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## **Why are you tested in mathematics, geometry and physics, at Swiss AviationTraining?**

Swiss AviationTraining requires that, before entering our school, you have already gained a certain level of knowledge in the subjects mentioned above. **This knowledge is tested** previously to the beginning of the course, giving you thereby the opportunity to close any gap you may have before you start your classes at Swiss AviationTraining.

### **Why is previous knowledge required?**

- During your aeronautical studies, you will be confronted with mathematical subjects such as aerodynamics or power plants. But also subjects like meteorology, navigation or aircraft performance require you to handle **mathematical calculations**.
- For centuries, trigonometry was vital for navigational purposes. And even today, in the age of flight management systems, pilots still need solid **geometric knowledge** to pass in navigation and aerodynamics.
- It goes without saying that aerodynamics and airframes and systems are related to **physics**. And the laws of the lever will also play an important role when you do your mass & balance calculations.

### **These are our requirements**

The demands of Swiss AviationTraining are listed below. At the entry test, you can expect to be asked three questions about each chapter mentioned.

## Requirements for candidates in the subject mathematics

To meet the expectations of Swiss AviationTraining in the subject mathematics, you have to be familiar with the following:

### **Chapter 1: arithmetic terms, sums and products**

- You can solve simple arithmetic problems (sums and products). You correctly apply the basic arithmetic formulae (for example: *products are calculated first, before the sums*).
- You are able to mathematically solve simple problems formulated in text form. Problems formulated in an abstract way do not cause any difficulty for you either.

### **Chapter 2: ratios and percents**

- You know how to handle figures expressed as percents and you can do simple calculations.
- You correctly solve problems formulated in text form that deal with ratios.
- You find the correct solution for complex and abstract problems formulated in text form that include ratios and percents.

### **Chapter 3: square and cube calculations**

- You are familiar with raising numbers to a given power and the way this is expressed in mathematics (i.e.  $4^5 = 1'024$ ).
- You can find the square or cube root of an integer.
- You can calculate the surface areas of rooms or objects with a square base.
- You can determine the linear measures and volume of rectangular solids or receptacles.

### **Chapter 4: algebraic terms**

- You can make correct algebraic calculations with terms in brackets.
- You feel at ease when solving simple algebraic problems formulated in text form (sums and products).
- You know the different mathematical laws that are applicable for algebra. Namely the laws about sums, products and the use of brackets. You can pick the correct mathematical law out of a list of four suggestions.

### **Chapter 5: algebraic fractions**

- You correctly solve fractions and convert the result into natural numbers.
- You can simplify and remodel fractions.
- You can pick the correct algebraic equation out of a list of four equations containing fractions.

**Chapter 6 linear equations**

- You understand simple linear equations with one unknown. You can solve such an equation.
- You can transform problems formulated in text form into a linear equation with one unknown.
- Furthermore, you can correctly solve such problems formulated in text form (again by developing a linear equation with one unknown).

**Chapter 7: linear equations with several unknowns**

- You are given different systems of equations. Each system consists of two equations and two unknowns. You are capable of solving these systems of equations.
- In accordance with a problem formulated in text form, you correctly develop and solve a system of equations (with two or several unknowns).

**Chapter 8: raising numbers to a given power**

- You are familiar with raising numbers to a given power and capable of solving calculations with non-integer exponents (i.e.:  $4^{2.5} = 32$ ) or with negative exponents (i.e.:  $4^{-5} = 0.001$ ).
- You can convert natural numbers containing several decimal places or several figures into an exponential number.

**Chapter 9: exponential calculations**

- You are capable of solving calculations with non-integer exponents and/or with negative exponents.
- You correctly solve simple formulae that describe an exponential growth or decay.
- You are given a problem in text form describing exponential growth or exponential decay. You can reformulate this problem as a formula.

## **Requirements for candidates in the subject geometry**

To meet the expectations of Swiss AviationTraining in the subject geometry, you have to be familiar with the following:

### **Chapter 1: basic trigonometry**

- You can determine the missing angular width of a triangle if you are given the two other angles.
- You are familiar with the basic theorems applicable for equilateral or right triangles (We give you some angles and side lengths. You should be able to make statements about the remaining angles and sides).
- When given the side lengths of a right triangle, you can determine the area of the triangle.

### **Chapter 2: calculation of triangles**

- You are familiar with the sine, cosine and tangent theorems.
- You can apply the sine, cosine and tangent theorems to calculate the angles of a triangle.
- You correctly apply the theorem of Pythagoras ( $a^2 + b^2 = c^2$ ).

### **Chapter 3: lengths, areas, volumes and surfaces**

- You feel at ease with the different units of measurement for volumes, areas and lengths and can convert them (i.e.:  $1 \text{ dm}^3 = 1'000 \text{ cm}^3$ ).
- You can calculate the correct size of simple rectangular areas.
- You can calculate the volume and surface of two classic, stereometric objects: the sphere and the cylinder.

### **Chapter 4: graphic representation in the form of a diagram**

- You can determine the coordinates of a particular point in a two-dimensional coordinate system.
- You are familiar with the representation of coordinates. In particular, you can determine whether a certain coordinate belongs to a two- or three-dimensional coordinate system.
- You can determine the shape of a three-dimensional body on the basis of given coordinates.

### **Chapter 5: functions and equations with two variables**

- We specify a straight line in a two-dimensional coordinate system. Your task will be to derive the corresponding equation.
- When being confronted with a parabola or an exponential curve, you can figure out the correct corresponding equation out of a list of four.
- You can correctly graph a given function in a two-dimensional coordinate system.

## **Requirements for candidates in the subject physics**

To meet the expectations of Swiss AviationTraining in the subject physics and chemistry, you have to be familiar with the following:

### **Chapter 1: vectors**

- We graph two or several vectors in a two-dimensional coordinate system. Your task will be to demonstrate the ability to (graphically) add or subtract these vectors.

### **Chapter 2: forces and momenta**

- You can solve simple problems formulated in text form concerning physical forces by consequentially adding or subtracting these forces.
- You are familiar with momenta. In particular, you understand the correct application of the laws of the lever.
- You apply the laws of the lever to a seesaw or a balance by getting the objects back into equilibrium.

### **Chapter 3: centre of gravity**

- You can give a correct physical description of the term „centre of gravity“.
- We move, rotate or accelerate an object. You can correctly predict the effect this movement will have on the centre of gravity.

### **Chapter 4: laws of gas, density and buoyancy**

- You know the basic laws of gas used in thermodynamics. You can therefore describe the reaction of an ideal gas when its volume, temperature or pressure is being changed.
- You can judge on the basis of the different densities of liquids or solids whether a material will float or sink.

### **Chapter 5: physical terms, movement and acceleration**

- You are familiar with the common physical units used for mass, force, power and work. In addition, you know the units used for time, temperature, velocity, acceleration and pressure.
- An object is being accelerated. You can make statements (qualitatively and quantitatively) about its velocity and you can estimate the time the object will need to cover a certain distance.
- You understand the three laws of Newton and can describe them in your own words.

**Chapter 6: kinematics and impulse**

- You can determine the angular velocity of rotating objects.
- You can make qualitative statements about the potential and kinetic energy of a given object.
- You are capable of making quantitative calculations about the potential and kinetic energy of different objects. In particular, you can evaluate the change in energy when an object is accelerated.
- Two objects collide in either an elastic or inelastic impact. You can in both cases determine the influence this collision will have on the kinetic energy of the two objects.
- You can describe in your own words the momentum of a rotating body and decide at what time the body has a high or a low momentum.

**Chapter 7: thermodynamics**

- Using the example of an ideal gas, you can explain the laws of thermodynamics.
- In addition, you can estimate the reaction a change in pressure will have on the temperature and the movement of molecules of any gas.
- You are familiar with the three states of matter of water (*solid, liquid, gaseous*). You know how the energy and movement of molecules change when you transform water from one state of matter to another one.

