



Signs that may indicate a problem with eye health or vision development:

- White pupil
- Tearing
- Eye appears turned
- Child covers an eye
- Child rubs eyes very frequently
- Short attention span for the child's age
- Difficulty with eye-hand-body coordination
- Avoidance of coloring, puzzles or other detailed activities
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**This list is not comprehensive. If you think that your child may have a problem or you are not sure about something, it is probably best to take your child for an examination.**

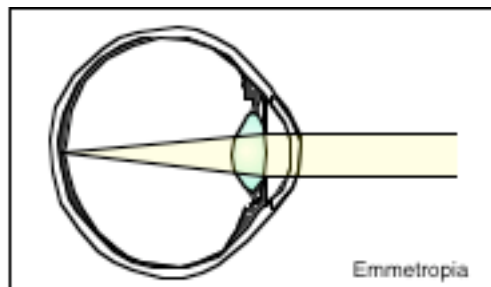
Once your child starts school, you can also look for the following symptoms that may indicate your child has a vision problem:

- Avoiding close work
- Holding reading material very close to eyes
- Rubbing eyes frequently
- Frequent headaches
- Turning or tilting head or covering an eye to use one eye only
- One or both eyes appears turned
- Losing his or her place while reading
- Confusing similarly shaped letters such as c and o
- Consistently performing below potential

**It is important to realize that vision changes can occur without you or your child noticing them. Although a school vision or pediatrician's screening will detect many problems, it is not a substitute for a thorough eye examination. Consequently, it is a good idea for your child to have an eye examination by an optometrist or ophthalmologist at least every two years or more frequently if specific problems or risk factors exist.**

### Common vision problems that can be corrected by wearing glasses:

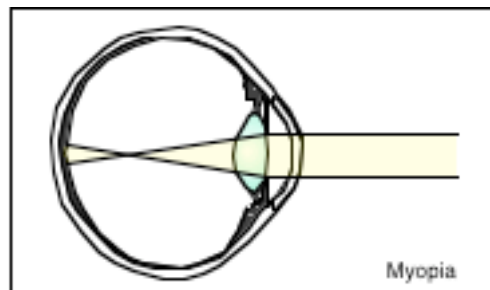
First, you will need to understand how the eye sees. Perhaps the easiest way to think about the way that the eye sees is to compare it to a camera. In a camera, the camera lens redirects light rays coming into the camera so that they come into focus exactly at the plane of the film. If you've ever taken a



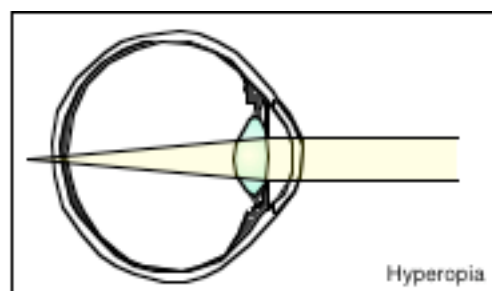
picture using a manual-focus camera, you know how easy it can be to end up with a picture that is out of focus. Similarly, the ability of the eye to focus light is determined by several factors that must all be exactly 'in tune' in order for the eye to function properly. Light rays entering the eye are redirected by the cornea, at the front of the eye, and then again by the crystalline lens, inside the eye. Ideally, the light is focused exactly at the surface of the retina, which is like the 'film' of the eye. If the eye is able to focus the light appropriately we call this 'emmetropia'.

On the other hand, if the eye is not able to focus the light onto the retina this is known as a 'refractive error'. The most common refractive errors are called myopia (or nearsightedness), hyperopia (or farsightedness), and astigmatism.

1. **Myopia.** The common name for myopia is nearsightedness. A nearsighted person is able to see clearly at a near distance (just how close varies depending on the degree of nearsightedness—the higher the nearsightedness the closer the object must be to be seen clearly), but is unable to see more distant objects clearly. This is because, in an eye with myopia, parallel light rays coming from a distant object are focused on a point that lies in front of the retinal surface. So, myopia can result if either the length of the eye is too long for the focusing power of the eye, and/or the curvature of the cornea is too steep (a steeper cornea bends the light more) in relation to the length of the eye. Both of these situations result in the image being focused in front of the retina. Unfortunately, the eye is not able to compensate for this condition because the problem is that the eye is 'too strong'. To try to compensate, nearsighted people are often seen squinting, which does help to make things somewhat more clear (although not perfectly so) due to a reduction in optical aberrations. The best solution for myopia is glasses or contact lenses. Many adults these days are also considering refractive surgery, but this procedure is controversial for children.

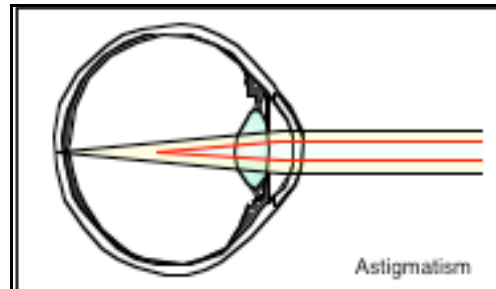


2. **Hyperopia.** Hyperopia and farsightedness are the terms used to describe the condition in which light rays from a distant object are naturally focused at an imaginary point behind the retina (the point is imaginary because, obviously, the light is not able to pass through the retina). Hyperopia results from either the eye being too short, or the refractive system of the eye being 'too weak' for the length of the eye, such that the light is not bent enough to come to a focus at the plane of the retina. Despite this, depending on the degree of farsightedness, many farsighted people are still able to see distant objects clearly, hence the term 'farsighted' (meaning able to see better at far than near). This is because of the eye's ability to accommodate or increase its 'focusing power'. By focusing, the human eye is in a sense made stronger. Focusing has the effect of bringing the focal point of the eye forward; so, if a farsighted person is able to focus enough, s/he can bring the focal point forward so that it coincides with the retina. This often works fine for distant objects. The problem is, however, that the closer an object is to the eye, the more focusing the eye has to do to be able to bring the focal point forward far enough to see it clearly. For a farsighted person, the eye may not have the ability to



focus sufficiently to bring near objects into clear focus, especially for extended periods of time. Therefore, farsighted people often find it difficult to see near objects clearly, and one of the most common complaints of farsighted people is difficulty reading.

3. Astigmatism. Astigmatism occurs when the refractive components of the eye, primarily the cornea, are not spherical, but are more egg-shaped instead. If the eye focuses light rays from different meridians (such as vertical and horizontal light rays) at different focal lengths, due to differing refractive powers in the various meridians of the eye, the resulting refractive error is known as astigmatism. Astigmatism can exist either with hyperopia or myopia, or alone. Astigmatism can also make straight lines appear slanted, although the brain is very well adapted to correcting this, so



most people don't notice it. In fact, this normal adaptation is why it often takes some time to adapt to newly prescribed astigmatic glasses—the brain needs time to “undo” the correction it has been making to compensate for the astigmatism present in the eye. The brain cannot correct for the diminished visual acuity that can occur secondary to astigmatism, however, people with astigmatism often find it impossible to see anything very clearly without glasses. When reading, they often confuse similarly shaped letters like 'o' and 'c' and 'e'. Astigmatism can easily be corrected with glasses or contact lenses. Some people may also consider having refractive surgery.

4. Presbyopia. Although this is not a problem for children, it happens to every adult so we have included it here for completeness. All people, as they grow older, gradually lose their ability to focus their eyes. This loss of accommodation (eye focusing) is called presbyopia. A person who does not have any refractive error to begin with, will start to notice symptoms of presbyopia at about age 40 to 45 years. The first symptoms are usually a difficulty focusing on very small print held at a normal reading distance (i.e., 16 inches) or while doing other fine detail work such as threading a needle. These symptoms are usually worse in dim light and/or when the person is fatigued. At first, it is usually still possible to do these near activities, but the person may become tired, or feel strain around the eyes. Nearsighted people start to notice the symptoms of presbyopia at about the same time that emmetropic people do. However, a nearsighted person has one advantage—removing their distance glasses and holding things at the distance of the natural focus of their eyes (how close depends on how nearsighted the person is). So, perhaps there is one advantage to being nearsighted after all! In fact, farsighted people generally start to notice the symptoms of presbyopia at an earlier age. Particularly for farsighted people who don't wear glasses, the more farsighted they are the earlier the symptoms usually start. Luckily, correction of presbyopia is now easy. Emmetropic people and farsighted people can often use reading glasses. Nearsighted people can remove their distance glasses. However, the best solution for many people is bifocals. Bifocal glasses are the most widely used form of correction for presbyopia, because, with these glasses, it is possible to have both the distance and the near prescription in front of the eyes at the same time. Contact lenses can also be used to correct presbyopia, but they tend to work best in people who have some other form of refractive error as well (e.g., myopia or hyperopia).

## What do these numbers on my eyeglass prescription mean?

Refractive error is measured in units called diopters. A diopter is approximately equal to the inverse of the focal length of the eye (measured in meters). So, for example let's say you have the following prescription:

Prescription A				Prescription B		
(1)	(2)	(3)	(4)	(1)	(2)	(3)
OD:	-2.00	-0.75	X 180	OD:	+1.50	SPH
OS:	-2.00	-0.50	X 175	OS:	+2.00	SPH
				ADD:	+1.50	(5)

Let's take each part of the prescription in turn:

- (1) OD simply refers to the right eye, and OS to the left eye. Any prescription that starts with a minus sign is a prescription for nearsightedness, a plus sign means it's a prescription for farsightedness.
- (2) The first number (-2.00 in prescription A) refers to the "spherical" power, or the power of the least minus meridian of the eye. It is measured in diopters. It is easier to get an idea of what this means for a nearsighted person: take the inverse of the sphere power, which is 1/2 in prescription A above. This represents the distance in meters of the far point of the eye. Therefore, the nearsighted person for whom prescription A above was written, sees most clearly when the object is ~0.5 meters in front of the eye. Anything more distant will be blurred. For a farsighted person, the "far point" is actually behind the eye, which is difficult to conceptualize unless you are familiar with optics. However, it is perhaps enough to know that the larger the number after the plus sign, the stronger the prescription is and the harder it would be to focus without the glasses.
- (3) The second number is the amount of astigmatism present. Sometimes there will not be a number there, but instead something such as "diopters sphere," "DS," or "sph" may be written on your prescription. These indicate that there is no astigmatic correction in the prescription. If there is a number there, however, it means that you are being corrected for some astigmatism. The prescription above corrects for 0.75 diopters of astigmatism (a mild amount).
- (4) This brings us to the third number in the prescription (X 180), which describes the "axis" or orientation of the astigmatism.
- (5) Finally, there is sometimes the word "ADD" or just another number below the OD and OS lines of the prescription. This number is always positive and refers to the near power of the prescription. This number is called the ADD because the power listed is added to the spherical power of the prescription to obtain the near prescription. If you have an ADD listed on your prescription, you may want to consider bifocal glasses. Another option would be to get two separate pair of glasses, one pair for distance and another for near. For an adult, the choice of whether to get bifocals or not is a personal one. You will not harm your eyes if you don't get a pair of bifocals. However, it is generally the easiest way to go, since you don't have to constantly change from one pair of glasses to another, or remove your distance glasses (if you are nearsighted) to read.

### Links:

[American Optometric Association](http://www.aoanet.org/): (<http://www.aoanet.org/>)

[American Academy of Optometry](http://www.aaopt.org/ConsumerInfo/ConsumerInfo.html): <http://www.aaopt.org/ConsumerInfo/ConsumerInfo.html>