| | |
|---|---|
| **Part D** | Problems 17-26 which require complete solutions. |
| **Test time** | 120 minutes. |
| **Resources** | Digital resources, formula sheet and ruler. |

**Level requirements**

The test consists of an oral part (Part A) and three written parts (Part B, Part C and Part D). Together they give a total of 65 consisting of 24 E-, 23 C- and 18 A-points.

Level requirements for test grades
E: 18 points
D: 28 points of which 8 points on at least C-level
C: 36 points of which 15 points on at least C-level
B: 46 points of which 7 points on A-level
A: 55 points of which 12 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.**

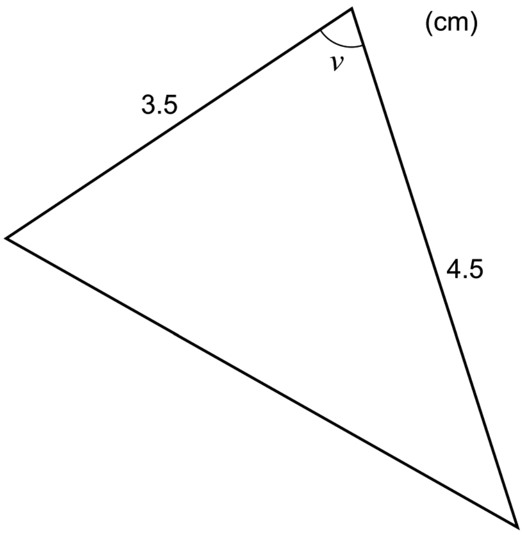
Name: ____________________

Date of birth: ____________________

Educational programme: ____________________

**Part D:** Digital resources are allowed. Do your solutions on separate sheets of paper.

**17.** Determine the acute angle $v$ so that the area of the triangle is 7.0 cm$^2$. (2/0/0)

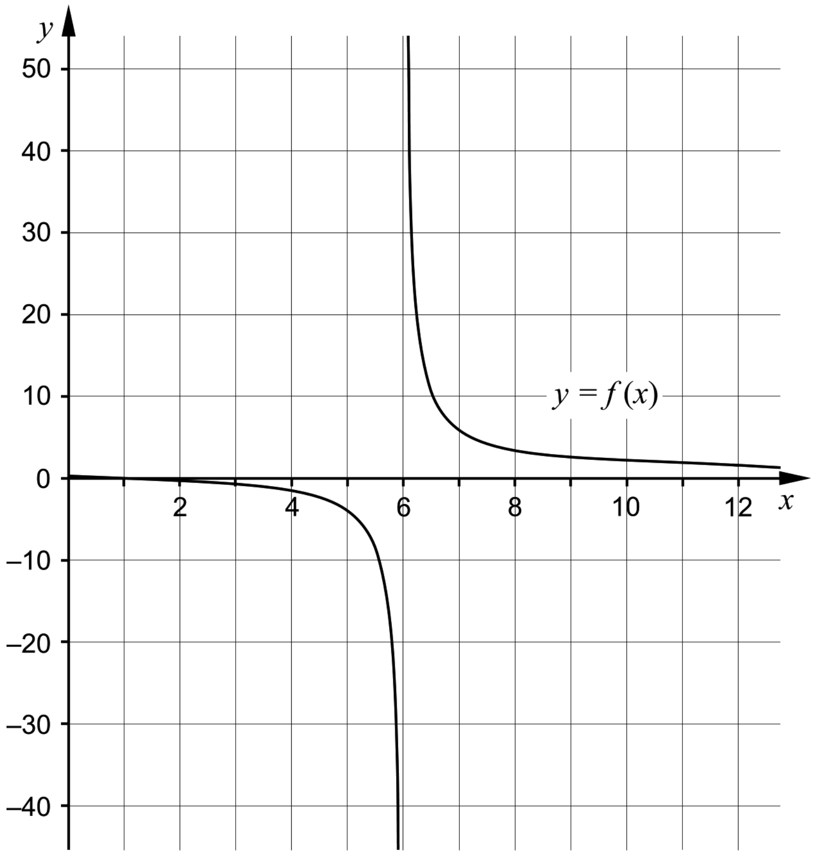



**18.** In Sweden we eat more and more pasta. According to a simplified model, the consumption of pasta in Sweden can be described by the exponential function: $P = 0.791 \cdot e^{0.0526 \cdot t}$
where $P$ is the yearly pasta consumption in kg per person and $t$ is the time in years after 1960.

a) Assume that the pasta consumption continues to increase according to the model. Determine in what year the yearly pasta consumption will be 15 kg per person. (2/0/0)

b) The model has corresponded well with reality from 1960 to today. Evaluate how well the model will correspond to reality at the end of this century. (2/0/0)

**19.** Sofia draws the graph of $f(x) = \dfrac{x-1}{x-6}$, see figure below.




a) Sofia claims that: “The largest value is found when $x = 6$”
Is she right? Justify. (1/0/0)

b) Sofia claims that: “For $x > 6$ the smallest value of the function is 1”
Is she right? Justify. (0/1/1)

**20.** Kalle is going to solve the following problems:

a) Find all antiderivatives of $f(x) = x^2$

b) Calculate $\int_0^2 x^2 \mathrm{d}x$

Below you can see his correct solution:

a) $f(x) = x^2$

$F(x) = \frac{x^3}{3} + C$ ANSWER: $F(x) = \frac{x^3}{3} + C$

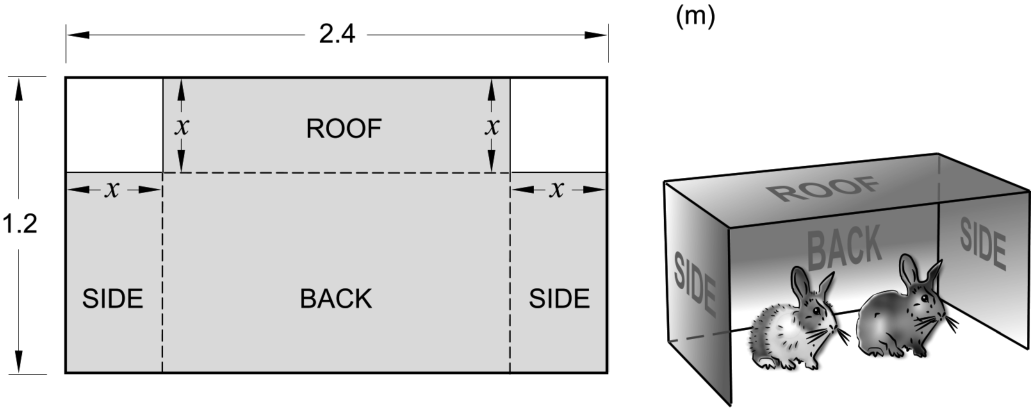
b) $\int_0^2 x^2 dx = \left[ \frac{x^3}{3} \right]_0^2 = \frac{2^3}{3} - \frac{0^3}{3} = \frac{8}{3}$ ANSWER: $\frac{8}{3}$

When he determines all antiderivatives in the a)-task he adds a constant $C$. Explain why he does not have to add a constant $C$ when calculating the integral in the b)-task.

(1/1/0)

**21.** Kajsa has a thin iron sheet that measures 2.4 m ×1.2 m. She will make a wind shield for her rabbits out of the iron sheet.

The wind shield will consist of a roof, two sides and a back. Kajsa will cut out two squares from the iron sheet and then fold it into a wind shield. Kajsa wants the wind shield to have as large volume as possible. Assume that the pieces she will cut out have the length $x$ metres where $0 < x < 1.2$
See figure.

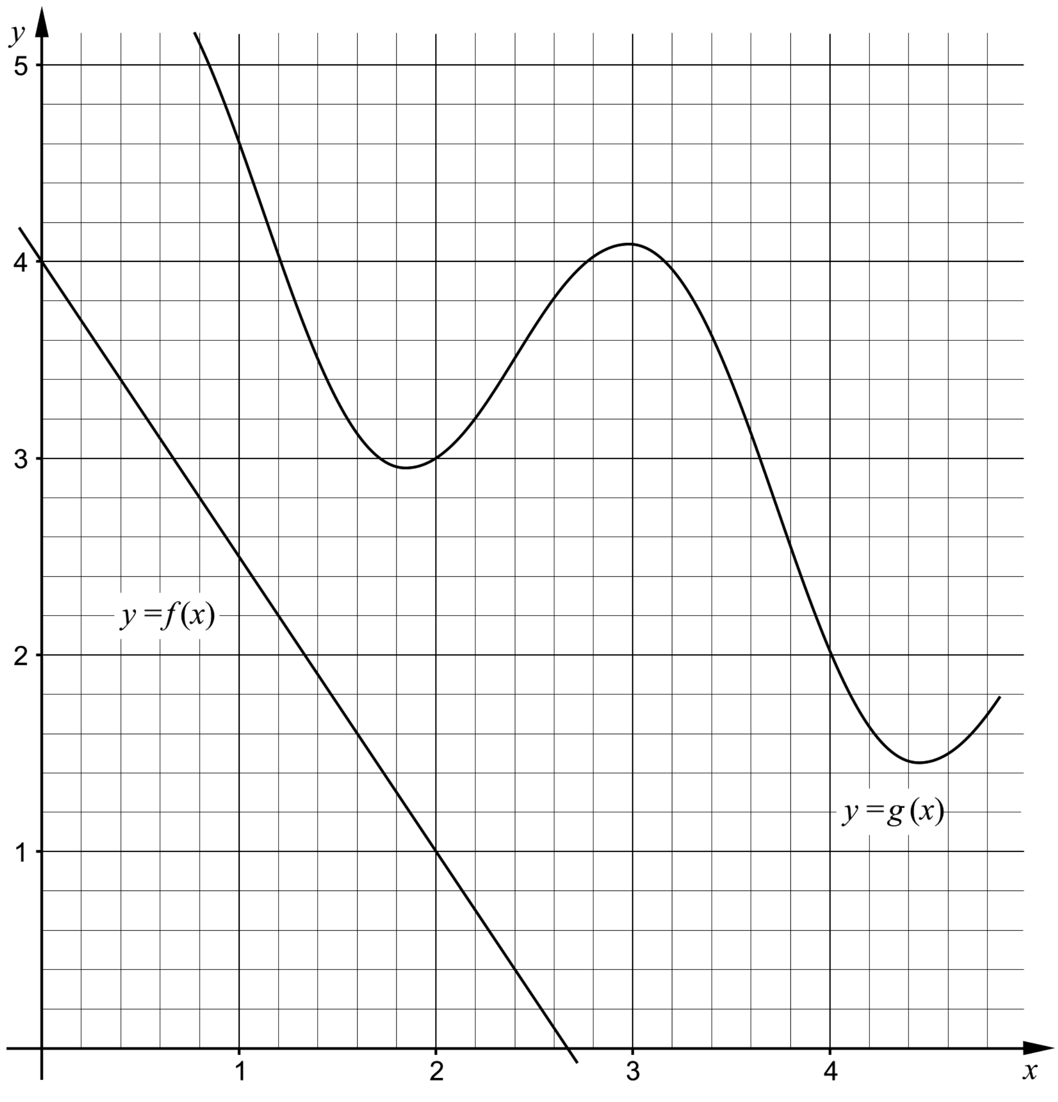



Determine $x$ so that the wind shield will have as large volume as possible. (0/3/0)

**22.** The graph of $f(x) = x^4 - 4x$ has a tangent at point $P$.
The tangent has the gradient $-17.5$
Determine the $x$-coordinate of point $P$. (0/2/0)

**23.** In the triangle $ABC$ the angle $B = 25°$ and the side $BC$ is twice as long as side $AC$. Calculate angle $A$. (0/3/0)

**24.** The figure shows the graphs of the functions $f$ and $g$.




It holds for the function $h$ that $h(x) = f(x) - g(x)$.
Determine $h'(2)$. (0/0/2)

**25.** It holds for a polynomial function $f$ that:

- $f''(x) = -2$ for all $x$
- $f(1) = 5$
- $f(2) = 3$

Determine the function $f$. (0/0/2)

**26.** The number of bacteria in a bacterial cultivation increases exponentially with time. At 16.00 the number of bacteria is 20 000 and the growth rate is then 5 000 bacteria/hour.

Determine how many bacteria there were in the bacterial cultivation at 12.00 (0/0/3)