Basic Optical Training

Best-Spherical-Correction

Martin Aufmuth

Good Vision

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Best-Spherical-Correction

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For all the people in the world who need a simple pair of eyeglasses to change their lives.

Contents

A global challenge

According to WHO, **about 950 million people worldwide** need glasses but cannot afford them or do not have access to glasses. Out of these, 826 million suffer from unaddressed presbyopia.

As a consequence, children cannot go to school and adults cannot work or provide for their families. The estimated **lost income for these people amounts to more than 200 billion US-Dollars every year.** Approximately 47,000 additional full-time functional clinical refractionists and 18,000 ophthalmic dispensers would be required to provide refractive care services for these individuals.

We want to change this.

Martin Aufmuth
Founder and President

Martin Aufmuth, CEO of GoodVision

Children often fail at school because they need eyeglasses

Training in “Best-Spherical-Correction”

The present training course in Best-Spherical-Correction (BSC) is designed as a one-year training course. The BSC has the target to enable the students, the future Good Vision Technicians (GVTs) to find the right spherical correction for people suffering from URE (uncorrected refractive errors), to be able to adjust the eyeglasses to the faces of the people, and to raise awareness for the need of eyeglasses and refractive care. The students also learn when they have to refer the patient to an ophthalmologist or an eye hospital.

The training course is part of the concept of GoodVision to supply people in developing countries with high quality, locally produced and affordable eyeglasses. The goal is a basic optical eye care system which is affordable for everyone.

In cooperation with ophthalmologists, optometrists and opticians, GoodVision has developed the present, year-long training course. Best-Spherical-Correction (BSC) educates the student in finding the appropriate lenses during vision testing, selecting the correct frame size according to the pupillary distance, and fitting the glasses in a professional manner.

Patients with pathological eye diseases, or in cases where the Good Vision Technician cannot achieve significantly improved eye sight, will be identified and referred to hospitals and ophthalmologists. A well thought out quality control system guarantees compliance with quality standards.

The BSC training course has a specific population segment in mind and targets the needs of first time or basic vision care. It is meant to be a necessary addition to the existing infrastructure.

The GoodVision Association

Martin Aufmuth, the inventor of GoodVisionGlasses, founded the GoodVision Association in 2012. GoodVision finances training and bending machines from donations. The wages for the Good Vision Technicians and material costs are financed through the sale of the glasses.

The goal is a financially independent local supply of affordable, robust, high quality eyeglasses.

GoodVision has different regional trade marks like GoodVisionGlasses or Lentes Al Instante.

Award-winning

From more than 800 projects worldwide, GoodVision was awarded 1st prize by the Siemens Foundation.

In 2015 GoodVision won the prestigous Tech Award in the USA.

In 2016 GoodVision was awarded the Robert E. Hopkins leadership award of the Optical Society of America (OSA). So GoodVision was recognized by one of the world‘s most prestigious trade associations for the first time for groundbreaking research.

Martin Aufmuth, Founder and President

The Tech Award, USA

Siemens Foundation, Empowering people Award

Robert E. Hopkins leadership award, OSA

The system of GoodVision

The GoodVisionGlasses (GVGs)

The extremely light-weight and flexible spring-steel wire frames, with added colored beads, are attractive and affordable. The materials cost around 1 US Dollar.

The selling price of the basic model is 2 to 3 times the typical local daily wage. Everyone can afford these glasses.

The frame: flexible and light

Local production and value creation

The bending machine fits into a wooden box measuring just 30x30x30 cm. The box contains all the tools needed to manufacture the frames.

With the machine, a small team of producers can produce more then 20,000 glasses a year. The glasses can be made in various sizes: The yellow mark is for a small pupillary distance (PD), red is for medium PD, and blue for people with a large PD.

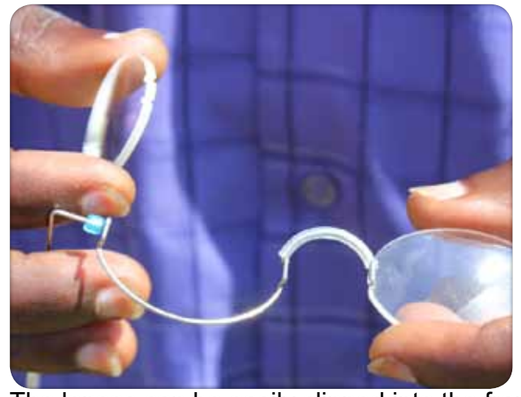
Colorful marks for different sizes of eyeglasses

The GVGs get their unique design with two colorful glass beads

Fast and cost effective care

GoodVision's modular assembly system, consisting of prefabricated lenses ranging from -10 to + 8 diopters (in steps of 0.5 diopter increments in the standard system) and precut frames in different sizes and colors, allows for fast, individual and cost effective care, particularly in remote areas. Immediately after the vision test (always provided free of charge) the patient receives the glasses. No expensive grinding equipment is needed and a second consultation for fitting the glasses is not required.

Box with precut lenses



The lenses can be easily clipped into the frame

Sustainability

The people trained by GoodVision in vision testing and the production of glasses are able to make their living from these activities. The goal is to offer permanent, basic vision care in developing nations.

Adjusting the eyeglasses

Eye testing

Information for trainers

The main goals of this training course

1. Always to find the right spherical lenses for the patient.
2. Knowing how to adjust the frame to the patient‘s face.
3. Knowing when to send the patient to the ophthalmologist (eye doctor) or to the eye hospital.
4. In addition the students know how to become successful salesperson by learning marketing techniques and customer service.

Timetable and content

The training for Good Vision Technicians is designed as a 1-year course. During the first two months the students learn the content of this training manual and additionally get trained in the production and repair of GoodVisionGlasses. This helps the students to get manually skilled and to be able to adjust eyeglasses frames later. The two months training finishes with a first exam.

After the second month, there is a practice phase of internship. After 6 months there is a second exam. It follows a second period of 6 months supervised working with a third and final exam.

Let‘s think product orientated

To be successful, a manufacturer has to think product orientated: “How can I reach an optimum in quality and quantity in a minimum of time?“ For him what counts is the end product. But what is the product of my training session as a trainer? The product is not if I talked a lot or if I made a nice lesson. No – the product is, if my students have learnt and understood the content and can use it!

Student activity

Studies show that concentration falls if the teacher is talking for more than 10 minutes (so 10 minutes of talking is already too much!). In addition, many of your students will have difficulties understanding you at all because of their educational background or a different mother tongue.

So, give a very short introduction, a little bit information in the beginning, then let your students learn themselves – give them a LOT of exercises. Be a tutor and a coach, NOT a teacher! Time efficiency: If you are talking in front of your class, only one person is active – you. But: We learn best, when we are in action. So let the students talk, explain, draw, making experiments themselves. Think always: What exercise, what activity could they do next? How can I make them become active themselves? If 20 students work themselves, the efficiency will be about 20 times higher than if you talk alone. Let them make as many eye tests as possible!

Train the trainers

Take students out of the group to explain to the group. They can also explain in their local language. The less you stand in front of the group and the more active the group is itself, the better it is. Once a student has successfully explained a concept to the group, you can be sure he has understood and he won‘t forget. You can give new content to a small group one day before in order to present it the next day. Train the trainers.

Working in groups, students explaining each other

Be positive about mistakes

Let your pupils make mistakes – every mistake is a chance because we can learn from it. It helps to avoid mistakes later, after the training. When teaching the adjustment of glasses to a patient, don‘t start demonstrating yourself. Let somebody from the group start. Look at what he is doing and then ask your team what was already well done and what could be done even better.

Repetition

Repeat every day those lessons which are most important. **Let them do a couple of eye tests every day!** After repeating the same lessons over 4 to 8 weeks, the students will never forget. Let your students also repeat the content of this training course and the experiments from time to time.

Check the results

Do you remember this question when you were in school: “OK students, does everyone understand?“ And when one out of 30 students confirmed it by nodding, the teacher thought it meant he could move on? But consider the scenario more closely: the teacher knows that ONE out of 30 has (maybe) understood, and perhaps this student already knew the content. The question is misleading, at best! A much better question to ask is, “Who understands this?“ Now you can see exactly how many students will raise their hands. And then, ask those who do understand to help those who don‘t understand yet!

Even better than asking is a short test. Make as many tests as possible! You can make such tests whenever you want. After 10 minutes. Every day. If the answers are right you know that you were successful and your students know they succeeded as well. The time during a test is used most efficient: Everybody gives their best. (A good time for a test is in the afternoon, when concentration goes down.)

Speed learning

We can learn extremely fast if necessary. Example: The eye. You can explain every term – some students will listen, others won‘t. A loss of time. Much more efficient is to give them 10 minutes to learn every term and function (they can help each other). Then immediately make a test: everybody draws an eye himself, writes down the terms and explanations. Afterwards you can correct the answers together with your students. Do this with other content too.

Transparency

If you are doing something, explain why you are doing it. Tell your students in the morning what the goal will be for the day. For example “By this evening I want you to know to refract a patient and to find the right lenses.“

Don‘t be abstract

If you go through a content, make sure that everybody can understand it. Example: Light rays passing lenses. This is very abstract for somebody who maybe never had physics. But that shouldn’t be a problem. Make experiments – let your students experiment with the lenses, draw pictures, and so on. Give them time to really understand. Don‘t be abstract – be practical.

Manual in local language

This training manual shall be available for every student in the local language or in both languages: local language and formal language.

Writing one’s own manual

Hand out a manual and an workbook to every student. The students should **write their own manual in their own language** in their workbook! They can write, draw and paint, in the classroom and also during the evening. Things you have created yourself you will not forget.

Speaking loudly

If the trainer or a student explains something to the group – make sure he speaks loud enough for everyone to hear and really understand. Ask your students: “Who is able to understand...?“

Student in India with her own manual

You are a team

Always remember, you and your students share the same vision: Helping as many people as possible with the best service as possible.

I wish you good success!

Martin Aufmuth – President of OneDollarGlasses

Training material lists

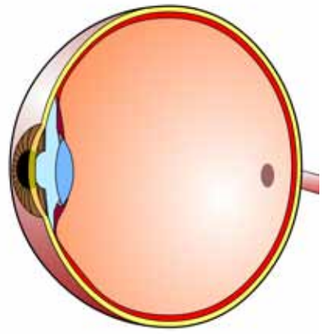
Material for optical training

- Vision charts, far distance (4m): 1 for 2 students (two types: with and without binocular test)
- 3D Test glasses polarized: 1 for 2 students
- Nails or “blue tack“ for vision charts: 1 for 2 students
- Pointing sticks: 1 for 2 students
- Lens bars: 1 pair for 2 students
- Pinhole glasses: 1 for 4 students
- Boxes with lenses: 1 for 4 students
- Carded workbook (A4): 1 per student
- Workbooks blank: 1 per student for writing their own manual
- Triangle (rectangle ruler): 1 per student
- Pens: 1 per student
- Pencils: 1 per student
- Eye-test-card: 1 for 2 students
- Water soluble marker: 1 for 2 students
- Sets of wooden color pencils for each student (plastic pencils get dry fast)
- Pencil sharpener: 1 per student
- Erasers: 1 per student
- Name stickers: 1 per student
- Needle and thread: 1 per student (for pupillary distance testing glasses and for eye test)
- Frames in different sizes (1 small, 1 medium, 1 large per student)
- Sunglass lenses: 4 per student
- Pocket rulers (1 m or longer): 1 per 2 students
- Client‘s books for training: 1 for 4 students
- Long nose pliers (for adjusting and repairing frames): 1 per student
- Mirrors: 1 for 4 students
- Plastic boxes for water with soap and for clean water
- Toilet paper (for drying lenses)
- Table cloth (for nice selling table): 1 for 4 students
- About 10 pieces of very strong white paper (about 350 g/m²)
- Paperclips: at least 4 per student
- Spring steel wire: 2 pieces per student
- Flashlight (if you don‘t have flashlights, a bright candle does it as well): for paper eye-experiment
- 1-2 pairs of cylindric eyeglasses
- 1 Water restistant marker (thick one)
- Experiment set – laser with lens profiles
- rice with little stones

1. Basic optics

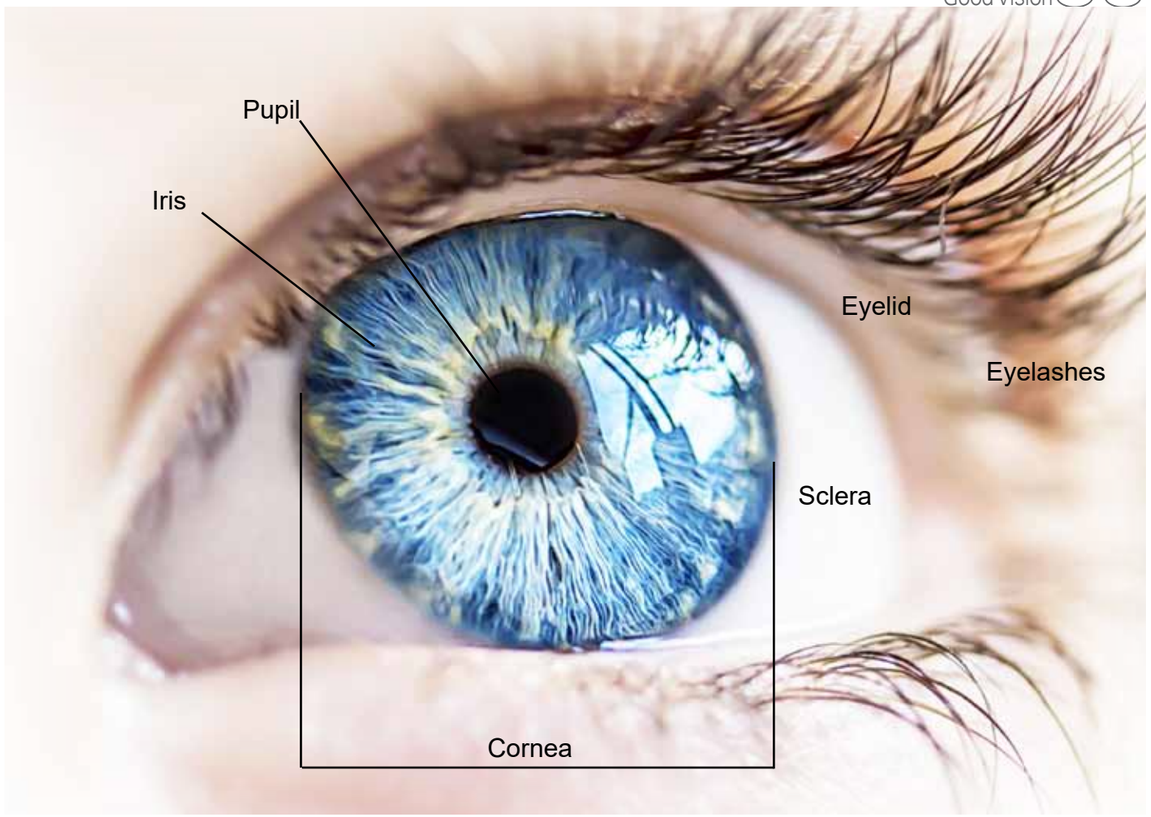
1.1 The eye

Orange model

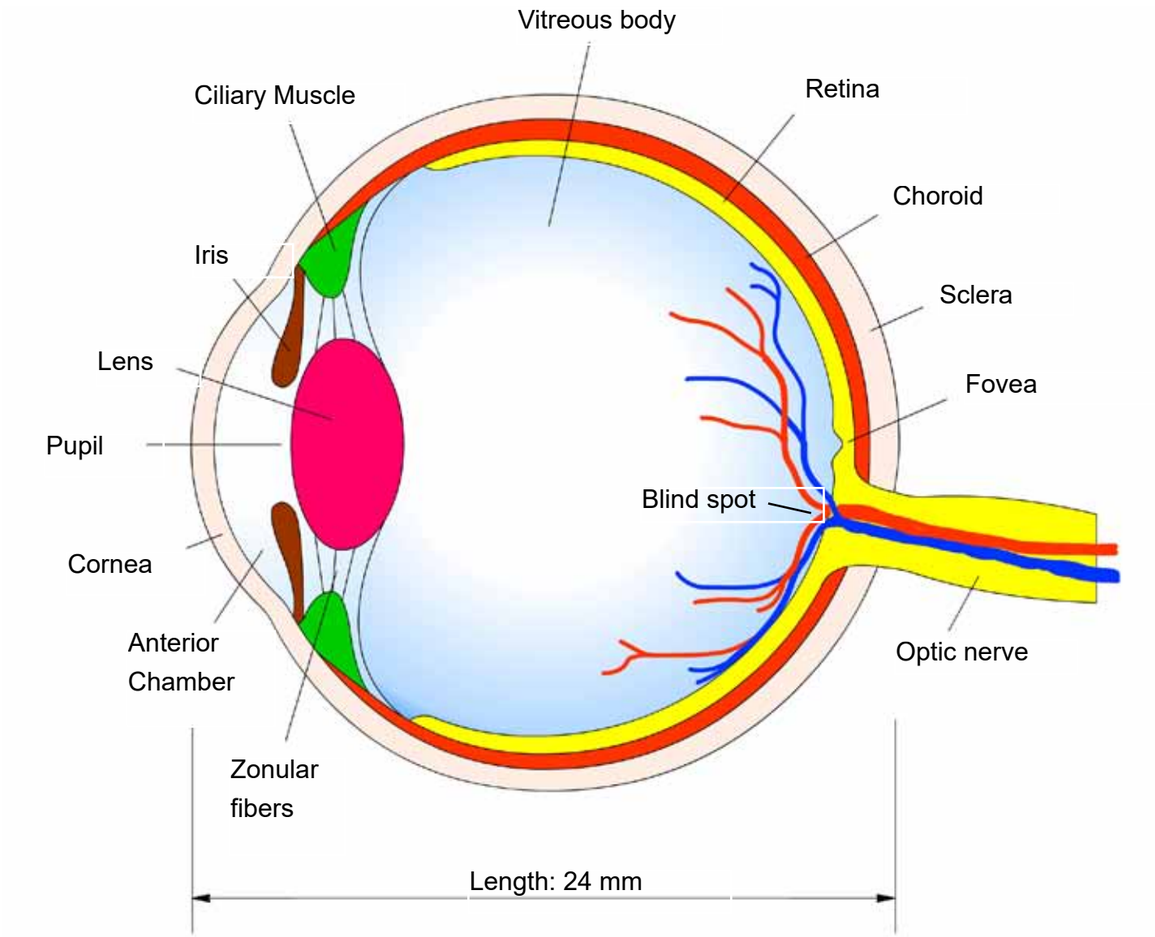


If you cut an orange in the middle, you can see what is inside...

... and if you cut an eye in the middle, you can also see what is inside.



Important parts of the eye

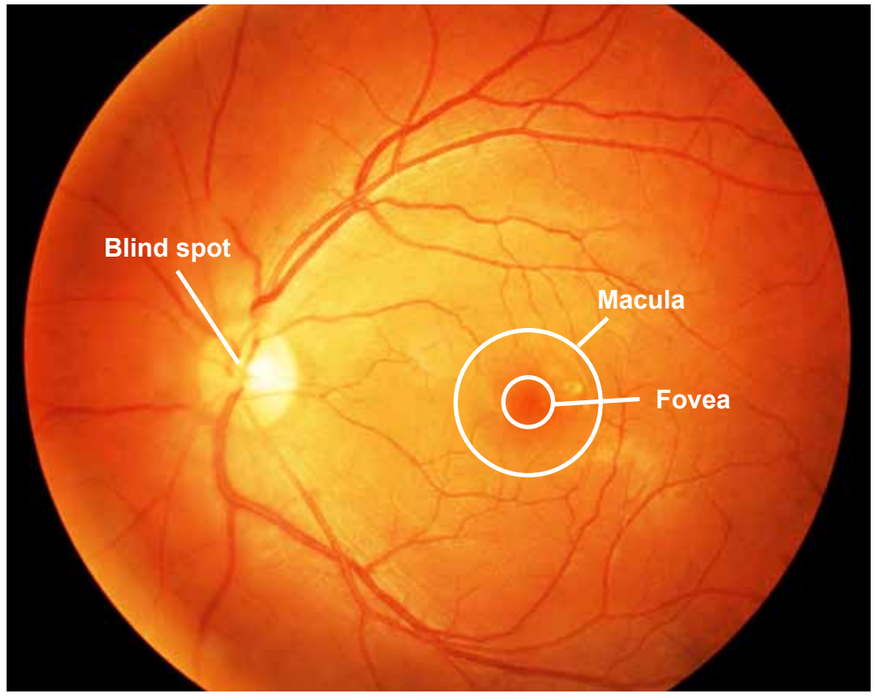


Functions of the important parts

1. **Cornea:** Clear part over the colored part of the eye. The cornea helps to protect the eye. The cornea helps to focus light that enters the eye. It provides 2/3 of the eye‘s refractive power.
2. **Iris:** The nice round colored part of the eye (brown, blue, green). Muscles in the iris can make the pupil wide when it is dark and small when it is bright.
3. **Pupil:** Round hole in the middle of the iris. It normally looks black because it is dark in the eye.
4. **Lens:** together with the cornea, brings the image of an object on the retina. Can change the focus of the eye so that we can see things at different distances. The refractive power: app. 20 D.
5. **Ciliary muscle:** fixed to the lens with zonular fibers. It can contract and relax so that the lens gets thinner or thicker and so change the power of the lens. This is called accommodation.
6. **Sclera:** The sclera is very strong. It protects the inside of the eye and gives the eye its shape.
7. **Retina:** catches the light that comes into the eye and transforms it into nerv impulses that are sent to the brain via the optic nerve.
8. **Fovea:** the place of best visual acuity (the area around is called macula).

For trainer: Everybody has 10 minutes to learn all parts of the eye and their functions. Then the manual has to get closed and the eye and all terms and functions have to be written down. Then everybody compares with the manual if he forgot something.

The retina



Picture of the retina with blind spot, macula and fovea.

Experiment – blind spot

Close your left eye and stare at the cross with your right eye with approximately 40 cm reading distance. Now slowly move the paper towards your face. Suddenly the black circle will disappear! This is when the area of the black circle is projected on the blind spot of your eye.

+ ●

Important facts

Refractive power of the eye: about 60 diopters (cornea about 40 diopters; lens: about 20 diopters)

On the retina of an eye there are more than **100 million sensory cells** sending the image information to the brain (a camera has probably 10 million pixels).

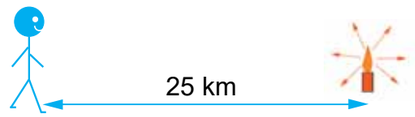
The retina contains two types of photoreceptors, rods and cones. **The rods** are more numerous than the cones. They number about 120 million. They are responsible for seeing at night.

The 6 to 7 million **cones** provide the eye‘s color senitivity for seeing at daylight. They are concentrated in the 0.3 mm diameter fovea.

The eye can be very strong: In a dark night, you can see the light of a candle up to 25 km distance!

Digital camera:
more than 10 million pixels

Human eye:
more than 100 million “Pixels“



Experiment – rods and cones

Look straight forward. Bring a color pencil from the side of your face into your view. Try to guess its color.

You will see: Before you see the color of the pencil with the cones in the center of your eye, your rods see that there is a pencil.

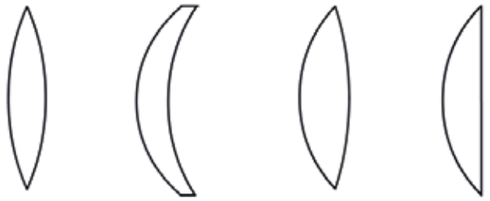
Experiment – pupil

Wait until darkness. Now shine with a flashlight into the eye of your partner.
=> The pupil will get smaller immediately! If you dont have a flashlight, cover the eye with your hand and remove it quickly (same effect).

1.2 Lenses

If you cut an optical lens in the middle, from the side it looks like this:

PLUS lenses



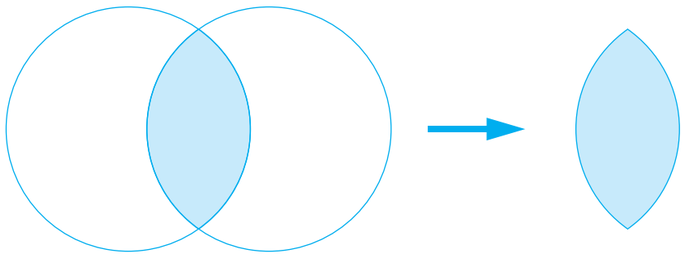
PLUS lenses are THICK in the center and thin outside.

Memory aid: If you eat more (PLUS) you get a big belly.

PLUS lenses make things look **larger.**

Power: +0.5; +1.0; +1.5; ... +6.0 D
The power P of a lens is measured in diopter D.

This is how you can imagine a PLUS lens:
Space inside 2 overlapping lenses

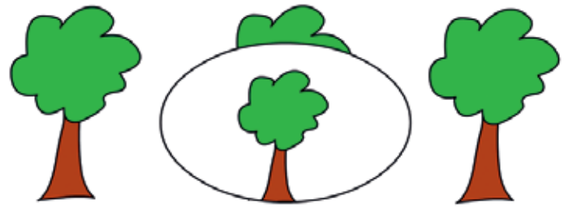


Experiment
Take different lenses and decide if they are positive or negative. Check if they are thicker in the center or thinner. Look through the lenses and see if they make things larger or smaller.

MINUS lenses

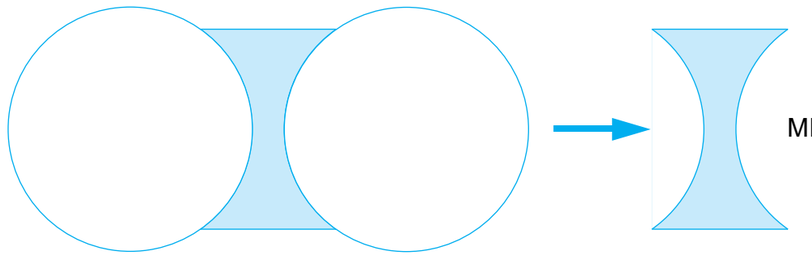
MINUS lenses are THIN in the center and thick outside.

MINUS lenses make things look smaller.



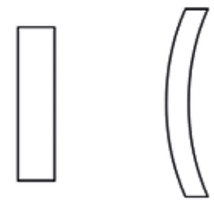
Power: -0.5; -1.0; -1.5; ... - 6.0 D

This is how you can imagine a MINUS lens:
Space between 2 spheres next to each other



Lenses without optical power

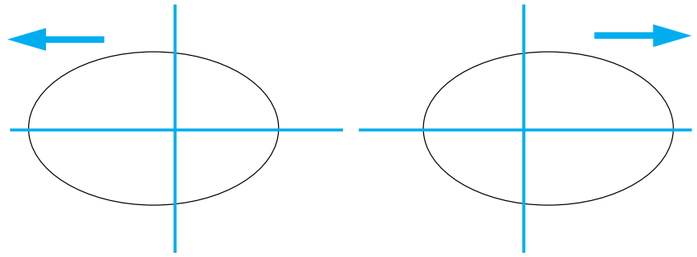
They have the same thickness everywhere.



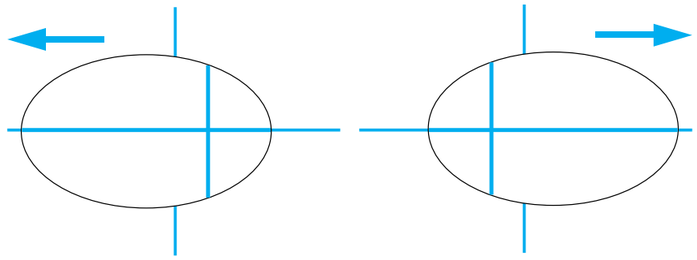
Lenses without power change nothing.
Optical power: 0 D

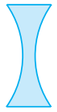
Shift of a line

If you look through a **lens without power** at two crossed lines and move it left and right, nothing

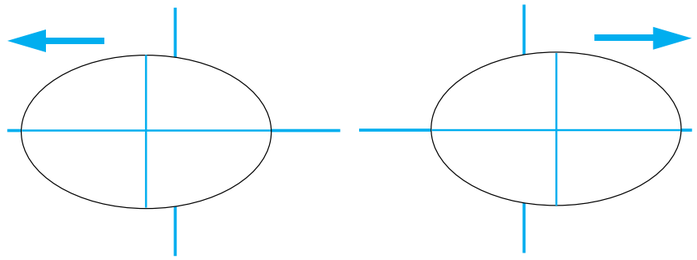


PLUS lens: the image **moves contrary to** the movement of the lens.

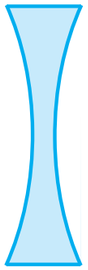




MINUS lens: the image **moves with** the movement of the lens.



PLUS lenses
- are thick in the middle
- make things look larger
- shift the image contrary to the movement of the lens



MINUS lenses
- are thin in the middle
- make things look smaller
- shift the image with the movement of the lens

1.3 The optical center of a lens

How to find the optical center of a lens?

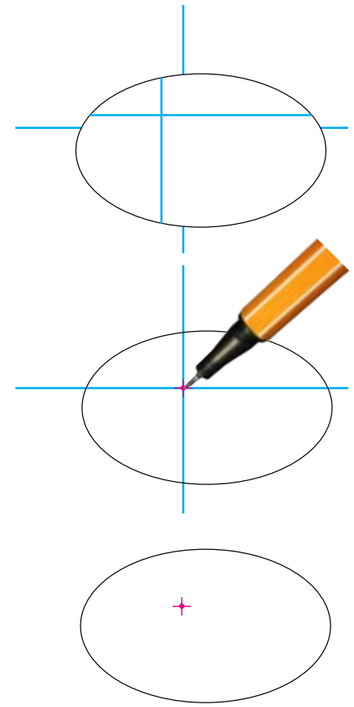
The optical center is the point of a lens where light rays passing through remain unrefracted.

How to find the optical center without measuring instrument:

1. Look from above and hold the lens 10-20 cm in front of two crossed lines.

2. Bring the images of the lines together with the lines by moving the lens.

3. Then mark the point where the lines meet with a water soluble pen. This is the optical center of the lens!



Optical center

Task

Take different lenses and mark their optical centers. Remember, use a water soluble pen!

Experiment

Take two lenses of very different power, e.g. +6 and -6 and hold both in front of your eyes. Now look to your partner...
Hold 2 lenses of +6 in front of one eye. That is how somebody feels who needs strong glasses for distance vision.

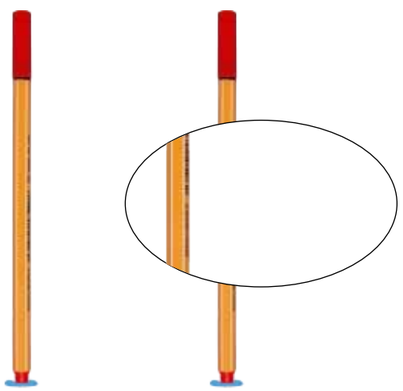
1.4 The power of a lens

How to find the power of a lens?

Put a pen upright on the table about 1m in front of you (fix it with a piece of blue tack).

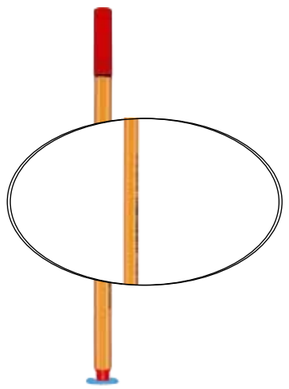
Now hold the unknown lens 40 cm in front of your eye and move it left and right.

The pen is larger and it moves against the movement of the lens. It must be a PLUS lens.



You guess: The lens could have +4.0 D
You take a **-4.0** lens and hold both lenses together – one on top of the other.

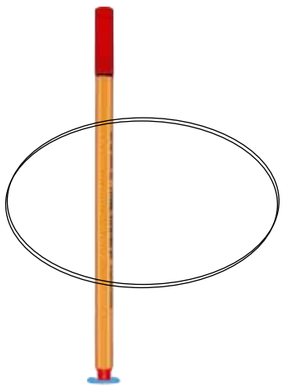
Now the pen is smaller and it moves with the movement of the lens.
=> The MINUS lens is stronger than the PLUS lens



Now you try **-3.0** and hold it together with your PLUS lens.

Now nothing changes!
Both lenses together have 0 D

Calculation: -3.0 + 3.0 = 0
=> The power of the unknown lens is +3.0 D



Calculating with lenses

Little mathematics

+3 + (+1) = +4

+3 + (-1) = +2

+3 + (-3) = 0

+1 + (-3) = -2

-2 + (-3) = -5

Exercises

+5 + (-4) = ____

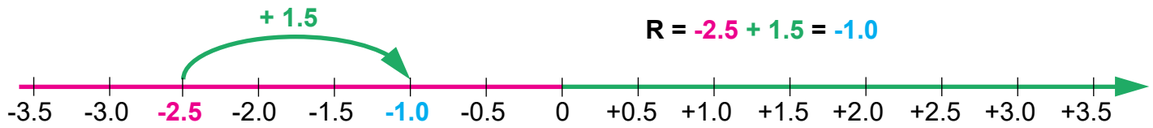
+3.5 + (-3.5) = ____

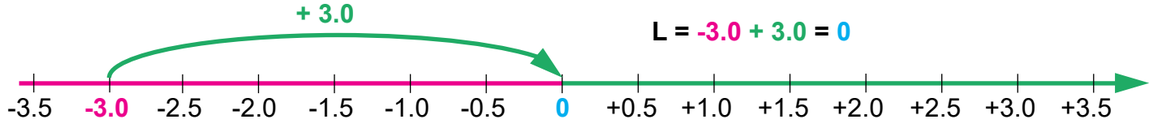
+2 + (-3) = ____

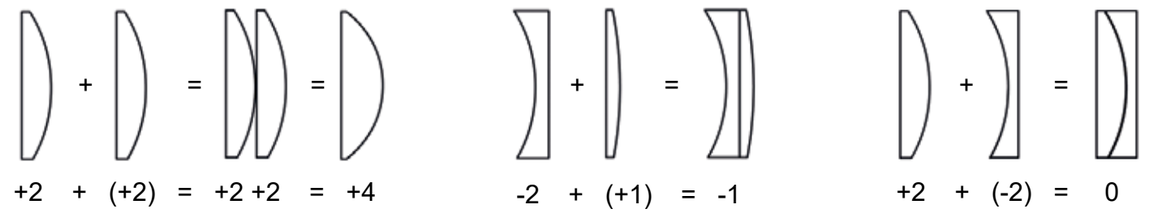
+2 + (-3.5) = ____

-0.5 + (-1.5) = ____

For calculations the **number line** can help:







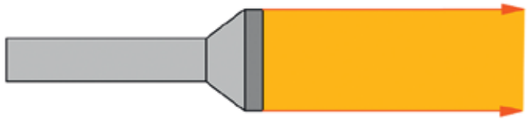
Task

Take different unknown lenses out of the box. First decide if they are positive or negative. Then find out the diopter by addition. You can use the lensbar too. Write down your results.

For Trainer: Scratch numbers on about 20 different lenses with a needle. Write the numbers and their diopters on a paper. Then you only have to compare the results of the students with your list.

1.5 Light and lenses

Normally light spreads out straight ...

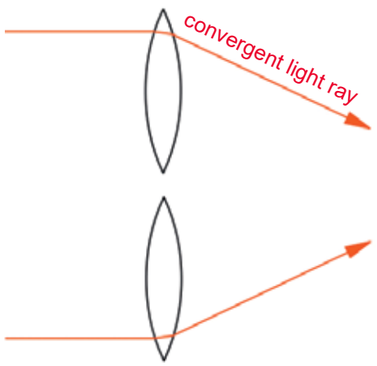


... and into all directions

But when a **single light ray** passes through a lens, it changes its direction. We say it gets **refracted** (like a broken stick).

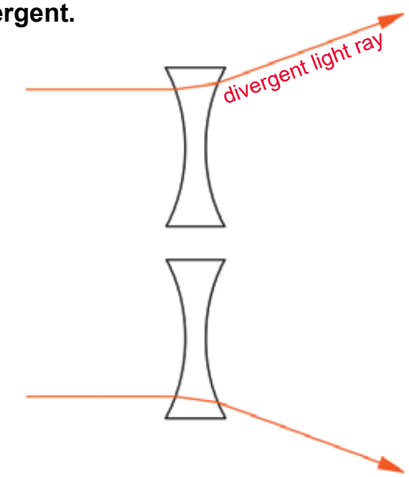
PLUS lens

The light ray is refracted to the center.
It is **convergent.**

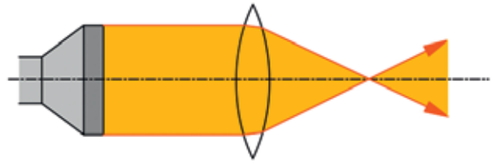


MINUS lens:

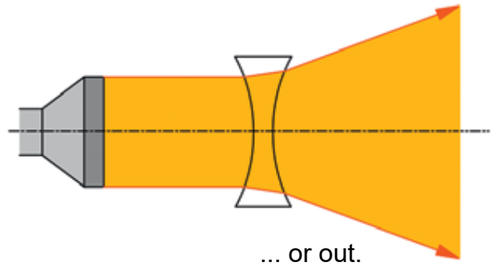
The light ray is refracted out.
It is **divergent.**



When many (millions) of light rays pass through the lens as a parallel light beam, all of them get refracted ...



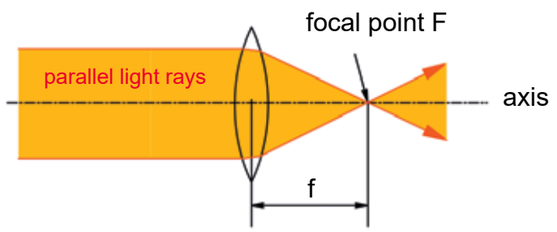
to the center ...

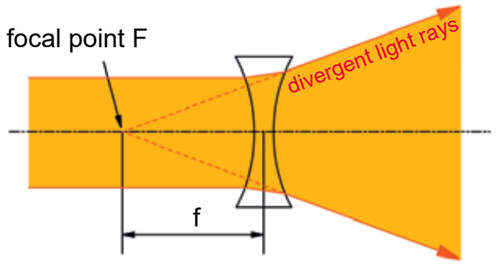


... or out.

Parallel light rays passing through a positive lens, meet all in one point behind the lens, the **focal point F**. They are convergent (they converge).

Parallel light rays passing through a negative lens are divergent (they diverge).





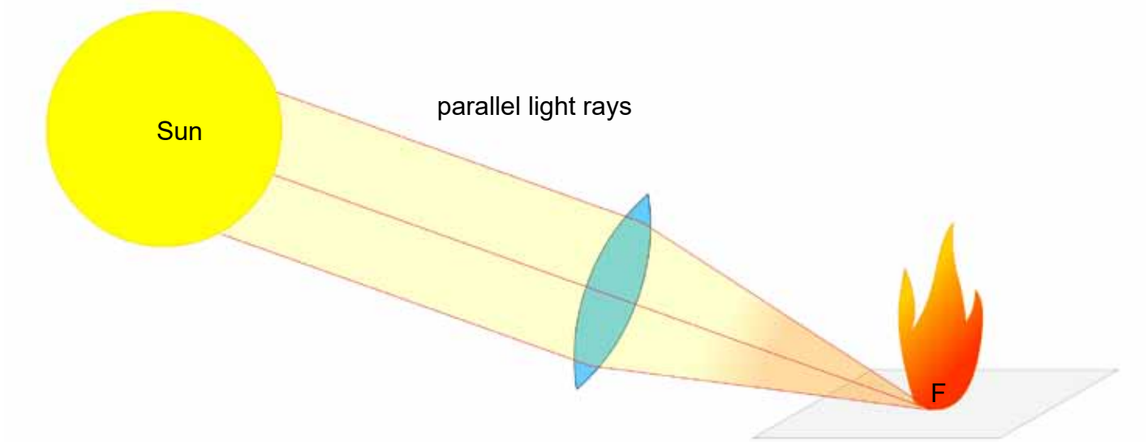
Experiment – **Attention: Put on your sunglasses!**

Take the lens bar, go outside and let the sun shine through the lenses. On the ground you will see light spots or shadows depending on the lens power and the distance of the lensbar to the floor. Vary the distance. What happens?

Put one +6 lens in front of one of the MINUS lenses. What happens? Change the +6 lens to another MINUS lens...

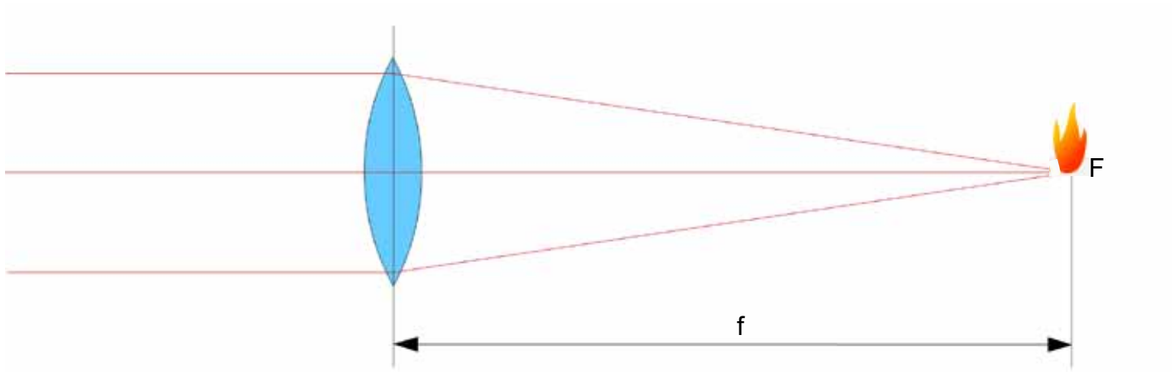
1.6 Refractive power

DANGER: For Experiments with sunlight put on your sunglasses!



If parallel light rays pass through a positive lens, they get focused in one point, the **focal point F** (or focus). At this point a piece of paper starts to burn.

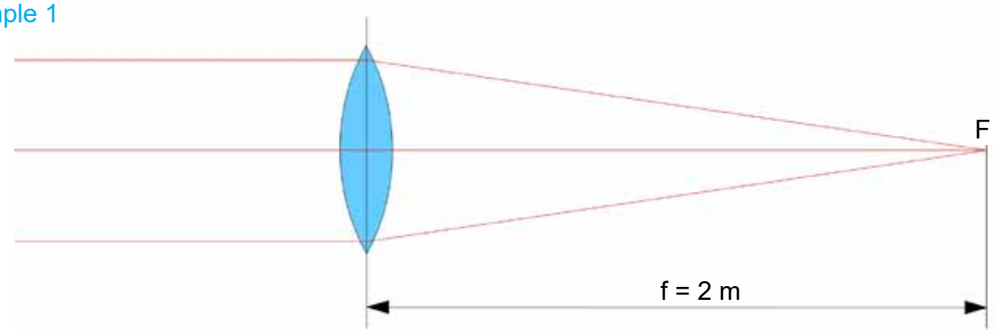
Tip: Before this experiment paint a black point on the paper: ●
Dark and black colored surfaces absorb the light rays best.



The **focal length f** is the distance between the centre of the lens lens and the focal point F.

The power of a lens

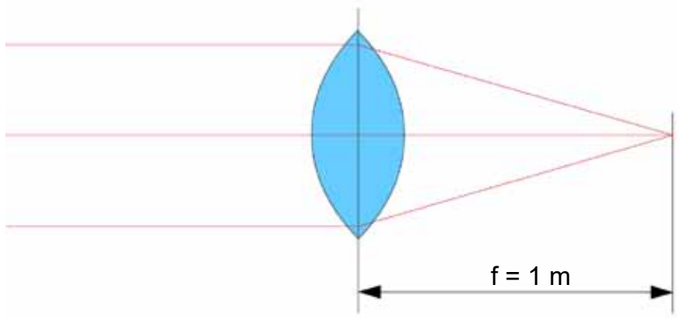
Example 1



This lens has a focal length of f = 2 m

The power of the lens is $\mathbf{D} = \frac{1}{f} = \frac{1}{2\ m} = \mathbf{0.5\ D\ (diopter)}$

Example 2



This lens has a focal length of f = 1 m

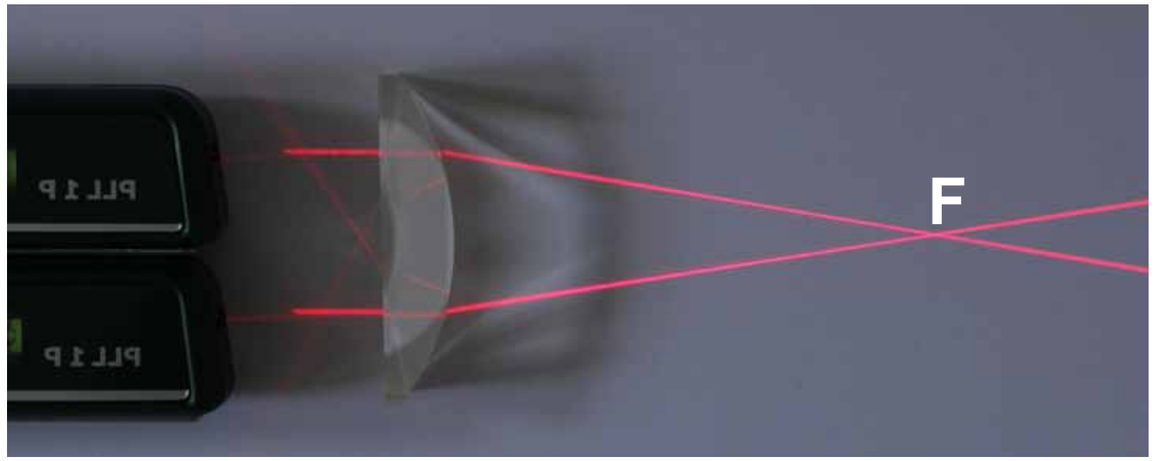
The power of the lens is $\mathbf{D} = \frac{1}{1\ m} = 1.0\ D$

Task

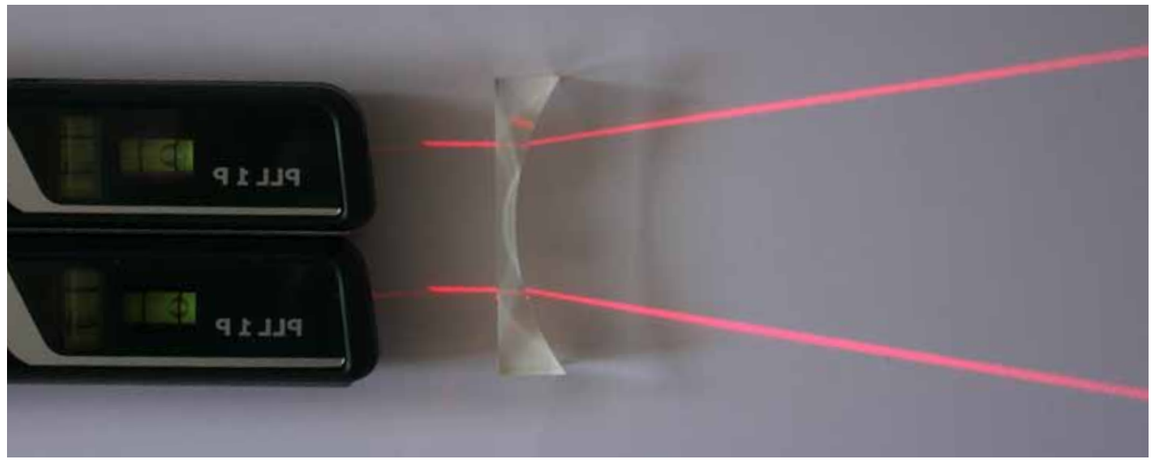
a) What is the power of a lens with f = 3.0 m? (f = 4.0 m, f = 10 cm, f = 0.20 m)
b) Find out the focal length of a lens with the optical power of +20 D (+2.5 D, +3 D, +4 D)
c) Hold your lens bar into the sun and test the different focal lengths.

1.7 Experiments with the laser

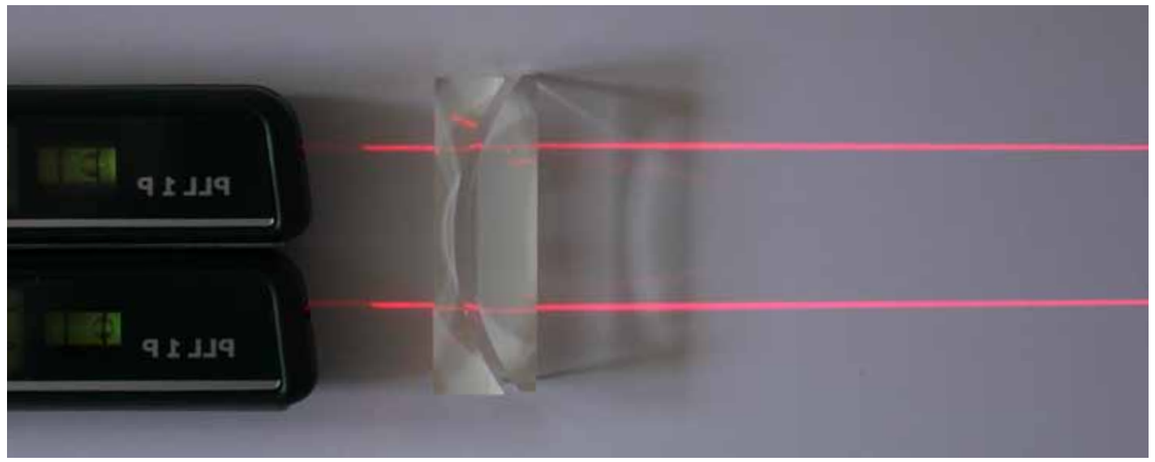
ATTENTION: Never point the laser into anyone‘s eyes!



Positive lens – focuses the light rays in the focal point F

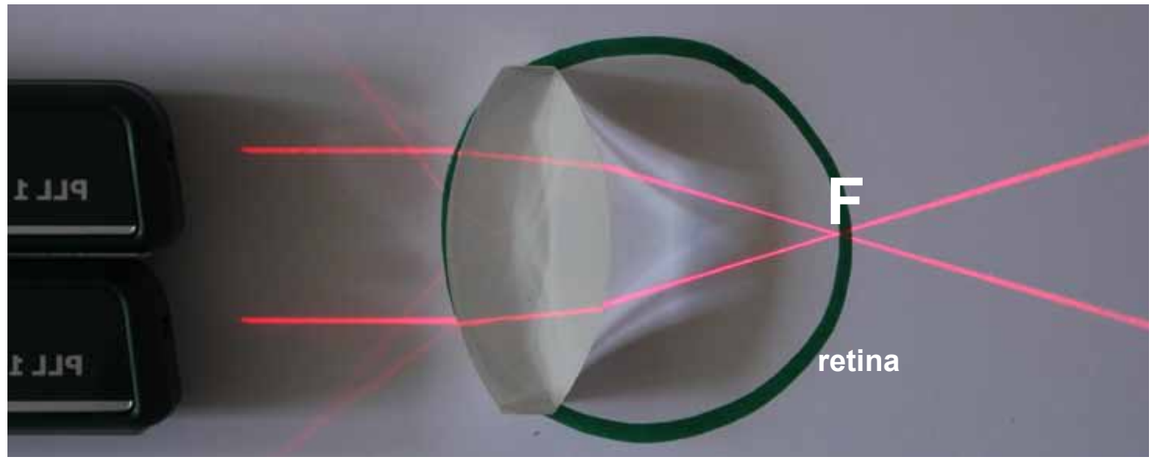


Negative lens: disperses the light

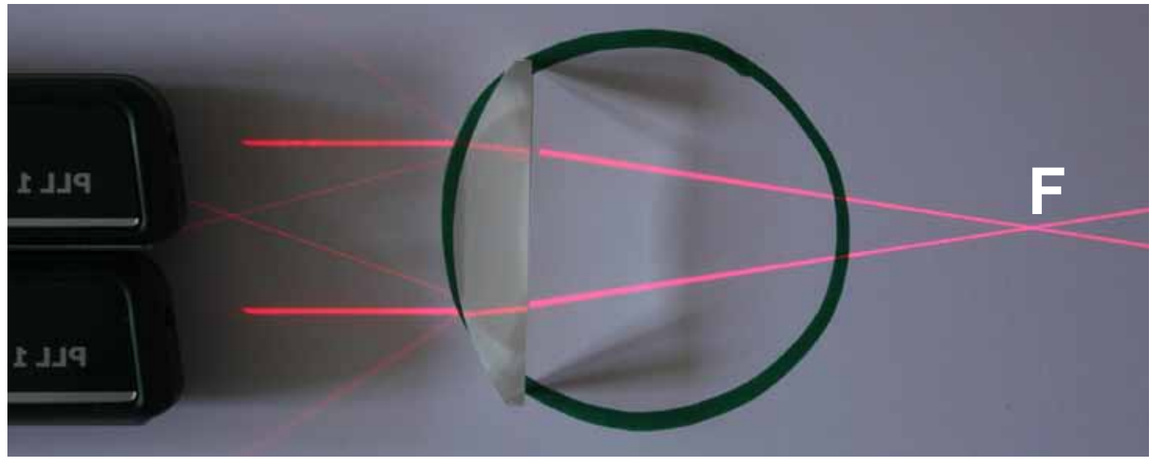


Addition: A positive and a negative lens compensate each other

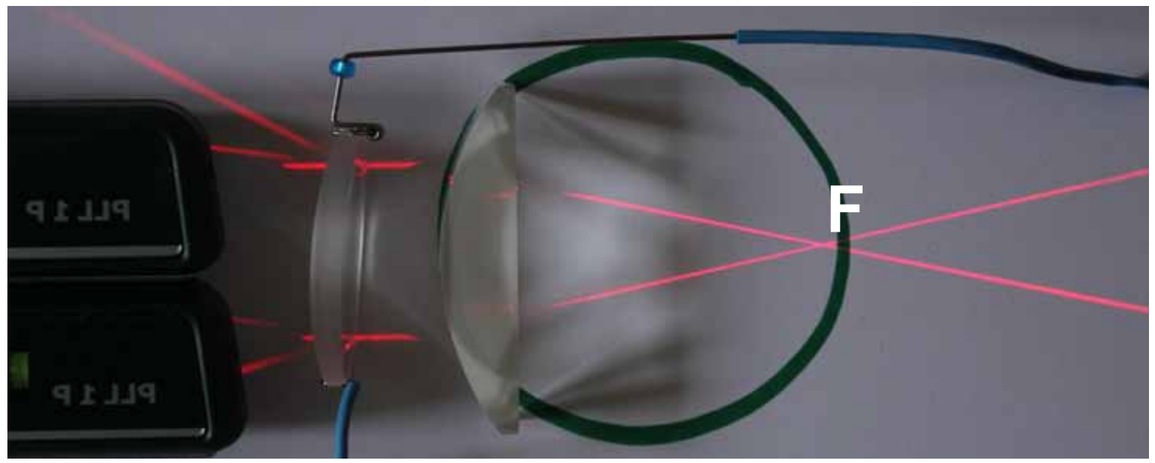
Eye model with light rays



Here the lens of the eye focuses the light exactly on the retina. This eye sees sharp.



The lens is not strong enough – F is behind the retina. This eye cannot see sharp.



Give the eye a pair of (positive) glasses to bring the focal point on to the retina!

Measure the focus of a lens

DANGER: For experiments with sunlight put on your sun glasses!

What is the power of this lens?

The focal point has a distance of 16 cm (0,16 m) from the lens.

So the power D of the lens is
D = 1 / 0.16 m = **+6.25 D**

Now do the experiment yourself and calculate the power of different lenses!

1.8 Optical imaging

Life on the wall

Hold a lens with high positive power in front of a white wall opposite the window. Find out the distance where the image on the wall gets sharp. This is the focal length. How does the image look?

You see: The image is
- smaller
- upside down
- reversed

Raindrop

A raindrop is like a PLUS lens: The image you see is smaller, upside down and reversed.

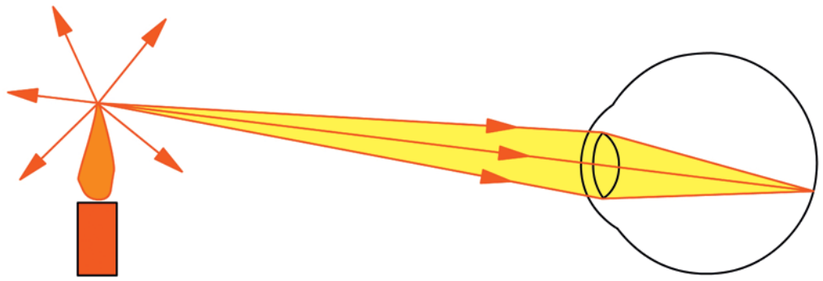
Experiment

Close one eye and hold a +6.0 lens about 30 cm in front of your open eye. Look through the lens around and outside. You will see everything small, upside down and reversed.

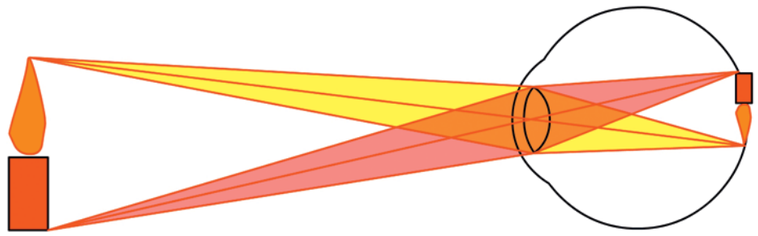
1.9 Seeing

How we can see a candle

From the top of the flame the light rays go straight in all directions.
Some of the light rays pass into the eye (through the pupil).
They get refracted by the lens and
then meet again in one image point on the retina.
From there the optic nerve sends the information to the brain.



The same thing happens to all other points of the candle. The image of the candle occurs on the retina.



The image is
- **smaller**
- **upside down**
- **reversed!**

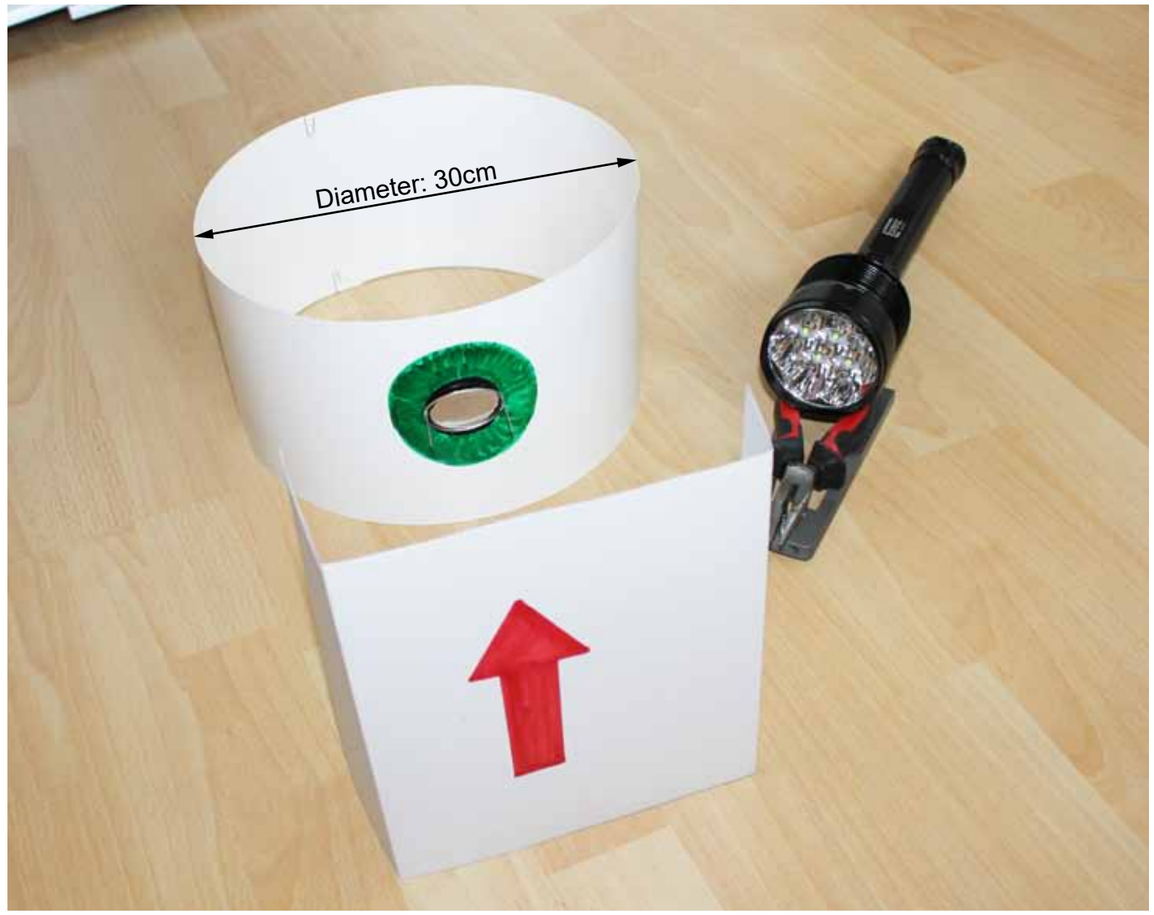
Image of the F

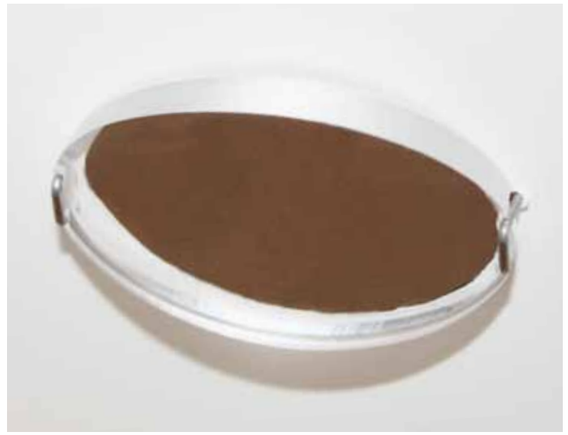
Paper eye (Part I)

What material do you need?

- A flashlight (if you don‘t have a flashlight use the light of a mobile)
- About 10 pieces of very strong white paper (about 350 g/m²)
- Lenses (+6.0 D; +1.0 D; -1.0 D)
- Glue
- Paperclips
- Spring steel wire

1. Make a long strip of the paper (about 100x15 cm)
2. Form a ring and fix the ends with two paperclips
3. Cut an elliptic hole in one side (a bit smaller than the lens)
4. Draw a nice red arrow on another piece of paper (about 10 cm height)

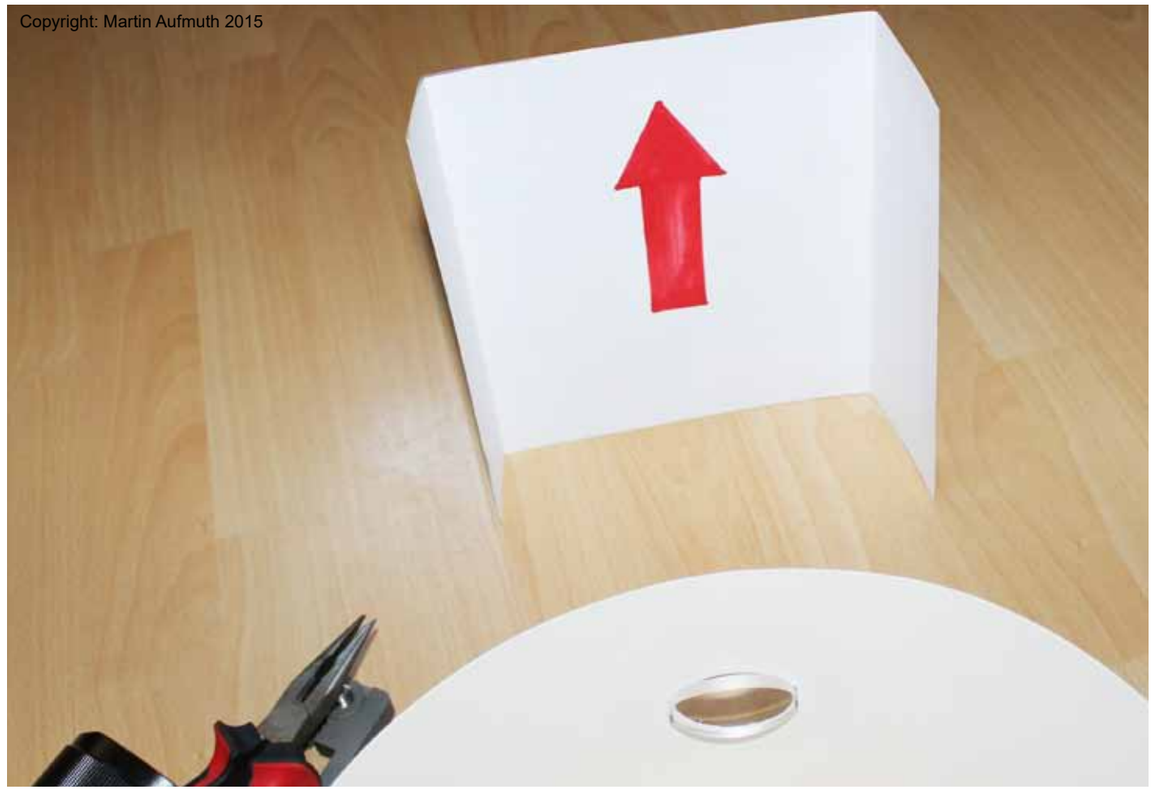




5. Fix the +6.0 D lens by means of a half frame from INSIDE the paper ring.

6. From outside you can put other lenses as “eyeglasses“ on the ends of the wire

7. Wait until evening, turn on the flashlight and shine on the red arrow.



Like a real eye, the light from the red arrow is passing through the lens into the eye.

Like a real eye, there is an image of the red arrow at the back of the eye on the retina.

Alternatively you can also draw a nice “F“.
The “F“ has the additional advantage that you can see not only the image is upside-down but also inversed.

Iris

You can also simulate the function of the iris.
Cut one iris from paper with a big opening and one with a small one.

=> The image will change its brightness.

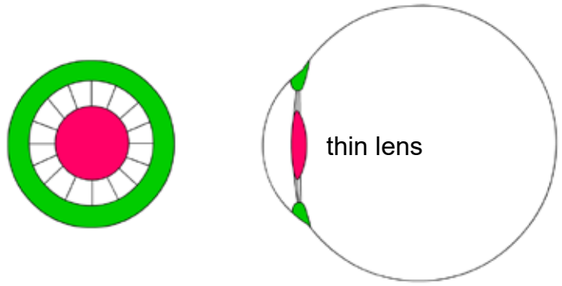
Wide and closed Iris

1.10 Accommodation

Distance vision

If you see something distant, your **lens is thin and long.**

The ciliary muscle is relaxed, the zonula fibers are tight.

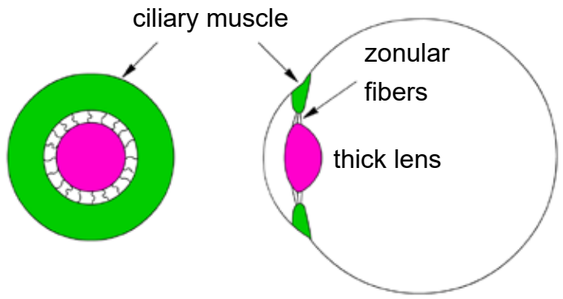


For distance vision the lens is thin and long.

Near vision

If you want to read and see near objects, the ciliary muscle is contracted, the zonula fibers are loose.

The lens is thick.



For near vision the lens is thick and round.

The refractive power of the lens changes according to the distance of the object you are looking at. This is called **accommodation.**

Group experiment

All of you stand in a circle (at least 12 persons). In the middle two persons are the pupil (they can open and close).

Two other persons are the ciliary muscle holding the lens (a third person) in the middle and let it get thicker and thinner. In the back there is the retina getting the information from outside from the pupil...

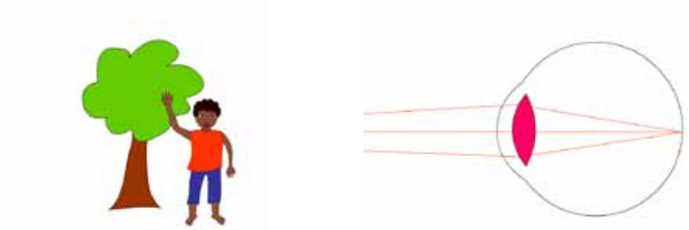
Seeing in different distances

Far distance

- Thin lens
- No accommodation
- Ciliary muscle relaxed

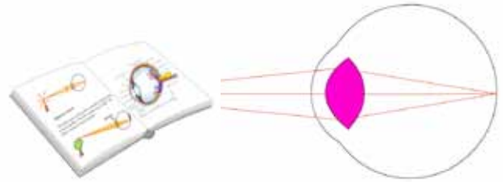
Middle distance

- Medium lens
- Medium accommodation



Near distance

- Thick lens
- Strong accommodation
- Ciliary muscle contracted



Experiment: Feel your eye muscle

Look at your finger. Now bring your finger close to your eye (but don‘t touch it) and focus on it. How do your eyes feel now?

You feel it is hard for your eye (your ciliary muscle has to contract very strong).

Now look outside to a very distant point (a remote tree, house, mountain). How do your eyes feel now?

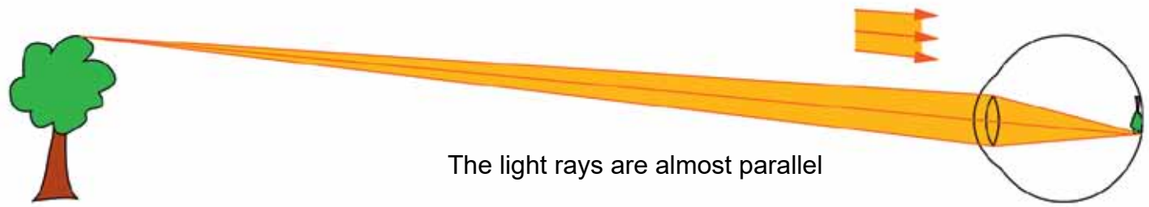
Yes, your eyes feel at ease – your ciliary muscle is relaxed now (thin lens).

1.11 Emmetropia

The good, perfect functioning eye.

Normally, the eyeball has a length of about 24 mm. The refractive power is about +60 D.

Looking at **far distant objects**, the almost parallel light rays pass through the lens, get refracted and focused on the retina in the back of the eye.



The light rays are almost parallel

=> The image is **sharp on the retina**

=> Far things can be seen sharply without accommodation (ciliary muscle relaxed)

=> everything is OK

Experiment

Do the cow experiment on the right side on your own: Put on a pair of glasses with strong PLUS lenses and look around.

1.12 Ametropia: Myopia and Hyperopia

The opposite of emmetropia is ametropia: The eye has a refractive error when viewing distant objects.

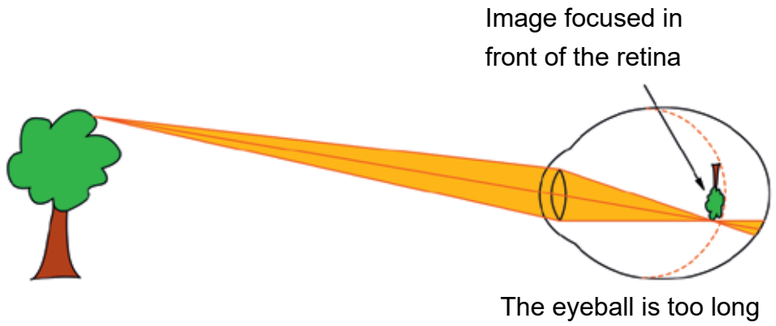
This is how a cow looks like with a defect vision of 6 diopters ...

... and the same cow with the right pair of eyeglasses.

Myopia: short-sightedness (near-sightedness)

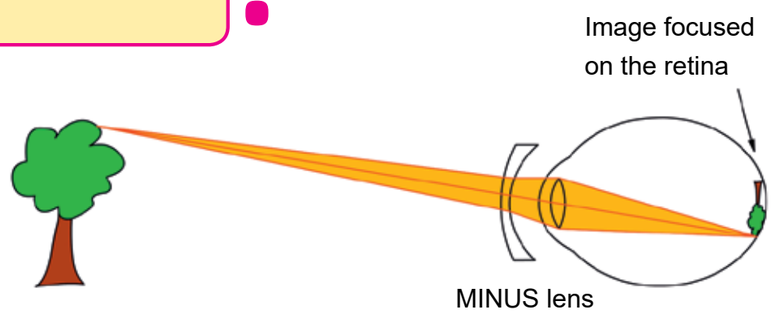
The eyeball is too LONG

- The image is **focused in front of the retina**
- Only **close things at a short distance are sharp**
  Distant things are blurred (you are myopic = short-sighted)



The eyeball is too long

How can we correct myopia?
People with myopia need **negative lenses!** The negative lens brings the image back to the retina.



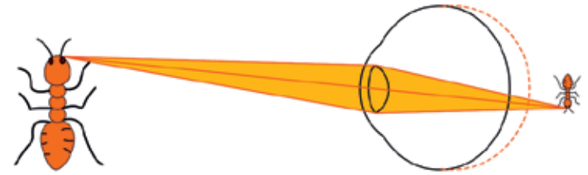
MINUS lens

Experiment
Put on a pair of glasses with positive lenses (e.g. +5.0 D on both eyes)
Now you feel exactly like somebody short-sighted with myopia!
Try to correct your “problem“ with a negative lens...

Hyperopia: long-sightedness (far-sightedness)

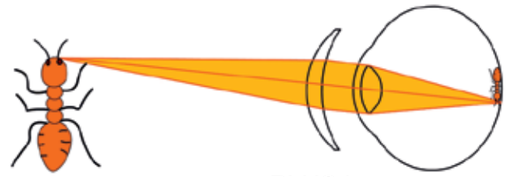
The eyeball is too SHORT

- The image is focused **behind the retina**
- Especially **near objects are blurred** (you are hyperopic = long-sighted = far-sighted)
- The eye lens is not strong enough to focus the object on the retina.



The eyeball is too short

How can we correct hyperopia?
People with hyperopia need **positive lenses!** The positive lens brings the image to the retina.



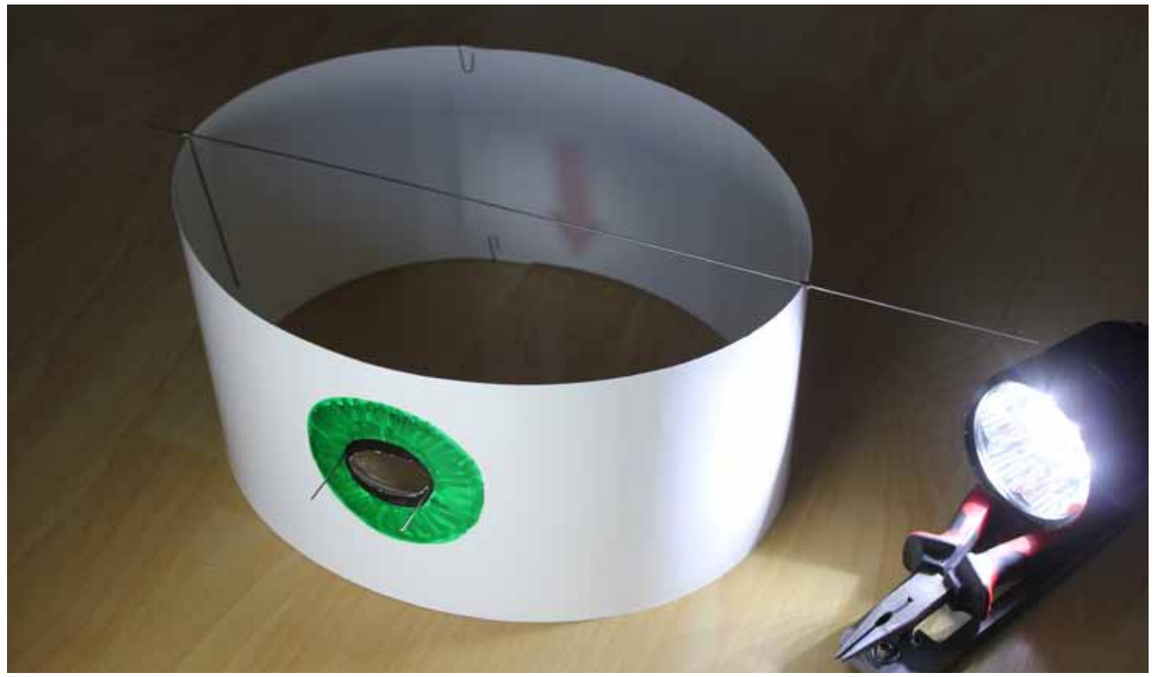
PLUS lens

Young hyperopic people can accommodate strongly (make their lens thick) and get a sharp picture, but it is hard for their eyes.

Experiment
Put on a pair of glasses with -6.0 D on both eyes.
Now you feel like somebody long-sighted with hyperopia! Distance vision will be a challenge but maybe possible. Reading at very near distance will be difficult. Test it!

Paper eye (Part II)

The myopic eye: The eye ball is too long. The image of the arrow is not clear first. If you take a -1.0 lens and put it before the eye as eye glass, the image becomes sharp.



A hyperopic eye which is too short can be corrected with e.g. a +1.0 D lens.

Experiment – Cataract

A frequent eye disease is Cataract: the lens gets grey and opaque. You can simulate a cataract when you hold a piece of paper in front of the lens of your paper eye. Then the picture on the retina will get darker or disappear completely.

Eye with cataract

Experiment – Stickman

Cut a stickman from strong paper and light it with your lamp. Now let this man “walk“ close to your paper eye and then “walk“ away. What changes on the retina of your eye? (That‘s why you see close objects large and remote ones small.)

Stickman

Experiment – Reading glasses

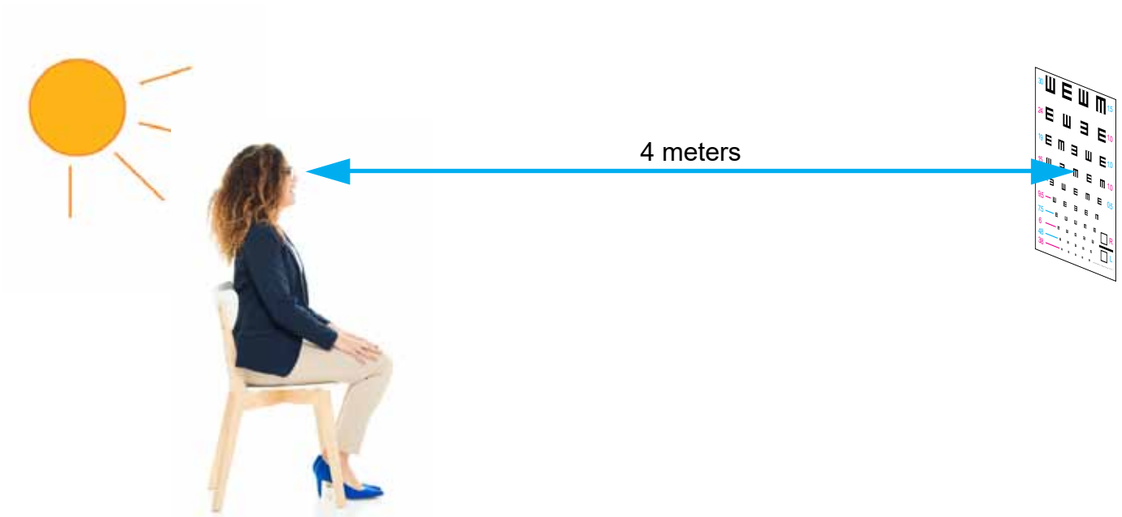
Bring the stickman very close to the lens of your eye. Now the picture on the retina is blurred, because the eye lens is not strong enough. Try to make it sharp again with a positive lens (+1.0 D, +2.0 D or more). That‘s what happens when you give somebody a pair of reading glasses.

2. Best-Spherical-Correction (BSC)

2.1 Eye Test – preparation

The right location – Preparations

Put the vision chart on a wall or on a tree. Measure **4 meters** from the chart and put the chair there. Make sure the light comes from behind.



Do the self-test

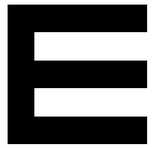
Sit down on the patient‘s chair yourself and look at the chart:

- Can you see the last line clear yourself?
- Does the chart reflect the sun?
- Does the sunlight or shadow disturb you?
- Is the vision chart at the same height as your eyes?
- Is there enough light in the room?

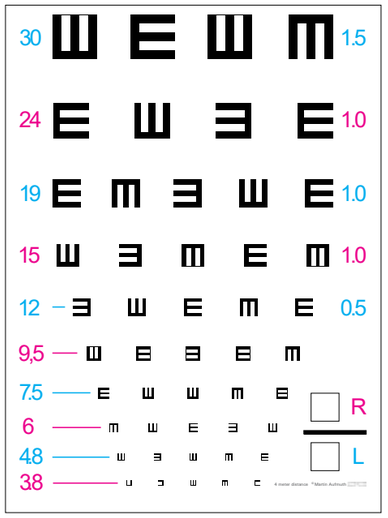
=> If not: Change the position of the chair or the vision chart!

The vision chart

We use the E chart with the letter “E“ in four kinds of rotation.



Optotype,
Symbol,
“E“



E chart

The Visual Acuity (VA)

VAsc means how well somebody can see **WITHOUT** glasses.
sc: *sine correctione* (lat.) = no correction

VAcc means how well somebody can see **WITH** glasses.
cc: *cum correctione* (lat.) = with correction

Grades of visual impairment
6/18 moderate visual impairment
6/60 severe visual impairment
6/200 or less: somebody is said to be blind.

Experiment 1
Which is the smallest line you can see with your eyes?

Experiment 2
Make the test: Which PLUS lens makes you moderate, which one severly visually impaired and which makes you blind?

$\frac{6}{12}$ (line 12) means somebody with good eyes can see this E at a distance of 12 meters, while the patient sees the E only from 6 meter distance.

Line No.
12 $\frac{6}{12}$

$\frac{6}{6}$ (line 6) this is the smallst line, somebody with good eyes normally can see at a distance of 6 meters. Someone with exceptionally good eyes can see also line 4.8 or even line 3.8.

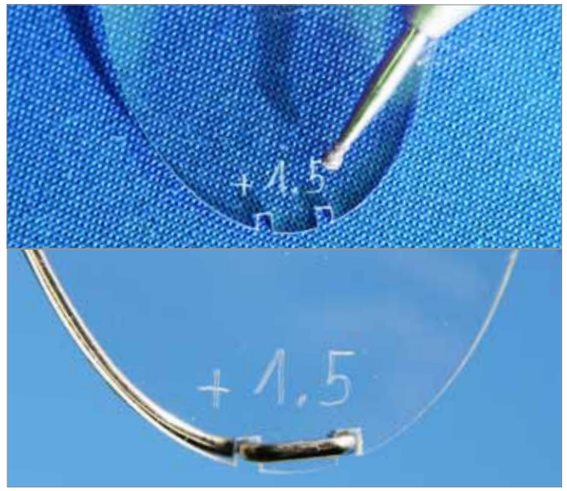
Information: We have modified the vision chart to a distance of 4 meters, as 6 meters is often difficult to maintain in small rooms.

The lens bar

The lens bar has lenses of the different diopters. Make sure that the lenses are always clean. If they are scratched then replace them.

Lens bar

Engrave the diopters into the lenses so that, if they drop out, you cannot mix them up.

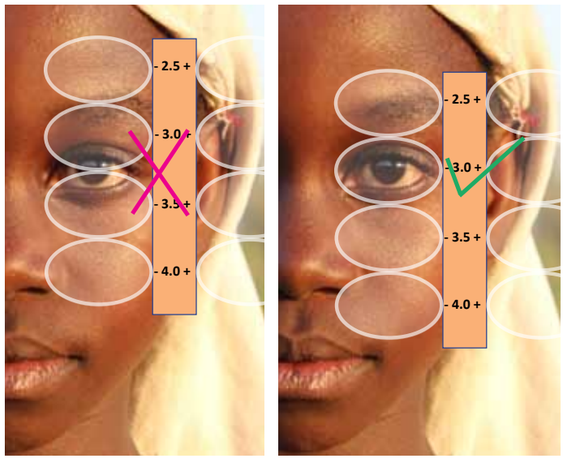


Lens with engraved power

Make sure, the patient looks through the middle of the lens!

Maybe the patient can hold the lens bar himself, then he holds it the right way.

If your hand is shivering – put it on the patient‘s head (ask him before if this is OK for him).



Don‘t cover the symbols with your finger or your stick! Take a thin stick!

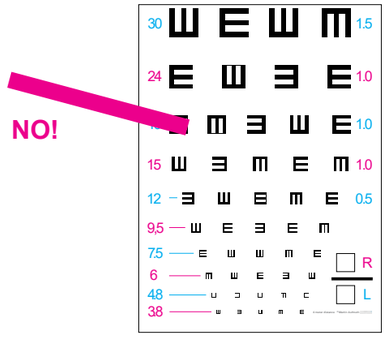
Make sure, the patient can see the **“E“ COMPLETE!**

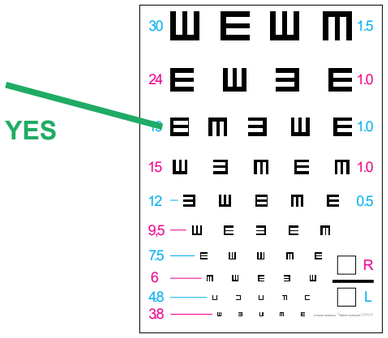
Experiments with the vision chart

Make experiments with the vision chart. Try to read from different distances – who in your group has the best eyes?

Double/triple the distance – which lines can you read now?

Try it in shadow/sun/in the evening. How does your vision acuity change?





Client‘s book

Welcome the patient, say hello, tell him your name.
Be friendly and polite – the patient might be afraid because he has never met an eye specialist before. **Don‘t hurry** – the patient needs time to see and to understand.

Ask his personal data:
- name
- age
- address
- phone number (if he has no phone, ask him for the number of a familiy member or neighbour)
- profession

Ask him about his problem:
- reading
- seeing at short distance
- seeing at far distance
- problem with light
- aching eyes
- cataract, or any other eye disease
- eye injury

Ask him how long he has had the problem

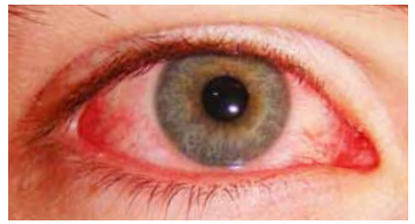
Write everything in the client‘s book!

Date: 20 - - Prescription by: _____
First name: _____ Age: _____
Surname: _____ Male ☐ Fem. ☐
Address: _____
Phone No.: _____ Profession: _____
Problem: _____ Had glasses before: Yes ☐ No ☐
Eye test: VA_{sc} R: L: VA_{cc} R: L: R ____ L ____
Glasses for: reading ☐ seeing far ☐ Sun ☐ PD: _____ (S/M/L)
Selling prize: _____ *Signature:*
I should go to hospital: Yes ☐ No ☐
With my signature I declare that the abovementioned data is true. I agree that my personal data may be stored and published.

2.2 Eye diseases

Look at the patient‘s eyes

1. Is the white of the eye red?



2. Is the pupil grey or white?

Does the patient have

3. Painful eyes
4. Swollen eyes
5. Watery eyes
6. Abnormal eye movement
7. anything which does not look normal

→ **=> Send the patient to the hospital!**

Important: Check if you are allowed to give eye drops in your country or not! Never touch an eye with your fingers or with an instrument!

Characteristics of a healthy eye

- Eyelids opening and closing normally
- Clear conjunctiva
- Clear cornea
- Round, black pupils of the same size
- Eyeball can move in all directions

2.3. Eye test without lens

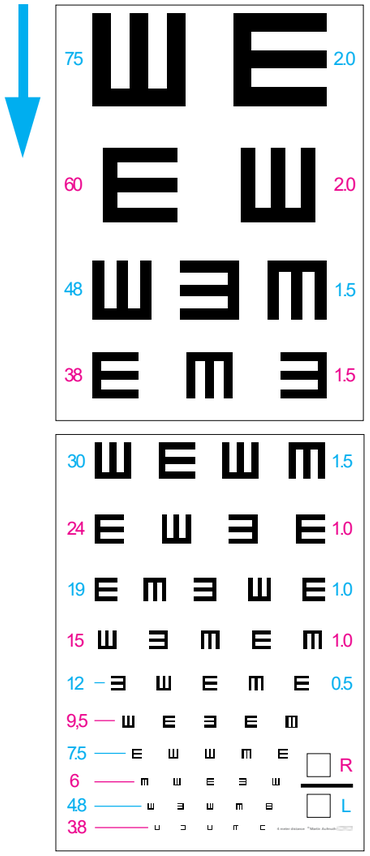
Test both eyes

The patient sits 4 m from the vision chart.

Ask which line he can see well.
=> Start with this line

Go down to the next line.
If he can see at least **4 out of 5 symbols** (80%) in one line this is OK. If he is not sure, let him guess.

If possible, **always take two charts** (large and small symbols)

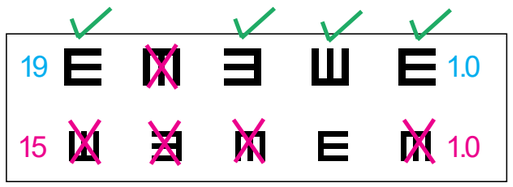


Example

The patient can see 4 out of 5 symbols in line 19. In line 15 he cannot see.

=> He has **VAsc =** $\frac{6}{19}$

(Somebody with perfect vision acuity would see this line from 19 meter distance)



Experiment
Which is the smallest line you can see at least 4 out of 5 symbols?

If he cannot see anything

Bring the vision chart 40 cm (one tenth of 4 meters) near to his eyes and test again:

If he can see nothing again:

If he can see **NOTHING** again:

=> If now he can see line 30, this is like a hypothetical line 300 (or at 15 it would be 150, always ten times as much)

=> Try finger counting very near to his eyes.

=> Send him to the eye doctor / hospital!

2.4 The Golden Rule of Refraction

The Golden Rule

An **increase** of 0.50 D means a 0.50 (50%) **decrease** in VA (visual acuity)

!

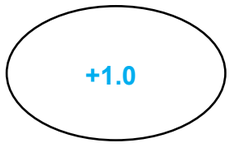
Experiment 1

If you see the line 6 (6/6 = 1) and you take a +0.5 lens, you will see only line 12 (6/12 = 0.50 = half) => You see half as good as somebody with normal eyes.

Half VA

Experiment 2

If you see the line 6 (6/6 = 1) and you take a +1.0 lens, you will see only line 24 (6/24 = 0.25 = half of half = a quarter)



Quarter VA

Experiment 3

If you see the line 6 (6/6 = 1) and you take a +1.5 lens, you will see only line 48 (6/48 = 0.125 = half of a quarter)

Half quarter VA

Visual acuity in %

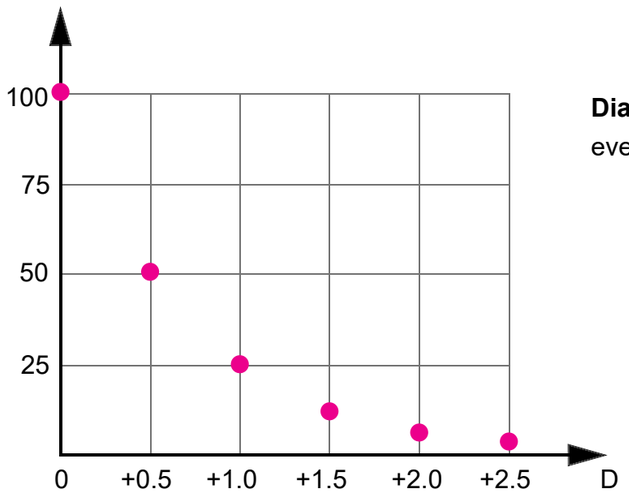


Diagram: If you look through a PLUS lens, for every +0.5 D the VA goes down by half.

2.5 The Starting-Power

If the patient can only see line 12 you start with the Starting-Power of +0.5

If this is worse you go to -0.5

The Starting-Power for line 12 is ±0.5

With -0.5, his visual acuity (VA) now should double and he should see line 6

The Starting-Power for line 24 is ± 1.0

With ±1.0 the VA should double twice and he should see line 6

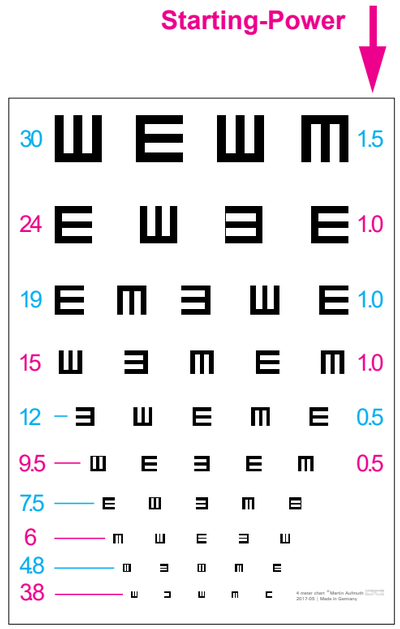
The Starting-Power for line 48 is ± 1.5

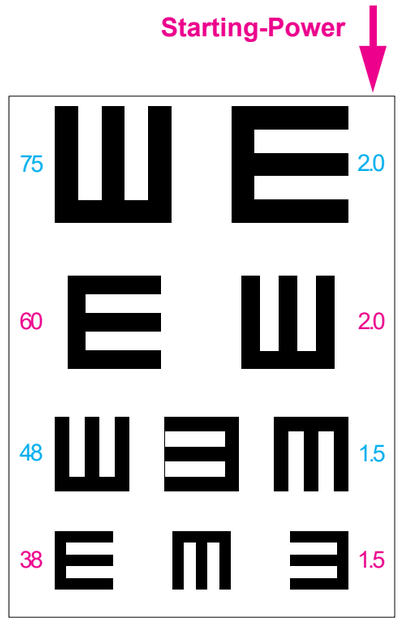
With ±1.5 the VA should double three times and he should see line 6

If he cannot even see the large symbols,
=> Take as Starting-Power **± 2.0**

Each line has its own Starting-Power!

!





2.6 The Refraction

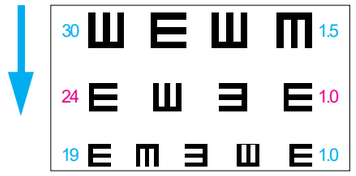
Step 1: Check without lens

The patient covers his LEFT eye with his PALM (not with his fingers!).

Ask which line he can see well with his RIGHT eye => Start with this line. Then go down and find the last line he can see at least 4 out of 5 symbols.

The Eye-Test-Card
This is a laminated card you can write on with a water-soluble marker. At the end of the refraction the data is transferred into the clients book.

Write down the VAsc of the last line he can see at least 4 out of 5



Name: _____

Optician: _____

	R	L
VA sc	6/19	6
VA cc *temporary*	6	6
Far		
Near		
VA cc *Final test!*	6	6

Step 2: Start with plus

Start with PLUS Starting-Power
Wait 3-5 seconds! (the eye can adapt)
Then ask: "**Is this worse?**"
Find the best line he can see (4 out of 5)

Take next higher plus and ask again:
"**Is this worse?**"
Find the best line he can see (4 out of 5)

Stop when he says "It is worse!"
a) if he still sees 4 out of 5
=> increase +0.5 more (and so on…)
b) if he can NOT see 4 out of 5
=> take +0.5 less and test again

Take highest PLUS lens he can see the best
If Plus is NOT good => go to Minus

Start with PLUS

Example 1

Without lens, the patient can see 4 out of 5 (or more) in line 19 (but not in line 15)
=> VAsc 6/19

=> Starting-Power = +1.0
Wait 3 seconds (count "21, 22, 23")
Ask: "Is it worse?"

He says "NO" and he can see 4 out of 5 in line 6 now
Go to +1.5
Ask: "Is it worse?"

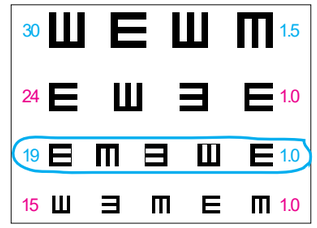
He says "NO" and he can still see 4 out of 5 in line 6
Go to +2.0
Ask: "Is it worse?"

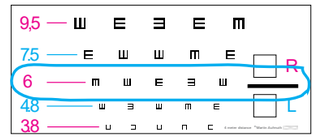
Now he says "YES" (it is worse)
If he can still see 4 out of 5 in line 6
=> Increase to +2.5 (... and so on...)

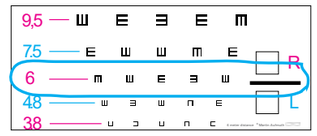
If he can NOT see 4 out of 5 in line 6
=> STOP and go back to +1.5

Write VAcc 6/6
Write prescription R +1.5

Starting-Power







	R	L
VA sc	6/19	6
VA cc *temporary*	6/6	6
Far	+1.5	

Not OK: covering the eye with fingers.

OK: He covers his eye with his palm.

Step 3: Minus

Start with MINUS Starting-Power
Ask: **“Is it better?“**

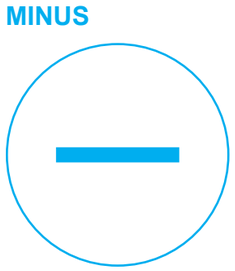
Find the line he can see (4 out of 5)
Go on with next higher Minus ...

Stop when he says “It is not better!“
Stop also when the line does not improve

Take -0.5 D less and test again

Take the lowest MINUS lens which is good

Write VAcc in Eye-Test-Card
Write the prescription in Eye-Test-Card



Example 2

Without lens, the patient can see line 15 with his right eye

=> VAsc 6/15
=> Starting-Power = +1.0

Check +1.0
“Is it worse?“ => YES (it is worse)

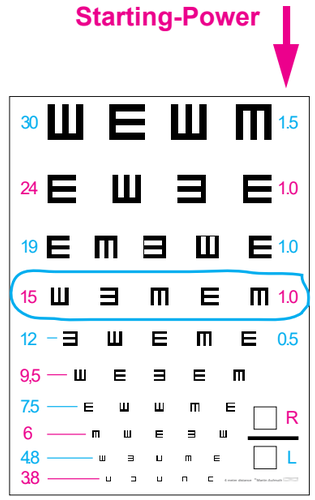
Check -1.0
“Is it better?“ => YES (it is better)
With this he should reach 6/6 or better

Check -1.0
=> line 15 OK
=> line 12 OK
=> line 9.5 OK
=> line 7.5 OK
=> line 6 NOT OK
=> The lens is probably too strong!

Go to -0.5
=> line 7.5 OK
=> line 6 NOT OK[1)]

Both lenses are the same
=> give the **smaller MINUS lens!**
=> Give -0.5

Write down the VAcc 6/7.5
Write prescription R -0.5



	R	L
VA sc	6/19	6/
VA cc *temporary*	6/7.5	6/
Far	-0.5	

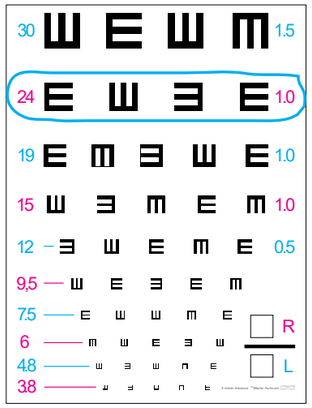
Plus-Minus Rule

Plus Refraction: Find the highest PLUS lens BEFORE it gets worse!
(If 2 lenses are the same, take the **higher PLUS**)
Minus Refraction: Find the smallest MINUS lens he can read the best line.
(If 2 lenses are the same, take the **smaller MINUS**)

1) The reason that the patient cannot reach line 6 can be an astigmatism.

Example 3

Without lens, the patient can see line 24 with his right eye



=> VAsc 6/24
=> Starting-Power = +1.0

Check +1.0
"Is it worse?" => NO (it is not worse)
=> Line 19 is OK

Go to +1.5
"Is it worse?" => NO
=> Line 12 is OK

Go to +2.0
Now he says "YES" (it is worse)
If he can still see 4 out of 5 in line 12
=> Increase to +2.5 (... and so on...)

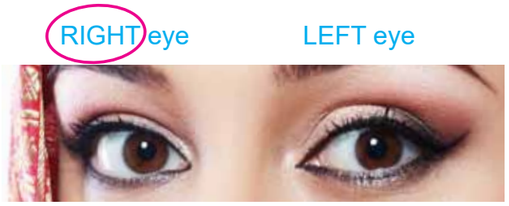
If he can NOT see 4 out of 5 in line 12
=> STOP and go back to +1.5

The best line was 6/12
Give +1.5

Write down the VAcc 6/12
Write prescription R +1.5

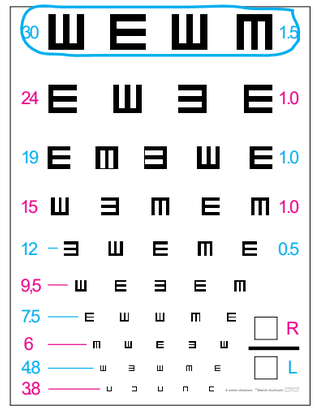
	R	L
VA sc	6/24	6
VA cc *temporary*	6/12	6
Far	+1.5	

Don't mix the RIGHT and LEFT eye of the patient! (For you right is left and left is right)



Example 4

Without lens, the patient can see line 30 with his left eye



=> VAsc 6/30
=> Starting-Power = +1.5

Check +1.5
"Is it worse?" => YES (it is worse)

Check -1.5
"Is it better?" => YES
With this he should reach 6/6 or better

Check -1.5
=> line 24 OK
=> line 19 OK
=> line 15 OK
=> line 12 OK
=> line 9.5 OK
=> line 7.5 OK
=> line 6 NOT OK
=> The lens is probably too strong!

Go to -1.0
=> line 7.5 OK[1)]

Both lenses are the same
=> give the smaller Minus!
=> Give -1.0

Write down the VAcc 6/7.5
Write prescription L -1.0

Rule: The final myopia prescription should not exceed the starting power by more than -0.50.

Example: The starting power is -1.5
The prescribed maximum can be -2.0 (less like -1.5 or -1.0 would be also possible).

	R	L
VA sc	6	6/30
VA cc *temporary*	6	6/7.5
Far		-1.0

Experiment
Take a pair of glasses with unknown power, put on the glasses and now ask your training partner to make an eye test finding out the power of your lenses.

1) The reason that the patient cannot reach line 6 can be an astigmatism.

2.7 Astigmatism

Besides Myopia, Hyperopia and Presbyopia, there can be another common refractive error too:
Astigmatism

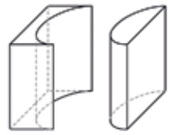
People suffering from myopia, hyperopia and presbyopia can be helped with “normal“ spheric glasses. Spheric means, the lenses are shaped like a part of a sphere/ball.

Sphere

Spherical lens

People suffering from astigmatism have a cornea which is deformed cylindrically.

Cylinder

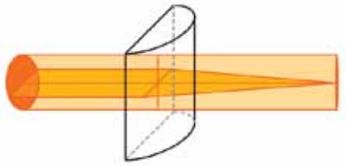


Cylindrical lenses

Normally, light coming from a round circle falling through a positive spheric lens, is focussed in a single point.

Point

The same light falling through a cylindric lens is focussed on a line.



Line

This is how a normal eye sees the ball.

This is how somebody with astigmatism sees the ball.

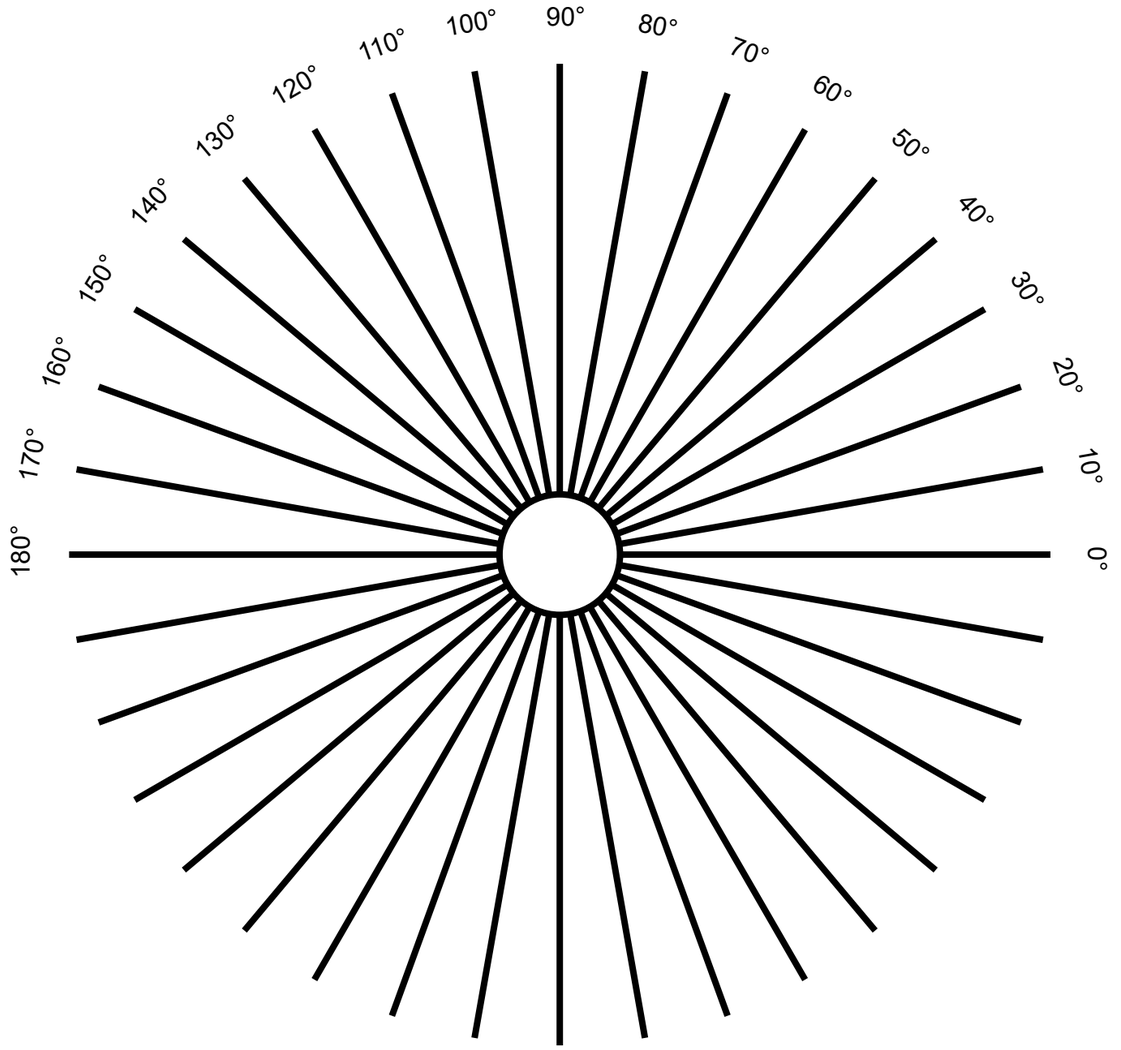
At night, people with astigmatism don‘t see the stars like round points but like flattened dots.

Stars seen with normal eye

Stars seen with astigmatism

Astigmatism test

With this test you can check if somebody has an astigmatism. Looking at the radial lines, somebody without astigmatism should see all lines similar. Somebody with astigmatism sees only lines in a certain direction black, the others are blurred.



Experiment

1. Do you see all lines similar?

2. Close your left eye and hold a lens with -2.0 D oblique in front of your right eye, looking at the radial lines. Now you should see some of the lines blurred.

The Best Spherical Lens (BSL)

Astigmatism normally must be corrected with a cylindric lens. But people with a small astigmatism (small cylindrical deformation of cornea) can be helped with a “normal“ spheric lens to some extent. We call this lens “**Best Spherical Lens (BSL)“.**

People with a strong astigmatism must be sent to an optometrist. If the patient reaches less than line 12 on the vision chart with your lenses, sent him to the optometrist.

A cylinder can be positive or negative. Every cylinder has an axis (A) which describes the direction of the cylindrical deformation.

Example

Prescription
R: sph. +2.50 cyl -1.00 A 180° (cylinder negative -)
L: sph. +3.00 cyl +2.00 A 180° (cylinder positive +)

Formula for the Best Spherical Lens

BSL = spherical correct. + cylinder / 2

BSL = sph + cyl / 2

Little mathematics

(+2) / 2 = +1
(-2) / 2 = -1
(+0.50) / 2 = +0.25
(-3.50) / 2 = -1.75

(+4.50) / 2 = _____
(-3.0) / 2 = _____
(+2.5) / 2 = _____

Example: Which spherical lens (BSL) is needed?

Prescription
R: sph. +2.50 cyl -1.00 A 180°
L: sph. +3.00 cyl +2.00 A 180°

+2.50 + (-1.00 / 2)
Right eye: = +2.50 - 0.50 = +2.00
=> **BSL right: +2.00 D**

+3.00 + (+2.00 / 2)
Left eye: = +3.00 + 1.00 = +4.00
=> **BSL left: +4.00 D**

If you have glasses in 0.5 steps (-6.0 D; -5.5 D; -5.0 D; ... +5.5 D; +6.0 D) you sometimes have to round.

Round towards the SMALLER Minus and towards the HIGHER Plus!

Little mathematics

round +3.75 into +4.00
round +1.25 into +1.50
round -1.25 into -1.00
round -3.75 into -3.50

round +4.25 into _____
round -0.75 into _____
round +5.75 into _____

Example: Which spherical lens (BSL) is needed?

Prescription
R: sph. -2.75 cyl +0.75 A 50°
L: sph. -3.00 cyl +0.50 A 160°

Right eye: -2.75 + (+0.75 / 2)
= -2.75 + 0.375 = -2.375
=> The smaller minus is: **-2.0 D**

Left eye: -3.00 + (+0.50 / 2)
= -3.00 + 0.25 = -2.75
=> BSL left = -2.75 D
=> The smaller minus is: **-2.50 D**

By the way: 2 cylindric diopters are as disturbing as 1 “normal“ spheric diopter.

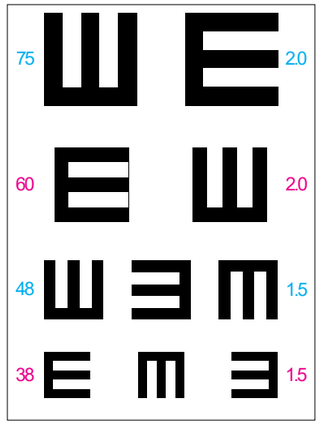
If you calculate the BSL, ALWAYS verify the result by performing a test for refraction.

For trainer: Make sure everybody knows how to add and subtract fractions like +1.25 - 0.50. (This can take a whole day!)

2.8 People with very low VA

If a patient cannot see the small symbols, turn the vision chart to use the large symbols.

Now use **your fingers to point to the symbols** because the patient will not see a thin stick or a pen.



Bring the vision chart 40 cm (one tenth of 4 meters) near to his eyes and test again:

=> If now he can see line 30, this is like line 300 (at 15 => 150, always **ten times** as much)

If he can see nothing again:

=> Try finger counting very near to his eyes.

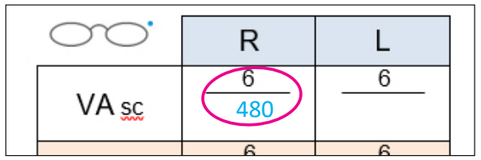
If he can see **NOTHING** again:

=> Send him to the eye doctor / hospital!

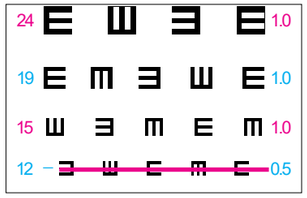
Example

The patient cannot see any symbols at 4 m distance. So you bring the chart 40 cm in front of his eyes.

Now the best line he can read is line 48
the number is 48x10 = **480**



If somebody cannot reach line 12 (VAcc less 50%) with any of your lenses => send him to the hospital. (If he wants he can buy your glasses nevertheless.)



line 15 or worse

2.9 The pinhole

Imagine this situation: You have tested the eyes of a patient for some time without any improvement of his vision. Now you want to know if glasses can help him at all. Here the pinhole glasses or a pinhole occluder can be used.

Let the patient look through the hole(s) at the vision chart.

If the patient can see better, try againg the refraction. If you are not successful, he might have a strong astigmatism. In this case send him to the optometrist.

If the patient cannot see better with the pinhole, he has an eye disease. **Send him to the eye doctor / hospital.**

Pinhole glasses

Pinhole occluder

Research – eye specialists

Where are the next ophthalmologists and eye clinics to refer to?
Write them down here:

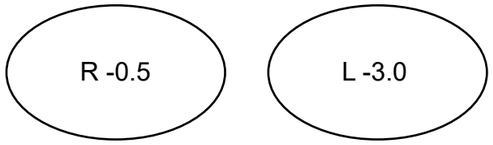
2.10 Special cases

Big difference between the correction of the left eye and the right eye

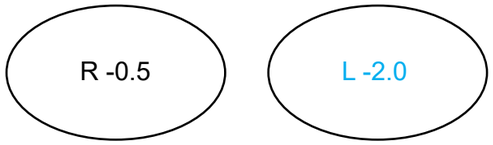
If the difference between the left lens and the right lens is 2 diopters or more, the patient can get problems like headache.

In such cases, let the patient test his new glasses for some hours.

If he gets problems, reduce the power of the stronger lens (e.g. take -2.0 instead of -3.0). Some weeks later he can try the stronger lens again.



Big difference between left and right eye



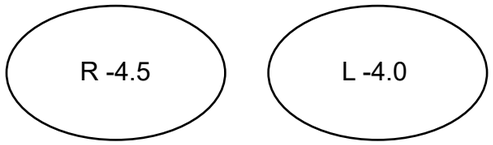
Stronger power reduced

Problems with high diopters

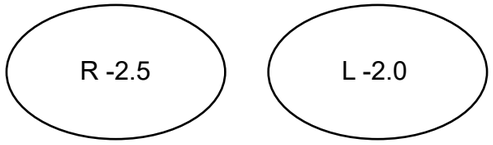
If a patient has glasses with high diopters for the first time in his life (e.g. R -4.5 and L -4.0) he may have problems with it.

In such cases, reduce the lens power of both lenses equally.

Some weeks later you can try to give him the stronger lenses again.



Problems with high diopters



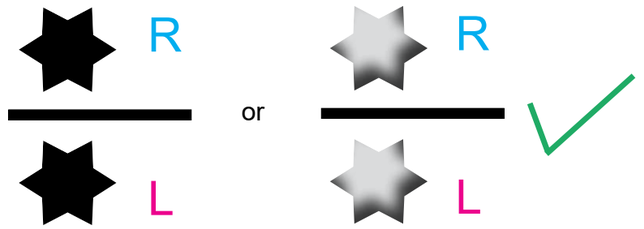
Reduced lens power

2.11 Binocular Balance

The **Binocular Balance** ensures that accommodation is balanced in both eyes.
If the patient can see with one eye only, testing is not necessary.

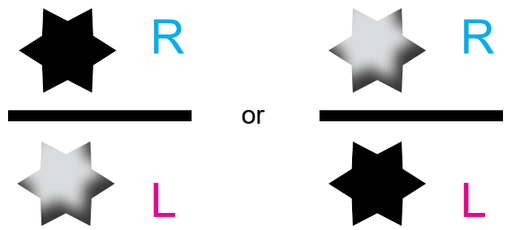
The patient puts on the polarized glasses (over his prescription glasses)

1. If **R**ight (top) and **L**eft (bottom) have the same color (black or gray):



=> No correction necessary.

2. If **R**ight (top) is darker or **L**eft (bottom) is darker:



a) Add +0.5 for the "darker" eye

Is it getting worse (less black or blurred) now?
Yes => Don't change the prescription

Is there no change?
=> add +1.0, +1.5 etc. until it gets worse

b) Now add +0.5 for the other eye

Is it getting worse now?
Yes => Don't change the prescription

Is there no change?
=> add +1.0, +1.5 etc. until it gets worse

Example: Left is darker

The left prescription was -1.5
You add +0.5 => No change
You add +1.0 => now it gets worse
The new prescription is: -1.5 + 0.5 = -1.0

VA cc *temporary*	6/7.5	6/6
Far	-1.5	~~-1.5~~ -1.0

Example: Right was the gray eye

The prescription was -1.5
You add +0.5 => it gets worse
=> you keep the old prescription -1.5

VA cc *temporary*	6/7.5	6/6
Far	-1.5	~~-1.5~~ -1.0

2.12 Reading glasses

When people get 40 years or older, their lens loses its elasticity and the ciliary muscle gets weak. They lose their accommodation!

This is called **Presbyopia.**

These people cannot read any longer. They need **reading glasses.**

Presbyopia without reading glasses...

... and with reading glasses.

Age and diopters

Here is a table which shows the average power of reading glasses at a certain age (individually it can be different).

Reading Table

age 40	**+1.0 D**
age 45	**+1.5 D**
age 50	**+2.0 D**
age 55 (or older)	**+2.5 D**

Experiment – Reading glasses

Bring this text very close to your eye. Now you cannot read it because your ciliary muscle is not strong enough.

Now take a strong PLUS lens (+6.0) close to your eye. Can you read again?

Research

Babies and young children can accommodate very good. They have a very strong ciliary muscle and they can see things very close to their eye. (A baby can focus at 5 cm in front of his eye)

Ask a child how close he can see his finger...

This girl child can accommodate more than 10 D. She doesn‘t need reading glasses.

This young woman can accommodate more than 6 D. She doesn‘t need reading glasses.

This old man can accommodate less than 4 D. **He needs reading glasses!**

Info:
Little babies can focus at 5 cm in front of their eyes (this equals 20 diopters). A 25 year old adult can still focus at 10 cm (or 10 diopters). A person at age 60 or older can only see clearly at a minimum distance of about 1 meter (this equals 1 diopter).

Finding the right reading glasses

First do the normal refraction for distance vision.
Write down the prescription for R and L.

Ask the age of the patient
Look at the reading table

Then calculate for each eye
distance vision power + reading power

Reading table	
age 40	+1.0 D
age 45	+1.5 D
age 50	+2.0 D
age 55 (or older)	+2.5 D

Comment: with +3.0 the reading distance will be 1/3 m = 33 cm. The problem with high diopters is the smaller depth of focus. So don‘t go too near to read if not necessary.

The right reading distance

The typical reading distance is 40 cm (reading with rectangle arms)

Let the patient hold the reading test himself
=> so he can find his best distance

The individual distance depends on what somebody is doing: reading, sewing, etc.

=> Ask the people what they want to do with their glasses and which distance they need.

If he holds reading test **too far**
=> Take more PLUS, check again

If he holds reading test **too near**
=> Take less PLUS, check again

If people cannot read: Give them a needle and a thread, or a box with rice mixed with little stones or let them type on a mobile phone.

Example 1
A 70-year-old man needs for far distance
R +1.5 and L 0.0

Look at the reading table:
70 years => +2.5 D

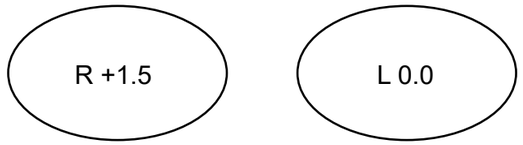
R = +1.5 + 2.5 = +4.0
L = 0 + 2.5 = +2.5

If he can read => **it is OK.**

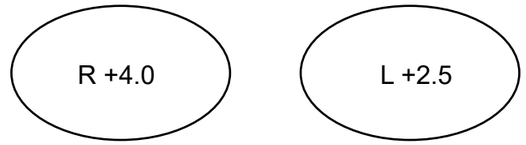
If he holds reading test **too far**
=> Take more PLUS, check again

If he holds reading test **too near**
=> Take less PLUS, check again

Glasses for far distance

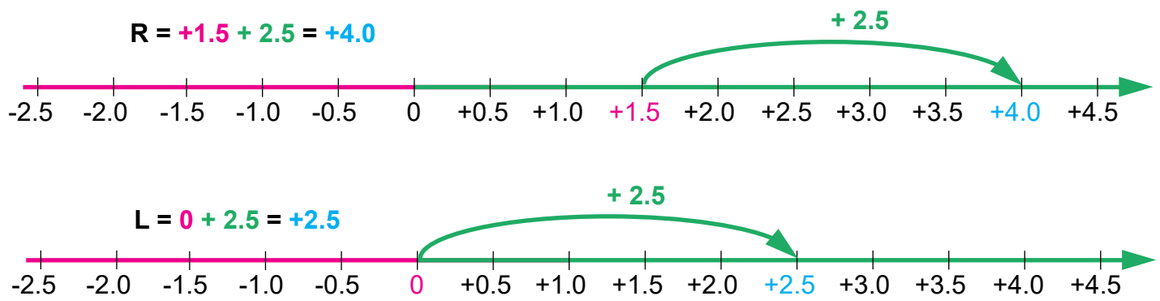


Reading glasses



ATTENTION!
If you look at the client, his LEFT eye is on your RIGHT side!

For calculations the number line can help:



Task
What problems are people beyond 40 years faced with, when they do not have reading glasses?
Write at least 10 examples. Think about your family, your neighbours, different professions ...

Example 2

A 49-year-old woman needs for far distance
R -3.0 and L -2.0

Look at the table: 49 years for reading glasses normally is about +2.0 D

R = -3.0 + 2.0 = -1.0
L = -2.0 + 2.0 = 0.0

Theoretically this is her reading glasses prescription.

But practically nobody with a moderate myopia will take reading glasses. Let her decide if she wants to buy these reading glasses or not.

Glasses for far distance

R -3.0

L -2.0

Reading glasses

R -1.0

L 0.0

Position of the reading glasses

Before bending the temple, ask the patient if he wants to have his reading glasses in the front of his nose or not.

Task

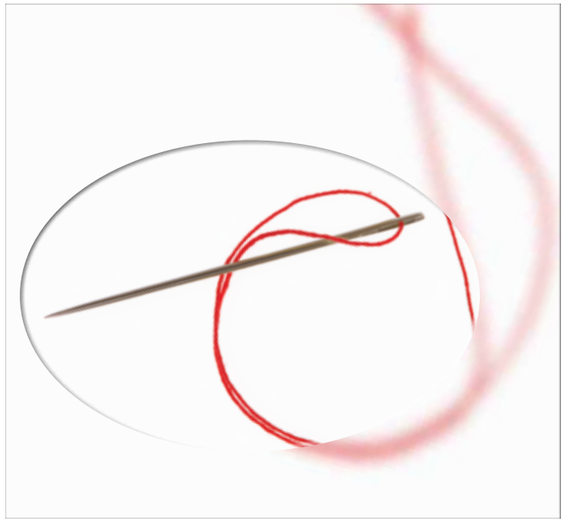
A 55-year-old woman needs for far distance R -5.5 and L -6.0
A 40-year-old man needs for far distance R +0.5 and L +2.0
=> Find the right reading glasses!
=> Find other examples and make the calculations!

Not only reading!

Reading test: Many people can no longer read the Bible, the Koran or the song book in the church. Have such books with you so that people can see the difference immediately.

Some people probably cannot read, but they need reading glasses for other important things.

Needle and thread: Many people cannot sew because they are presbyopic. Always have a needle and a thread with you, so they can feel the difference with glasses.

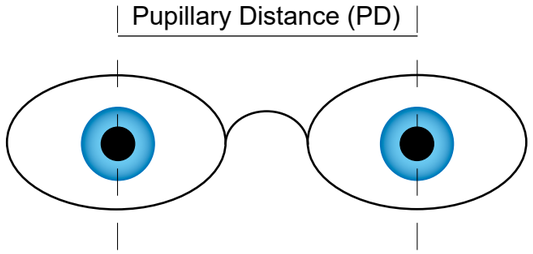


Rice and stones: Women have to check if the food is good for cooking. Always have a little box with rice (or beans) mixed with little stones with you.

Task

Put on a pair of strong negative glasses (e.g. -5.0). Now try to put the thread into the needle. Try to find the stones in the rice. That is how you will feel like when you are old and presbyopic.

2.13 The Pupillary Distance (PD)



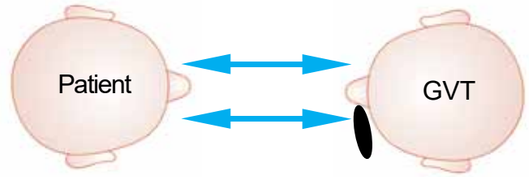
Typical pupillary distances

Children:	54 mm	(yellow point frame)
Adults average:	63 mm	(red point frame)
Adults large:	69 mm	(blue point frame)

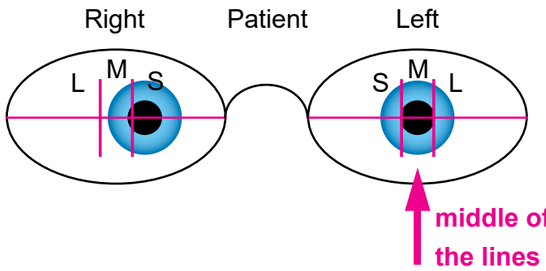
!

Measuring the PD – 7 steps

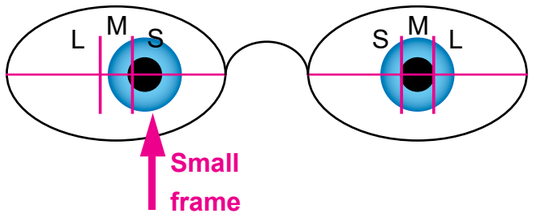
1. You stand face to face close to the patient.
2. You close your left eye with your left hand
3. You tell the patient: “Look into my eye“



4. You move your head in order to bring the pupil of the left eye of the patient in the middle of the two lines (M)
5. You tell the patient “Please don‘t move“. Now, both of don‘t move your head any more.

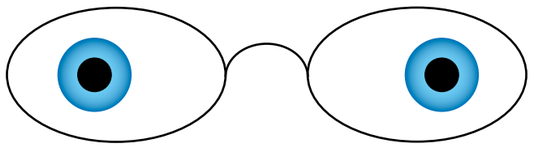


6. Now you close your right eye with your right hand
7. With your left eye you check the position (S, M or L) of the right pupil of the patient.

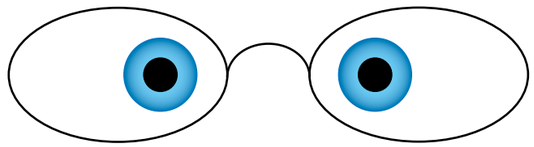


The right size of the frame

Both eyes must look through the CENTER of the GoodVisionGlasses!

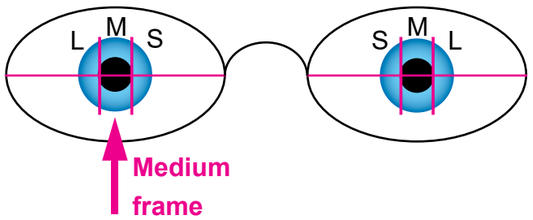


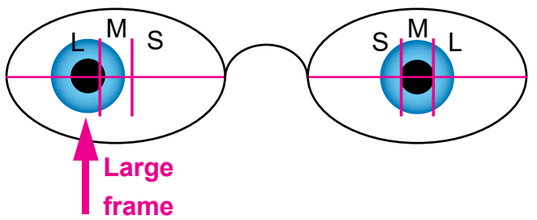
The frame is **too small!**
=> Take a larger one.



The frame is **too large!**
=> Take a smaller one.

If the frame is too small or too big, the eyes are forced to look angular. The patient gets a headache.



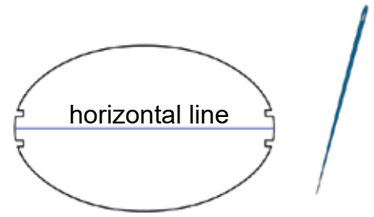


Task for the trainer

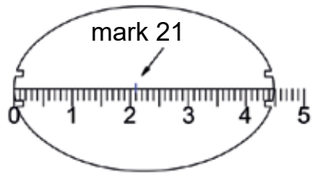
Every student should do the test at least 10 times. Check every step. At the end let each student determine your own PD – then you will know if everyone has understood correctly.

2.14 Producing PD test glasses

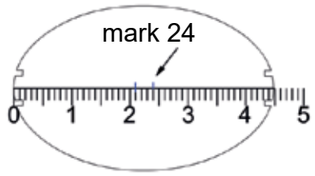
You need: 2 lenses of 0 D, a needle and a ruler. First scratch a horizontal line through the middle of the lens. (with a dark background it is easier)



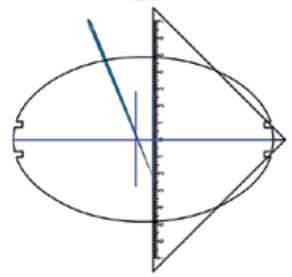
Now scratch a mark 21 mm from the left side into the lens.



Now scratch a second mark 24 mm from the left side into the lens.

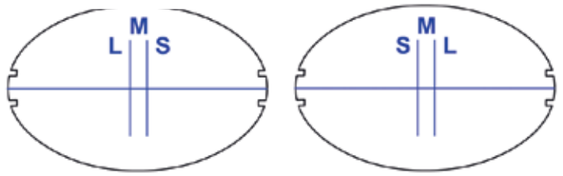


Now scratch two vertical lines into the lens.

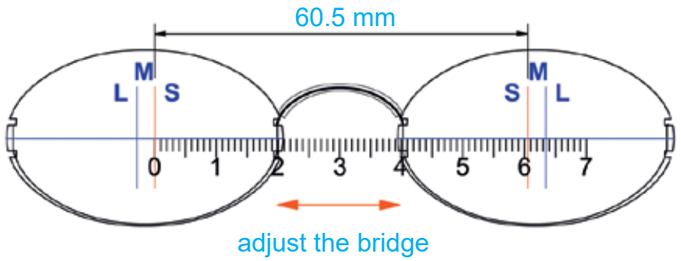


Scratch S, M and L in the lens.

Do the same with the second lens.



Now take a medium frame and adjust the size of the bridge so that the distance between **S left** and **S right** amounts to exactly **60.5 mm**.



Task

Produce your own test glasses. Test the pupillary distance of at least 5 colleagues and write down the results in his book. At the end you can compare your results with the others.

2.15 Useful Tools

To adjust and repair the frames, these tools are helpful:

Loop forming pliers

Two pairs of long nose pliers

Nail scissors

Front cutter

Diamond file

Cutter

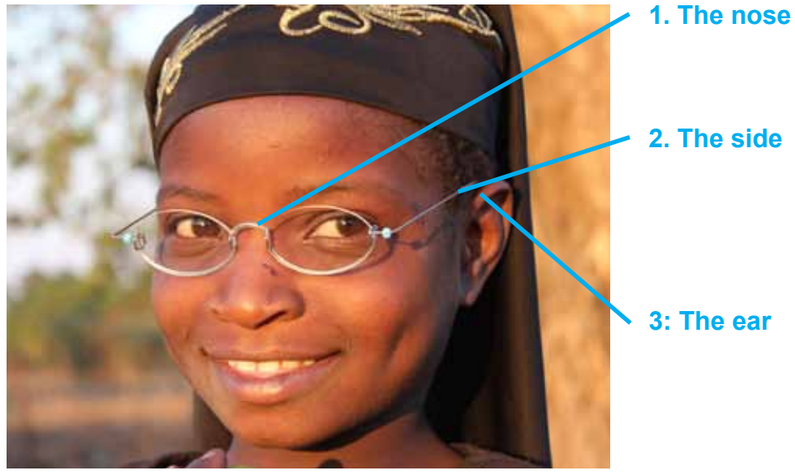
2.16 Adjustment of the frame

Closeness and distance

Normally strangers don‘t come too close to each other and in particular don‘t touch each other. There is a private sphere only family members or good friends may enter. So, before adusting the frame, always ask: “May I adjust these eyglasses?“

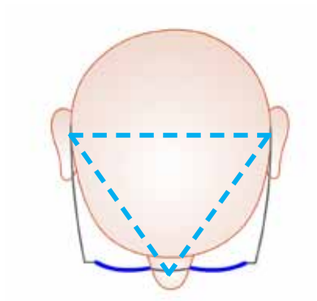
From the front to the back

Always adjust the frame from the front to the back!
Start at the nose (bridge), then come to the side, then to the ears.



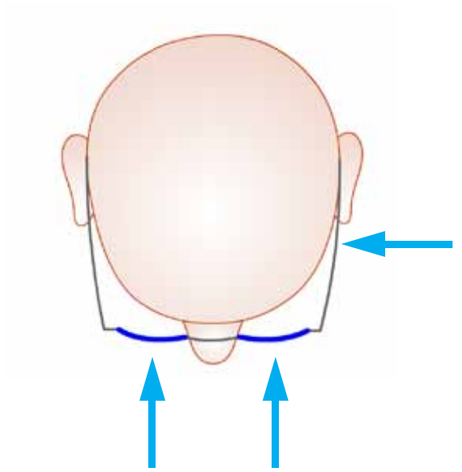
The well-adjusted frame will touch the person‘s head at **3 points only:**

1. The bridge on the nose
2. The sides of the person‘s head above and behind the ear
3. The top of the ear



Shape of the glasses

The shape of the frame, seen from above, should follow the shape of the face.



Both lenses should have the same distance from each eye.

The temple of the glasses is curved, so it does not touch the side of the head.

Make sure the temple of the glasses does not press against the **trigeminus nerve,** which is at the side of the head.

The temples of the GoodVisionGlasses therefore are already round shaped.

Check the Quality of the frame!
Before adjusting a frame, check if the frame is perfect. (No ‘propeller’ at the front, symmetric front, side pieces in one line, etc.)

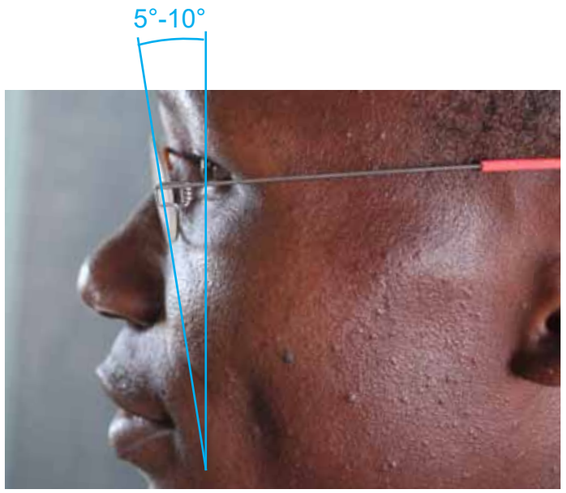
The front

The glasses must be at the same height for both eyes.

The side

The inclination of the lenses should be between 5° and 10°.

This inclination is called **the pantoscopic angle.**



The top

If the eyelashes touch the lens, take a frame with longer side parts at the bridge!

How to bend the temple?

The bending of the temple should start approximately 2 mm behind the base of the ear.

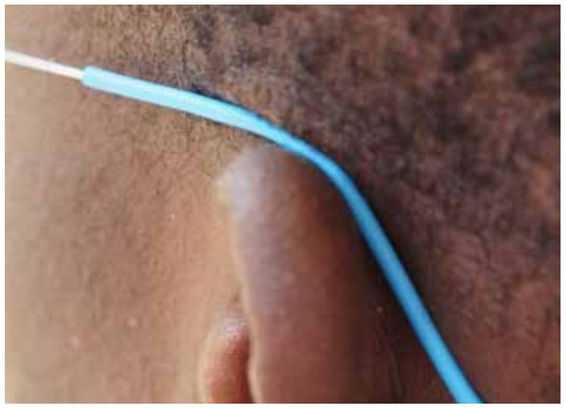
The temple is bent correctly!

The temple is bent too short!

If the temples are bent too short this is not comfortable AND it is not enough space between the lens and the eye.

Shape behind the ear

The bending of the temple should start approximately 2 mm behind the base of the ear. Behind the ear the temple should follow the shape of the ear and the shape of the head.



2.17 Final Check!

Before the patient leaves with his glasses, make the final check with his ready adjusted eyeglasses.

1. He closes his left eye. With his right eye he must reach the VAcc of the test before.

2. He closes his right eye. With his left eye he must reach the VAcc of the test before.

Fill the VAcc (final check!) on the Eye-Test-Card.

Name: _____

Optician: _____

	R	L
VA sc	6/30	6/24
VA cc *temporary*	6/7.5	6/6
Far	-1.5	-0.5
Near		
VA cc *Final test!*	6/7.5	6/6

Fill in any missing Information in the patient‘s book. **Every field must be filled!**

Date: 20[y][y]-[m][m]-[d][d] Prescription by: _____

First name: _____ Age: _____

Surname: _____ Male ☐ Fem. ☐

Address: _____

Phone No.: _____ Profession: _____

Problem: _____ Had glasses before: Yes ☐ No ☐

Eye test: VA_{sc} R: L: VA_{cc} R: L: R ____ L ____

Glasses for: reading ☐ seeing far ☐ Sun ☐ PD: _____ (S/M/L)

Selling prize: _____ *Signature:*

I should go to hospital: Yes ☐ No ☐

With my signature I declare that the abovementioned data is true. I agree that my personal data may be stored and published.

Task

In your work, always ask yourself the question: What can I do better?

3. The Glasses

3.1 The different types of GoodVisionGlasses

1. GoodVisionGlasses Basic (round)

The classic elliptic lenses fit everybody. All frames exist in different colors.

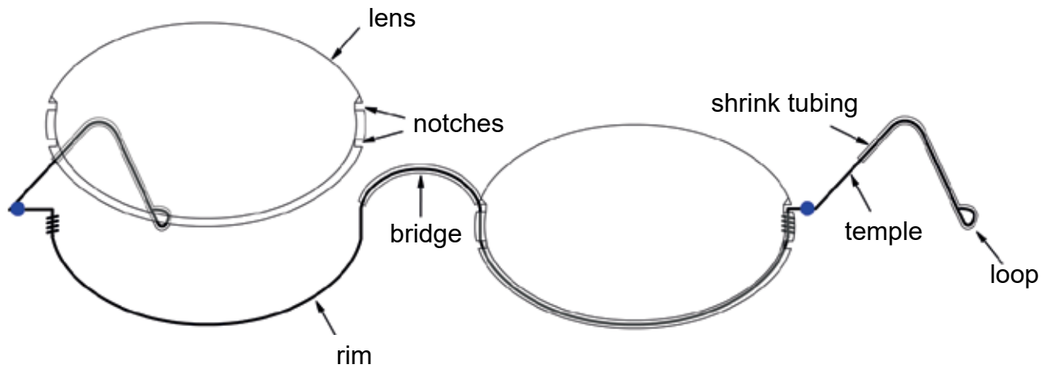
2. GoodVisionGlasses Sun

They are available as normal sun glasses without optical power and also with optical power. They fit into the eliptic standard frame.

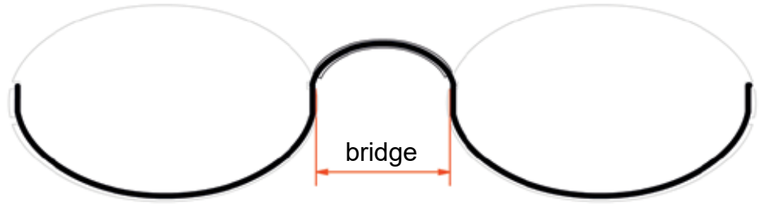
3. Rectangular GoodVisionGlasses

Here with stylish double frame.

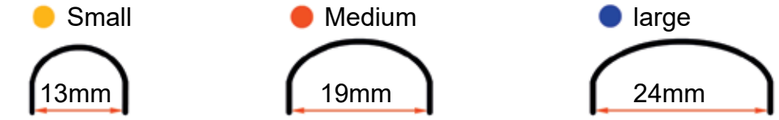
3.2 The glasses – technical terms



The size of the bridge



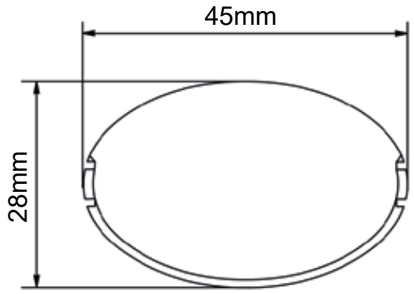
Measure the size of the bridge inside between the wire!

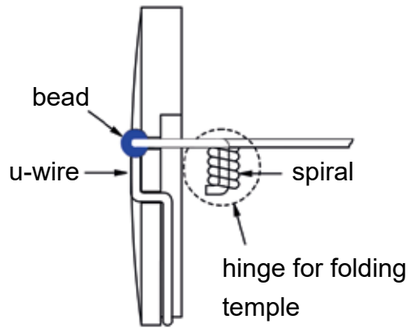


PD: 54 - 60.5 | PD: 60.5 - 66 | PD: 66- 71

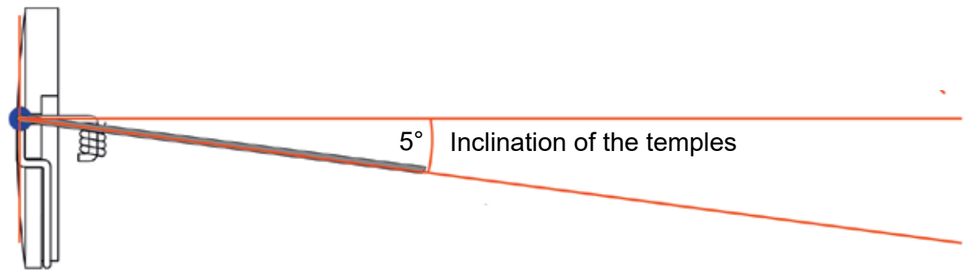
(PD: Pupillary Distance)

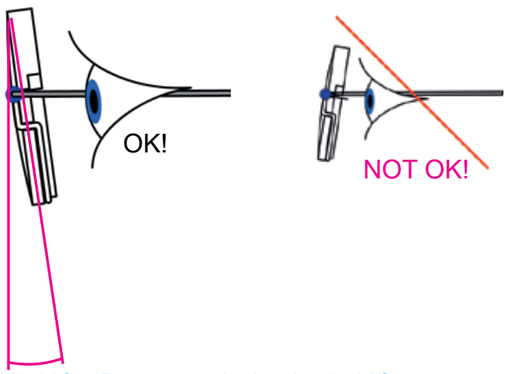
Measures of the lens





Inclination and Pantoscopic Angle





Pantoscopic Angle: 5-10°

The Pantoscopic Angle

The Pantoscopic Angle is the angle between the lens and the vertical position when wearing the glasses.

The Pantoscopic Angle should be 5-10°. You can adjust it by changing the inclination of the temples.

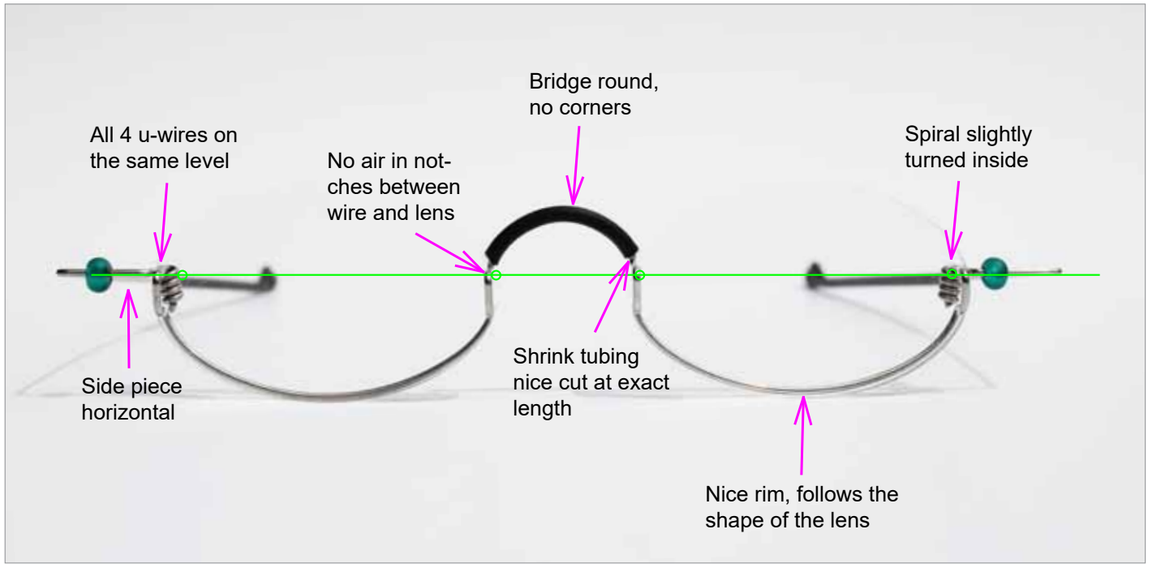
Task

Learn all the parts of the glasses (5 minutes).
Close your book and write them down. Did you forget any?

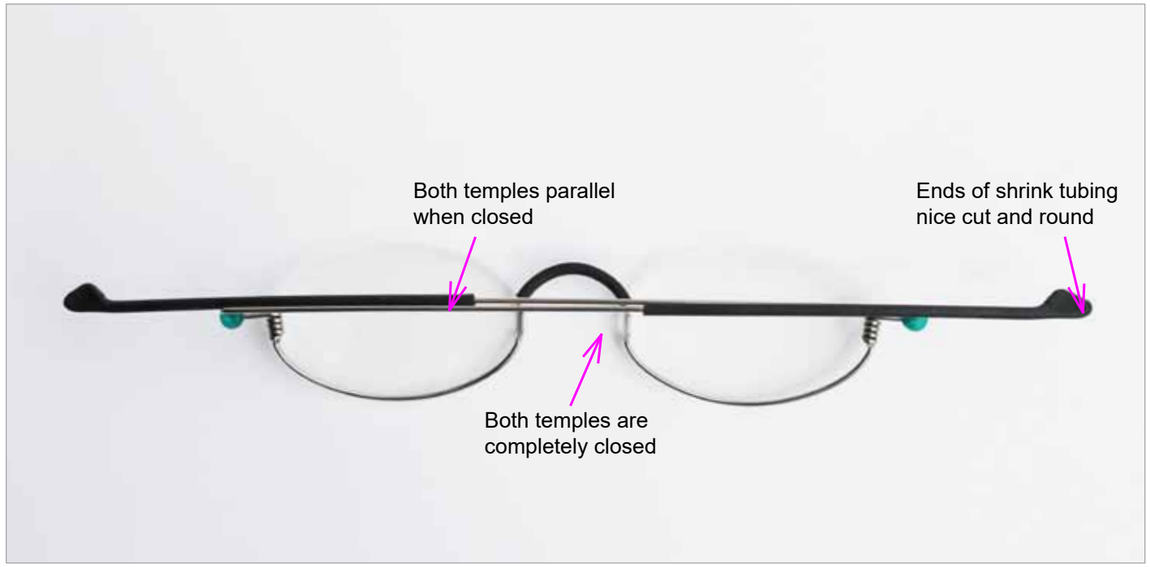
3.3 Quality criteria of GoodVisionGlasses

When using or repairing GoodVisionGlasses, take care that these quality criteria are met. Otherwise repair the glasses or replace them.

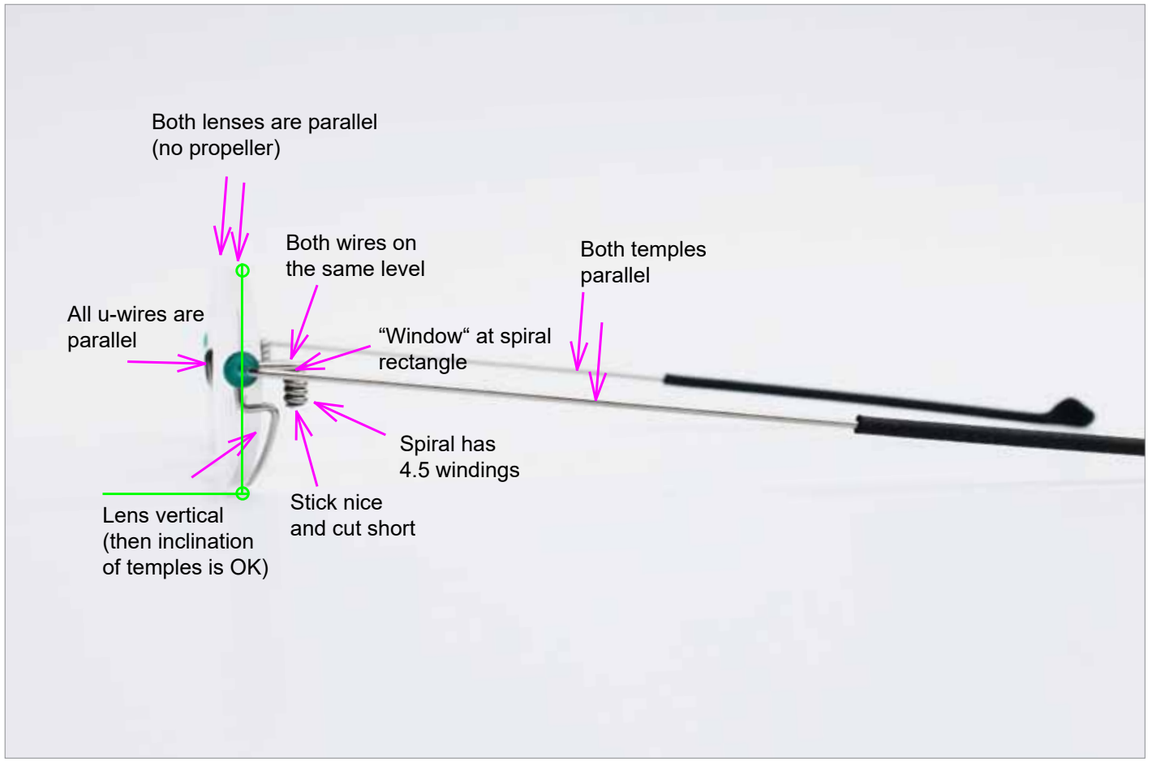
Frontal view



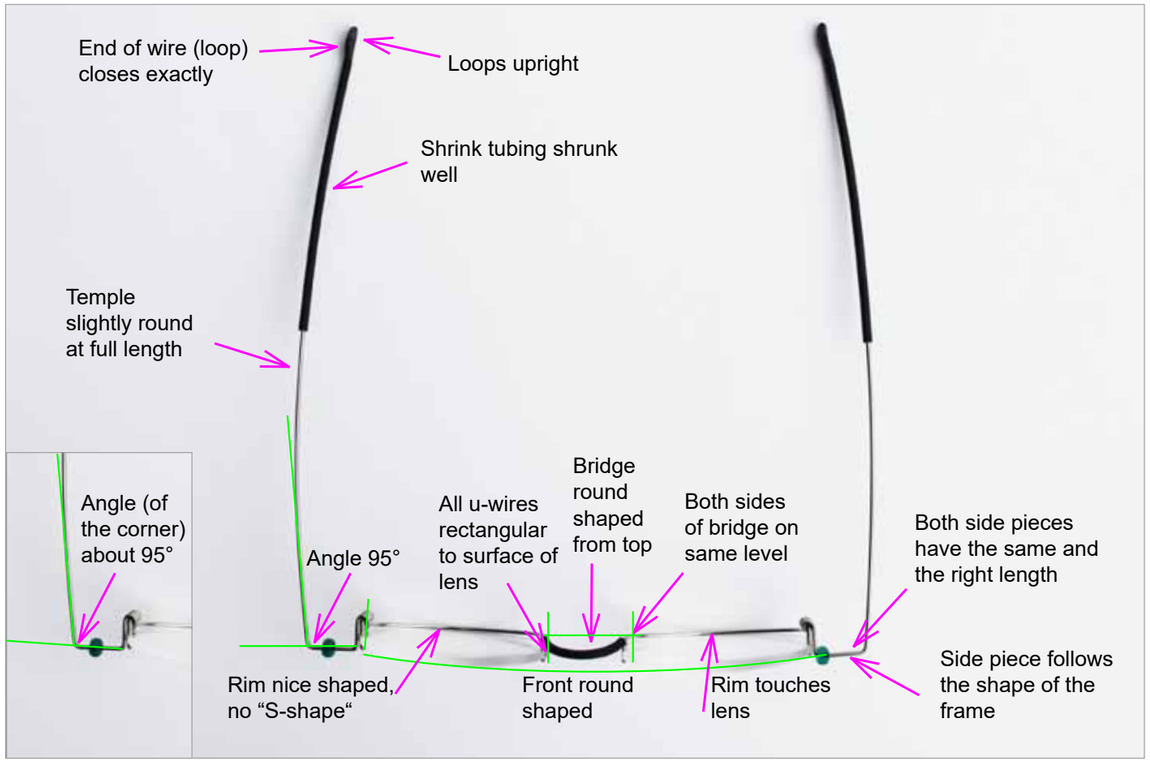
Closed



Side view



Top view

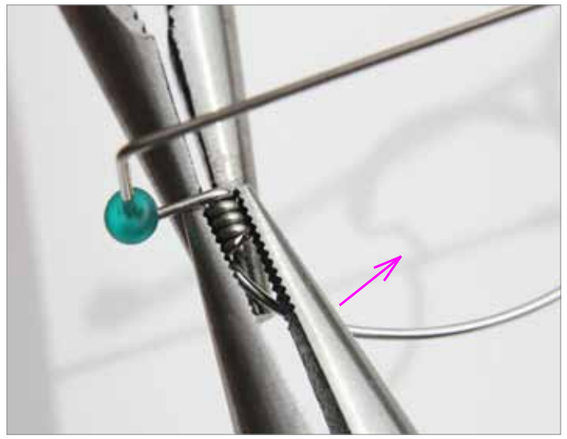


3.4 Repairing GoodVisionGlasses

Repair oplique temples

These temples are not well adjusted

Hold the u-wire with the first plier

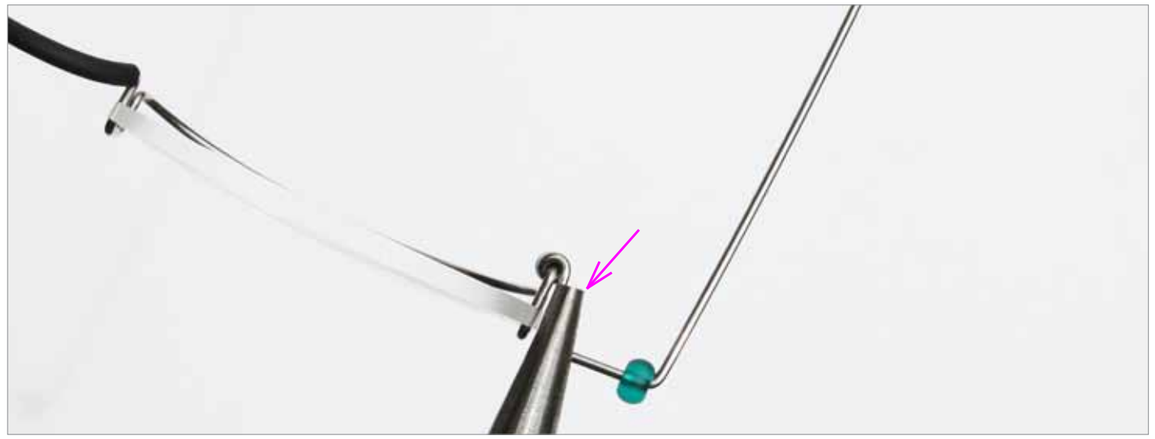


Bend the spiral in (or out) with the second plier

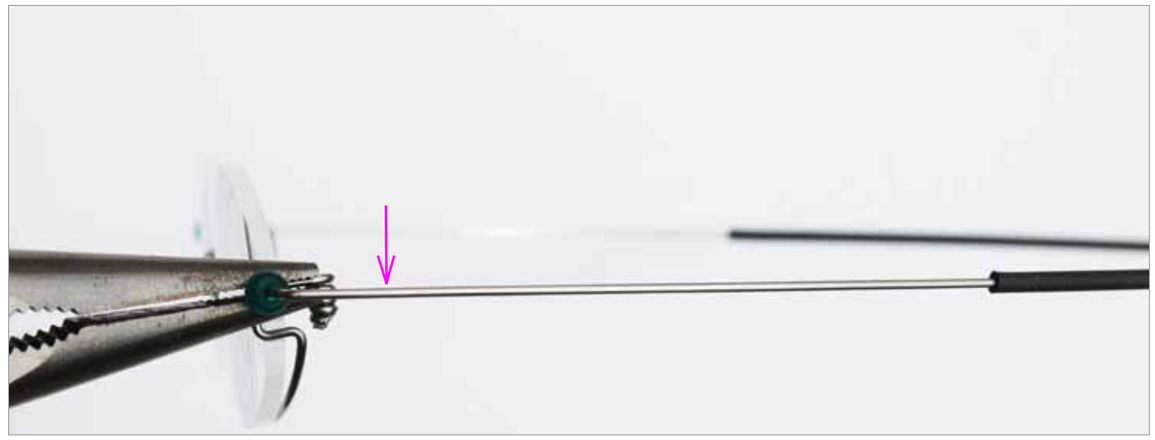
Well adjusted temples

Change the inclination of the temple

If the temples are not parallel...



Hold the temple with the plier at the small piece of wire beside the spiral

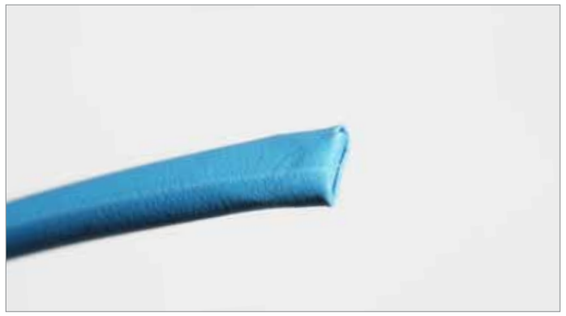


Now bend the temple down (or up) near the hinge

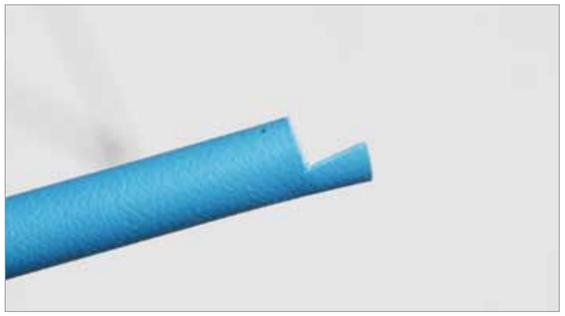
New shrink tubing for the temple

The spring steel wire of the GoodVisionGlasses is unbreakable. But the shrink tubing, after some time, can break. Here you see how to put new shrink tubing on the temples.

1. Cutting

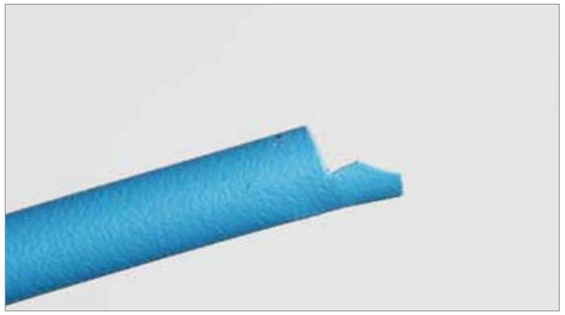


5. Put the shrink tubing on the temple



2. The cut

6. Heat shrinking



3. Cut again

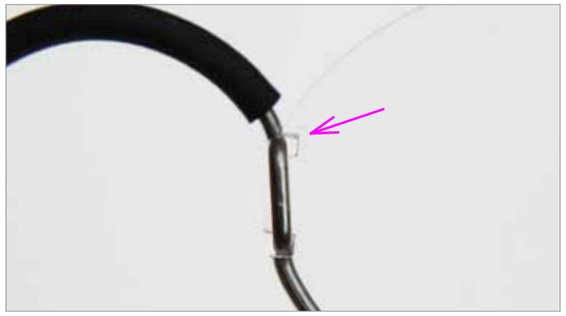
7. Filing on sandpaper (grade 400-600)

4. Tuck the cut end into the tube

8. Temple with nice new shrink tubing

Gap between wire and lens

If there is a gap between wire and lens, the lens can drop out.



Gap between wire and lens

Take u-wire into the plier and bend with finger

Now the gap has disappered

Demolishing frames

You want to get practise in repairing frames? Then find out how to demolish a frame effectively and repair it afterwards.

Glasses under a car

Demolished frame and repairing

4. Customer Experience

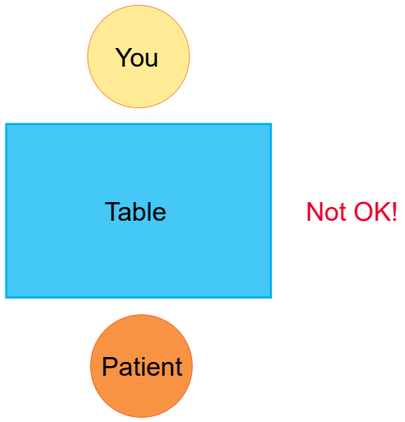
4.1 The sales process

Be friendly

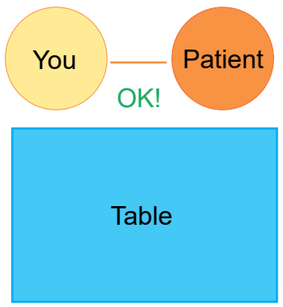
Heartily welcome your customer and be very friendly.

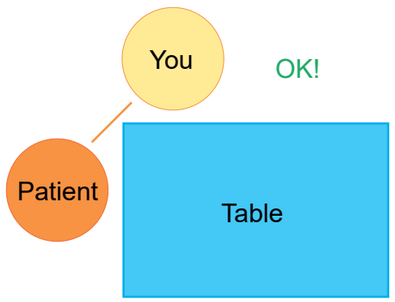
The right position

Don‘t sit behind your table when you fit the glasses. The distance is too large.



Not OK!





Task

Discuss in your team: What does a friendly welcome looks like? Play in your team the whole selling process.

Clean table

Always have a clean table with nice table cloth on it. Check if the glasses are nicely presented. Are there all different colors and types of glasses visible?

Mirror

Always have a clean mirror on the table.

Box for rubbish

Always have a box with a hole for rubbish with you.

Cleaning Instructions

Tell the patient how to clean his eyeglasses: Clean the glasses under clear water with some soap. Then dry them with a piece of new **toilet paper!**

Eye Camp - Checklist

Version 2021-04-30

==========

Place, Date: _____
Refractionist: _____
Adjusting Person: _____
Quality Controller: _____

VAsc R:___ VAsc L:___ Prescr. far R:____ L:____
VAcc R:___ VAcc L:___ Prescr. near R:____ L:____

1. For the Quality Controller:
Follow one patient, check ✓ EVERY point if done properly, make a cross × if not done.

2. For the GVT: Learn this list by heart!
Basis of the refraction process is the Optic Manual.

Arrival of the patients	
If many patients waiting: Give everybody a small paper or routing slip and write the number on it.	2
Make sure people who are waiting feel comfortable (shade, benches to sit, etc.)	3
Is the GVT wearing our glasses himself?	3
Preparation of patients	
Take groups of 10 to 30 people (or a whole school-class) together and prepare them for the eye test	2
Stay in front of them and explain the project	3
Ask them who has problems to see properly (awareness)	3
Ask them who has problems in handling their mobile phone, with reading, working on the field, seeing the numbers of the minibus, putting the thread into the needle, etc.	3
Ask them if they know friends/family/neighbors who need glasses – and to tell them to come too	2
Show them the glasses	3
Tell them about the glasses (high quality, affordable, as robust like the spokes of the wheel of a bike, produced locally, German design)	3
Tell them the price	2
Tell them what to do if they have no money today (where they can buy later, when you come back)	3
Explain the vision chart	4
Show the direction of different Es	3
Show me your hands (everybody shows his hand)	2
Show me your palms (everybody shows his palm)	3
Close your left eye with your palm (not with fingers!)	4
Show me the direction of the Es.	3
Now the same test with the other eye	2
School-class: First explain to all pupils of one class. Then take groups of 10 with you to the test room.	3
Vision chart	
Is the distance 4 meters?	3
Sit down on the chair YOURSELF and check if you can read the last line!	

No shadow on the signs? (from GVT or from stick)	3
No reflection from light?	3
No sun behind the vision chart? (sit down and check yourself if you can see the symbols)	3
Signs are not covered by the pointer of GVT?	3
Is there enough light in the room to see properly?	3
Check eye disease and eye complaint	
Is the pupil grey?	4
Does the patient have painful eyes, watery eyes, red eyes or is anything not looking normal?	4
=> In these cases send him to the hospital (tell him and write in the client book)	4
Lens bar	
Are the lenses of the lens bar clean?	3
Can patient see through the middle of the lens? (Look from front)	3
Lay your hand or fingers on the head of the patient to reduce shaking	2
Prescreening (for school children)	
Check if the child can read Line 6/9.5 with the right and left eye (the other eye is covered with palm)	4
Check if the child can read Line 6/12 with plus glasses (+2.0 D right, +2.0 D left) in front of both eyes	4
Record VA if the child is able to see line 6/12 with the plus glasses (+2.0 D)	4
Eye Test	
Both eyes: Ask the patient which the smallest line is he can see at least 4 out of 5 symbols	3
If he can see no line, turn the vision chart around for the large symbols	3
Right eye first (then left eye)	2
Left eye is covered with palm (not with fingers)	3
Which line he can see at least 4 out of 5 symbols? => you get the Starting-Power => **Starting-Power for VAsc < 6/15 = 0.50 D!**	4
Write VAsc in Eye-Test-Card	3
Special Case: School children who are able to see line 6/12 with +2.0 D (probably **Hyperopia)**	4
Children's accommodation is very strong! Spend enough time testing with PLUS!	4
Special Case: He can't see the largest symbols	3
Bring the vision chart 40 cm near to his eyes and test => if he can now see line 30, it`s like line 300 (or e.g. line 15 => always ten times as much) **Starting-Power: Take 2.0 D** Increase the power (first Plus, then MINUS) step by step. Stop only if none of your lenses can help If you cannot help => Send him to hospital	4
Start with PLUS Starting-Power	4
Wait at least 3 seconds (count 21, 22, 23)	4
Ask: "Is this worse?"	3
Check if the VA decline when the answer is worse	4
If it is not worse, find the line he can see 4 out of 5	4
Take next higher PLUS (continue ….)	4
Stop when he says "It is worse" and **VA declined**	3
Take 0.5 D less and test again	3
Take the **highest** PLUS-lens with the **best** VA	4
Write VAcc in Eye-Test-Card	3
Write prescription in Eye-Test-Card	3

If PLUS-lenses are worse and **VA declines** => go to MINUS Starting-Power	3
Ask: "Is this better" and check if **VA increases**	3
Find the smallest line he can see 4 out of 5	4
If he can see a smaller line then before and VA increases take next higher MINUS (continue …)	3
Stop when the line does not improve any more	4
Take 0.5 D less and test again	3
Take the **lowest** MINUS-lens with the **best** VA	4
Write VAcc in Eye-Test-Card	3
Write prescription in Eye-Test-Card (Then continue with left eye …)	3
If somebody cannot reach **line 12** (VAcc less 50%) or the VA is not improving with any of your lenses => perform pinhole frame test - continue Eye Test if VA is improving, otherwise send him to the hospital. (If he wants he can buy your glasses nevertheless)	4
Reading glasses (Customers older than 40 years)	
For **reading glasses** take the prescription **you found for distance** and add reading value: 40 => +1.0 | 45 => +1.5 50 => +2.0 | 55 and older => +2.5	3
Let the patient hold the reading test himself => so he can find his best distance	3
If he cannot read, take thread and needle, or rice with stones, etc. Ask him why he needs the glasses.	
Test if reading / working distance of 40 cm is OK (reading with rectangle arms)	3
If he holds reading test **too far** => Take more PLUS If he holds reading test **too near** => Take less PLUS	4
Sales Process	
Let the patient look into the mirror!	3
The GVT and the client sitting at the corner of the table (GVT not behind table) for better contact and easy adaption of glasses.	2
Let the patient choose his favorite color of glasses case	2
Let the patient choose his favorite color of eye glasses	3
Instruct to the patient how to clean the glasses (water, soap, toilet paper)	3
Specially for donated glasses for school kids: prepare plastic boxes for every class. The pupils give their glasses to their teacher when school ends. The teacher keeps the glasses in the director's office until the next morning.	3
The Table	
Is the table clean (no waste on it?)	2
Is there a plastic box for the waste? (Box with hole in cover)	3
Is there a nice blanket on the table? (dark blue blanket available in stock)	2
Is there a mirror standing (not lying) on the table	2
Are there two pairs of pliers on the table?	2
Are there glasses cases nicely presented on the table (4-5 pieces)	2
Are there different types of eye glasses available? (round, rectangle, sun)	3
Are there different colors of eye glasses available?	2

Reality eye-test	
Far vision: let the patient look outside with his new glasses (to people, nature, trees, etc.)	3
Near vision: ask him what he needs the glasses for: let him read / give him needle and thread / box of beans with stones, etc.	3
Adapting the glasses	
Front: Are the glasses horizontal?	3
Is the pupil distance (PD) being tested? Are the glasses having the right size?	4
Side: Do the temples fit behind the ears?	3
Do the temples of the glasses NOT press against the head of the patient? (=> round temples)	4
From Top: Do the eyelashes NOT touch the lens?	3
Are the lenses clean?	2
Patient-book	
Fill the book **completely** (every line or gap)	3
Phone No.: If patient has no phone no. => Ask him for the number of his Brother/Child/Neighbor, etc.	2
Address: if he has no address, write the name of his village	2
Final eye-check – Most important !!!	
After adapting the glasses do the final eye-check!!!	4
Which line can he read with his RIGHT eye with HIS NEW glasses?	4
Which line can he read with his LEFT eye with HIS glasses?	4
NOW write VAcc on eye-test-card and in the client book. (Is it the same as during the eye test?)	3
Stamp in the health book	
Put the stamp into the health book	3
If the patient does not have such a book, then give him his prescription on a card	2
Marketing	
Ask the patient, who of his family/friends/neighbors cannot see properly.	3
Give him a card for **every family member/ friend** who needs glasses, write their names on it (Mother, Brother, Friend 1, Friend 2, etc.)	3
Ask him if he works in a company. Get the phone number of his boss and make an outreach	2
Is he a priest => Ask him if you can make an outreach in his church. Is he a chief => Ask him for a village outreach, etc.	2
Ask the patient if he wants to buy **sunglasses** or reading glasses too or a second pair of glasses	3
End of Outreach	
Is everything cleared and no waste left behind?	3
Did the GVT act according to the current valid standard precautions?	4

Declaration of Quality Controller

With my signature I declare that I have filled out this form to the best of my knowledge. I spoke to the GVT about his eye test errors.

Shop - Checklist

Version 2021-04-30

==========

Place, Date: _____
Refractionist: _____
Adjusting Person: _____
Quality Controller: _____

VAsc R:___ VAsc L:___ Prescr. far R:____ L:____
VAcc R:___ VAcc L:___ Prescr. near R:____ L:____

1. For the Quality Controller:
Follow one patient, check ✓ EVERY point if done properly, make a cross × if not done.

2. For the GVT / Shopkeeper: Learn this list by heart! Basis of the refraction process is the Optic Manual.

Arrival of the patients	
Immediate welcoming of a new customer.	3
Make sure people who are waiting feel comfortable (shade, benches to sit, etc.)	3
Is the GVT wearing our glasses himself?	3
The Shop	
Doormat at the entrance?	2
No private stuff on the cabinets and table?	2
Panels properly aligned and filled?	2
Clean mirrors in the panels?	2
General cleanliness of the Shop?	2
Preparation of patients	
Stay in front of them and explain the project	3
Ask them who has problems to see properly (awareness)	3
Ask them who has problems in handling their mobile phone, with reading, working on the field, seeing the numbers of the minibus, putting the thread into the needle, etc.	3
Explain the vision chart	4
Show the direction of different Es	3
Show me your hands (everybody shows his hand)	3
Show me your palms (everybody shows his palm)	3
Close your left eye with your palm (not with fingers!)	4
Show me the direction of the Es.	3
Now the same test with the other eye	2
Vision chart	
Is the distance 4 Meter?	3
Sit down on the chair YOURSELF and check if you can read the last line!	
No shadow on the signs? (from GVT or from stick)	3
No reflection from light?	3
No sun behind the vision chart? (sit down and check yourself if you can see the symbols)	3
Signs are not covered by the pointer of GVT?	3
Is there enough light in the room to see properly?	3

Check eye disease and eye complaint	
Is the pupil grey?	4
Does the patient have painful, watery eyes, red eyes or is anything not looking normal?	4
=> In these cases send him to the hospital (tell him and write in the client book)	4
Lens bar	
Are the lenses of the lens bar clean?	3
Can patient see through the middle of the lens? (Look from front)	3
Lay your hand or fingers on the head of the patient to reduce shaking	2
Eye Test	
Both eyes: Ask the patient which the smallest line is he can see at least 4 out of 5 symbols	3
If he can see no line, turn the vision chart around for the large symbols	3
Right eye (then left eye)	2
Left eye is covered with palm (not with fingers)	3
Which line he can see at least 4 out of 5 symbols? => you get the Starting-Power => **Starting-Power for VAsc < 6/15 = 0.50 D!**	4
Write VAsc in Eye-Test-Card	3
Special Case: School children who are able to see line 6/12 with +2.0 D (probably **Hyperopia)**	4
Children's accommodation is very strong! Spend enough time testing with PLUS!	4
Special Case: He can't see the largest symbols	3
Bring the vision chart 40 cm near to his eyes and test => if he can now see line 30, it`s like line 300 (or e.g. line 15 => always ten times as much) **Starting-Power: Take 2.0 D** Increase the power (first Plus, then MINUS) step by step. Stop only if none of your lenses can help If you cannot help => Send him to hospital	4
Start with PLUS Starting-Power	4
Wait at least 3 seconds (count 21, 22, 23)	4
Ask: "Is this worse?"	3
Check if the VA decline when the answer is worse	4
If it is not worse, find the line he can see 4 out of 5	4
Take next higher PLUS (continue ….)	4
Stop when he says "It is worse" and **VA declined**	3
Take 0.5 dpt less and test again	3
Take the **highest** PLUS-lens with the **best** VA	4
Write VAcc in Eye-Test-Card	3
Write prescription in Eye-Test-Card	3
If PLUS-lenses are worse and **VA declines** => go to MINUS Starting-Power	3
Ask: "Is this better" and check if **VA increases**	3
Find the smallest line he can see 4 out of 5	4
If he can see a smaller line then before and VA increases take next higher MINUS (continue …)	3
Stop when the line does not improve any more	4
Take 0.5 D less and test again	3
Take the **lowest** MINUS-lens with the **best** VA	4
Write VAcc in Eye-Test-Card	3
Write prescription in Eye-Test-Card (Then continue with left eye …)	3

If somebody cannot reach **line 12** (VAcc less 50%) or the VA is not improving with any of your lenses => perform pinhole frame test - continue Eye Test if VA is improving, otherwise send him to the hospital (If he wants he can buy your glasses nevertheless)	4
Reading glasses (Customers older than 40 years)	
For **reading glasses** take the prescription **you found for distance** and add reading value: 40 => +1.0 | 45 => +1.5 50 => +2.0 | 55 and older => +2.5	3
Let the patient hold the reading test himself => so he can find his best distance	3
If he cannot read, take thread and needle, or rice with stones, etc. Ask him why he needs the glasses.	
Test if reading / working distance of 40 cm is OK (reading with rectangle arms)	3
If he holds reading test **too far** => Take more PLUS If he holds reading test **too near** => Take less PLUS	4
Sales Process	
Show them the glasses	3
Tell them about the glasses (high quality, affordable, as robust like the spokes of the wheel of a bike, produced locally, German design)	3
Make the customer aware that with these glasses he can do what was not possible before.	3
Let the patient look into the mirror!	3
The GVT and the client sitting at the corner of the table (optician not behind table) for better contact and easy adaption of glasses.	2
Let the patient choose his favorite color of glasses case	2
Let the patient choose his favorite color of eye glasses	3
Instruct to the patient how to clean the glasses (water, soap, toilet paper)	3
Tell them the price	2
Tell them what to do if they have no money today (where they can buy later, when you come back)	3
The Table	
Is the table clean (no waste on it?)	2
Is there a plastic box for the waste? (Box with hole in cover)	2
Is there a nice blanket on the table? (dark blue blanket available in stock)	2
Is there a mirror standing (not lying) on the table	2
Are there two pairs of pliers on the table?	2
Are there glasses cases nice presented on the table (4-5 pieces)	2
Are there different types of eye glasses available? (round, rectangle, sun)	3
Are there different colors of eye glasses available?	2
Reality eye-test	
Far vision: let the patient look outside with his new glasses (to people, nature, trees, etc.)	3
Near vision: ask him what he needs the glasses for: let him read / give him needle and thread / box of beans with stones, etc.	3
Adapting the glasses	
Front: Are the glasses horizontal?	3
Is the pupil distance (PD) being tested? Do the glasses have the right size?	4

Side: Do the temples fit behind the ears?	3
Do the temples of the glasses NOT press against the head of the patient? (=> round temples)	4
From Top: Do the eyelashes NOT touch the lens?	3
Are the lenses clean?	2
Patient-book	
Fill the book **completely** (every line or gap)	3
Phone No.: If patient has no phone no. => Ask him for the number of his Brother/Child/Neighbor, etc.	2
Address: if he has no address, write the name of his village	2
Final eye-check – Most important !!!	
After adapting the glasses do the final eye-test!!!	4
Which line can he read with his RIGHT eye with HIS NEW glasses?	4
Which line can he read with his LEFT eye with HIS glasses?	4
NOW write VAcc on eye-test-card and in the client book. (Is it the same as during the eye test?)	3
Stamp in the health book	
Put the stamp into the health book	3
If the patient does not have such a book, then give him his prescription on a card	2
Marketing	
Ask the patient, who of his family/friends/neighbors cannot see properly.	3
Give him a card for **every family member/ friend** who needs glasses, write their names on it (Mother, Brother, Friend 1, Friend 2, etc.)	3
Ask him if he works in a company. Get the phone number of his boss and make an outreach	2
Is he a priest => Ask him if you can make an outreach in his church. Is he a chief => Ask him for a village outreach, etc.	2
Ask the patient if he wants to buy **sunglasses** or reading glasses too or a second pair of glasses	3
End of Sale	
Is everything cleared and no waste left behind?	3
Did the GVT act according to the current valid standard precautions?	4

Declaration of Quality Controller

With my signature I declare that I have filled out this form to the best of my knowledge. I spoke to the optician about his eye test errors.

Notes

Notes


Good Vision