

Name:	
Class:	



Standardised Competence-Oriented
Written School-Leaving Examination

AHS

8th May 2025

Mathematics



Advice for Completing the Tasks

Dear candidate,

The following booklet contains Part 1 and Part 2 tasks (divided into sub-tasks). The tasks can be completed independently of one another. You have a total of *270 minutes* available in which to work through this booklet.

Please do all of your working out solely in this booklet and on the paper provided to you. Write your name and that of your class on the cover page of the booklet in the spaces provided. Please also write your name on any separate sheets of paper used and number these pages consecutively. When responding to the instructions of each task, write the task reference (e.g. 25a1) on your sheet.

In the assessment of your work, everything that is not crossed out will be considered.

The use of the official formula booklet for this examination that has been approved by the relevant government authority is permitted. Furthermore, the use of electronic device(s) (e.g. graphic display calculators or other appropriate technology) is allowed provided there is no possibility of communicating via the internet, Bluetooth, mobile networks etc. and there is no access to your own data stored on the device.

An explanation of the task types is displayed in the examination room.

Instructions for Completing the Tasks

- Solutions must be unambiguous and clearly recognisable.
- Solutions must be given alongside their corresponding units if this has been explicitly required in the task instructions.

For tasks with open answer formats, evidence of the targeted core competency is required for the award of the point. When completing tasks with open answer formats, it is recommended that you:

- document how the solution was reached, even if electronic devices were used,
- explain any variables you have chosen yourself and give their corresponding units,
- avoid rounding prematurely,
- label diagrams or sketches.

Changing an answer for a task that requires a cross:

1. Fill in the box that contains the cross.
2. Put a cross in the box next to your new answer.

In this instance, the answer " $5 + 5 = 9$ " was originally chosen. The answer was later changed to be " $2 + 2 = 4$ ".

$1 + 1 = 3$	<input type="checkbox"/>
$2 + 2 = 4$	<input checked="" type="checkbox"/>
$3 + 3 = 5$	<input type="checkbox"/>
$4 + 4 = 4$	<input type="checkbox"/>
$5 + 5 = 9$	<input checked="" type="checkbox"/>
$6 + 6 = 10$	<input type="checkbox"/>

Selecting an item that has been filled in:

1. Fill in the box that contains the cross for the answer you do not wish to give.
2. Put a circle around the filled-in box you would like to select.

In this instance, the answer " $2 + 2 = 4$ " was filled in and then selected again.

$1 + 1 = 3$	<input type="checkbox"/>
$2 + 2 = 4$	<input checked="" type="checkbox"/>
$3 + 3 = 5$	<input type="checkbox"/>
$4 + 4 = 4$	<input checked="" type="checkbox"/>
$5 + 5 = 9$	<input type="checkbox"/>
$6 + 6 = 10$	<input type="checkbox"/>

Grading System

points awarded	grade
32–36 points	very good
27–31.5 points	good
22–26.5 points	satisfactory
17–21.5 points	pass
0–16.5 points	fail

Best-of Assessment: A best-of assessment approach will be applied to tasks 26, 27 and 28. Of these three Part 2 tasks, the task with the lowest point score will not be included in the total point score.

Good luck!

Task 1

Expressions

The following statement holds for the non-zero integers a and b : $a = -4 \cdot b$

Task:

Put a cross next to each of the two expressions that definitely result in a natural number.

[2 out of 5]

$a - b$	<input type="checkbox"/>
$\sqrt{-\frac{a}{b}}$	<input type="checkbox"/>
$a + b$	<input type="checkbox"/>
$(-a - b)^2$	<input type="checkbox"/>
$a \cdot b$	<input type="checkbox"/>

[0/1 p.]

Task 2

Domain

Six expressions defined on the universal set \mathbb{R} are shown below.

For one of these expressions, the set $D = \mathbb{R} \setminus \{1\}$ is the greatest possible domain.

Task:

Put a cross next to the correct expression. *[1 out of 6]*

$\frac{1}{x + 1}$	<input type="checkbox"/>
$\sqrt{x^{-1}}$	<input type="checkbox"/>
$\sqrt{x - 1}$	<input type="checkbox"/>
$\frac{1}{x - 1}$	<input type="checkbox"/>
$x - 1$	<input type="checkbox"/>
$\frac{1}{x}$	<input type="checkbox"/>

[0/1 p.]

Task 3

Equation with a Parameter

$a \cdot x - 5 = 10$ is an equation with $x \in \mathbb{R}$ and the parameter $a \in \mathbb{R}$.

Task:

Complete the gaps in the following sentence by putting a cross next to one of the given possibilities for each gap so that the sentence becomes a correct statement.

If _____ ① _____, then the equation has _____ ② _____.

①	
$a > 0$	<input type="checkbox"/>
$a = 0$	<input type="checkbox"/>
$a < 0$	<input type="checkbox"/>

②	
no real solutions	<input type="checkbox"/>
two real solutions	<input type="checkbox"/>
infinitely many real solutions	<input type="checkbox"/>

[0/1 p.]

Task 4

Points on a Line

The line g in \mathbb{R}^3 goes through the points $P = (-1, 0, 3)$ and $Q = (3, -1, 2)$.
The point A lies on g and is distinct from points P and Q .

Task:

Write down possible coordinates of A .

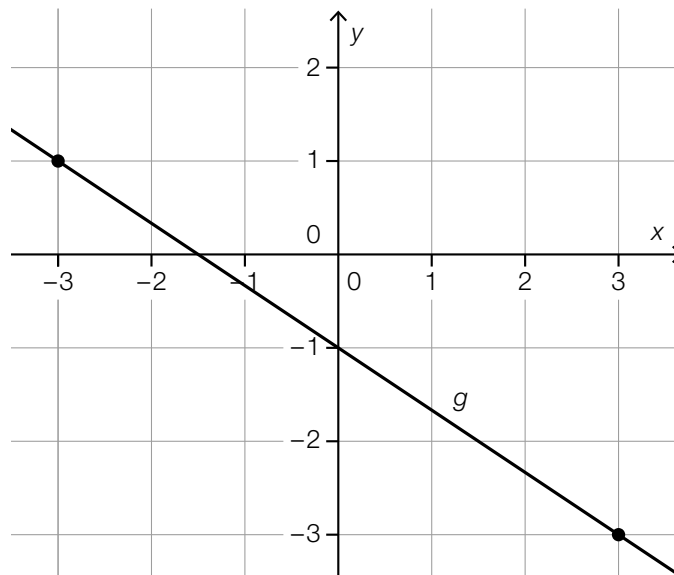
$A = (\rule{1cm}{0.4pt} , \rule{1cm}{0.4pt} , \rule{1cm}{0.4pt})$

[0/1 p.]

Task 5

Normal Vector of a Line

The diagram below shows the line g and two points on g that have integer coordinates.



Task:

Write down a normal vector \vec{n} for the line g .

$$\vec{n} = \begin{pmatrix} \boxed{} \\ \boxed{} \end{pmatrix}$$

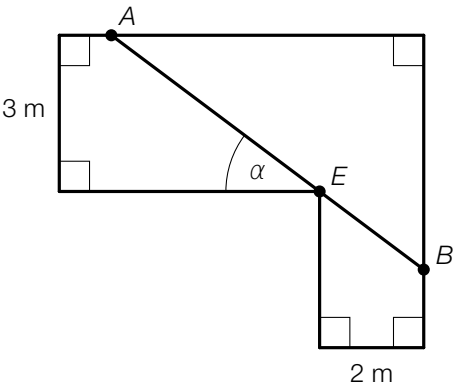
[0/1 p.]

Task 6

Corridor

The not-to-scale diagram below shows a corridor in a building. The corridor has a width of 3 m and 2 m respectively.

The line segment AB goes through the corner E .



Task:

Using the angle α , write down a formula that can be used to calculate the length of the line segment AB .

$\overline{AB} =$ _____

[0/1 p.]

Task 7

Income Tax

Workers in Austria have to pay part of their annual income E to the state in the form of income tax L (E, L in €).

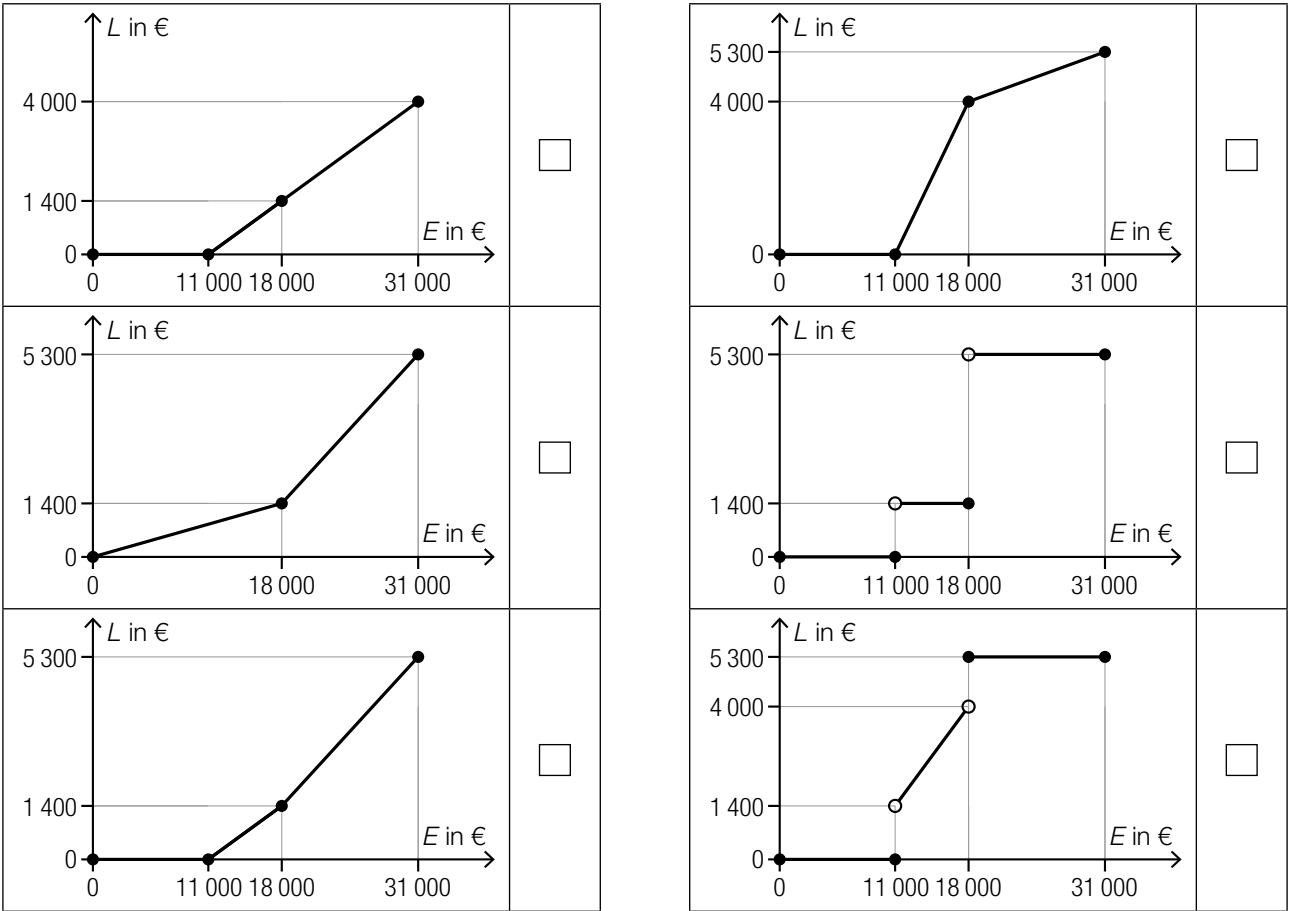
The table below shows how the corresponding income tax L was determined for each annual income E from € 0 to € 31 000 for the year 2022.

annual income E in €	income tax L in €
$E \leq 11\,000$	0
$11\,000 < E \leq 18\,000$	20 % of $(E - 11\,000)$
$18\,000 < E \leq 31\,000$	$1\,400 + [30\% \text{ of } (E - 18\,000)]$

One of the diagrams below correctly represents the relationship between each annual income E from € 0 to € 31 000 to the corresponding income tax L .

Task:

Put a cross next to the correct diagram. [1 out of 6]



Task 8

Linear Function

The following properties of the linear function f are known:

- The function f has a zero when $x = -4$.
- For all $x \in \mathbb{R}$, $f(x + 2) = f(x) - 6$ holds.

Task:

Write down an equation of the function f .

$f(x) =$ _____

[0/1 p.]

Task 9

Mappings

Mappings are shown in the tables below. Two of these tables each describe a mapping that can be represented by a function of the form $f(x) = \frac{a}{x}$, with $a, x \in \mathbb{R} \setminus \{0\}$.

Task:

Put a cross next to each of the two tables that show a mapping of the type described above.
[2 out of 5]

<table><tr><th>x</th><th>f(x)</th></tr><tr><td>-2</td><td>30</td></tr><tr><td>-4</td><td>15</td></tr></table>	x	f(x)	-2	30	-4	15	<input type="checkbox"/>
x	f(x)						
-2	30						
-4	15						
<table><tr><th>x</th><th>f(x)</th></tr><tr><td>-2</td><td>-20</td></tr><tr><td>-4</td><td>-30</td></tr></table>	x	f(x)	-2	-20	-4	-30	<input type="checkbox"/>
x	f(x)						
-2	-20						
-4	-30						
<table><tr><th>x</th><th>f(x)</th></tr><tr><td>-2</td><td>-10</td></tr><tr><td>-4</td><td>-30</td></tr></table>	x	f(x)	-2	-10	-4	-30	<input type="checkbox"/>
x	f(x)						
-2	-10						
-4	-30						
<table><tr><th>x</th><th>f(x)</th></tr><tr><td>-2</td><td>18</td></tr><tr><td>-4</td><td>-9</td></tr></table>	x	f(x)	-2	18	-4	-9	<input type="checkbox"/>
x	f(x)						
-2	18						
-4	-9						
<table><tr><th>x</th><th>f(x)</th></tr><tr><td>-2</td><td>-24</td></tr><tr><td>-4</td><td>-12</td></tr></table>	x	f(x)	-2	-24	-4	-12	<input type="checkbox"/>
x	f(x)						
-2	-24						
-4	-12						

[0/1 p.]

Task 10

Argument of a Quadratic Function

Let f be a quadratic function with $f(x) = \frac{2}{3} \cdot x^2 + b \cdot x + c$ with $b, c \in \mathbb{R}$.

The table below shows pairs of values of f , where $r > 0$.

x	-1	0	r
$f(x)$	5	1	1

Task:

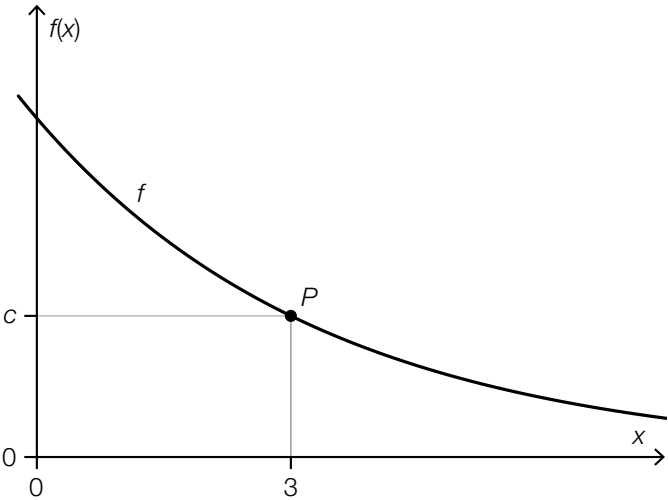
Determine the value of r .

[0/1 p.]

Task 11

Exponential Function

The diagram below shows the graph of an exponential function f with $f(x) = a \cdot b^x$ with $a, b \in \mathbb{R}^+$. The point $P = (3, c)$ with $c \in \mathbb{R}^+$ lies on the graph of f .



Task:

Using a and c , complete the equation of the function f shown below.

$f(x) = a \cdot \left(\boxed{} \right)^x$

[0/1 p.]

Task 12

Trigonometric Functions

For two trigonometric functions f and g , the following statements hold:

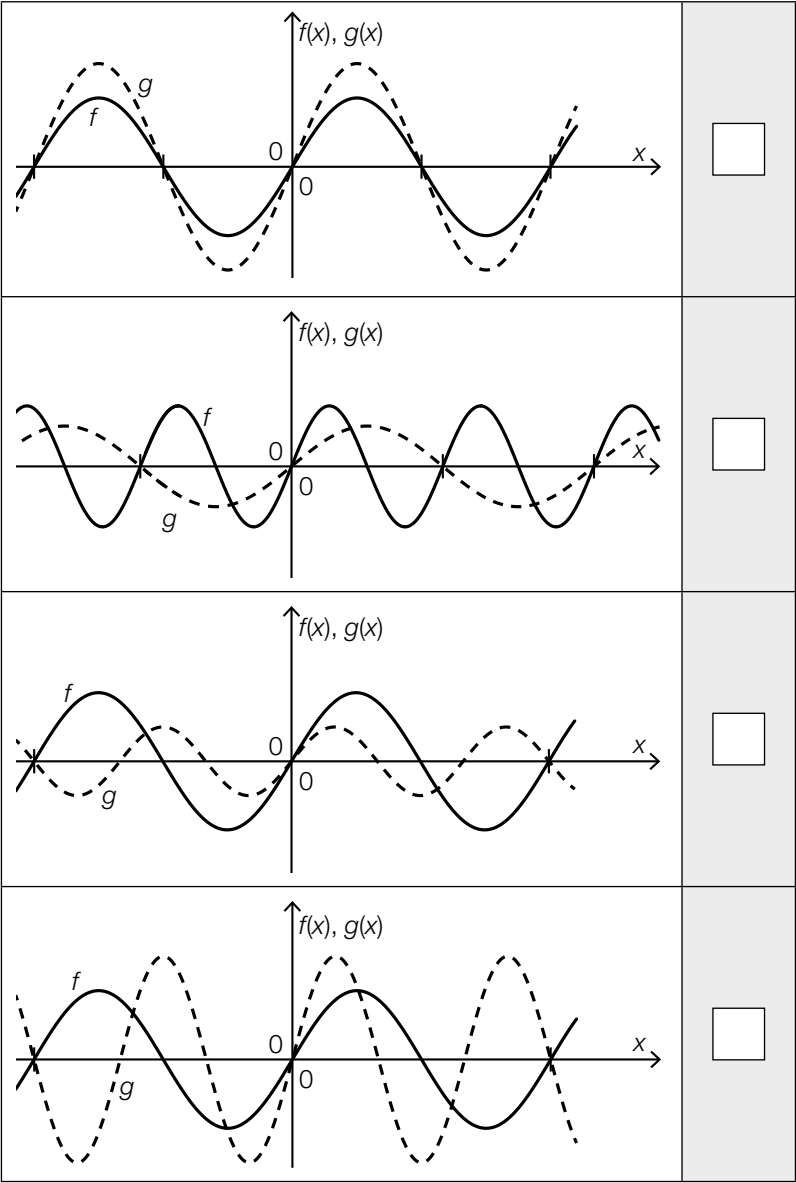
$f(x) = a \cdot \sin(b \cdot x)$ with $a, b \in \mathbb{R}^+$

$g(x) = c \cdot \sin(d \cdot x)$ with $c, d \in \mathbb{R}^+$

The diagrams below show graphs of f and g for particular values of a, b, c and d . The common zeros for each pair of functions in the region shown are marked on the x -axis.

Task:

Match each of the four pairs of graphs to the corresponding conditions from A to F.



A	$a > c, b < d$
B	$a < c, b = d$
C	$a < c, b < d$
D	$a = c, b > d$
E	$a > c, b > d$
F	$a < c, b > d$

Task 13

Differentiation Rules

Let f be a power function with $f(x) = a \cdot x^b$ with $a, b \in \mathbb{N}$ and $a > 1$ as well as $b > 1$. For f' , $f'(x) = c \cdot x^d$ with $c, d \in \mathbb{N}$ holds.

Task:

Put a cross next to the equation that is definitely true. *[1 out of 6]*

$b = c$	<input type="checkbox"/>
$a \cdot b = c$	<input type="checkbox"/>
$a \cdot (b - 1) = c$	<input type="checkbox"/>
$c - 1 = d$	<input type="checkbox"/>
$d - 1 = b$	<input type="checkbox"/>
$d - 1 = c$	<input type="checkbox"/>

[0/1 p.]

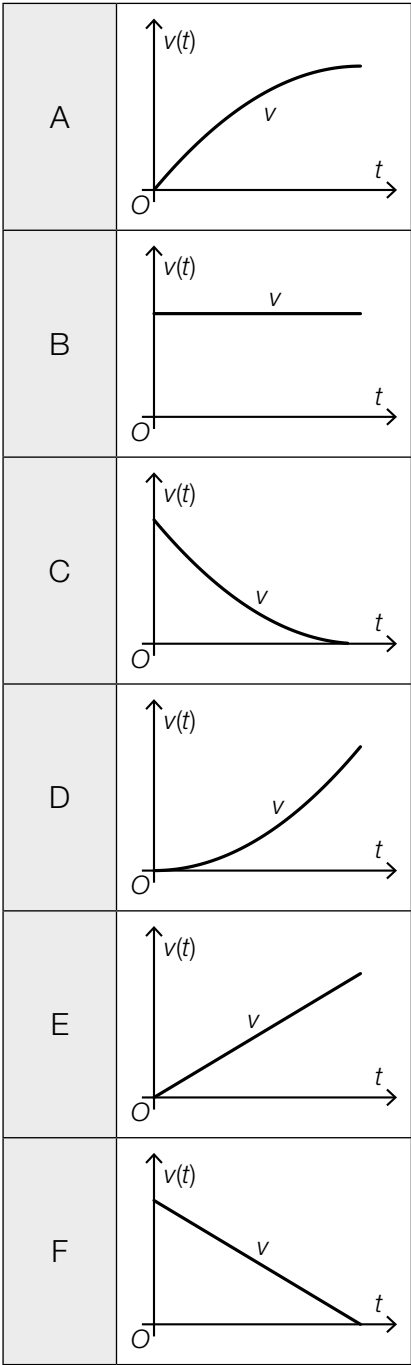
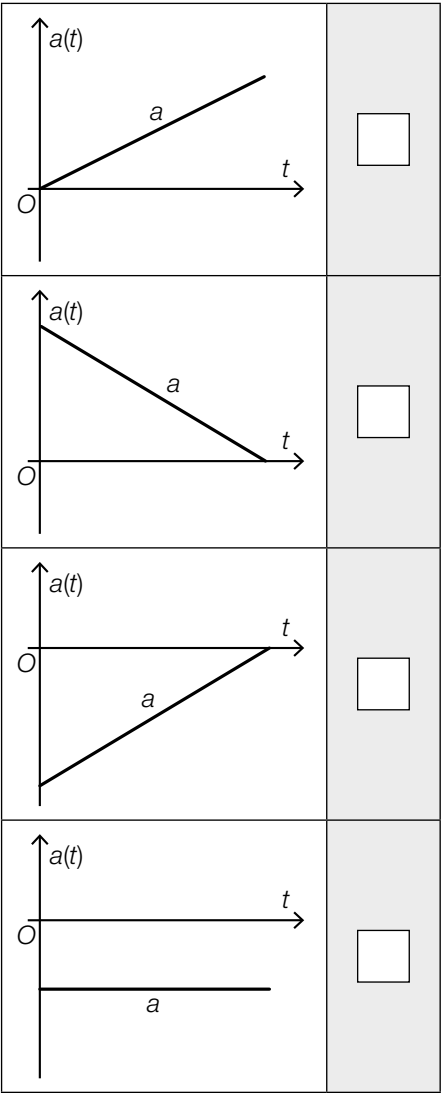
Task 14

Velocity and Acceleration

Four graphs of acceleration functions and six graphs of velocity functions in terms of time t (each for the same period of time) are shown in the diagrams below.

Task:

Match each of the four acceleration function graphs to the corresponding velocity function graph from A to F.



Task 15

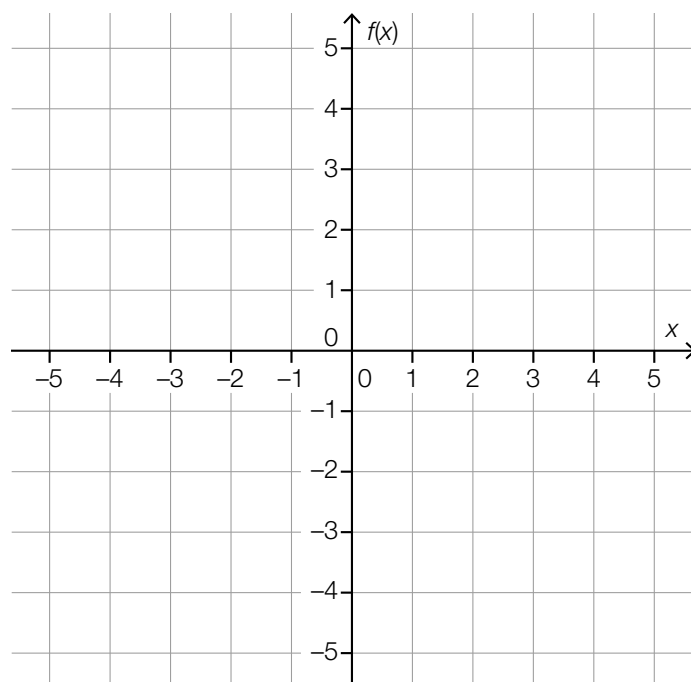
Third Degree Polynomial Function

The following statements hold for the third-degree polynomial function f :

- $f(1) = 2$
- $f'(1) = 0$
- $f''(1) = 0$

Task:

Sketch the graph of one such third-degree polynomial function in the coordinate system below.



[0/1 p.]

Task 16

Estimating a Definite Integral

Let $f: [0, 2] \rightarrow \mathbb{R}^+$ be a continuous function.

The function f is strictly monotonically increasing in the interval $[0, 1]$ and is strictly monotonically decreasing in the interval $[1, 2]$.

The definite integral $\int_0^2 f(x) \, dx$ is to be estimated using the values $f(0)$, $f(1)$ and $f(2)$.

Task:

Complete the gaps in the following sentence by putting a cross next to one of the given possibilities for each gap so that the sentence becomes a correct statement.

The inequalities _____^①_____ and _____^②_____ definitely hold.

①		②	
$\int_0^2 f(x) \, dx \geq 1 \cdot f(0) + 1 \cdot f(1)$	<input type="checkbox"/>	$\int_0^2 f(x) \, dx \leq 2 \cdot f(0)$	<input type="checkbox"/>
$\int_0^2 f(x) \, dx \geq 1 \cdot f(1) + 1 \cdot f(2)$	<input type="checkbox"/>	$\int_0^2 f(x) \, dx \leq 2 \cdot f(1)$	<input type="checkbox"/>
$\int_0^2 f(x) \, dx \geq 1 \cdot f(0) + 1 \cdot f(2)$	<input type="checkbox"/>	$\int_0^2 f(x) \, dx \leq 2 \cdot f(2)$	<input type="checkbox"/>

[0/1½/1 p.]

Task 17

Definite Integral

Let f be a polynomial function and F be an antiderivative of f .

Task:

Put a cross next to the equation that is definitely true. [1 out of 6]

$\int_a^b (f(x) + x) \, dx = F(b) + b - (F(a) + a)$	<input type="checkbox"/>
$\int_a^b f(b \cdot x) \, dx = F(b \cdot b) - F(b \cdot a)$	<input type="checkbox"/>
$\int_a^b (f(x) + b - a) \, dx = F(b) - F(a) + \frac{b^2}{2} - \frac{a^2}{2}$	<input type="checkbox"/>
$\int_a^b b \cdot f(x) \, dx = b \cdot F(b) - b \cdot F(a)$	<input type="checkbox"/>
$\int_a^b x \cdot f(x) \, dx = b \cdot F(b) - a \cdot F(a)$	<input type="checkbox"/>
$\int_b^a f(x) \, dx = \frac{1}{F(b)} - \frac{1}{F(a)}$	<input type="checkbox"/>

[0/1 p.]

Task 18

Acceleration

A car in motion has a velocity of 15 m/s at time $t = 0$.

The equation $a(t) = -0.1 \cdot t^2 + t$ (t in s, $a(t)$ in m/s^2) holds for the acceleration a of the car at time t .

Task:

Determine the velocity of the car (in m/s) at time $t = 5$ s.

[0/1 p.]

Task 19

Siblings

A particular number of people is divided into groups A and B.

Each person in these two groups has either 0, 1 or 2 siblings.

The number of siblings is represented by two percentage bar graphs shown below (see the diagram below in which the marked boundaries between the regions shown correspond to integer percentage values).



Task:

Complete the gaps in the following sentence by putting a cross next to one of the given possibilities for each gap so that the sentence becomes a correct statement.

The mode of the number of siblings in group A is ① the mode of group B. The arithmetic mean of the number of siblings in group A is ② the arithmetic mean of group B.

①		②	
greater than	<input type="checkbox"/>	greater than	<input type="checkbox"/>
less than	<input type="checkbox"/>	less than	<input type="checkbox"/>
equal to	<input type="checkbox"/>	equal to	<input type="checkbox"/>

[0/1½/1 p.]

Task 20

Maximum Daily Temperatures

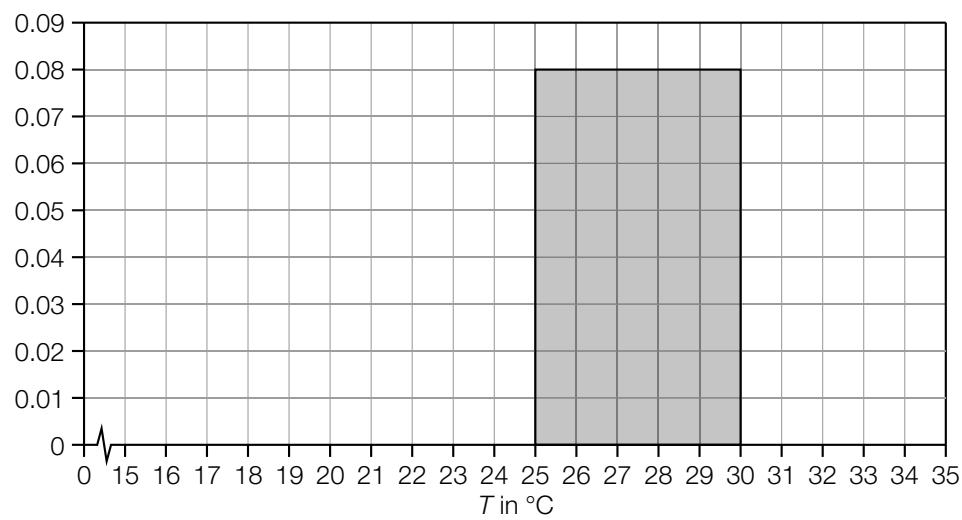
At a particular place, the maximum daily temperature was measured on 30 consecutive days. The table below shows the results of these measurements.

maximum daily temperature T in $^{\circ}\text{C}$	number of days
$15 \leq T < 25$	9
$25 \leq T < 30$	12
$30 \leq T < 35$	9

The area of a rectangle in the histogram shown below represents the relative frequency of the maximum daily temperatures in the corresponding class.

Task:

Complete the histogram below with the missing rectangles so that the data in the table above are represented correctly.



[0/1 p.]

Task 21

Arithmetic Mean

A list of data x_1, x_2, \dots, x_6 has arithmetic mean a .

This list of data is expanded by 4 values so that a new list of data $x_1, x_2, \dots, x_6, x_7, x_8, x_9, x_{10}$ with arithmetic mean b is created.

Task:

Write down a formula in terms of a and b that can be used in all cases to calculate the sum below.

$$x_7 + x_8 + x_9 + x_{10} = \underline{\hspace{10cm}}$$

[0/1 p.]

Task 22

Dice

Stefanie makes a 6-sided dice out of wood. The faces are labelled 1, 2, 3, 4, 5 and 6. After she has finished making it, she would like to check whether the dice is fair.

She rolls the dice 300 times. A 6 is rolled n times in these 300 rolls. Based on these data, she determines an estimate p for the probability of rolling a 6 with this dice.

She is satisfied with her dice if $0.12 \leq p \leq 0.2$ holds.

Task:

Determine the smallest possible and largest possible value of n such that $0.12 \leq p \leq 0.2$ holds.

smallest possible value of n : _____

largest possible value of n : _____

[0/1 p.]

Task 23

Probability Distribution for a Random Variable

The table below shows the probability distribution for a random variable X that can only take the values 0, 1, 2, 3 or 4.

k	0	1	2	3	4
$P(X = k)$	$\frac{1}{16}$	$\frac{4}{16}$		$\frac{4}{16}$	$\frac{1}{16}$

Task:

Write down the missing value in the table above.

[0/1 p.]

Task 24

Experiments

A particular experiment is conducted 20 times. Each individual experiment results in success with the same probability p , independent of all other experiments.

An expression with which the probability of exactly one experiment resulting in success in these 20 experiments can be calculated is required.

Task:

Write down an expression in terms of p with which this probability can be calculated.

[0/1 p.]

Task 25 (Part 2)

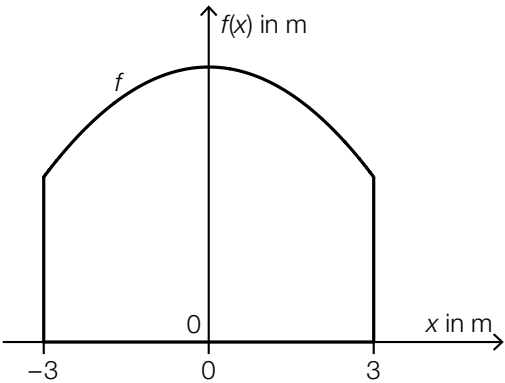
Garden

Task:

- a) A bird’s eye view of a flowerbed is modelled by the not-to-scale diagram on the right.

The flowerbed is bounded by three straight sides and the graph of the function $f: [-3, 3] \rightarrow \mathbb{R}$.

$f(x) = a \cdot x^2 + b$ with $a, b \in \mathbb{R}$ holds.

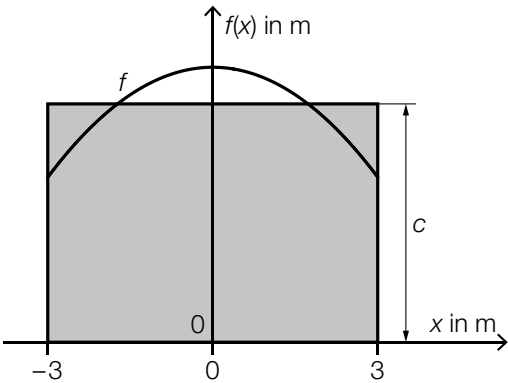


- 1) Complete the gaps in the following sentence by putting a cross next to one of the given possibilities for each gap so that the sentence becomes a correct statement. [0/½/1 p.]

_____ ① _____ holds for the parameter a ; _____ ② _____ holds for the parameter b .

①		②	
$a < 0$	<input type="checkbox"/>	$b < 0$	<input type="checkbox"/>
$0 < a < 1$	<input type="checkbox"/>	$b = 0$	<input type="checkbox"/>
$a > 1$	<input type="checkbox"/>	$b > 0$	<input type="checkbox"/>

This flowerbed is to be redesigned so that it takes the form of a rectangle of length 6 m and width c (in m) (see diagram below). The area of the flowerbed is to remain unchanged.



- 2) Write down a formula in terms of f that can be used to calculate c .

$c =$ _____

[0/1 p.]

- b) A spruce was planted in a garden. The height of this spruce can be modelled in terms of the time t by the function h .

$$h(t) = \frac{35}{1 + 7 \cdot e^{-0.06 \cdot t}} - 4$$

t ... time in years with $t = 0$ for the time of planting

$h(t)$... height of the spruce at time t in m

According to this model, the height of the spruce tends towards the value G as t grows larger.

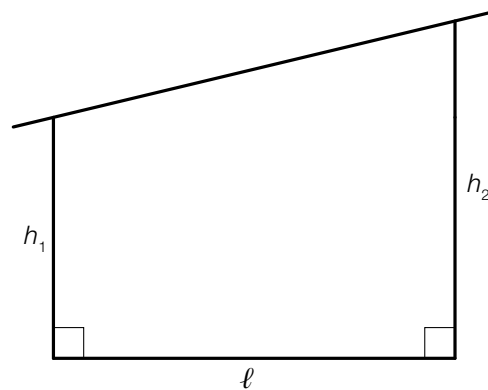
$G = \lim_{t \rightarrow \infty} h(t)$ holds.

- 1) Write down the value of G .

$G = \underline{\hspace{2cm}}$ m

[0/1 p.]

- c) A shed is to be built in a garden. The diagram below shows a cross-section view of a plan of this shed.



- 1) In the diagram above, draw the angle α that can be calculated using the formula shown below.

$$\alpha = \arctan\left(\frac{h_2 - h_1}{\ell}\right)$$

[0/1 p.]

Task 26 (Part 2, Best-of Assessment)

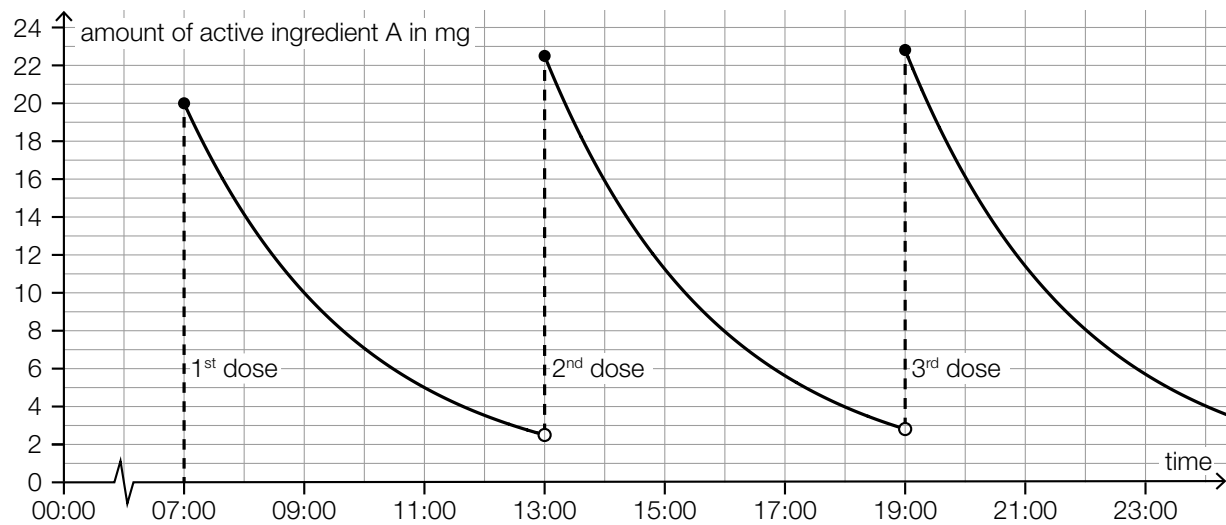
Active Ingredients

Active ingredients are broken down in the human body at different rates.

Task:

- a) Mr Winter receives a dose of active ingredient A a total of 3 times. At 07:00, Mr Winter receives his first dose of active ingredient A.

The diagram below shows a model of the amount of active ingredient A in Mr Winter’s body in terms of the time.



- 1) Complete the following sentence by putting a cross next to one of the given possibilities for each gap so that the sentence becomes a correct statement. [0/1½/1 p.]

The amount of active ingredient A in Mr Winter’s body at 13:00 is ① the amount of active ingredient A in Mr Winter’s body at 07:00; the half-life of active ingredient A in Mr Winter’s body is ②.

①		②	
equal to	<input type="checkbox"/>	2 h	<input type="checkbox"/>
less than	<input type="checkbox"/>	3 h	<input type="checkbox"/>
greater than	<input type="checkbox"/>	6 h	<input type="checkbox"/>

- b) Ms Egger receives a dose of active ingredient B at time $t = 0$.
 The real function m_B with $m_B(t) = 1.019 \cdot t \cdot e^{-0.025 \cdot t}$ models the amount of active ingredient B in Ms Egger's body in terms of the time (t in min, $m_B(t)$ in mg).

From the time $t = 240$ min, the amount of active ingredient B in Ms Egger's body can be modelled by the linear function f (t in min, $f(t)$ in mg).

The functions m_B and f have the same value and the same gradient when $t = 240$ min.

- 1) Write down an equation of the function f .

$f(t) =$ _____ [0/1 p.]

- c) The probability of experiencing nausea as a side effect after taking active ingredient C is 14 %.

n people who have taken active ingredient C are selected at random. The number of people who experience nausea as a side effect is assumed to be binomially distributed.

- 1) Interpret the inequality below in the given context.

$$1 - 0.86^n \geq 0.90 \quad [0/1 p.]$$

The probability that tiredness occurs as a side effect after taking active ingredient C is given by a .

The side effects of nausea and tiredness occur independently of each other.

The probability that both nausea and tiredness occur as side effects is 0.0126.

- 2) Determine a .

$a =$ _____ [0/1 p.]

Task 27 (Part 2, Best-of Assessment)

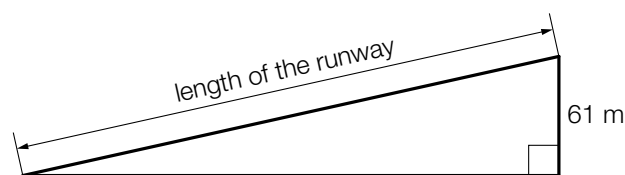
Mount Everest Marathon

The 42.195 km long Mount Everest Marathon is one of the most demanding marathons in the world. The starting point is the base camp of Mount Everest.

Task:

- a) The journey to the base camp starts at Lukla airport in Nepal.

It can be assumed that the runway at Lukla airport has a constant gradient of 11.7 %. The runway covers a difference in altitude of 61 m (see the not-to-scale diagram below).



- 1) Determine the length of the runway.

[0/1 p.]

The *Mount Everest Trek* runs from Lukla airport to the base camp and is completed on foot. The prevailing low air pressure there makes this trek particularly demanding.

Lukla airport lies 2 860 m above sea level.

The base camp lies 5 364 m above sea level.

It can be assumed that the air pressure reduces exponentially with increasing height above sea level.

For an increase in height above sea level of 80 m, the air pressure reduces by 1 %.

On a particular day, the air pressure at Lukla airport is 708 hectopascals (hPa).

- 2) Under this assumption, determine the air pressure at the base camp on this day. [0/1 p.]

- b) The course of the marathon goes from the starting point at the base camp to the end point in Namche. At particular waypoints, the time taken for a particular runner to reach these waypoints is recorded (see table below).

name of the waypoint	the distance covered until this waypoint in km	the time taken to reach this waypoint in h
base camp	0	0
Dingboche	17.3	t_1
Tengboche	32.6	t_2
Namche	42.195	t_3

The expected time t_3 to complete the whole marathon can be approximated using the time t_1 and the following formula:

$$t_3 = t_1 \cdot \left(\frac{42.195}{17.3}\right)^k$$

t_3 ... the expected time for the whole marathon in h

t_1 ... the time taken to reach the waypoint Dingboche in h

$k > 0$... fatigue factor

For this runner, $k = 1.073$ holds.

The runner sets off from the base camp at 07:00 (07:00:00). At 08:30 (08:30:00), she reaches the waypoint Dingboche. According to the model above, the runner reaches the finish line in Namche at a particular time of day.

- 1) For this particular time of day, write down the hours and minutes in the boxes provided below.

time of day: : : 16

[0/1 p.]

- c) After completing the marathon, two values are calculated for all runners as part of the race analysis:
- the average speed \bar{v} (in km/h)
 - the pace c (in min/km)

The pace gives the average number of minutes required per kilometer.

- 1) Complete the gaps in the following sentence by putting a cross next to one of the given possibilities for each gap so that the sentence becomes a correct statement. [0/½/1 p.]

The pace c can be calculated using the equation _____^①_____, and it _____^②_____ if the average speed \bar{v} doubles.

①		②	
$c = \frac{60}{\bar{v}}$	<input type="checkbox"/>	halves	<input type="checkbox"/>
$c = \frac{1}{\bar{v}}$	<input type="checkbox"/>	doubles	<input type="checkbox"/>
$c = \frac{3.6}{\bar{v}}$	<input type="checkbox"/>	quadruples	<input type="checkbox"/>

Task 28 (Part 2, Best-of Assessment)

Chocolate

A company produces different types of chocolate.

Task:

- a) A new type of chocolate is made of milk chocolate and white chocolate.

The ingredients for 100 g of milk chocolate and 100 g of white chocolate are shown in the table below.

	sugar	cacao	milk powder	other ingredients
milk chocolate	35 g	42 g	21 g	2 g
white chocolate	38 g	30 g	30 g	2 g

The cacao content of the new type of chocolate is 35 %.

For the production of a 300 g bar of the new type of chocolate, v grams of milk chocolate and w grams of white chocolate are required.

- 1) Determine v and w . [0/1 p.]

For the production of 1 kg of milk powder, 7 litres of milk are required.

- 2) Determine the number of litres of milk required for the production of the milk powder for a 300 g bar of the new type of chocolate. [0/1 p.]

- b) In a machine melted chocolate is brought to the required temperature for further processing. The function $T: [0, 1.5] \rightarrow \mathbb{R}^+$ models the temperature of the chocolate in terms of the time.

The following equation holds:

$$T(t) = -\frac{304}{27} \cdot t^5 + \frac{392}{27} \cdot t^4 + \frac{1100}{27} \cdot t^3 - 62 \cdot t^2 + 45$$

t ... time in h

$T(t)$... temperature of the chocolate at time t in °C

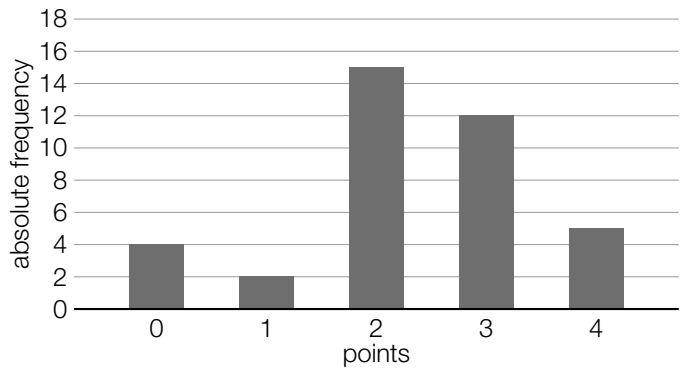
Until time t_1 , the temperature of the chocolate in the machine reduces. From time t_1 , the temperature increases again.

- 1) Determine the average rate of change of the temperature of the chocolate in the time interval $[0, t_1]$. Write down the result in °C/min. [0/1 p.]

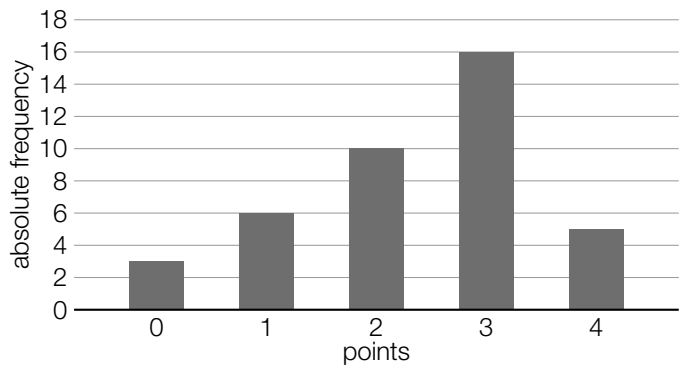
- c) Before the new type of chocolate is brought to market, it is tasted by testers. The testers are divided into two groups of different sizes, A and B. Each tester rates the new type of chocolate between 0 and 4 points.

The absolute frequencies of the results are shown in the diagrams below.

group A



group B



- 1) Complete the gaps in the following sentence by putting a cross next to one of the given possibilities for each gap so that the sentence becomes a correct statement. [0/1½/1 p.]

The relative frequency of the 4-point rating for group A is ① the relative frequency of the 4-point rating for group B; the median of the results for group A is ② than the median for group B.

①		②	
greater than	<input type="checkbox"/>	greater than	<input type="checkbox"/>
less than	<input type="checkbox"/>	less than	<input type="checkbox"/>
equal to	<input type="checkbox"/>	equal to	<input type="checkbox"/>

