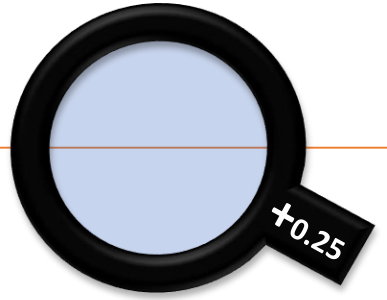
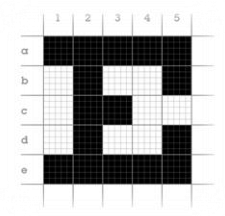
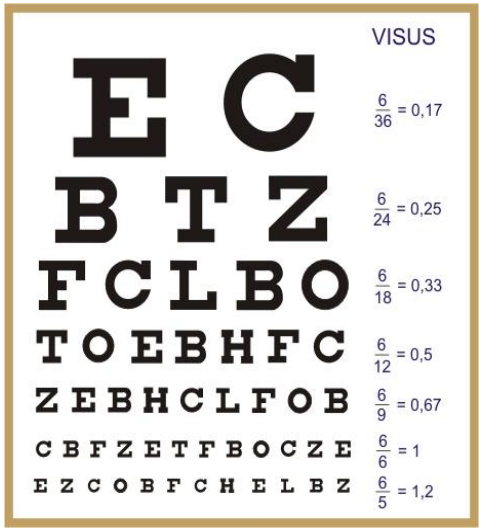
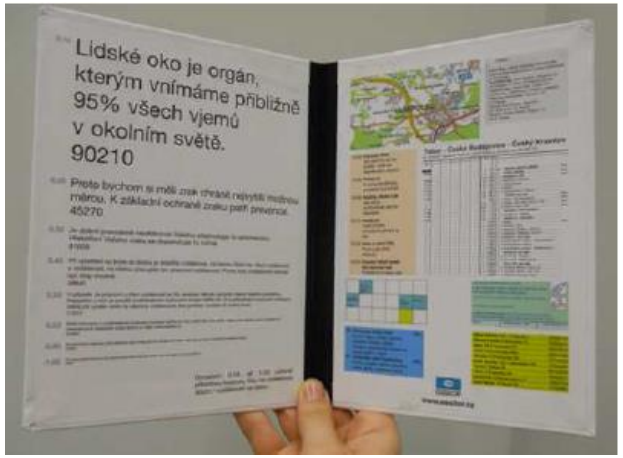


Visual Acuity



Jana Sokolová Šidlová



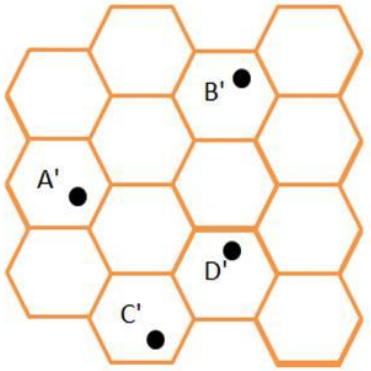


Visual Acuity

- Definition: ability of the visual system to detect spatial changes
- Performed at viewing distance of 5 or 6 m and 40 cm for near

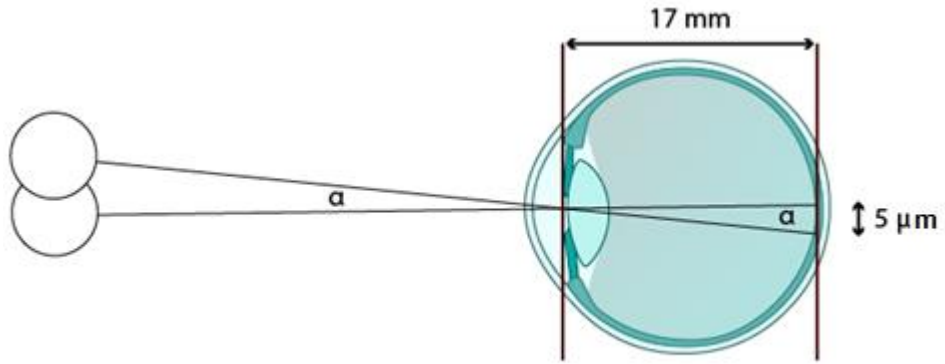
Minimum separabile

- Emetropic eye: we can only distinguish two points from one another if there is between two cones irritated to the retina one cone not irritated
- These two cones are observed at an angle of one minute



Minimum separabile

- The average length of a cone is approximately 0,005 mm and the retinal distance from image modal point of the eye is approximately 17 mm. The angular distance still distinguishable poinds are:
- tgα=0,005/17 -> α≈1 angular minute



tgα = 0,005 / 17 ⇨ α = 0,0167° = 1 úhlová minuta

The principle of VA measurement

- **Types of measurements:**

  Unaided VA – visual acuity without correction (natural, native)

  abbreviations: UCVA =, Vsc =, VAsc =, V_N=

  Habitual VA – own glasses or contact lenses (existing spectacle correction)

  abbreviation: VAcc =

  Optimal VA - best corrected VA after subjective clinical refraction

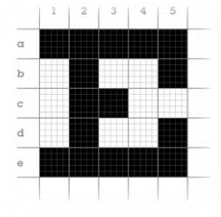
  abbreviations: BCVA =, Vcc =, VAcc =

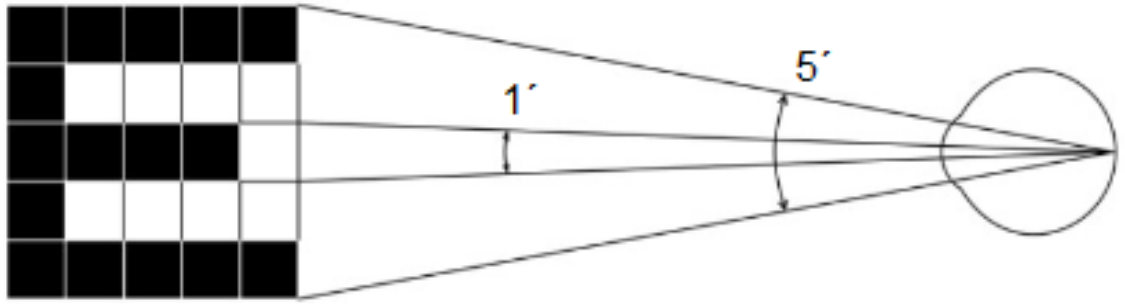
Stenopic aperture (pinhole disk)

- The target with a small hole in the center
- The part of trial lens kit
- May be used diagnostically to determine a patient´s potential VA
- It transmits only narrow parallel rays of light
- In stenopic vision the refractive error is ruled out. If poor vision persists - it is not the case of a refractive error.
- Experiment – now we can try

Evaluation of visual acuity

- used to measure the visual acuity during clinical refraction- **optotypes**
  - Snellen optotypes: letters, numbers, pictures, symbols
- Each symbol is inscribed in a square visible from a specified distance below the viewing angle of 5´
- The symbol thickness (not size) is equal to one fifth of the square and corresponds to angle of 1´
- Examination distance: 5 m or 6 m (the eye is in the rest, the acommodation is less then 0,25 D – the eye is looking to infinity, it does not acommodate)
- We measure first the right eye and then the left eye

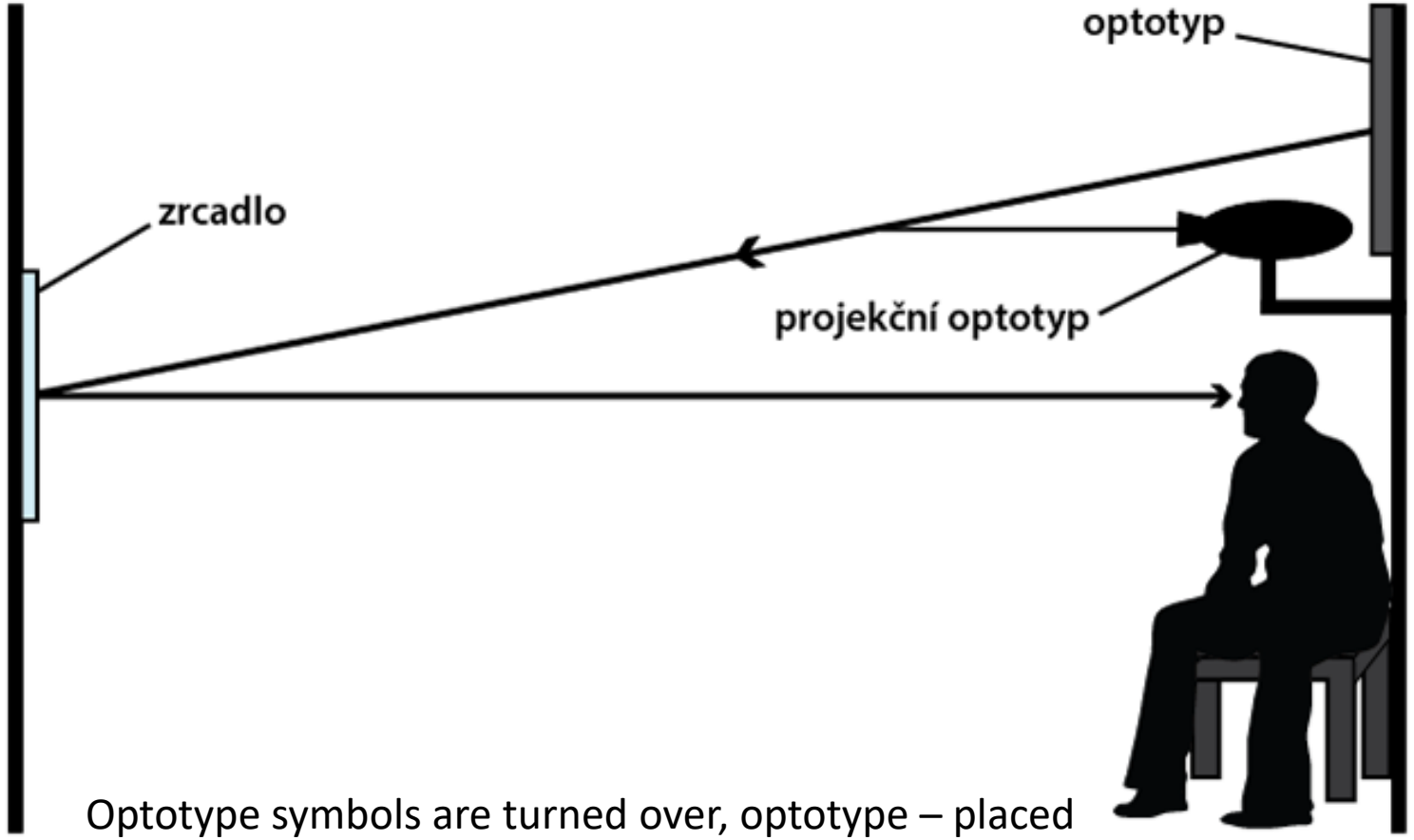




Optotypes

- According to the design: printed panels, light panels, projection charts and LCD optotypes, 3 D charts
- Snellen, Pflüger, Landolt, pictures, LEA, ETDRS optotypes
- The most of optotypes chats have the range of visual acuity – 1,6 - 0,1

Projection optotype with mirror image



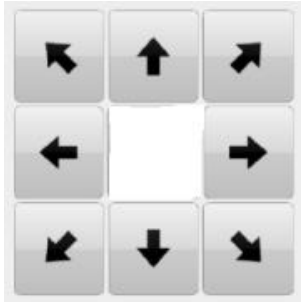
Optotype symbols are turned over, optotype – placed over the patient´s head, opposite the patient is the mirror at eye level

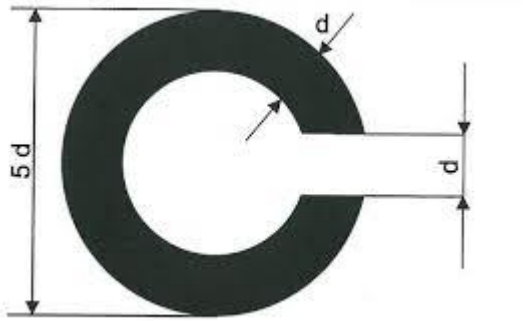
Snellen optotypes

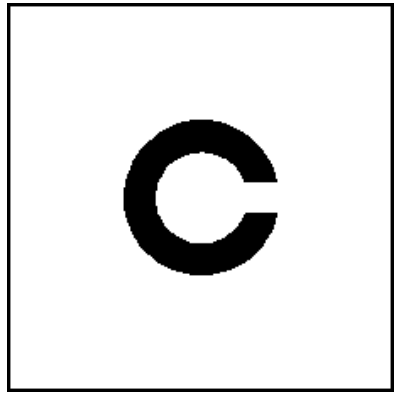
- Herman Snellen (1834 –1908)
  - a Dutch ophthalmologist
- 1862 – Snellen optotypes
- 6/60, 6/36, 6/24, 6/18, 6/12, 6/8, 6/6, 6/5, 6/4
- The signs: C, D, E, F, L, N, O, P, T, Z
- The patient have to identify minimum 60% of the optotype sign at the line

Landolt C optotype

- is recommended by the ICO
- is the standard optotype (C – a standardized symbol) for acuity measurement in most European countries. It was standardized.
- The Landolt C consists of a ring that has a gap, thus looking similar to the letter C (The width of the gap and the thicknes of the line of the symbol is $^1/_5$ of the diameter, and the gap width is the same)
- 8 different positions of the gap (comparison to the positions of a clock face)



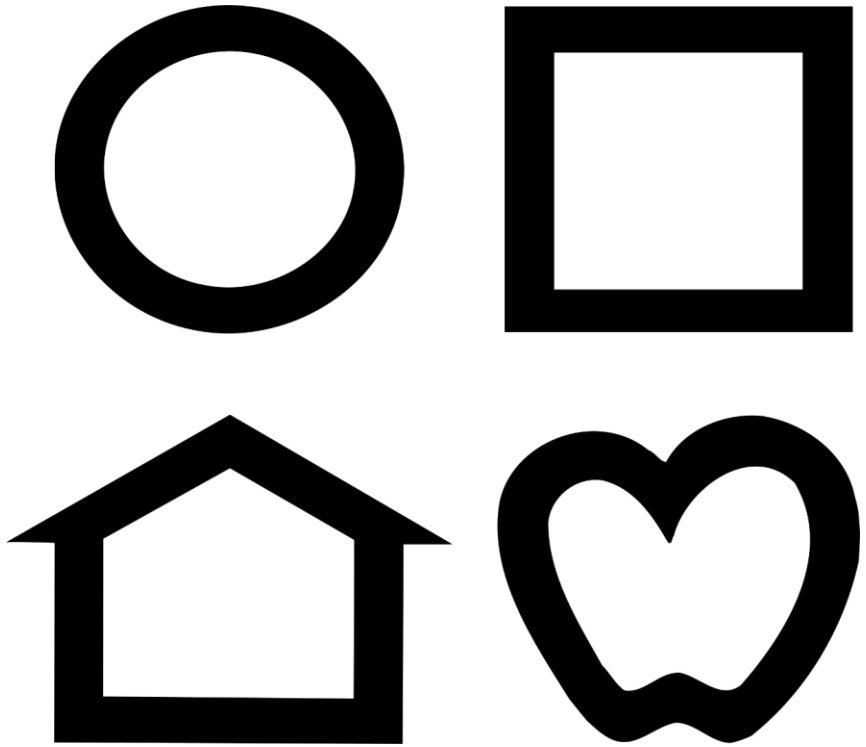




Pflüger E (hooks) = (Tumbling E test)

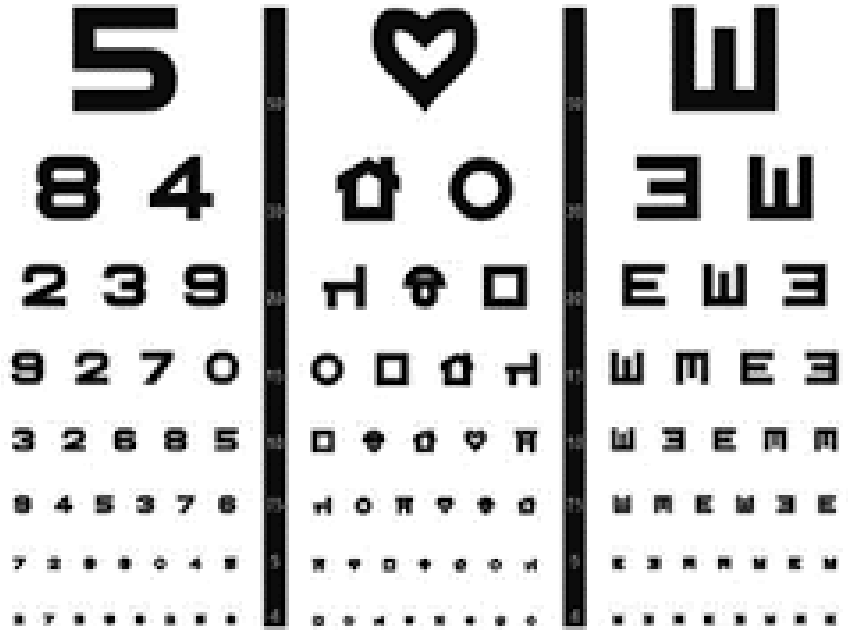
- Can be performed on children or patients who do not speak the same language as the practitioner
- The directions of E in 4 ways (up, down, right or left side)
  - higher probability of guessing
- The aid: the child´s hand or E in (rotation of the direction the letter E)

LEA SYMBOLS

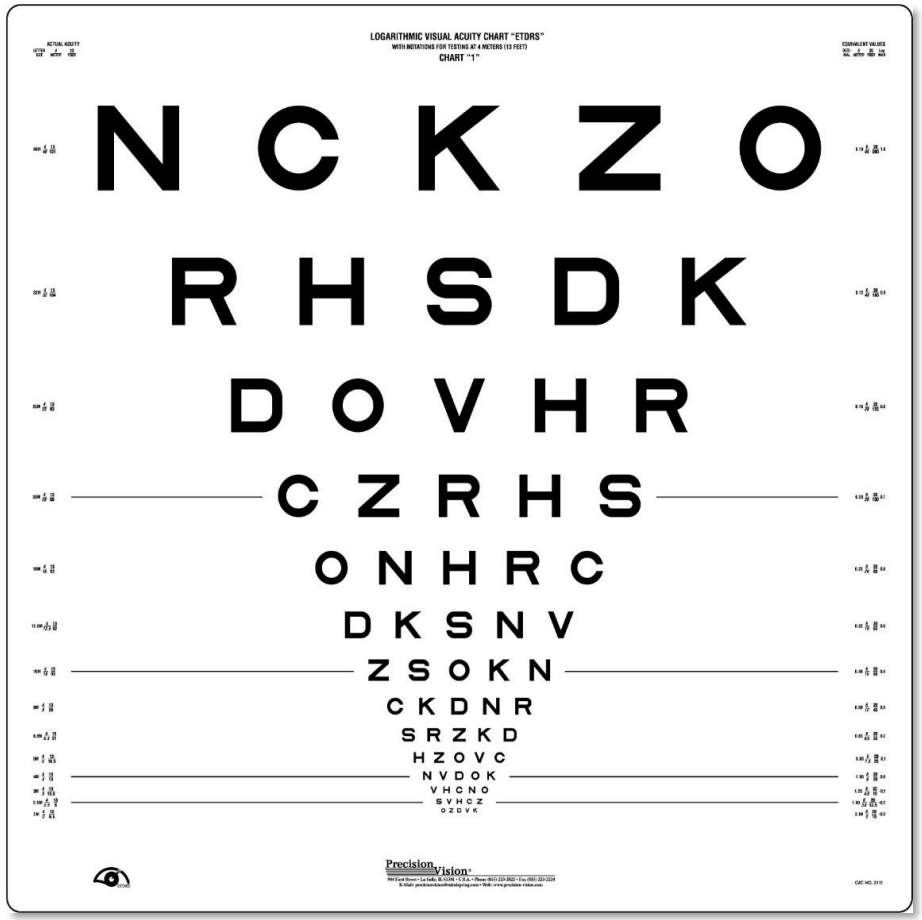


- to measure the clarity of vision of children or analphabet
- test for near and for far
- symbols: circle, square, house, apple

Optotypes for children



ETDRS optotype (LogMAR chart)



ETDRS optotype (LogMAR chart)

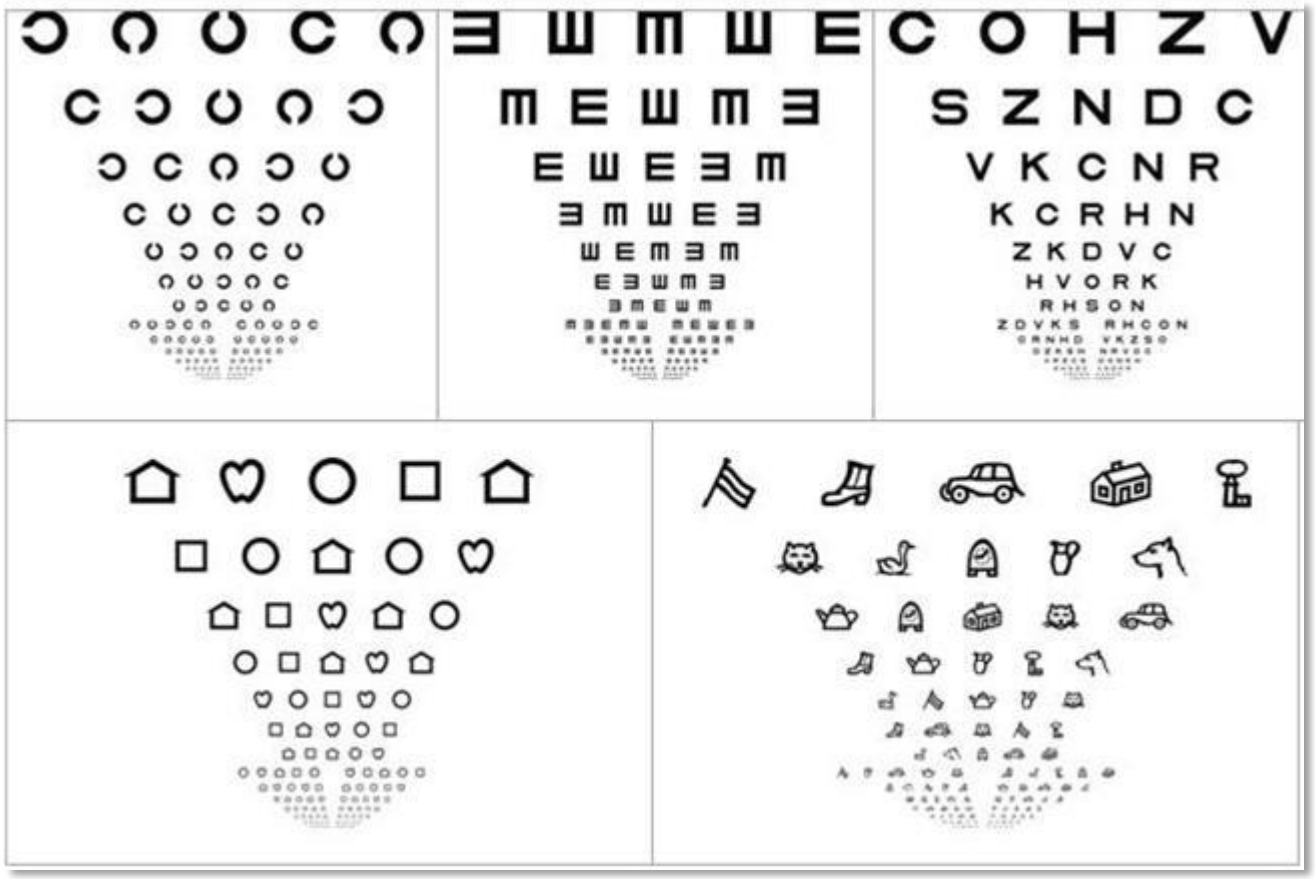
- Named after study of Ricka Ferrise „**E**arly **T**reatment of **D**iabetic **R**etinopathy **S**tudy“ (Developed for testing VA before and after retinal koagulation by diabetic retinopathy)

  <u>Logaritmic optotype chart log MAR</u>

- Are standard for clinical studies or clinical tests in ophthalmic devices or drugs
  - 14 lines with log.progression, the line always has the same number of symbol (5 symbols)
  - The hight of the flatter correspond with logaritmic progression and increases in the same step in 0,1 log MAR
  - same space between lines and symbols
  - examination distance was 4 m (modificate for 5 and 6 m)
  - each letter has a score value of **0.02** log units

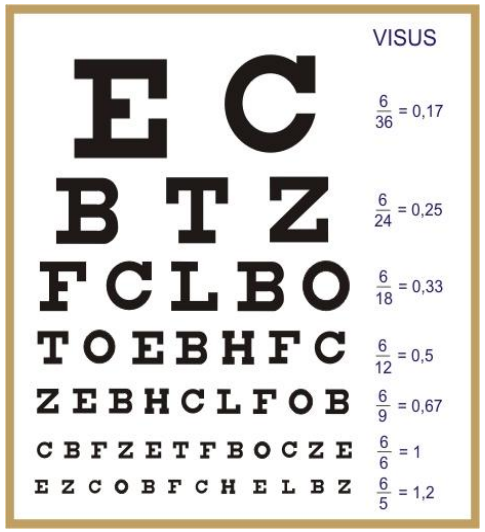
  (**M**inimal **A**ngle **R**esolution – MAR)

ETDRS optotypes



Visual acuity notations

- **Fraction**: V = d/D (V = 5/5, V = 6/6)
  - actual viewing distance (5 or 6 m)/ the number of the row (distance from which a normal eye can see the letter on the chart)
  - D…is the distance from which the thickness of the symbol line of read symbol appears at an angle of one minute (whole symbol - 5 ´)
- **Decimal notation:** use of decimal number (V=1)
- **Log MAR -** is widely used in scientific publications



Visual acuity scales

Visual acuity scales

Foot	Metre	Decimal	LogMAR
20/200	6/60	0.10	1.00
20/160	6/48	0.125	0.90
20/125	6/38	0.16	0.80
20/100	6/30	0.20	0.70
20/80	6/24	0.25	0.60
20/63	6/19	0.32	0.50
20/50	6/15	0.40	0.40
20/40	6/12	0.50	0.30
20/32	6/9.5	0.63	0.20
20/25	6/7.5	0.80	0.10
20/20	6/6	1.00	0.00
20/16	6/4.8	1.25	−0.10
20/12.5	6/3.8	1.60	−0.20
20/10	6/3	2.00	−0.30

- Snellen´s fraction is internationally recognized both in meters and feet.
- Zero LogMAR indicates standard vision, positive values indicates poor vision and negative values indicates good visions.