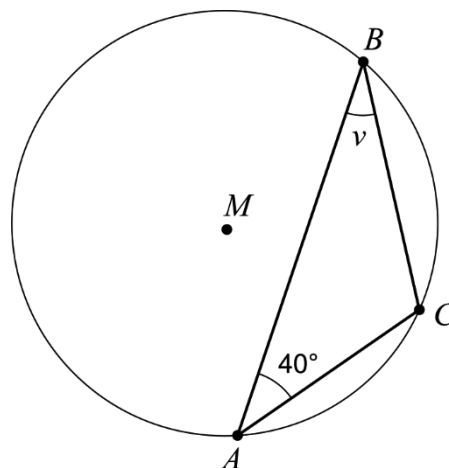
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Determine the radius r of the semi-circles.

(0/0/4)

24. The triangle ABC is inscribed in a circle with centre M . The distance AC has the same length as the radius of the circle. The angle $BAC = 40^\circ$, see figure.



Calculate the angle v .

(0/0/2)